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The earliest appearance of domesticated plant species and their origins on the western fringes of the Eurasian Steppe

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ABSTRACT – *This paper presents the results of the first archaeobotanical investigation of Neolithic-Chalcolitich-period sites in eastern Ukraine and southwest Russia. The goal of this research is to understand the timeline of the earliest appearance and possible geographical origins of domesticated plants species in the region of study. The research conducted consists of the retrieval and study of macrobotanical remains and the analysis of plant impressions in pottery. Three possible corridors of influence upon agriculture in eastern Ukraine are postulated in this paper, originating from the Balkans, the Caucasus, and the Eurasian steppe.*

IZVLEČEK – *Članek predstavlja rezultate prve arheobotanične raziskave neolitskih in eneolitskih najdišč v vzhodni Ukrajini in jugozahodni Rusiji. Namen raziskave je razumeti časovnico pojavljanja prvih domesticiranih rastlin in njihov geografski izvor. Raziskava temelji na pridobivanju in analizi makrobotaničnih ostankov ter analizi odtisov rastlin v lončenini. V članku predstavljamo tri možne koridorje, po katerih so lahko prihajali vplivi zgodnjega poljedelstva, in sicer iz področja Balkana, Kavkaza in Evrazijske stepe.*

KEY WORDS – *Eurasian Steppe; domesticated plants; archaeobotany; Ukraine; Neolithic; Chalcolithic*

Introduction

Archaeological research into cereal cultivation during the Neolithic-Chalcolithic periods in Ukraine to date has been concentrated on the western regions of the country, especially investigations into the Cucuteni-Tripolye Culture. In contrast, the study of archaeobotanical remains in eastern Ukraine has been limited. The theory most often postulated for the earliest appearance and spread of cereal cultivation in western Ukraine states that this phenomenon is connected with the west to east movement of the Linearbandkeramik Culture (hereafter LBK) peoples and Tripolye farmer expansions during the second half of the 6th–5th millennia calBC (*e.g.*, *Chernysh 1962; Zvelebil 1989; Zvelebil, Dolukhanov 1991; Anthony 1995; Zvelebil, Lillie 2000; Dolukhanov, Shilik 2007; Dolukhanov 2008*). It has been suggested that agricultural expansion into the central territories of Ukraine was undertaken by farmer groups from the Cucuteni-Tripolye Culture, who followed the forest-steppe belt to the Dnieper River no earlier than the first half of the 5th millennium calBC (*cf. Dolukhanov 1986; Anthony 1994; Whittle 1996; Sanzharov* et al. *2000; Zvelebil, Lillie 2000; Pashkevich 2003; Telegin* et al. *2003; Davison* et al. *2006*). According to Telegin (*1968*), the contacts between the Dnieper-Donets forager cultures and the Tripolye farmer populations are marked by the appearance of Tripolye pottery imports, the occurrence of cereal impressions in pottery, and some domesticated animal remains (*Telegin 1968*). The further eastward spread of cereal cultivation to the other half of Ukraine (eastwards from the Dnieper River) as well as to the south-east did not occur until the 4500–3000 BP (*e.g.*, *Velichko* et al. *2009.7*).

Some researchers, however, have envisaged crop cultivation and the formation of domestic animal husbandries in Ukraine arriving from the opposite

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direction – the Caucaso-Caspian corridor (*Shnirelman 1989; 1992; Jacobs 1993; 1994; Kotova 2003; Levkovskaya* et al. *2003; Kotova, Makhortykh 2009*). Based on human dental studies from the Dnieper Rapids, Ukraine Jacobs (*1993; 1994*) for example, suggested the possibility of an independent and pre-Danubian route of cereal cultivation in central Ukraine, arriving via the corridor between the Black and Caspian Seas. Some Ukrainian archaeologists, such as Nadezdha Kotova, have envisaged a very early Neolithic agriculture in south-eastern Ukraine (starting from end of the 7th millennium calBC) (*Kotova 2003*). Kotova based her arguments on Pottery Neolithic sites in the northern Azov Sea region and Lower Don River, where domesticated animal bones, reaping knives, pestles, horn mattocks, grinding stones and cereal pollen have been reported (*Belanovskaya 1995*). The available pollen evidence includes '20 large grass pollen grains', presumed to be of cereal type, from the Neolithic level (attributed to 6350 calBC) at the Matveev Kurgan–I site on the northwest coast of the Azov Sea (*Krizhevskaya 1992*). Kotova and Tuboltsev (*1992*) reported the presence of domestic sheep at the Semenovka site (beginning of the 6th millennium calBC) located on the northern coast of the Sea of Azov. However, no macrobotanical work has been done in this region. To date, only one hulled barley impression in pottery from eastern Ukraine has been reported from the Serebryanskoe site located on the Donets River (*Pashkevich 2003*). A pottery shard with mollusc temper from the archaeological layer was radiocarbon dated to the 5th millennium calBC (*Sanzharov* et al. *2000*). However, it is not clear if the pottery with cereal impressions can be attributed to the dated layer. This is the only macrobotanical evidence from the Neolithic of eastern Ukraine and southwestern Russia available to date.

An alternative Eurasian steppe belt route for early agricultural dispersal was suggested by Jones (*2004*), proposing the arrival of the broomcorn millet crop (*Panicum miliaceum*) in Neolithic Ukraine from the Eurasian steppe. Broomcorn millet has been identified at several Neolithic sites which lie far to the north from the standard Anatolian east-west crop movement range (*Jones 2004*). Broomcorn millet is not known to have been cultivated in the Fertile Crescent prior to the 1st millennium calBC (*Nesbitt, Summers 1988*). Therefore, the geographical origin of broomcorn millet may thus be presumed to lie elsewhere. The earliest known carbonised broomcorn millet remains are from central China, dated to around 8000 years calBC (*Lu et* al. *2009*). Later dates show broomcorn millet cultivation at the end of the 7th/first half of the 6th millennia calBC in northern China (*Cohen 2002; Zhao 2005; Crawford 2006; Liu* et al. *2012*). Fuller (*2006*) claims that China is without a doubt the place where millet was domesticated. So far, the earliest broomcorn millet record from the territory between China and the Urals is relatively late, coming from the Chalcolithic Sokolniki site (3200–2500 calBC) in the southern Tumen region in western Siberia (*Shnirelman 1992*). However, not much known about the nature of the find.

The broomcorn millet crop has been reported from Neolithic cultural sites in various parts of Europe, including the LBK, Vinča, Körös, Criş, Bug-Dniestr, Volyn, Kiev-Cherkasy, Donetsk, Proto Sesklo/Sesklo, and Tripolye cultures (*Hopf 1962; Kroll 1981; Comşa 1996; Larina 1999; Pashkevich 2003; Kreuz* et al. *2005; Greenfield, Jongsma 2008; Hunt* et al. *2008*). Moving from east to west along the Asian steppe corridor, broomcorn millet was probably the first crop to cross Ukrainian territory. However, during the period under consideration (pre-5000 calBC), macro-remains of broomcorn millet in Europe from Neolithic sites are very rare and rather uncertain in nature (*Hunt* et al. *2008*).

In order to understand the earliest appearance of domesticated crops in eastern Ukraine and to test the existing theories of their origins, the author conducted archaeobotanical investigations of both cereal impressions in pottery and macrobotanical remains recovered from Neolithic-Chalcolithic period sites in eastern Ukraine and south-western Russia.

Background information about the sites under investigation

Archaeobotanical investigations were conducted at 5 principle sites. Analyses of macro-plant remains were conducted at three of the five sites: Starobelsk–I, Novoselovka–III and Razdorskoe–II. The two additional sites of Rakushechny Yar and Zanovskaya were analyzed using pottery impressions only. To augment the study, an analysis of pottery for cereal impressions was conducted using samples from 12 additional secondary sites. All primary and secondary sites are located in the Don and Donets River basins in southwest Russia and east Ukraine (Fig. 1).

Razdorskoe–II site

The Razdorskoe–II site is a well-known multi-stratified site in the steppe region of southwest Russia

(47°32'12.71 N; 40°38'49.28" E). The site is situated on the right bank of the Don River on a 4–8m high terrace, a few kilometres downstream from the Razdorskoe–I and Rakushechny Yar settlements. The cultural layers of the Razdorskoe–II site are overlain by sterile layers of aeolian, colluvial and alluvial sediments 1m in depth. These sediments sealed the archaeological horizon, creating an anoxic calcareous environment which allowed for good preservation of bone material. The stratigraphy of the site consists of 12 cultural horizons. The anthropogenic horizons consist of thick accumulations of molluscs (mostly *Unio* and *Viviparus* spp.), animal bones and lithics. Black lenses in the stratigraphy consist of the charcoal and ash by-products of burning. Between the anthropogenic horizons, sterile layers of peaty humus, aeolian and alluvial silt are present (*Tsybrii 2008*). Nine radiocarbon dates from the early Neolithic layers of the Razdorskoe–II site have been reported (*Aleksandrovsky* et al. *2009*) (Tab. 1). A total of 144 litres of sediments were collected for flotation from two hearths and a mollusc midden at depths of 195–205cm and 200–210cm dated to the early Neolithic period.

Rakushechny Yar site

Rakushechnyi Yar is one of the best-known archaeological monuments in southwest Russia from the Neolithic period, giving the name to the Rakushechny Yar culture (*Belanovskaya 1995*). The Rakushechy Yar settlement is located in the Rostov region, approximately 100km upstream from the present-day city of Rostov (*Aleksandrovsky* et al. *2009*) in the steppe zone of southwest Russia (47°33' N; E 40°40'). The site is situated on an island in the River Don, almost opposite the Razdorskoe–I site and a few kilometres downstream from the Razdorskoe–II site.

23 cultural layers have been identified at the Rakushechnyi Yar site (*Belanovskaya 1995*), consisting of mollusc middens, ash, charcoal, and peaty deposits with alluvial sand clusters, all of which are distributed through a 6m thick stratigraphy (*Aleksandrovsky* et al. *2009*). Tatyana Belanovskaya (*1995*) reports the presence of soil digging tools and grinding stones found in layers 3–5, and 7. Domestic sheep bones have been reported from the 21st layer onwards, while the presence of domestic cattle has been reported from layer 20 onwards (*Belanovskaya 1995*). Pollen analysis of the site has not identified any pollen attributed to domesticated grasses, allowing Belanovskaya (*1995.152*) to state that "*there is not enough evidence to suggest the presence of cereal cultivation by the inhabitants of the site*".

Layers 23–5 belong to the Neolithic period, with pottery making technology appearing already in the 23rd layer; layers 4–2 are attributed to the Chalcolithic and the top layer belongs to the Bronze Age (*Belanovskaya 1995*). Layer 20, the lowest dated Early Neolithic layer, contains three radiocarbon dates (Tab. 1) (*Timofeev* et al. *2004*). Layers 15–14 indicate the start of the Middle Neolithic period (*Tsybrii 2008; Timofeev* et al. *2004; Telegin* et al. *2003*). Layer 5, the top Late Neolithic layer, has three ^{14}C dates (*Belanovskaya 1995.28; Timofeev* et al. *2004; Aleksandrovsky* et al. *2009*). It can be noted that Dmitry Telegin *et al.* (*2003*) attributed layer 4

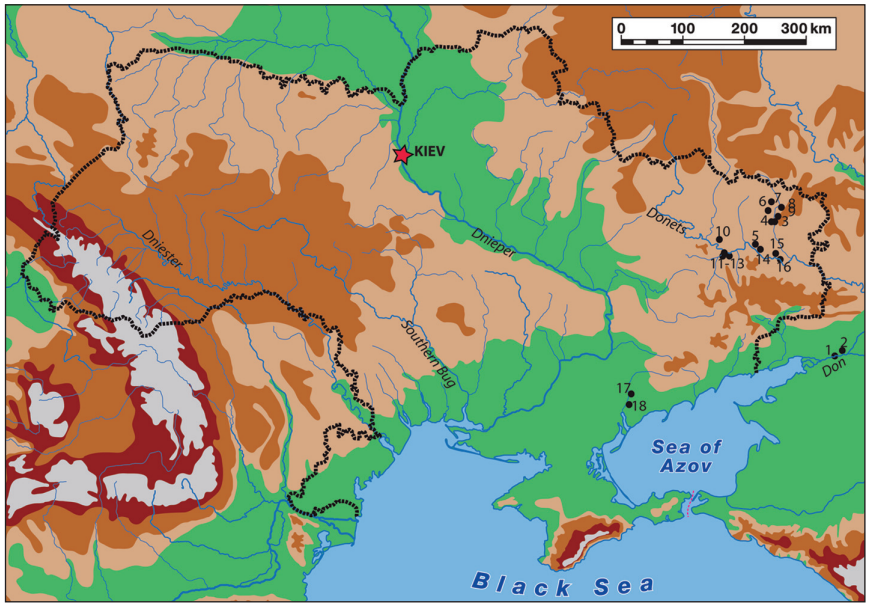

Fig. 1. A map of Ukraine and sites discussed in the text. See legend. 1 Razdorskoe–I; 2 Rakushechny Yar; 3 Starobelsk–I; 4 Novoselovka–III; 5 Zanovskoe; 6 Podgorovka–I; 7 Podgorovka–V; 8 Starobelsk–II; 9 Starobelsk–III; 10 Kleshnya–II; 11 Zelena-Gornitsya–I; 12 Zelena-Gornitsya-V; 13 Zelena-Gornitsya–IV; 14 Tuba–II; 15 Olkhovaya–V; 16 Orekho-Donetskoe–III; 17 Kamenaya Mogila; 18 Semenovka.

Site's name	Dated material	Laboratory number	^{14}C age bp	95.4% ^{14}C age calBC at 2 s.d.	References
Razdorskoe–II	Charcoal	Le–6873	7640±120	6770–6232	*Tsybrii 2008.92*
	Charcoal	Le–6950	7450±100	6467–6087	*Timofeev et al. 2004.77*
	Animal bones	Le–6952	7930±50	7035–6661	
	Charcoal	Ki–15178	8210±80	7460–7059	
	Molluscs from pottery	Ua–37000	8145±110 (AMS)	7480–6776	*Aleksandrovsky et at. 2009.97*
	Charcoal	Le–8428b	8130±100	7454–6775	
	Charcoal	Le–8428a	7920±110	7980–6507	
	Charcoal	Ki–15179	7840±80	7029–6503	
	Charcoal	Ki–15777	7490±60	6637–6446	
Rakushechny Yar site					
Layer 2	Sediments with charcoals	Le–5327	5290±260	4716–3536	*Tsybrii 2008.91*
	Charcoal	Le–5343	6300±300	5787–4546	*Timofeev et al. 2004.76*
	Charcoal	Le–5387	4830±90	3797–3372	
Layer 3	Charcoal	Bln–704	4360±100	3357–2702	*Timofeev et al. 2004.75*
Layer 4	Animal bone	Le–5340	5060±230	4361–3365	*Timofeev et al. 2004.76*
		Ki–3545	5150±70	4227–3774	*Telegin et al. 2003.460*
		Le–5482	6300±90	5471–5056	*Tsybrii 2008.91*
		Ki–15190	7020±80	6026–5736	
Layer 5	Molluscs	Ki–955	5890±105	5020–4501	*Timofeev et al. 2004.76*
		Le–5582a	6440± 35	5479–5341	*Tsybrii 2008.91*
		Le–5582b	6320± 40	5461–5214	*Telegin et al. 2003.460*
Layer 8	Charcoal	Bln–704	6070±100	5286–4727	*Tsybrii 2008.91*
Layer 9	Turtle bone	Le–5344	7180±250	6564–5622	*Manko 2003.15*
Layer 10–11	Pottery	Ki–11091	6955±160	6206–5563	*Manko 2003.16*
		Ki–11096	6810±140	5983–5490	
Layer 11	Pottery	Ki–11095	6850±160	6022–5486	*Timofeev et al. 2004.76*
Layer 12	Pottery	Ki–11090	7090±110	6211–5741	*Manko 2003.16*
		Ki–15189	7580±90	6598–6244	
Layer 13	Pottery	Ki–11093	7205±150	6395–5789	*Aleksandrovsky et at. 2009.97;*
		Ki–11094	7130±150	6355–5721	*Manko 2003.16*
		Ki–15186	7690±90	6748–6382	
		Ki–15187	6750±110	5876–5482	
		Ki–15188	6760±90	5841–5514	
Layer 14–15	Burned organic material on the internal walls of pottery vessel	Ki–6479	6925±110	6006–5636	*Timofeev et al. 2004.76; Telegin et al. 2003.460*
Layer 15	Burned organic material	Ki–6478	6930±100	5999–5646	*Timofeev et al. 2004.76;*
	on the internal walls	Ki–6480	7040±100	6085–5720	*Telegin et al. 2003.460;*
	of pottery vessel				*Aleksandrovsky et at. 2009.97*
Layer 20	Burned organic material	Ki–6475	7690±110	6901–6260	*Timofeev et al. 2004.76*
	on the internal walls	Ki–6477	7860±130	7062–6466	
	of pottery vessel	Ki–6476	7930±140	7246–6472	
Starobelsk–I	Pottery shards	Ki–9437	6800±120	5976–5512	*Manko, Telizhenko 2002.3*
	with mollusc temper	Ki–9438	6570±120	5712–5318	
		Ki–8290	6700±200	6014–5234	
	Wood charcoal	Ki–15034	6810±100	5967–5541	primary date
Novoselovka I&II	Pottery shards	Ki–9241	5970± 180	5300–4464	*Manko, Telizhenko 2002.4*
		Ki–9242	5830± 190	5304–4464	
		Ki–9243	6120± 150	5464–4707	
		Ki–9244	6055± 160	5342–4584	
Zanovskoe	Animal bones	Ki–8257	5460± 90	4462–4050	
		Ki–8258	5420± 80	4446–4046	
		Ki–9245	4910±80	3943–3525	*Manko, Telizhenko 2002.4*
Zelena Gornitsya–I	Pottery	Ki–9436	6700±130	5882–5380	*Manko 2003.15*
Zelena Gornitsya–V	Pottery	Ki–9435	6510 ±120	5661–5225	*Manko 2003.15*
Zelena Gornitsya–VI	Pottery	Ki–9434	6455 ±120	5639–5082	*Manko 2003.15*
Podgorovka–I	Pottery	Ki–9439	6050±90	5214–4729	*Manko, Telizhenko 2002.4*
Tuba–II	Bone	Ki–8253	6220±90	5459–4938	*Manko, Telizhenko 2002.4*
	Bone	Ki–8254	6270±90	5468–5011	
	Bone	Ki–8255	6095±90	5293–4792	
	Bone	Ki–8259	6360±90	5488–5073	
	Bone	Ki–8260	6070±90	5221–4746	
	Bone	Ki–8262	6215±80	5354–4958	
	Pottery	Ki–10389	6260±150	5508–4842	
	Slag	Ki–10388	6170±180	5482–4707	
	Slag	Ki–10390	6290±180	5612–4809	

Tab. 1. The collation of ^{14}C dates from the sites mentioned in the text. All radiocarbon dates were calibrated using the calibration program OxCal 4.1.5, at 95.4 % after (*Bronk Ramsey 2009; Reimer *et al.* 2009*).

to the Late Neolithic period, while most researchers tend to follow Belanoskaya's classification, which attributes this layer to the Chalcolithic. Layer 4 has four radiocarbon dates (*Aleksandrovsky* et al. *2009; Tsybrii 2008; Manko 2006; Telegin* et al. *2003*) (Tab. 1). Of the four dates from the upper Chalcolithic layers No. 2 and No. 3, most fall within the 5th–4th millennia calBC (Tab. 1).

The author conducted an archaeobotanical investigation of the site by analysing pottery for cereal impressions. In total, over 1000 pottery shards were analysed from the Rakushechny Yar site from layers 23–13 and 5–2.

Starobelsk–I site

The Starobelsk–I site is located in the steppe zone of the easternmost region of Ukraine, on the western edge of Starobelsk city (N 49°17'52.3, E 38°50'58.6). The site is situated on the left bank of the Aidar River, about 70–80m from the riverbank. Across the river from the Starobelsk–I settlement lies a steep chalk cliff. The Starobelsk–I site is located about 7km south of the Novoselovka–III site. The main part of the Starobelsk–I site is situated on a small elevation of the second Aidar River terrace, which consists of a narrow strip of raised land overgrown by trees. Part of the Starobelsk–I settlement is situated in an intensively ploughed area; therefore, the cultural layer at the site varies significantly in depth. The stratigraphy of the settlement consists of four clearly distinguishable lithological horizons. Parts of the cultural layer were constituted by anthropogenic mollusc clusters, consisting of *Unio* sp. and *Viviparus* sp. All the mollusc clusters were accumulated on the edge of the settlement, on the fringe of the third horizon.

The Starobelsk–I site contains one of the earliest examples of pottery in eastern Ukraine (*Manko 2003*). It has also been reported that the site contains domestic animal bones belonging to cattle, pig, dog, horse and sheep/goat (*Gurin 1998*). Judging from lithics, Gurin also inferred that the inhabitants of Starobelsk–I settlement used sickles for harvesting and processing domesticated cereals.

The excavation of the Starobelsk–I site was conducted in the summer of 2007 by the author and Sergiy Telizhenko, during which 50m^2 were investigated and 1704 litres of sediments from 12 fireplaces floated for the purpose of archaeobotanical investigation.

The chronology of the Starobelsk–I site was previously established through ^{14}C dating of pottery with a mollusc temper (*Manko, Telizhenko 2002*). One conventional and two AMS radiocarbon dates received from the site attributed it to the beginning of the 6th millennium calBC (Tab. 2). The AMS radiocarbon dates were conducted on a tree-branch charcoal and a *Sus scrofa* bone, which were found in the fireplace together with fragments of the one of the oldest potteries in Ukraine (Tab. 2).

Novoselovka–III site

The Novoselovka site is located about 6km south of the Starobelsk settlement on the second terrace of the River Aidar (N 49°17'09.79; E 38°49'41.69). The site is situated in an open field, which is presently ploughed and irrigated, within a large loop of the Aidar; a few kilometres to the west and northwest, steep chalk cliffs surround the site valley. The total area of the settlement is not known. However, mollusc clusters ('mollusc middens' or 'kitchen middens'), representing a disturbed cultural layer, are distributed throughout the field over a few hectares. During the period of site's occupation, the entire territory was an island in the Aidar (*Gurin 1998*). The recovered bone remains and pottery at Novoselovka–III were mostly concentrated within the mollusc midden horizon, indicating that the basic environment (high pH) created by the mollusc remains allowed for the preservation of some artefacts.

The Late Neolithic period of the second half of the 6th millennium calBC at the Novoselovka–III site was determined from one AMS radiocarbon date. During

Site's name	Dated material	Laboratory number	δ^{13}C	^{14}C age bp	95.4% ^{14}C age calBC at 2 s.d.
Starobelsk STAR–3B	Bos Taurus	OxA–22278	–20.40	6950±39	5971–5736
Starobelsk STAR–3C	Wood charcoal	OxA–22279	–24.36	6954±35	5970–5740
Starobelsk	Wood charcoal	Ki–15034	–	6810±100	5967–5541
Novoselovka–III NOV–7B	*Sus scrofa*	OxA–22281	–18.13	6297±34	5342–5213
Semenovka	*Ovis aries/Saiga tatarica*	BA–071462	–	6595±40	5617–5482

Tab. 2. AMS ^{14}C radiocarbon dates from the Starobelsk, Novoselovka and Semenovka sites.

the summer of 2008, 1060 litres of sediments were floated for the purposes of archaeobotanical sample collection.

Zanovskoe site

The Zanovskoe site is situated in the steppe zone of eastern Ukraine in the Lugansk district, near the village of Orovskoe (or Barovskoe) (48°48'28.77" N – 38°37'27.78" E). The Zanovskoe site is situated on a periodically inundated flood plain on the left bank of the Donets, and surrounded by two oxbow lakes, Zanovskoe and Matkino. Excavations revealed Chalcolithic pottery shards and flint tools (*Telizhenko, Motuzaite Matuzeviciute 2007*), and a range of domesticated animal species, including cattle, sheep, goat, pigs, horses and dogs (*Zhuravlov, Telizhenko 2008*). The site is chronologically younger than the Starobelsk–I and Novoselovka–III sites. Three existing ^{14}C dates from the Zanovskoe site were received from the Kiev Radiocarbon Laboratory from animal bones and pottery (Tab. 1) (*Manko, Telizhenko 2002; Manko 2006*). The dates attribute this site to the Chalcolithic period Sredny-Stog culture, dated by Telegin *et al.* (*2003*) to 4400–3500 calBC. No flotation was conducted from the Chalcolithic period layers; only pottery shards were analysed for cereal impressions.

Methods

Samples of macrobotanical remains were collected from a variety of archaeological features and phases encountered at the archaeological sites: fireplaces, pits, house floors, and waste dump places such as mollusc middens. The collection of sediment samples and the procedure for manual flotation followed the descriptions in Deborah Pearsall (*2000*). Soil samples from each archaeological feature were collected in bags, according to the stratigraphy within each feature. The quantity of sediments taken for each sample and from each feature was then recorded. A standard 12l size bucket was used in order to keep track of the sample volume taken from the feature. Water for flotation was obtained from whatever nearby water source was available, such as oxbow lakes, rivers and springs. A 300μm mesh size was used for flotation to ensure the full recovery of plant seeds. Once the botanical material was retrieved from the sediment, each mesh containing the float was collected, labelled, and dried in a location away from direct sunlight. The sorting and identification of archaeobotanical material took place at the University of Cambridge in the George Pitt-Rivers Laboratory for Bioarchaeology. Each flotation sample was sorted individually by selecting, counting and identifying all charred seeds within the sample.

The procedure used for initial analysis of cereal impressions in pottery from shard collections involved a careful visual review of each pottery shard from both sides, specifically concentrating on evaluations of the pottery's clay temper and noting any full or partial plant part or seed/grain impression through the use of a magnifying glass.

The criteria applied for the identification of plant impressions are as follows. For a satisfactory identification to species, a cereal impression had to contain not only a distinctly impressed seed or grain shape, but also other features such as an impression of the lemma/palea pattern, grain/scutellum, or the ventral furrow with hilum. Usually, cereal impressions were identified to species if chaff components were found; chaff characteristics can be more species-specific than grain impressions, especially the glume bases of *Triticum spelta* or spikelets or rachis segments of *Hordeum vulgare*, *etc*. Cereal impressions found to fit the identification criteria to genus or species levels were usually recorded as *cf*. Plant impressions that did not fully fit the identification criteria were not recorded at all. Access to pottery shard collections was obtained at the Lugansk History Museum in Ukraine and at the State Hermitage Museum of Saint Petersburg, Russia.

AMS ^{14}C dates were provided by Malcolm Lillie (Hull University, UK) via a NERC ORADS grant at the Oxford Radiocarbon Accelerator Unit (OxA) and by Zhou Li-Ping from the Accelerator Mass Spectrometer Unit in Peking University, Beijing. Conventional radiocarbon dates were received from the Kiev Radiocarbon Laboratory (Ukraine). All radiocarbon dates were calibrated using the calibration program OxCal 4.1.5, at 95.4% after (*Bronk Ramsey 2009; Reimer* et al. *2009*)

Archaeobotanical results

Razdorskoe–II site

The flotation samples contained a large quantity of charcoals and constituted mostly of woody plant species. As can be seen in Table 3, the samples contained a very low quantity of charred plant seeds. Only fractions of *Chenopodium* cf. *album* (fat-hen), *Hedera helix* (common ivy), *Persicaria* sp. (knotweeds), *Thlaspi* cf. *arvense* (field penny-cress) plants and one un-identified seed were found in samples

1 and 12, from fireplace No. 1 at a depth of 195–205cm.

Some small pieces of charred starchy parenchyma were also found in samples 2, 3, 7, 8, 9, 12, and a few culm-nodes of grass stems were identified in samples 8, 10, 12 from fireplaces No. 1 and No. 2. The rest of the charcoals originated from tree trunks and branches.

The flotation samples also contained a large amount of charred and un-charred bone remains, consisting of mostly fish and various microfauna. The amounts of fish scales, bones, teeth and vertebra parts were sometimes more numerous than the wood charcoal, such as in fireplace No. 1, sample No. 9. The preservation of charcoals at the site is quite good and the very low incidence of plant seeds cannot be explained only by the site's taphonomic processes; rather, this is an indicator of the population's passive plant gathering and activities directed towards the exploitation of fresh water resources.

Rakushechny Yar site

Pottery samples from the Rakushechny Yar site were analysed for cereal impressions at the Hermitage State Museum in Saint Petersburg, Russia. Over 1000 pieces of pottery from settlement layers 2–5 and 13–22 were analysed (Tab. 4). The analysis of pottery from the stratigraphic sequence revealed not only changes in pottery-making technology over time – including change in vessel styles, clay temper and the complexity of ornamentation – but also revealed the first evidence of cultivated cereals in the region.

Starting from the uppermost layers, layer No. 2 contains clay vessels with a mollusc, grass and cereal chaff temper. Only the pottery shards with a cereal chaff and crushed mollusc temper contained glume impressions of mostly *Triticum* spp., (wheat) crops. One shard containing a seed impression probably attributable to cf. *Linum usitatissimum* (flax) (4.8mm long and 2.2mm wide)

Sample number		<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>	<9>	<10>	<11>	<12>
Feature		1	1	1	1	1	1	2	3	1	2	1	1
Feature type		hearth	hearth	hearth	hearth	hearth	hearth	hearth	mollusc midden	hearth	hearth	hearth	hearth
Contex/squire		V-1	V-3	V-1	V-1	V-1	V-2	B-1	A-2	V-3	B-1	V-1	V-1
Depth (cm)		195-205	195-205	200-210	195-205	200-210	195-205	195-205	195-205	195-205	200-210	195-205	195-205
Chenopodium cf. *album*	Fat-hen												1
Hedera helix	Common Ivy	1											
Persicaria sp.	Knotweeds												1
Thlaspi cf. *arvense*	Field Penny-cress												1
Un-identified seeds													1
Parenchyma			2	3				1	1	1			9
Grass stems		+	+					++	+		+		+
Charcoal >4mm		++	++	++++	++++	++	++	++++	++	+++	+++	+	++
<4mm		+++	++	++++	++	+	++	++++	++	+++	+++	+	+++
Fish remains (bones, scales)		++		+++	+	++	+	++	++	+++	+	+	++
Micro fauna		+++		++	+	++		++	++	++		+	++
Molluscs		+	+	+	+	+		+	+	+	+		+
Beadles				+	+			+					+

Tab. 3. Plant macro-remains and micro-faunal remains from the Razdorskoe-II settlement, southwest Russia, collected February 2007 using a 300 µm sieve. Each sample constitutes 12 litres of sediment. Key: + <10 items; ++<20 items; +++ <100 items; >1000 items +++.

(Fig. 2) was found in the pottery with a mollusc temper. In the same shard, the charred glume base of *Triticum spelta* (spelt wheat) (7.5mm long and 3.7mm wide) was found preserved in the inner wall. This impression contains clear characteristics of spelt wheat glume dorsal veins (Fig. 2).

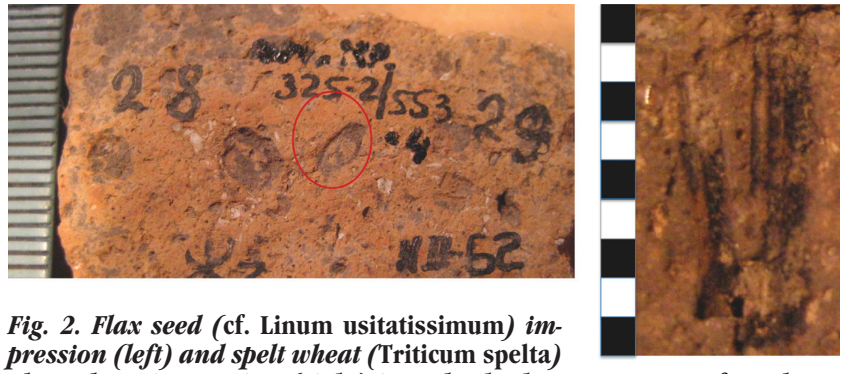

Fig. 2. Flax seed (*cf. Linum usitatissimum*) impression (left) and spelt wheat (*Triticum spelta*) glume base impression (right) in Rakushechny Yar pottery from layer No. 2.

Finally, impressions of what appeared to be *Vicia* sp. genus were noted. However, the impressions were not very clear, and therefore kernel components such as hilum or radicle were difficult to identify with confidence. The second layer has three radiocarbon dates ranging over the period 5787–3372 calBC (*Timofeev* et al. *2004*). As can be seen, the date range of layer 2 is very broad. Such a broad time range from the same archaeological horizon might be the result of dating bioturbated material (thereby including material from the upper layers), dating charcoal, the dates from which may be biased by the 'old wood effect'. Surely, such a wide date range is too wide to gain the most accurate insight into the introduction of agriculture in the region. Nevertheless, cereal impressions in pottery and the radiocarbon dates presented above are so far the only information available to the author.

In layer No 3, both heavy, thick-walled vessels with a mollusc-organic temper and porous, light vessels with a cereal chaff temper were found. The second type of pottery contained glume impressions of wheat (*Triticum* spp.) (Fig. 3). In this pottery, impressions of cereal parts and imprints of wild plants and seeds were noted. This cereal chaff temper-type of pottery from Rakushechny Yar is similar to that of the Tripolye culture, where cereal-processing waste was commonly used as a clay temper for pottery and daub production (*Pashkevich, Videiko 2006*). Pottery with a cereal chaff temper dated to the second half of the 5th millennium calBC was also found at the Zanovskoe site, where impressions of hulled and naked barley were detected (see below). One radiocarbon date exists from the 3rd layer of Rakushechny Yar, falling between 3357–2702 calBC (*Tsybrii 2005*); that this date is younger than the layer above shows the great need to re-date the stratigraphical sequence of the site.

In layer No. 4, cereal impressions were found in two types of pottery: a light and porous pottery with a chaff temper (as above), and pottery with a vegetative matter (grass) and sand-rich temper. Most of the cereal impressions were found in pottery shards with the cereal chaff temper. The vessels with the cereal chaff temper are very light and porous, containing fragments of cereal glumes which burned away during the vessel firing process, but had their shapes preserved within the pottery walls. In this

Cultural layer of Rakushechny Yar	Identified domestic cereal impressions
Layer 2	*Triticum* spp. (Wheat glumes), *cf. Linum usitatissimum* (Flax seed), *Triticum spelta* (The glume base of Spelt Wheat)
Layer 3	*Triticum* spp. (glumes)
Layer 4	*cf. Hordeum vulgare* (grain of Hulled Barley), *Triticum* spp. (Wheat chaff), *cf. Panicum miliaceum* (one seed of Broomcorn Millet), *Tritucum cf. aestivum* (one grain of probably naked wheat)
Layer 5	*Thalictrum cf. minus* (Lesser Meadow- rue)
Layer 13	No impression
Layer 14–15	No impression
Layer 15	No impression
Layer 20	Wild plant seed and stem
Layer 23	No impression

Tab. 4. Archaeobotanical analysis results from the Rakushechny Yar site, layers: 2–5, 13–20.

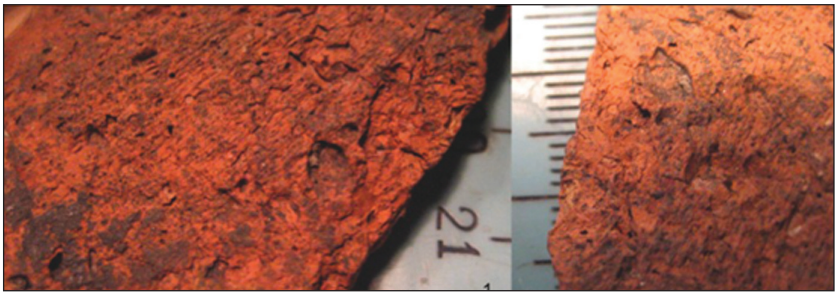

Fig. 3. Pottery shard with cereal chaff (*Triticum *spp.) temper from layer No. 4 of Rakushechny Yar.

type of pottery, the imprints of hulled barley (*cf. Hordeum vulgare*) (4.4mm long and 3.2mm breadth) (Fig. 4), *Triticum* spp. chaff and probably one broomcorn millet seed (*cf. Panicum miliaceum*) (2.8mm long, 1.9mm breadth) were identified. The broomcorn millet impression contained a seed with glumes and preserved parts of the charred grain. The distinct pattern of the lemma and palaea was still present on the pottery shards, which allowed the imprinting seed to be identified to the species level as broomcorn millet. Only one impression of wheat (*Tritucum cf. aestivum*) (3.8mm long and 2.48mm wide) was found in the pottery type with a mollusc and grass temper (Fig. 4). Four radiocarbon dates were obtained from layer No. 4, ranging from 6026–3365 calBC (*Aleksandrovsky* et al. *2009; Telegin* et al. *2003; Timofeev* et al. *2004*).

In layer No. 5, the pottery styles change to a type consisting of only heavy, thick-walled vessels with a grass, sand and mollusc temper. No shards with a cereal chaff temper were found in this layer. Wild plant seed impressions were found only from shards with the grass-rich clay temper. In this type of pottery, only one impression of a seed of *Thalictrum* cf. *minus* (lesser meadow rue) (4.6mm long and 2.4mm wide) was identified (Fig. 4). Layer 5 has three radiocarbon dates, ranging from 5479–4501 calBC (*Telegin* et al. *2003; Timofeev* et al. *2004*).

Pottery recovered from lower layers did not exhibit much contact with plants, and only a few impressions of wild plant parts and seeds were noted. Owning to the absence of a plant reference collection in the museum archives of Saint Petersburg, these plant species were not identified. Most pottery vessels in layers 8–20 were very robust and heavy, made of clay or river-marl, with a sand, river silt and mollusc temper, and fired at a low temperature. Most of the dates from these layers fall into the period of the 7th millennium calBC (*e.g.*, *Telegin* et al. *2003*).

Starobelsk–I site

The macrobotanical remains recovered from flotation samples consist of wood charcoal and land snails. The abundance of modern rootlets in the samples strongly correlates with the amount of modern contaminate seeds of *Chenopodium* sp. in the flotation samples. Both modern rootlets and *Chenopodium* sp. seeds were found in areas where the cultural layer was at its shallowest. Among the charred plant seeds discovered, only a few seeds of *Silene* sp. (campions) genus plants were identified in fireplace No. 5. Two seeds of *Galium aparine* (cleaver) were found in fireplace No. 10. In the same fireplace, one seed of *Stellaria* sp. (stitchwort) was identified (Tabs. 5–6). The small quantity of plant seeds found at the site limits any contribution to a wider discussion of human and plant interaction, or the past ecology at the site.

It is important to note a few taphonomic aspects of the Starobelsk site. Firstly, the fireplace structures were constructed directly on the ground surface, with no deepened fire-pit structure. Such a form of fireplace construction might indicate that the fires were burning in an oxygen-rich environment capable of turning any plant remains into ashes, and therefore leaving very little plant material remaining for later recovery. Furthermore, the high abundance of terrestrial molluscs, which is greater than the amount of charcoal found in the samples by many orders of magnitude, indicates that after abandonment, the fireplaces stood exposed on the ground

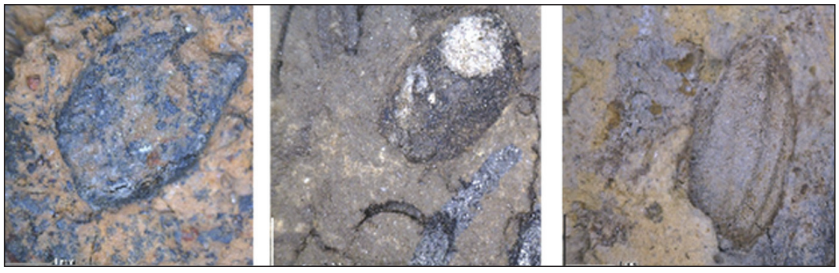

Fig. 4. Pottery shard impressions from Rakushechny Yar:* cf. Hordeum vulgare *grain (left) and* Triticum cf. aestivum *grain (middle) from layer No. 4;* Thalictrum cf. minus *seed from layer No. 5 (right).

surface for a long time, before being deposited by aeolian or alluvial sediments. Their long exposure prior to deposition could also have affected the preservation of charred plant remains at the site. Moreover, experimental work on charcoal preservation in alkaline environments has demonstrated both higher fractionation and degraded preservation quality of deposited material (*Braadbaart* et al. *2009*).

Novoselovka–III site

During the archaeological excavation of the Novoselovka–III site, a mollusc midden zone and one fireplace were used to obtain samples for archaeobotanical investigation. Most of the flotation samples taken for archaeobotanical data collection were from the mollusc midden feature, which was selectively sampled in places with a concentration of charcoal, burned bone and burned flint pieces. Additionally, the entire content of the fireplace was sampled. In total, 1060 litres of sediments were floated from Novoselovka–III. After sorting the archaeobotanical samples from all the floated sediments, a very small quantity of 16 charred plant seeds were recovered (Tab. 7).

The only plant species identified from the charred seeds were *Galium cf. aparine* (cleaver), *Galium* sp. (bedstraws) and *Chenopodium cf. hybridum/ficifolium* (maple/fig-leaved goosefoot), *Brassica* sp. (cabbage family) and *Juncus* sp. (rush family), *Echinochloa/Setaria* genus (cockspur/bristle-grasses), *Matricaria cf. chamomilla* (scented mayweed), *Stachys* sp. (woundworts), *Sambucus* sp. (elders), *Setaria cf. pumila* (yellow bristle-grass) (Tab. 7). Some plants of this genus are native to Europe (*Tutin* et al. *1996*) and grow in meadows, open fields, roadsides and as a weed (*Hanf 1983; Luneva 2011*).

Analysis of pottery impressions from Neolithic settlements in eastern Ukraine

15 Neolithic and Chalcolithic sites in Ukraine were analysed for the presence of cereal impressions in their pottery remains (see the site location map in Fig. 1). Some pottery shards were accessed at the Lugansk History Museum storage centre, while others were analysed during periods of archaeological excavation (Tab. 8). Pottery shards were investigated from the following sites: Orekhovo-Donetskoe–III, Starobelsk–I, II and III, Olkhovaya–V, Zelena-Gornitsya–I, V and IV, Kleshnya–II, Podgorovka–I and V, Novoselovka–I and III, Tuba–II and Zanovskoe. In total, approximately 4500 pottery shards were analysed.

Sample number	<1>	<2>	<3>	<6>	<7>	<8, 9, 10>	<11, 12, 13>	<14>	<15>	<4>	<5>	<16, 17>	<18>	<38>	<37>
Feature	1	1	1	1	1	1	1	1	1	2	3	4	4	12	10/11
Feature type	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace
Depth (cm)	45–50	45–50	50–55	45–50	50–55	50–55	55–60	34–45	35–45	65–80	65–80	55–60	60–70	70–80	65–70
Sample volume – litres	48	48	60	48	48	60	60	48	96	48	48	48	48	24	24
Date of sampling	09.07.'07	09.07.'07	09.07.'07	09.07.'07	10.07.'07	10.07.'07	11.07.'07	11.07.'07	12.07.'07	11.07.'07	11.07.'07	12.07.'07	12.07.'07	18.07.'07	19.07.'07
Chenopodium sp. (Goosefoots)	+++	+++	++	+++	++	++	++	+++	+++	+	+	++	++	++	++
Modern rootlets	+++	++	++	++	+++	+++	+++	+++	+++	++	++	++	++	+++	+++
Charcoal >4mm	+	+	++	++	++	+	+++	+	++	+++	++	++	+	+++	+++
2–4mm		+	++	++	+		+	+	++	+++	+	+++	+	+++	+++
<2mm	+		++	+	++	++	+	+	++	+++	+	+++	+	++	++
Bones of microfauna	+	+	+	+	+	+	++	++	+	++	+	+	+		
Molluscs: *Vallonia costata* and *V. pulchella*	++++	++++	+++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++

Tab. 5. Plant macro-remains from the Starobelsk-I site, eastern Ukraine. Sieve size – 300 µm. Key: + <10 items; ++<20 items; +++ <100 items; >1000 items +++.

Sample number	**<19>**	**<20>**	**<25, 26>**	**<24>**	**<21>**	**<22>**	**<23>**	**<27>**	**<28>**	**<29>**	**<30>**	**<32>**	**<31>**	**<33>**	**<34>**	**<35, 36>**
Feature	4	4	4	5	5	6	6	7	8	9	9	9	10	10	10	10
Feature type	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	fireplace	pit	pit	pit	pit	fireplace	fireplace	fireplace
Depth (cm)	65-70	65-70	65-70	35-40	35-40	80-85	80-85	45-55	65-70	67-70	67-70	67-70	60-65	65-70	65-70	70-80
Sample volume – litres	48	48	72	72	24	48	48	60	72	48	72	96	144	24	24	48
Date of sampling	12.07.'07	14.07.'07	14.07.'07	13.07.'07	13.07.'07	13.07.'07	13.07.'07	17.07.'07	17.07.'07	17.07.'07	18.12.07.'07	18.12.07.'07	18.12.07.'07	18.07.'07	18.07.'07	18.07.'07
Chenopodium sp. (Goosefoots)	++	++	++	+++	++			++	+			++				+
Galium aparine (Cleaver)													1			1
Parenchyma																2
Silene sp. (Campions)				2												
Stellaria sp. (Stitchworts)																1
Modern rootlets	++	++	++	++		++	++	+++	+++	+++	+++	+++	+++	++	++	++
Charcoal :4mm	+++	+++	+++	+		+++	+++		++	+++	+++	+++	++	+++	+++	+++
2 - 4mm	+++	+++	+++	+		+++	+++	+	++	+++	+++	+++	++	+++	+++	+++
;2mm	+++	+++	+++	++	++	+++	+++	+	++	+++	+++	+++	++	+++	+++	+++
Bones of microfauna	++	++	++	+		++	++	+	+	++	+++	+	+		++	++
Molluscs:	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++
Vallonia costata and *V. pulchella*																

Tab. 6. Plant macro-remains from the Starobelsk-I site, eastern Ukraine. Sieve size – 300 µm. Key: + <10 items; ++<20 items; ++ <100 items; >1000 items +++.

Except for the Zanovskoe settlement (see below), none of the analysed pottery shards from the sites listed above contained any clearly defined cereal impressions. A few shards from the Novoselovka–I, Olkhovaya–V and Tuba–II sites had impressions of seeds, caryopses and plant parts which appeared similar to domestic cereal. However, none of those impressions could be attributed to a domestic cereal species with confidence. For example, some seed impressions from the organic-rich pottery recovered from Tuba–II were discerned, the shapes of which appeared to be similar to that of broomcorn millet seeds. These elongated seeds were impressed in small clusters together with their stems. The seed impressions in the Tuba–II pottery were not impressed to a full seed shape, and their contours were not distinct. With the absence of either clear seed shape impressions or lemmas and paleas surface patterns, such cereal impressions cannot be confidently identified.

The only pottery shards where cereal chaff and grain impressions were identified with confidence were found at the Zanovskoe site. At Zanovskoe, three main types of pots were found: a type light and rich in organic temper with a polished surface; a type rich in organics with a rough surface; and heavy clay pots with a mollusc and coarse sand temper. Cereal impressions were identified on a few pottery shards of the first pottery type with an organic temper. The pottery shards with cereal impressions were found in the Chalcolithic period pottery, at a 50–60cm depth. This layer has been dated to 4462–3525 calBC (*Manko, Telizhenko 2002*). More precise analysis of these shards under the microscope has shown that the pot clay contains a cereal chaff temper. The cereal impressions represent the glumes and palaea of naked barley and a grain of hulled barley (*Hordeum vulgare var. nudum* and *Hordeum vulgare*), as well as different parts of the cereal chaff, probably that of the *Triticum* genus (Fig. 5).

Discussion of archaeobotanical results from the lower Don and Donets river basins

Archaeobotanical investigation has been conducted on several 8–6th millennium calBC

Feature		<12>	<10>	<14:	<11>	<13>	<6>	<1>	<3>	<9>	<2>	<4+5>	<7>	<8>	<12>
Sample number		19+20	10+11+12	18	13	15+16+17	6+7	1	3	9	2	4+5	7	8	14
Feature type		Chalcolithic	Burned	Bronze Age	Mollusc	fireplace	Mollusc	Mollusc	Mollusc	Mollusc	Mollusc	Mollusc	Mollusc	Mollusc	Chalcolithic
		pit	wood	trench	midden		midden	midden	midden	midden	midden	midden	midden	midden	pit
			and broken												
			vessel												
Depth (cm)		50	35	40	40	35	35	45	50-60	60	35	40-50	60-70	25-35	35
Semple volume – litres		96	150	96	12	178	96	48	48	48	48	96	48	48	48
Sieve size (µm)		300	300	300	300	300	1000	300	300	300	300	300	300	300	300
Date of sampling		02.07.'08	30.06.'08	02.07.'08	01.07.'08	02.07.'08	24.06.'08	32.06.'08	22.06.'08	29.06.'08	23.06.'08	23.06.'08	28.06.'08	28.06.'08	01.07.'08
Brassica sp.	Cabbages												3		2
Chenopodium	Maple/Fig-leaved	1										1			
hybridum/ficifolium	Goosefoot														
Echinochloa/Setaria	Cockspurs/Bristle-		1												
	grasses														
Galium cf. *aparine*	Cleaver						2								
Galium sp.	Bedstraws					1			2						1
Juncus sp	.Rushes						1								
Matricaria cf. *recutita*	Scented Mayweed	1													
Unidentified seeds						2					1				
Modern rootlets		+++	+	+++	+++	+++	+++	+++	+++	+	+++				
Charcoal >4mm		+	+++	+++	+	+	+++	+++	++	+	+++		++	+++	
2–4mm		+	+++	+++	+	++	++	++	++	+	+++		+++	+++	
<2mm		+	+++	++	+	++	++	++	++	+	+++		+++	+++	
Animal bones		+		+	+	+	+	+	+		+		+ (fish)	++	
Molluscs															
Vallonia costata and		+++	++	+++	+	+++	+++	+++	+++	++	+++	+++	+++	+++	+++
V. pulchella															
Seed fragmentation		W	W			F	W/F		W/F		W	W			W
Non-charred plant seeds															
Carex sp.	Sedges				+	+	+	+							
Chenopodium	Goosefoots	+++	++	+++	+	+	+		+	+++					
Datura cf. *stramonium*	Thorn-apple									+					
Echinochloa crus-	Cockspur/Shama			+											
galli/collona	Millet														
Panicum miliacemum	Broomcorn Millet			+											
subsp. *ruderale*															
Sambucus sp.	Elders														+
Setaria cf. *pumila*	Yellow Bristle-	++	+	++											
	grass														
Stachys sp.	Woundworts	++	+	++											
Thlaspi arvense	Field Penny-cress												++		
Trifolium sp.	Clovers	++		++											

Tab. 7. Plant macro remains from the Novoselovka-III site, eastern Ukraine. Key: + <10 items; ++<20 items; +++ <100 items; >1000 items ++++; W-whole seed; F-fragment of seed.

sites situated in the Lower Don and Donets River basins. This investigation has not provided any evidence for cereal cultivation in this area during this particular period of prehistory. In addition, the archaeological or zooarchaeological evidence from these sites suggests that subsistence in this region was based on the exploitation of wild food resources, rather than food production.

At the Razdorskoe–II site, dated to the 8th-first half of the 7th millennia calBC, a large variety of wild animal species were identified (*Tsybrii 2008*), demonstrating highly developed hunting skills amongst the population. This site was especially abundant in mollusc and fish bones, indicating specialised human exploitation of water resources. An abundance of bone harpoons and stone weights probably used for sinking nets, along with tools made from molluscs shells, show that human activities were tightly aligned with fish consumption (*Tsybrii 2005*) and food-procurement activities. The same conclusions were reached from the analysis of the Neolithic layers of the Rakushechny Yar and Razdorskoe–I sites (*Aleksandrovsky* et al. *2009*). Furthermore, previous palynological analysis of the Razdorskoe–II site was carried out by Kremenetski (*1991*) and Spiridononova *et al.* (published in *Tsybrii 2008*) from approximately the same period as the macrobotanical samples reported above were retrieved. The pollen analysis at Razdorskoe–II has shown no evidence of any pollen belonging to domestic cereal species.

A situation similar to the Razdorskoe–II site was revealed while investigating the Starobelsk–I and Novoselovka–III settlements of eastern Ukraine. Except for the remains of dog, the rest of the animal bones from the 2006 excavation of Starobelsk–I resulted in the discovery of only wild species (*Telizhenko, Motuzaite Matuzeviciute 2007*). River mollusc middens combined with fish and turtle bones indicate the exploitation of the fresh water resources at both sites.

The abundance of flint chips at Starobelsk–I was concentrated mostly in areas around the fireplaces, indicating that tool-making activities took place at the site. It has been argued that most flint tools from the Starobelsk–I settlement are linked with hunting, flaying, meat cutting and scraping (*Telizhenko 2007*). It has to be mentioned that Gurin (*1998*) regarded the flint blades at Starobelsk as cereal harvesting tools. However, during the 2007 archaeological excavation, a flint blade was found embedded in a mollusc shell, indicating that it was used to open shells and extract their contents.

It can also be pointed out that the fireplaces at the Starobelsk–I site were wide (up to 2m in diameter), and constructed directly on the ground surface. None of the fireplaces contained any permanent structure, such as a clay bedding or stone circles, indicating their temporary use. The fireplaces at Starobelsk–I often have heat epicentres in a few different places, showing reuse of the fireplace location over different periods. The absence of pits, dwelling construction, or postholes also suggests a temporary, probably seasonal, camp where people had simple ground dwellings, or no dwellings at all. The geographical location of the site also indicates the selection of the site for hunting purposes. Across from the site the River Aidar makes a bend beneath a set of steep chalk cliffs, a situation that may have benefited the hunting strategies of the site occupants. All this evidence seems to suggest that the Starobelsk–I site was a hunting campsite, the inhabitants of which hunted wild animals and exploited river resources.

According to ^{14}C dates the Novoselovka–III mollusc midden site represents a later chronological period than the Starobelsk–I site; however, the subsistence patterns of its inhabitants were still very similar to those at Starobelsk–I. No traces of house constructions, postholes, or pits from the Late Neolithic period were found at Novoselovka–III. The presence of wood charcoals, burned bone and flint fractions in mollusc middens, coupled with a few wild plant seeds, show that cereals were not a part of normal kitchen waste. However, one must keep in mind that very little evidence of fire-making activities were found at the site, and therefore any potential plant

Fig. 5. Lemma and palea impressions of naked barley (*H. vulgare var. nudum*) in Zanovskoe pottery from the second half of the 5th millennium calBC – first half of the 4th millennium calBC layer, 50–60cm depth horizon, square 320.

crops used at the site would not have survived in an un-charred state.

The investigation of Novoselovka–III provided evidence of the population's extensive involvement in mollusc gathering activities for subsistence purposes. The seasonality studies of mollusc consumption among the inhabitants of the Ertebølle culture in Denmark has shown that the molluscs were collected in early spring – March and April (*Milner 2002*). Mollusc meat is not an adequate protein replacement for other animal meats; it is actually highly rich in carbohydrates and can substitute as a replacement for grains (*Greenfield, Jongsma 2008*). Haskel J. Greenfield and Tina Jongsma (*2008*) note that in areas where grains were not consumed, or consumed in very small quantities, the collection of molluscs was of greater importance.

The discoveries of wild animal bones, bone awls, stone axes, a variety of flint tools and flint chips at the Novoselovka–III site indicate more diverse activities at the site than only mollusc gathering. Furthermore, the Novoselovka–III site contained a large quantity of pottery, with the largest vessels being up to 50cm in height and 34cm in diameter (*pers. comm. Sergey Telizhenko*), indicating the reduced mobility of the population. Moreover, a pottery ornamentation stamp made from an incised mollusc shell (*Unio* sp.) was found at the Novoselovka–III site in a shell midden (Fig. 6). All these facts could suggest both local pottery production adjacent to the mollusc midden site and the proximity of human settlement to the mollusc midden site. Such evidence reinforces the argument that the absence of evidence for cereal cultivation is not because the wrong areas were sampled, but rather because it is very unlikely that the people of Novoselovka–III were involved in agriculture.

It has to be mentioned that the Novoselovka–III site is unique in its abundance of pottery and variety of pottery styles. The variety of vessel ornamentation patterns, clay temper, and the amount of pots per area excavated in Novoselovka–III site constitute the greatest pottery collection from Neolithic Ukraine. From the total excavated surface area of 133m^2, 25 complete vessels were found. It can be noted that pottery vessels very similar in ornamentation, clay admixture and shape to those from the Novoselovka–III site have been found in layer 10 at the Rakushechny Yar site (Fig. 7), showing close contacts between the Novoselovka–III and the Lower Don populations. Overall, it has to be pointed out that the similarities in Neolithic pottery-making technology between the Novoselovka I–III and Starobelsk–I sites with the Lower Don region sites are much stronger than with that of the peoples inhabiting the Dnieper River region. The westward movement of pottery technology from Russia to Ukraine has been noted by many researchers (*Danilenko 1969; Belanovskaya 1995; Kotova 1998; Kuzmin, Orlova 2000; Sanzharov* et al. *2000; Gronenborn 2003; Dolukhanov, Shukurov 2004; Dergachev, Dolukhanov 2007*). Such interregional similarities are important for understanding the zones of influence by human interaction along connecting waterways, which later played a role in the exchange of agricultural products.

The evidence discussed above leads to the conclusion that the human populations in the Donets nor Don basins did not practice cereal cultivation during the 6th millennium calBC. A similar situation obtains with domestic cattle. The identification of animal species at Neolithic sites in Ukraine and Russia as domestic has added to the confusion about the origins of agriculture in the region. Animal remains at sites are usually identified as domestic without following standard animal bone gender patterns and morphometric analysis of decreasing size and age. Furthermore, due to the osteological similarity between sheep/goat and steppe antelope (*Saiga tatarica*), especially in dentition (*Hillson 2005*), the identification of Near Eastern sheep and goats are probably often confused with steppe antelope species. Steppe antelope was a very frequent game animal among the prehistoric inhabitants of the steppe (*Vekilova 1971; Dolukhanov 2009*). It has been noted, however, that at many Neolithic sites only sheep/goat or steppe antelope bones have been identified,

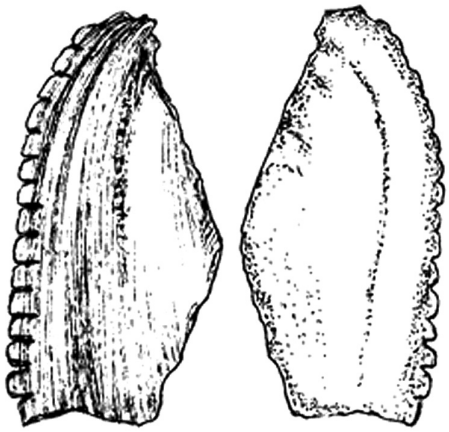

Fig. 6. Stamp for decorating pottery made from fresh water mollusc, found at Novoselovka-III site (S. Telizhenko drawing).

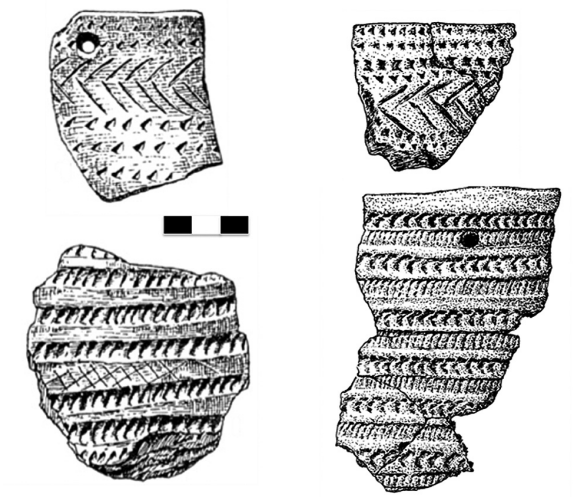

Fig. 7. A few examples of the similarities between Rakushechny Yar layer 10 (left column) (after,* Belanovskaya 1995.106*) and Novoselovka III (right column) pottery styles (V. Telizhenko drawing).

probably indicating some confusion in differentiating these threeanimal species from each other (*Tsybrii 2008*). A specimen from Semenovka site, identified by Kotova as sheep bone, from the lower layers of the settlement, was dated at the Beijing Radiocarbon Accelerator Unit for AMS radiocarbon dating. The date ranged between 5617–5482 calBC (BA–071462; 6595±40 BP) (Fig. 8). It was on the sheep/goat remains from the Semenovka site that N. Kotova based her theory of the Caucasian-Steppe origins of agriculture in eastern Ukraine (*Kotova 2009*). However, according to the opinion of a zooarchaeologist colleague from the University of Cambridge (*pers. comm. Katie Boyle, Ryan Rabett and Tony Legge*), this bone specimen is more likely to be that of *Saiga tatarica* than *Ovis aries orientalis*.

The presence of agriculture in the Lower Don and Donets basins has been detected by the author only in the Chalcolithic period. Cereal impressions in pottery were found at the Rakushechny Yar in site layers 4–2 and Zanovskoe's Chalcolithic layers. Rakushechny Yar and Zanovskoe are attributed to a very similar period of the Sredny-Stog culture and dated to the second half of the 5th and the 4th millennia calBC. The archaeobotanical investigation of the Rakushechny Yar site pottery has shown that the inhabitants were familiar with cultivating spelt wheat (*Triticum spelta*) and other wheat species, hulled barley (*cf. Hordeum vulgare*), probably flax (*cf. Linum usitatissimum*) and possibly broomcorn millet (*cf. Panicum miliaceum*). The Zanovskoe inhabitants were probably cultivating hulled and naked barley (*Hordeum vulgare*, *Hordeum vulgare* var. *nudum*) and wheat (*Triticum* spp.). Unfortunately, the cereal impressions in pottery from the Zanovskoe and the Rakushechny Yar sites do not have direct dates, but only dates of the layer and, therefore, constitute a less accurate piece of information than dates directly derived from dating charred cereal grains. It also should be pointed out that the dates from Rakushechnyi Yar were received from pottery consisting of a mollusc or humus temper – material not very appropriate for dating. The dates also have a very large error band of up to ±300 years, making these dates very inaccurate (see Tab. 1). Nevertheless, neither of the Zanovskoe or Rakushechny Yar

Site name	No of analysed pottery fragments	Archaeobotanical data (seed/grain impressions)
Orekhovo-Donetskoe–III	13	3 – wild plants
Olkhovaya–V	167	2 – wild plants
Starobelsk–I	379	3 – wild plants
Starobelsk–II	22	None
Zelena Gornitsya–I	22	None
Starobelsk–III	17	None
Zelena Gornitsya–V	24	1 – wild plant
Zelena Gornitsya–VI	1	None
Kleshnya–II	7	None
Podgorovka–I	573	3 – wild plants
Novoselovka–III	Over 1000	3 – wild plants
Novoselovka–I	1266	5 – wild plants
Tuba–II	24	10 – seeds imprinted in cluster, millets (?)
Zanovskoe	Not recorded	*Hordeum vulgare* var. *nudum*, *Hordeum vulgare*, *Triticim* spp.
Rakushechy-Yar	Over 1000	See Table 5.1–2 in this chapter
Total fragments	~4500	

Tab. 8. List of sites from where pottery sherds with cereal impressions were analysed.

sites are being excavated at present, which means that flotation or radiocarbon cannot be applied, and that the existing pottery impressions and dates constitute the only information about the presence of agriculture in the Donets and Don basins from around the 5–4th millennium calBC. During this period, an increase in the use of domestic animals in the region can be noted; a large quantity of domestic animal bones has been reported from the Zanovskoe and Rakushechny Yar sites and from other sites. For example, from the Chalcolithic layer at Zanovskoe (350m^2), O. P. Zuravlev identified bones from twenty-two individuals of domestic cattle, eight sheep, six goats, eight sheep/goat, twenty-two 'domestic' horses and eight dogs (*Zhuravlov, Telizhenko 2008*). Viktor Tsybrii (*2008.71*) notes that at the end of the Neolithic and Chalcolithic periods, the populations of the lower Don became predominately cattle and horse breeders. It is argued that during the 5th millennium calBC, some changes in the society of the Donets Basin can be seen, for example, an increase in population represented by the appearance of large burial grounds, such as Alexandria (*Manko 2003; Rassamakin 1999*); the development of metallurgy, where the first metal objects and crucibles were found at the Kleshnya site (*Manko 2006; Manko, Telizhenko 2002*), and others.

It can be only speculated about the geographical origins of domesticated plant species in the region. The arrival of agriculture in the territory of Ukraine could be seen as taking place not only following the branched Danubian route, but also by following the later steppe and Caucasian route. The broomcorn millet found at the Rakushechny Yar was probably introduced via the steppe corridor from the populations at the present territories of China. Unfortunately, not much is known about millet cultivation in central Asia. So far, the earliest ^{14}C dated (end of the 3rd millennium calBC) *Panicum miliaceum* grain was found in eastern Kazakhstan (*Frachetti* et al. *2010*).

The wheat and barley agriculture of the sites in eastern Ukraine and southwest Russian could have arrived from the northern Caucasus region. There is substantial evidence of agriculture in the northern Caucasus region during the early stages of the Chalcolithic period. The best-known site in the northern Caucasus, the Chokh settlement in the Dagestan region, is probably dated to Chalcolithic-Bronze Age (*pers. comm. Nadia Kotova*). Khizri Amirkhanov (*1987*) reports cultivars of barley (*Hordeum vulgare* var. *polystichum*, *Hordeum* var. nudum), millet (*Panicum* spp.), and wheat (*Triticum monococcum, Triticum dicoccum, Triticum aestivo-compactum*) from the site, retrieved by applying flotation methods to the settlement layers. Besides the Chokh site, more Early Chalcolithic sites in the northern Caucasus provide evidence for agriculture, such as Svobodnoe, Yasenovaya Polya, Meshoko, Zamok, Khadzhokh, *etc*. Archaeobotanical data from the Chalcolithic fortified Svobodnoe site; macro report the remains of grain and chaff of *Triticum monococcum*, *Triticum dicoccum*, and *Hordeum vulgare* were found from the flotation samples (*Lebedeva 2011*). At the fortified Svobodnoe site, 39% of all tools discovered were attributed to cereal cultivation and processing activities (*Nekhaev 1992*). The Svobodnoe site was radiocarbon dated to the second half of the 5th millennium calBC (*Rassamakin 1999*). Authors have reported the presence of farming village establishments along the River Kuban, where large granite cereal grinding stones and flint sickles for cereal cultivation were recovered (*Formozov 1965; Korenevskii 2004*).

Fig. 8. The fragment of* Ovis aries*/* Saiga tatarica *metatarsal from the lower cultural layer at the Semenovka site dated at the Beijing Radiocarbon Accelerator Unit for AMS.

To the north Caucasus, agriculture spread from the central and southern Caucasus, where it existed during the Shulaveri-Shomutepe Culture, dated to the 6–5th millennia calBC (*Lisitsina, Prishchepenko 1977; Lisitsina 1978; Nebieridze 1978; Lisitsina 1984*). Irrigation channels were found at the Arukhlo–I, Imiris-gora, Chakh-tepe, Kiul-tepe and Alikemek-Pepesi sites (*Korobkova 1999*). The sites with domesticated animal and plant remains that have seen the best investigation of archaeobotanical data are the Aratashen and Aknashen Neolithic sites in Armenia, where the majority of radiocarbon dates fall into the period of the first half of the 6th millennium calBC (*Hovsepyan 2004; Hovsepyan, Willcox 2008*). Early cultivars started to spread north, reaching the northern territories of the Caucasus pro-

bably only during the early metal period around the 5th millennium calBC. The discovery of a stratified Late Mesolithic-Early Neolithic-Bronze Age site, such as Tsmi (7th to the 3rd millennia calBC) at an elevation of 1700m in the northern Caucasus shows "*the importance of the traverse across the nearby passes in the longue durée of Caucasian communication network*" (*Rostunov* et al. *2009.73*) and the possibility that the Neolithic populations of northern Caucasus had contact with the agricultural societies to the south.

According to Yuri Rassamakin (*1999*), in the Chalcolithic period, the route of a bi-directional network of interaction via the steppe belt stretched from the Prut River all the way to the north-west Caucasus. Imported items from the food producing pre-Maykop populations of the Kuban River region in the northern Caucasus are distributed through Sredny-Stog and Tripolye sites (*Rassamakin 2004*). For example, serpentinite bracelets from the Caucasus were found at the Novye-Ruseshti site in Moldova, green serpentinite axes also from the Caucasus, and pottery typical of the fortified agricultural village of Svobodnoe (north Caucasus) were found in the Sredny-Stog sites. This demonstrates the existence of interactions between the northern Caucasus region and the Ukrainian steppe already during the Early Chalcolithic period, which continued all the way through to the Maykop culture period (*Rassamakin 1999; Anthony 2007*). Rassamakin (*1999*) also emphasises the close similarity in the pottery making traditions of the northern Caucasus region with the Lower Don region during the Chalcolithic. The similarities in the material cultures of the steppe populations in Russia and Ukraine and northern Caucasus populations have also been noted by Nikolay Merpert (*1994*).

To conclude, the archaeobotanical investigations conducted by the author have provided evidence that cereal cultivation began in eastern Ukraine and south-west Russia around the second half of the 5th millennium calBC, as demonstrated by the analysis of pottery impressions from the Zanovskoe and Rakushechny Yar sites. The earliest evidence of cereal cultivation in eastern Ukraine and southwest Russia comes from the Sredny-Stog culture sites at Zanovskoe and Rakushechny Yar, where cereals and their chaff impressions were identified by the author in the layers dated to the second half of the 5th to the first half of the 4th millennium calBC. A variety of cereal species were identified from the grain and chaff impressions, comprising hulled and naked barley, spelt wheat, probably flax, and broomcorn millet species.

The archaeobotanical and archaeological evidence has shown that the possibility cannot be excluded that the spread of cereal cultivation into the eastern regions of Ukraine and south-western Russia may have arrived from the Caucasian corridor and the Eurasian steppe, but only during the Chalcolithic period.

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BACK TO CONTENTS

Stone Age hunter-gatherer ceramics of North-Eastern Europe: new insights into the dispersal of an essential innovation

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ABSTRACT – *This paper explores the emergence and dispersal of the earliest pottery among the hunter-gatherer groups east and north of the Baltic Sea in the 6th and 5th millennium calBC. By combining existing knowledge with the results of detailed statistical analyses of 17 selected early ceramic complexes with altogether 535 vessel units from Finland, Estonia, Lithuania and Russia, chronological, typological and spatial trajectories in the history of early ceramics are reconstructed. On the basis of this information, a scenario for the spread of the pottery technology into the study area is put forward, illuminating the situation not only for the actual research area, but for a wider region from the Baltic to the Urals mountains and from the Barents Sea to the Black and Caspian Seas. As a result, it is suggested that three separate lines of tradition in early pottery development played a role in the genesis of early ceramic groups east and north of the Baltic Sea.*

IZVLEČEK – *V članku raziskujemo pojav in razširitev najzgodnejše lončenine med lovsko-nabiralniškimi skupnostmi vzhodno in severno od Baltskega morja v 6. in 5. tisočletju calBC. Z združevanjem obstoječega znanja z rezultati natančne statistične analize 17 izbranih zgodnje-keramičnih kompleksov s skupno 535 enotami lončenine iz Finske, Estonije, Litve in Rusije poskušamo rekonstruirati kronološke, tipološke in prostorske trajektorije pri razvoju zgodnjega lončarstva. Na osnovi teh podatkov predstavljamo scenarij razširitve lončarske tehnologije na študijskem območju in v širši regiji od Baltika do Urala ter od Barentsovega do Črnega morja in Kaspijskega jezera. Na podlagi teh rezultatov ugotavljamo, da so v razvoju zgodnjega lončarstva obstajale tri ločene tradicije, ki so odigrale določeno vlogo v genezi skupin z zgodnjo keramiko vzhodno in severno od Baltskega morja.*

KEY WORDS – *North-Eastern European forest zone; Mesolithic/Neolithic; hunter-gatherers; dispersal of early pottery; correspondence analysis*

Introduction

The reconstruction of the dispersal and development of early ceramics in North-Eastern Europe on a supra-regional level remains a desideratum in prehistoric research. Filling this gap in the archaeological knowledge is an important task, not least because the outlook towards the east is also very important for Central European questions. The present study is dedicated to the investigation of the earliest pottery in the Eastern and Northern Baltic region in the 6th and 5th millennium calBC.

The cultural groups in question are characterised by the production and use of ceramic vessels in a cultural environment based on a foraging economy and the seasonal mobility of their makers (*Edgren 2009. 502*). This distinguishes them from their Southern, Central and Western European counterparts, where the earliest pottery is mostly associated with the onset of the Neolithic era, which in these regions is defined by the transition towards a productive economy, residential sedentism and the emergence of more complex forms of society. The fact that the complex of pottery-bearing hunter-gatherers not only left traces in Eastern Europe, but also reached west as far as Northern Germany and Southern Scandinavia in the guise of the Ertebølle culture, has increa-

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singly been understood also by western researchers since the end of the Cold War and triggered immense interest in this complex (see *e.g.*, *Hartz, Lüth and Terberger 2011; Jordan, Zvelebil 2009a*).

The problem of the differing definitions of the term 'Neolithic' in Western and Central European archaeology on the one hand and in the Eastern European scientific tradition on the other hand has been discussed repeatedly in recent years (see *Werbart 1998; Oshibkina 2006; Jordan, Zvelebil 2009a. 33–36*). In the present study, the terminus will be used according to an 'Eastern' understanding, in which the beginning of the Neolithic is marked by the first appearance of pottery vessels, irrespective of the prevailing economy.

While at the local level, a substantial amount of work has been dedicated to groups with early pottery in the study area (*i.e.*, *Brazaitis 2002; Engovatova, Zhilin and Spiridonova 1998; Europaeus-Äyräpää 1930; German 2002a; 2002b; Ivanishcheva, Ivanishchev 2004; Kriiska 1995; Loze 1992; Marcinkevičiutė 2005; Nedomolkina 2004; Nuñez 1990; Skandfer 2005; Shumkin 2003; Torvinen 2000; Tsetlin 2008*), only a few articles have addressed the phenomenon at a more general level (*i.e.*, *Timofeev 1998; Gronenborn 2009; Mazurkevich, Dolbunova 2009*), and larger, material-based works revealing supra-regional coherences are completely lacking. Not least because of language barriers, the local studies remained largely unknown to Central and Western European archaeological researchers (*Klassen 2004.111–117*).

The work presented here summarises the results from these existing studies and places them on a new foundation by supplementing them with original material studies. Through a detailed analysis of exemplary pottery complexes, problems of regional, typological and chronological developments will be pursued.

The study area encompasses the regions east and north of the Baltic Sea, from the Barents Sea coast in the extreme north of Europe to the Neman-Pripyat basin in the south and from the Åland islands in the west to the upper course of the River Sukhona in the east (Fig. 1). For the period of the initial spread of ceramic technology, various archaeological cultures have been defined in this region, mainly based on ceramic styles. Among them are the Neman culture, with its early stage Dubičiai in the south (*Piličiauskas 2002*), the Narva culture of the

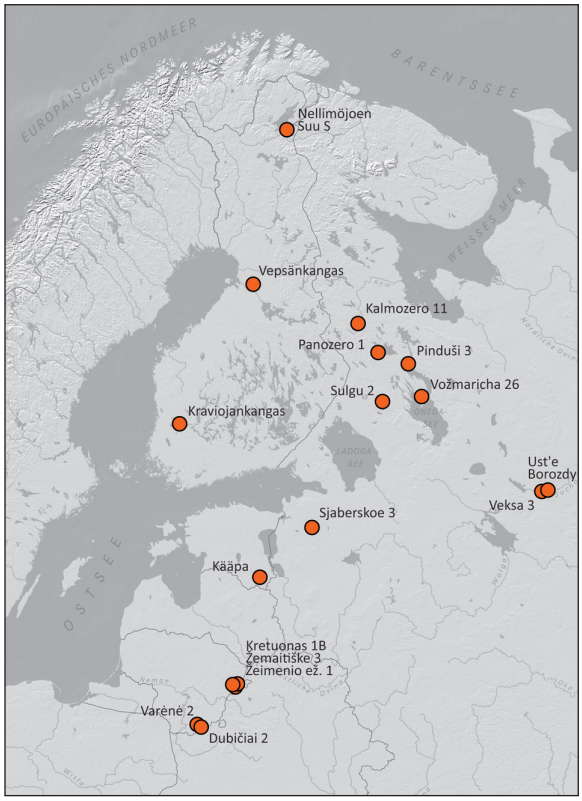

Fig. 1. The study area with sites from which original materials were analysed.

Eastern Baltic (*Kriiska 1995; Loze 1992*), the Sperrings culture in Russian Karelia (*German 2002a; 2002b*) and the closely related Ka I:1 style in South and Central Finland (*Nuñez 1990*), the Säräisniemi 1 type in Northern Fennoscandia (*Skandfer 2005; Torvinen 2000*), and a mosaic of various groups such as Upper Volga and 'Northern types' in Central Russia (*Engovatova, Zhilin and Spiridonova 1998; Nedomolkina 2004*). Although the cultural-historical character of these units remains open to discussion and the differentiation between them is seldom clear-cut and can also vary according to author (*Piezonka 2011*), they will nonetheless be employed in the this study, because at the moment they constitute the best and most widely understood basis for structuring the material.

Methods

The empirical background of the study

An assessment of the publications on evidence for early pottery in the study area shows that the quality of the information available is very heterogeneous. Comprehensive descriptions of sites and their associated finds which could be used for detailed analyses are almost completely lacking, and systematic, well-illustrated presentations of the ce-

Country	Administrative unit	Site	Relevant cultures	^{14}C dates	No. of vessels recorded	No. of sherds recorded	Percentage of all Early Neolithic pottery	Origin of recorded materials
Lithuania	Varėna county	Dubičiai 2	Neman, Narva	none	15	68	100%	excavations 1962
Lithuania	Varėna county	Varėnė 2	Neman	none	4	29	100%	excavations 1997, 1999
Lithuania	Švencionys county	Žemaitiške 3	Narva	yes	27	72	part	excavations
Lithuania	Švencionys county	Kretuonas 1	Narva	yes	23	73	part	excavations 1984, 2001
Lithuania	Švencionys county	Žeimenio ež. 1	Narva	none	12	30	?	excavations 1986
Estonia	Võru county	Kääpa	Narva, Ka II	yes	71	194	small portion	excavations 1960
Finland	Kokemäki parish	Kraviojankangas	Ka I:1, Ka I:2, Ka II	yes	72	143	small portion	excavations 1965–1983
Finland	Ylikiiminki parish	Vepsänkangas	Säräisniemi 1	yes	35	205	100%	excavations 1989–1998
Finland	Inari parish	Nellimöjoen suu S	Säräisniemi 1	yes	5	14	100%	surface finds 1974, excavations 1984, 1988
Russia	Leningrad oblast	Sjaberskoe 3	Narva	no relevant dates	20	21	part	excavations 1988
Russia	Vologda oblast	Veksa 3	Upper Volga, "2nd Comb Ceramic Complex", "Northern types", Lyalovo, Narva *etc.*	yes	118	205	small portion	excavations and surface finds 1996, 1999, 2000, 2001, 2002
Russia	Vologda oblast	Ust'e Borozdy	Narva	none	1	1	small portion	surface finds 1987/2002
Russia	Republic of Karelia	Sulgu 2	Sperrings	yes	64	150	100%	excavations 1960
Russia	Republic of Karelia	Vozhmarikha 26	Sperrings	yes	25	112	100%	excavations 2003
Russia	Republic of Karelia	Pindushi 3	Sperrings	none	37	227	part	excavations 1962, 1970
Russia	Republic of Karelia	Panozero 1	Sperrings	yes	5	13	part	surface finds 1994
Russia	Republic of Karelia	Kalmozero 11	Säräisniemi 1	yes	1	13	100%	test trench 1991
Total					**535 vessels**	**1570 sherds**		

Tab. 1. The ceramic complexes documented.

ramic material have been published only for very few sites (*i.e.*, *Yanits 1959; Kriiska 1995; Loze 1988*). For a material-based investigation of the dispersal of the earliest pottery in North-Eastern Europe it was therefore necessary to document and analyse the original ceramics of selected complexes.

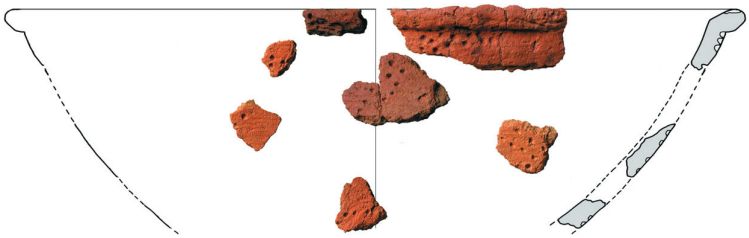

Fig. 2. Ceramic vessel of Dubičiai type from Varėnė 2, Lithuania. Scale 1:4.

In the selection of sites from which original ceramic finds were to be analysed, attention was paid to covering the study area and the respective cultural units as evenly as possible. Several study trips in 2006 and 2007 to find collections in Lithuania, Estonia, Finland and Russia were undertaken to assess and select the original material. Suitable sites were chosen together with the local archaeologists, paying special attention to criteria such as scientific importance and cultural type, quality and amount of the available material, reliability of the chronological attribution, and geographical location.

In this way, 17 sites with early pottery complexes were selected, covering the study area from the Byelorussian border in the south to the Inari region of Lapland in the north and from the Bothnian Bay in the west to the Sukhona basin in the east (Fig. 1). Five are located in Lithuania, one in Estonia, three sites are situated in Finland, and the remaining eight are located in Russia. Altogether, a total of 1570 sherds from 535 vessels were documented. Table 1 summarises the main characteristics of the complexes, illustrating the heterogeneous character of the material. For example, the number of vessel units documented per site ranges from just one respective vessel at Ust'e Borozdy and at Kalmozero 1 to 118 vessels at Veksa 3, and the number of sherds varies even more from one sherd, again at Ust'e Borozdy, to 227 at Pindushi 3. The complexes also differ in terms of the fraction of the documented material representing the entire amount of early pottery retrieved from the respective sites. In those cases where only part of the relevant finds was able for documentation, attention was paid to the selection of a representative extract of the early pottery spectrum, rather than, for exam-

Fig. 3. 1–2 ceramic vessels of Narva type from Žemaitiške 3, Lithuania; 3 Kretuonas 1, Lithuania. Scale 1:4.

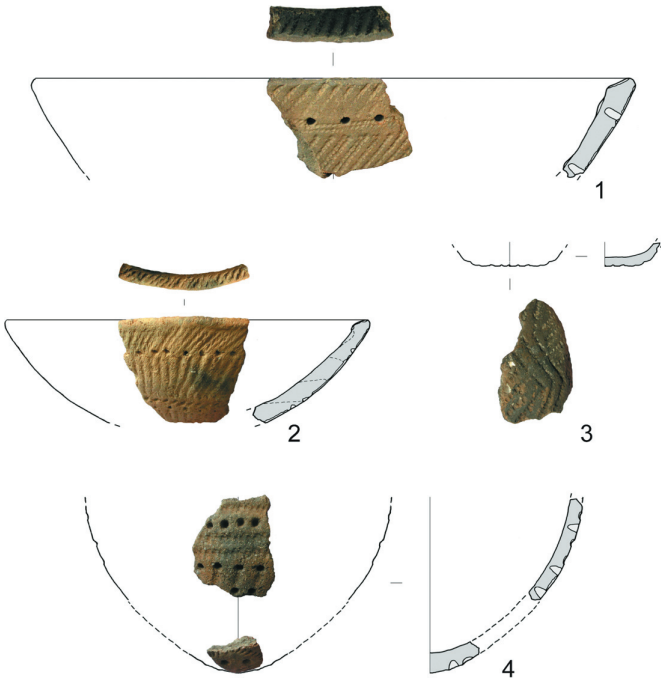

Fig. 4. 1–2 ceramic vessels of the 'Second comb ceramic complex'; 3 of Narva type and; 4 of 'Northern type' from Veksa 3, Russian Federation. Scale 1:4.

ple, the selection of only especially nice or well-preserved specimen, thereby disregarding less eye-catching, but perhaps typologically important pieces.

The ceramics from the selected sites include examples of all major early pottery styles of the study area (Figs. 2–6). While the analysed material from most sites can be more or less attributed to one respective typological group, the Veksa 3 site is a special case. This site on the upper course of the River Sukhona in North-Western Russia is characterised by a clearly stratified sequence up to 3m thick of archaeological layers from the Stone Age to the Middle Ages, including the entire Neolithic development from the 6th to the 3rd millennium calBC (*Nedomolkina 2004; 2007; in prep.*). This unique situation enabled the documentation of pottery from various Early Neolithic cultural units (Fig. 4). The relative sequence of these units is known from the distinct vertical stratigraphy at Veksa, and for this reason, plays an important role in the interpretation of the results of the correspondence analysis.

In the course of the work with the original finds, 16 organic samples from 7 sites were selected to be dated by the AMS radiocarbon method (Tab. 2). Most of the samples consisted of organic residue adhering directly to the pottery (charred crust, tar). The results contribute to a more precise reconstruction of the chronological division of the Early Neolithic in the study area, and also help to establish a sound basis for our understanding of the typological developments of the associated ceramics (*Piezonka 2008; 2011b*).

Ceramic documentation and correspondence analysis

The technological, formal and ornamental characteristics of the ceramics were recorded by macroscopic assessment of the original sherds. The basic unit investigated was the vessel. Sherds belonging to the same vessel were identified from a combination of characteristics such as decoration, rim shape, temper, surface and section colour, *etc*. Especially with the northern pottery types, it was possible to assign a large portion of the sherds, including wall fragments, to individual vessels, because here, the decoration generally covers the entire outer surface and the decorative elements are at the same time very distinct, so that the affiliation of fragments to vessel units was in most cases unambiguous (see Figs. 5 and 6).

For each vessel identified, a multitude of criteria concerning technology, shape and decoration was recorded and documented in a data base (Fig. 7). The selection of these criteria was determined by the culture-historical and chronological objectives of the study and the heterogeneous character of the material also had to be accommodated. Most important for the analysis were those characteristics which proved particularly significant for the recognition of lines of tradition in the Early Neolithic ceramic production of the study area: technological characteristics such as temper, moulding technique and surface treatment, formal criteria such as mouth diameter, wall thickness and rim shape, and particularities in the execution and design of decoration.

The systematic documentation of this information in the data base formed the basis for the study of combinations of features and immanent normative structures by correspondence analysis. The analysis was carried out using the CAPCA program version 2.0 (*Madsen online*). Multivariate analysis enables the mathematical identification of organising principles within the data set that could not be recognised by a mere impressionist consideration or statistical analyses of single characteristics. In archaeology, correspondence analysis is often employed in the investigation of cemeteries and settlements with

the primary goal being to disclose relative chronological sequences. In a supra-regional diachronic study like the one presented here, however, other possible structuring factors such as regional stylistic and technological traditions must also be expected to be reflected in the result of the analysis. It is therefore very important to consider carefully all the available archaeological information to reach valid interpretations of the calculated coherences within the data set.

To carry out the correspondence analysis appropriately, it was necessary to subsume the individual criteria recorded in the data base under significant categories which could be denoted as present or absent for each vessel unit and at the same time optimally capture the variability within the data set (Tabs. 3–5). The analyses themselves were run for various combinations of vessel units and variables to discover which factors influenced the internal structure of the complex and in which ways. All vessel units with two or more variables and all variables present on at least two vessels were included in the calculations. The results of the individual analyses are presented as two parable test diagrams, the axes of which are formed by the relevant eigenvectors (Figs. 9–15). The respective top diagrams show appropriate values of the vessel units while the diagrams below depict the values of the variables. The symbols in the vessel unit diagrams were selected according to the following system: the form of the symbols indicates the established cultural affiliation of the complexes; triangles mark the Dubičiai type, lozenges stand for Narva, circles depict the comb ceramic variants (Ka I:1, Sperrings, Säräisniemi 1), and squares denote the find complexes of the Upper Sukhona (Veksa 3 and Ust'e Borozdy). Within these cultural entities depicted by symbol form, each find complex (the material from the individual sites and from the stratigraphic units of Veksa 3) is coded by a specific colour. To make the results better perceivable optically, Dubičiai sites are marked in green tones, Narva sites in warm shades ranging from yellow to dark red, and comb ceramic sites in cool colours from blue to purple-brown (the colours for the stratigraphic units of Veksa 3 do not correspond to this scheme).

Results of the correspondence analysis

A basic structure within the data set can already be illustrated by a simple diagram depicting the number of different decorative elements per vessel for the four major cultural complexes and the Veksa 3 material (Fig. 8): Two units are clearly distinguished from each other, a 'southern' group with the Dubičiai and Narva traditions, and a 'northern' group consisting of the comb ceramic traditions of Sperrings, Ka I:1 and Säräisniemi 1 and of the Central Russian finds from the Upper Sukhona (Veksa 3 and Ust'e Borozdy).

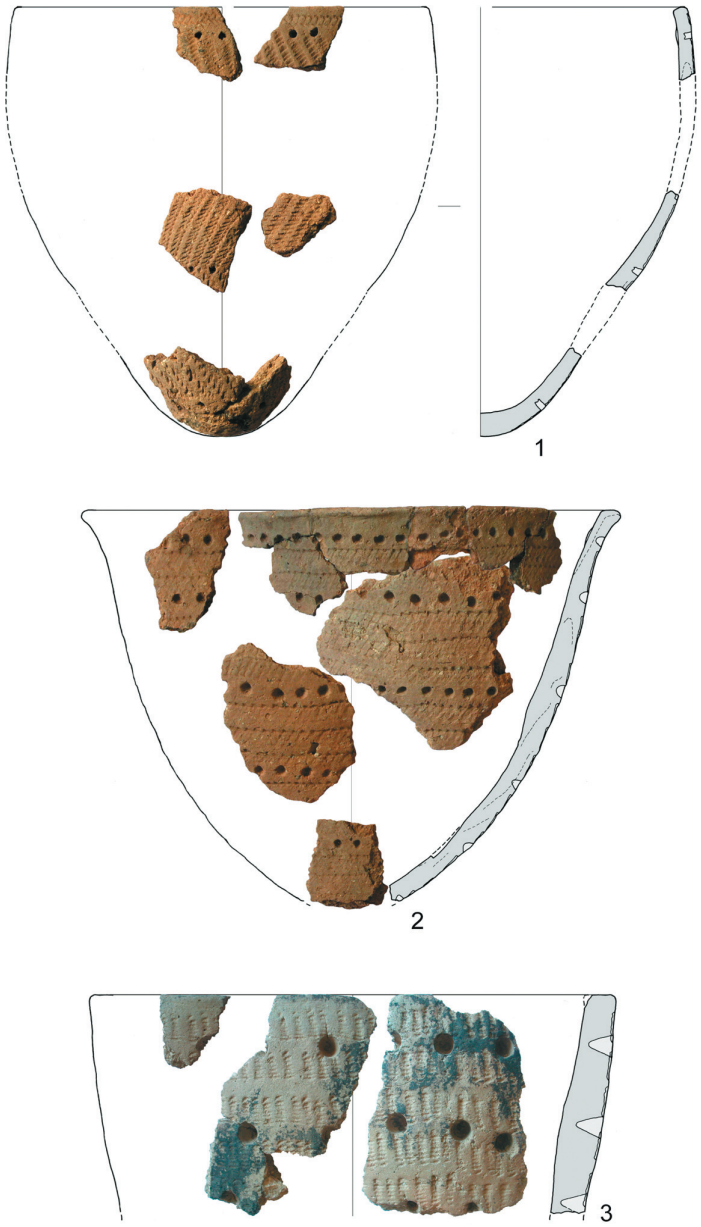

Fig. 5. 1–2 ceramic vessels of Sperrings type from Pindushi 3, Russian Federation and; 3 of Ka I:1 type from Kraviojankangas, Finland. Scale 1:4.

Very interesting results were produced by the correspondence analysis of the technological characteristics of the entire complex. Particularly informative is the graph depicting the first against the third eigenvector of the calculation (Fig. 9). The result resembles an – albeit somewhat distorted – geographical map of the research area: The 'south-west' is characterised by the Dubičiai type vessels, which accords with their geographical location in relation to the other complexes. The variables characterising this part of the diagram are plant impressions on the vessel surface and plant temper (Fig. 9, below). Further 'north', the vessels of the various Narva sites are distributed, with the 'northernmost' cluster being dominated by vessels from the Estonian site at Kääpa. The underlying technological characteristics include mollusc temper, coarse temper and scratched surfaces. Further to the 'east', the vessels of the Sperrings/Ka I:1 and Säräisniemi 1 comb pottery variants, as well as the pots from Veksa 3 form a dense cluster, the 'northern' part of which is dominated by Säräisniemi 1 vessels and vessels from Kraviojankangas. Among the technological characteristics are various types of mineral temper. A link between the two scatter clouds is provided by the vessels from Sjaberskoe 3, which indeed takes a geographically intermediate position (see Fig. 1). The Early Neolithic phase of this site has generally been attributed to the Narva culture, although the correspondence analysis now indicates that, at least technologically, strong links to the comb ceramics tradition are also evident. An interesting and somewhat unexpected result is the dissociation of the find complexes of the Narva sites Žemaitiške 3B, Kretuonas 1B and Žeimenio ežero 1, which are all located just a few kilometres apart in Eastern Lithuania (see Fig. 1). The vessels from Žemaitiške 3B are exclusively situated in the upper part of the point cloud among the pots from Kääpa, while the Žeimenio ežero 1 vessels are distributed in the lower part of the diagram, close to and partly overlapping with the pottery of the Dubičiai type. The Kretuonas 1B vessels are located in the centre and thus link the lower and upper parts of the 'western' point scatter. Possible reasons for this distribution might have been chronological variations in combination with varying typological relations. Also very instructive is the position of two vessels from the surface collections at Veksa 3 (vessels 113 and 118) and the vessel from the nearby site at Ust'e Borozdy. Just as had been already suspected from their general ap-

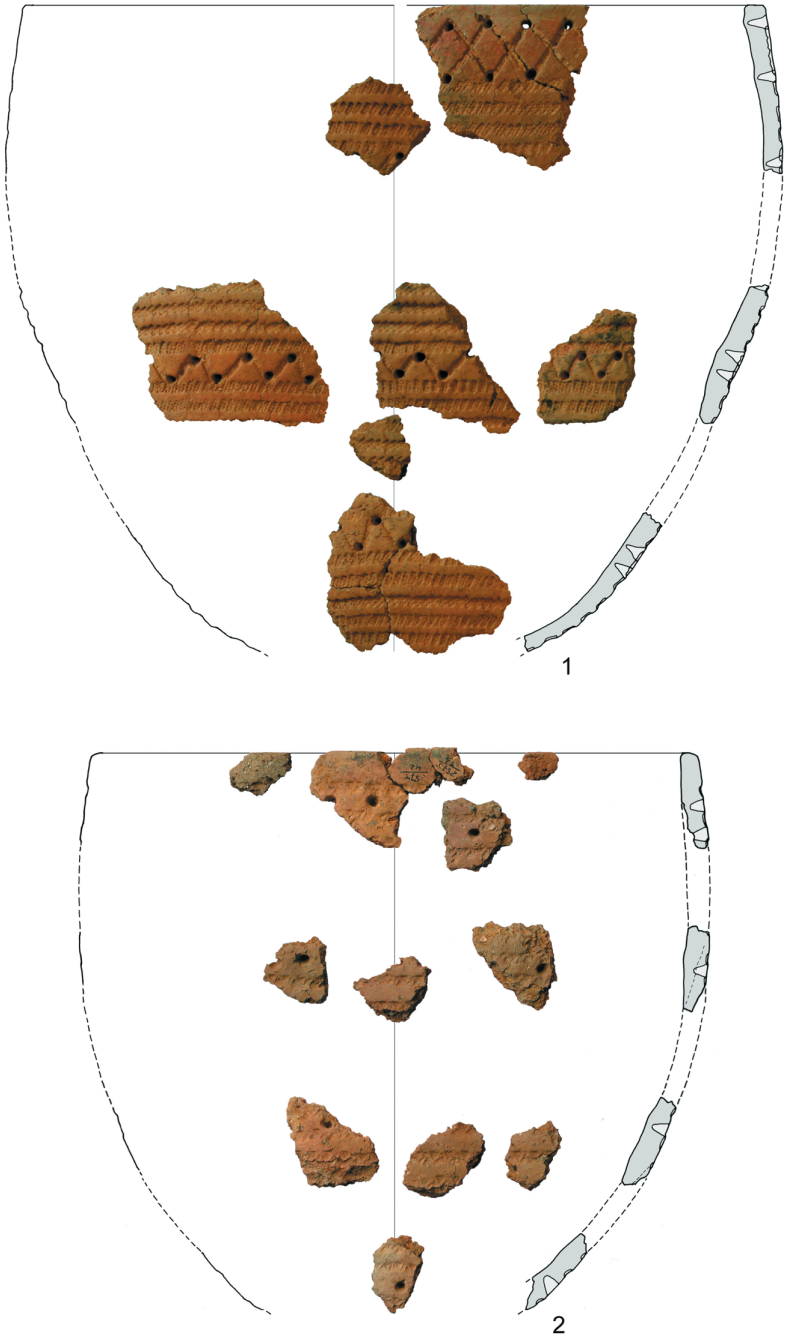

Fig. 6. 1 ceramic vessels of Säräisniemi 1 type from Vepsänkangas, Finland and; 2 Kalmozero 11, Russian Federation. Scale 1:4.

Site	Sample material	Cultural context	Lab. no.	^{14}C age bp	Age calBC (1σ, 68,2 %)	Age calBC (2σ, 95,4 %)	Notes
Žemaitiške 3B	Repairing tar on pottery	Narva	KIA–33923	5730±35	4650–4500	4690–4490	Context: horizon B
Žemaitiške 3B	Charred crust on pottery (inside)	Narva	KIA–35898	5210±45	4050–3965	4230–3940	Context: horizon B
Žemaitiške 3B	Charred crust on pottery (inside)	Narva	KIA–33922	4405±40	3100–2930	3120–2900	Context: horizon B; sample contaminated, not reliable
Kääpa	Charred crust on pottery (inside)	Narva	KIA–35897	6540±40	5530–5470	5620–5380	
Kääpa	Charred crust on pottery (inside)	Narva	KIA–33921	5985±35	4940–4800	4990–4780	
Veksa 3	Soil sample with fish remains	Upper Volga	KIA–33929	6340±30	5365–5300	5470–5220	Context: layer 9, pit
Veksa 3	Charred crust on pottery (inside)	'2nd Comb Ceramic Complex'	KIA–33927	6185±30	5210–5070	5230–5030	Context: surface find
Veksa 3	Charred crust on pottery (inside)	'Northern types'	KIA–33928	6105±30	5200–4960	5210–4930	Context: surface find
Veksa 3	Charred crust on pottery (inside)	Narva?	KIA–33926	5425±30	4330–4255	4340–4230	Context: surface find
Sulgu 2	Burnt bones of elk and reindeer	Mesolithic/ Sperrings?	KIA–35900	6670±35	5630–5555	5660–5520	
Sulgu 2	Tar or charred residue on pottery (outside)	Sperrings	KIA–36724	6085±30	5040–4950	5210–4900	
Sulgu 2	Repairing tar on pottery	Sperrings	KIA–33925	6015±30	4945–4845	5000–4830	
Vozhmaricha 26	Charred crust (outside)	Sperrings	KIA–35901	5505±50	4450–4270	4460–4250	
Panozero 1	Tar on pottery (outside)	Sperrings	KIA–33924	5795±35	4710–4605	4730–4540	
Kalmozero 11	Black residue on pottery (outside)	Säräisniemi 1	KIA–35899A	6340±70	5470–5220	5480–5200	Same vessel as KIA–35899B
Kalmozero 11	Black residue on pottery (inside)	Säräisniemi 1	KIA–35899B	6080±45	5190–4910	5210–4840	Same vessel as KIA–35899A

Tab. 2. Radiocarbon samples and dating results. Dates calibrated using OxCal v3 Bronk Ramsey (*2005*) and the IntCal04 curve data (*Reimer *et al.* 2004*).

pearance, these pots are not related to the remaining ceramics documented at the Upper Sukhona sites, but are closely associated with Narva pottery and in particular with the Kääpa/Žemaitiške 3B 'subgroup'.

A separate correspondence analysis of the two identified main groups regarding the technological characteristics yields additional, more detailed information. The calculation for the comb ceramic complex (Fig. 10) results in a scatter plot in which along the x axis (= 1st eigenvector) pots from Veksa 3 tend to be located on the right side around variables connected with small amounts and fine grain size of the temper, while Säräisniemi 1 vessels and pots from Kraviojankangas concentrate further left, where they are placed by characteristics such as coloured vessel surface and abundant temper. The centre is dominated by pottery from the Karelian Sperrings sites. The graph, however, does not form a parabola, because the y-axis (2nd eigenvector) already ceases to cause any discernible order of the material. Nevertheless, it is striking that the comparably small set of technological characteristics included in the calculation already distributes the Veksa 3 pottery and Säräisniemi 1 vessels to opposite ends of

the complex, a phenomenon which will be confirmed by the incorporation of decoration characteristics later on.

The analysis of the technological characteristics of the pottery from the southern complexes (Fig. 11) results in a very clear separation of the Narva sites and the sites attributed to the Dubičiai type along the x-axis (= 1st eigenvector). The characteristics causing the separation of the latter encompass crushed stone temper, very coarse temper, and plant impressions on the vessel surface. Only two pots from Dubičiai sites are located inside the Narva cloud: one vessel from Varėnė 2, for which an association with Narva has already been suggested on impressionist grounds (*Marcinkevičiūtė 2005*), and one vessel from Dubičiai 2, which is represented by just one small sherd. In addition to the described separation of Narva and Dubičiai along the x-axis, the Narva cloud shows a further sub-division into two parts along the y-axis (= 2nd eigenvector): The vessels from Kääpa and Žemaitiške 3B cluster in the upper left region around the technological criteria of coarse temper, mollusc shell temper, ochre/chamotte temper and surface residue, while the vessel units from Sjaberskoe 3, Kretuonas 1B and Žeimenio ežero 1 concentrate in the lower right area of the Narva cloud around characteristics such as plant temper, fine and middle-grained temper and scratched surface.

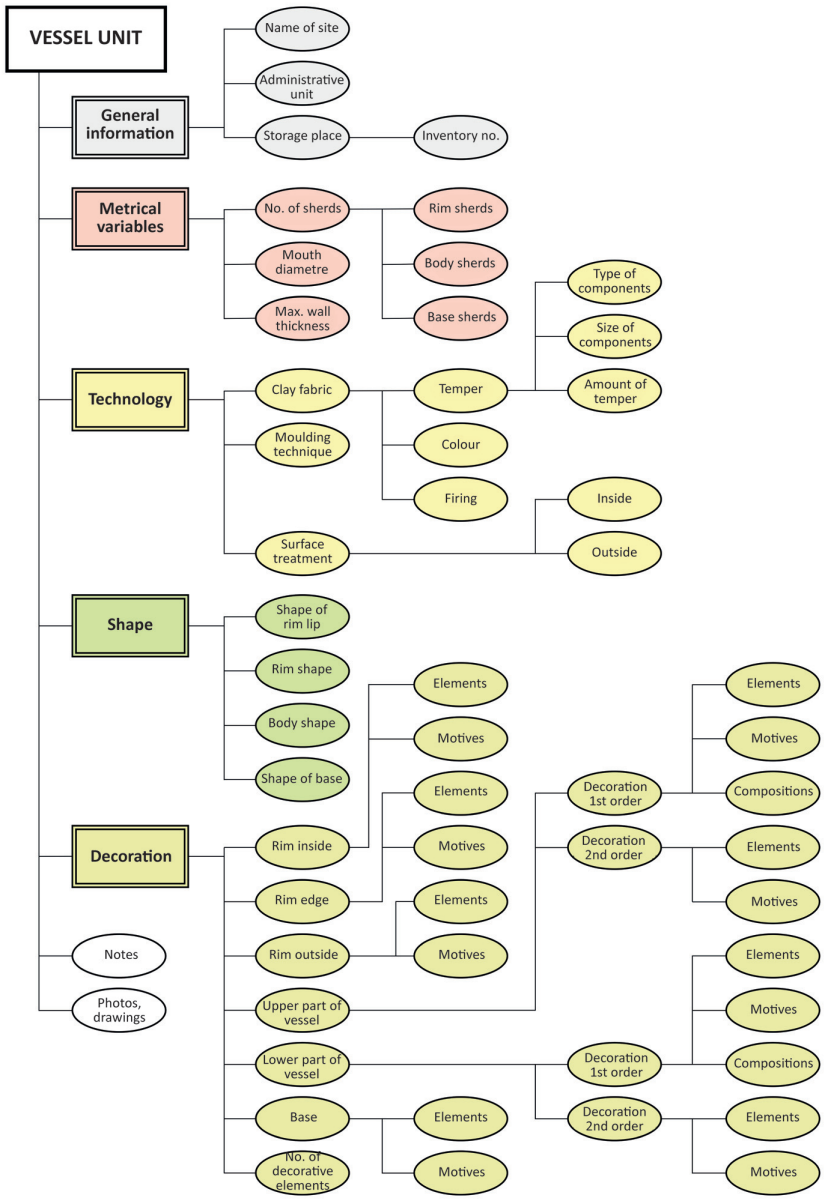

Fig. 7. The structure of the data base in which the analysed material was documented.

The combined analysis of technology and ornamentation is very revealing with regard to the inner structure of the investigated pottery complex and, in particular, of the large entity of early comb pottery styles (Figs. 12–14). Here, too, the 1st eigenvector (Fig. 12: x-axis) produces a clear distribution of the Narva/Dubičiai complex to the left and the comb pottery to the right, with the vessels from Sjaberskoe 3 again forming a link between the two areas, as has been the case in the above-described analysis of the technological characteristics. While the 2nd eigenvector (y-axis) does not describe any sub-division of the Narva/Dubičiai cloud, it captures a clear internal structure of the comb ceramic complex. Along the respective axis of the graph (Fig. 12: y-axis) the pottery from the older layers of Veksa 3 displays particularly negative values; Sperrings and Ka I:1 vessels are grouped around zero and in the lower positive region, and only a number of pots from Säräisniemi 1 sites are located in higher positive areas.

The results of this analysis thus indicate that regarding technology and ornamentation, the comb cera-

Code	Description
MSand	Tempering material sand
MGrus	Tempering material gravel/crushed stone
MOcker	Tempering material ochre/chamotte
MMuschel	Tempering material mollusks
MPflanze	Tempering material plants
Mfein	Tempering particles fine
Mmedium	Tempering particles medium
Mgrob	Tempering particles coarse
Msgrob	Tempering particles very coarse
Mwenig	Small amount of temper
Mmittel	Medium amount of temper
Mviel	Large amount of temper
OohneSch	Surface without slip
Ogekratz	Surface scratched
Opflanz	Surface brushed or with plant impressions
Ogefärbt	Surface coloured red or black
OAuflag	Surface with residue (foodcrust etc.)
Bgut	Firing temperature high
Bmittel	Firing temperature medium
Bschl	Firing temperature low
Bsschl	Firing temperature very low

Tab. 3. Codification of the variables concerning technology for the correspondence analysis.

mic complex is significantly subdivided into various sub-groups. For this reason, the complex will be analysed in more detail to follow up questions of the dispersal of the earliest ceramics into the north, of the role Veksa and the Upper Sukhona region played in these processes, and of the relations and links between the northern groups of Sperrings/Ka I:1 and Säräisniemi 1 (Figs. 13, 14).

Code	Description
Verz2Eb	2nd order decoration
EAnz3	3 decorative elements per vessel
EAnz4	4 decorative elements per vessel
EFisch	Element fish vertebrae impression
EKnoch	Element bone epiphysis impression
EKammk	Element short comb stamp
EKamml	Element long comb stamp
EMatrize	Element figured stamp
EungSt	Element unstructured stamp
EWickel	Element wound cord/knot stamp
EKerbe	Element notch
EFurche	Element stitch-and-furrow
ERitz	Element incised line
EFläche	Element plane impression
LövorBr	Element hole before firing
Mo1vert	Motive vertical row
Mo1mehr	Motive multiline band
Mo1Band	Motive band of oblique or vertical rows
Mo1komp	Motive complicated band made of one element
MoTremo	Motiv stepping comb band
Mo2einf	Motiv simple row made of two elements
Mo2komp	Motive complicated band made of several elements
Mounord	Motive unstructures pattern
Moleer	Motive undecorated field

Tab. 5. Codification of the variables concerning decoration for the correspondence analysis.

Code	Description
Dm1	Mouth diametre ≤ 5cm
Dm5	Mouth diametre ≥ 30cm
Wdst1	Wall thickness ≤ 0,5cm
Wdst4	Wall thickness ≥ 1,2cm
Form1	Vessel shape 1 (bowl-like, with wide mouth)
Form2	Vessel shape 2 (egg-shaped, upper part cylindrical)
Form3	Vessel shape 3 (egg-shaped, narrowing mouth)
Form4	Vessel shape 4 (oval lamps)
FormK	Vessel shape with bent
RFI	Rim shape I
RFC	Rim shape C
RFCS	Rim shape CS
RFS	Rim shape S
RAFger	Rim edge straight
RAFschr	Rim edge oblique
RAFrund	Rim edge rounded
RAFspitz	Rim edge sharp
RAFdick	Rim edge thickened

Tab. 4. Codification of the variables concerning vessel shape for the correspondence analysis.

Figure 18 displays the result of the correspondence analysis of all vessels in this group. Both the 1st and the 2nd eigenvectors attest to an order in the material which leads to a parabolic point scatter. Its lower right region is almost exclusively comprised of vessels from layers 9 and 8 of Veksa 3, which are the oldest complexes in the entire dataset. The relevant variables in this area are ornamentation characteristics such as long comb stamps, motifs with vertically placed elements or stepping comb pattern, and holes incised before firing. The centre of the

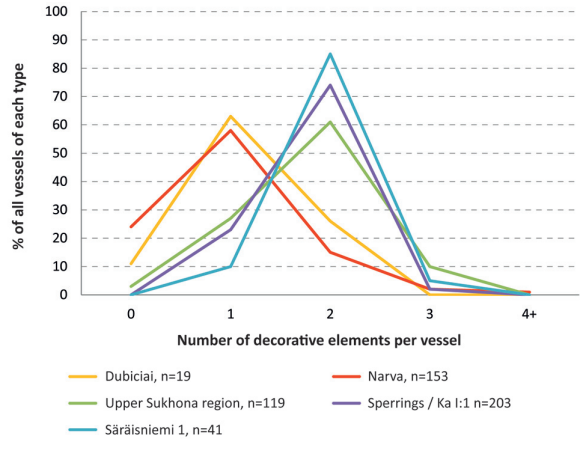

Fig. 8. Number of decorative elements per vessel according to cultural group (y-axis: percentage of all vessels of the respective cultural groups).

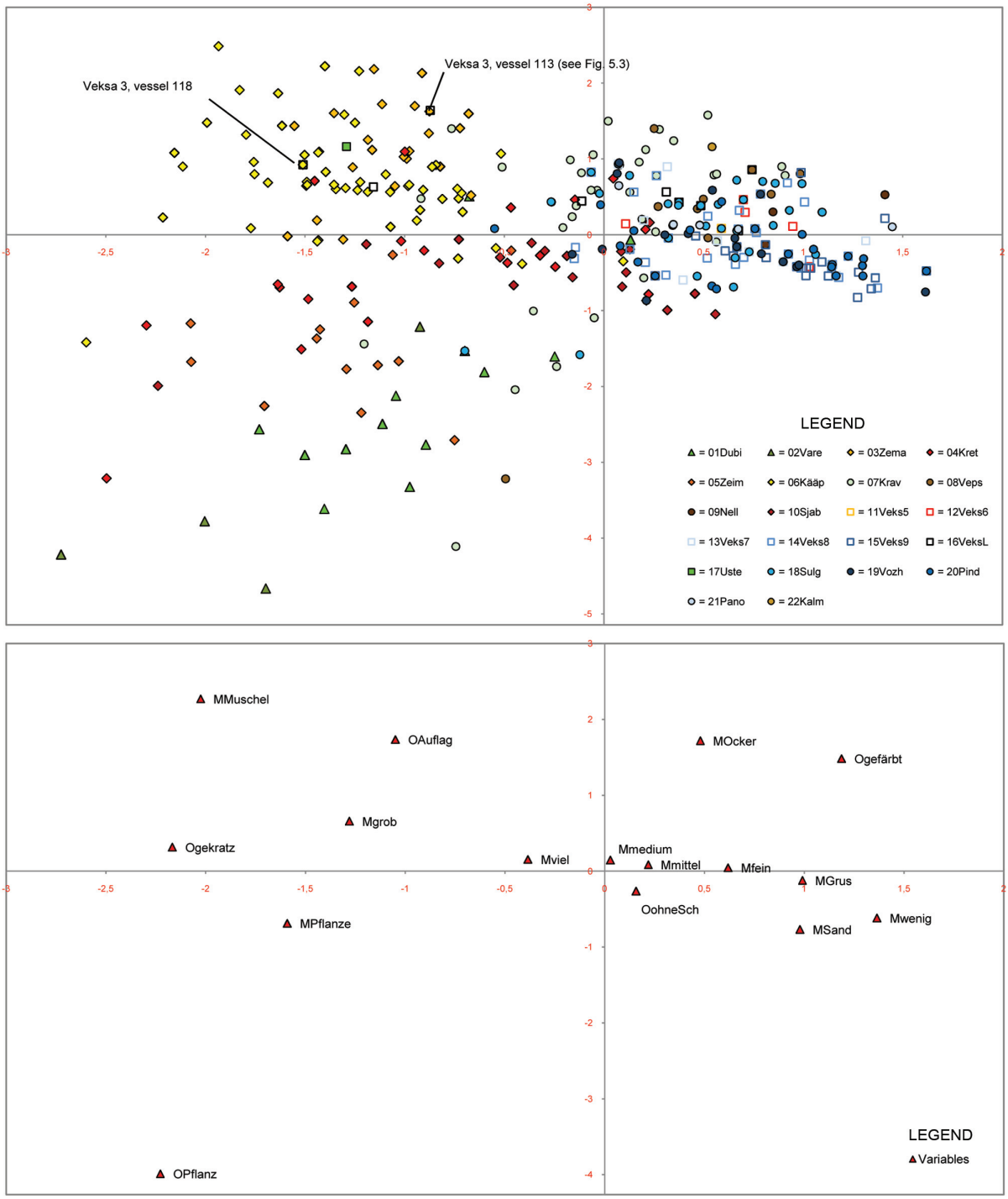

Fig. 9. Correspondence analysis of the technological characteristics for the entire complex, display of 1st against 3rd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tab. 3).

cloud concentrated around zero consists of a dense agglomeration of vessels from the younger layers of Veksa 3 as well as Sperrings pots. It is characterised by a large variety of decorative and technological criteria, some of which are apparently too common to structure the data set significantly. Down to the left, further Sperrings vessels are located together with the ceramics of the Ka I:1 site of Kraviojankangas, and the lower left arm of the point scatter is made up of Säräisniemi 1 pottery. At this end of the scatter, the technological characteristics include coloured surfaces and very coarse temper, and the relevant decorative features are wound cord impressions, figured stamps, and simple as well as complicated motifs composed of several elements. When the existing AMS radiocarbon dates of individual vessels are added to the illustration (Fig. 13, top diagram) it becomes clear that the scatter does

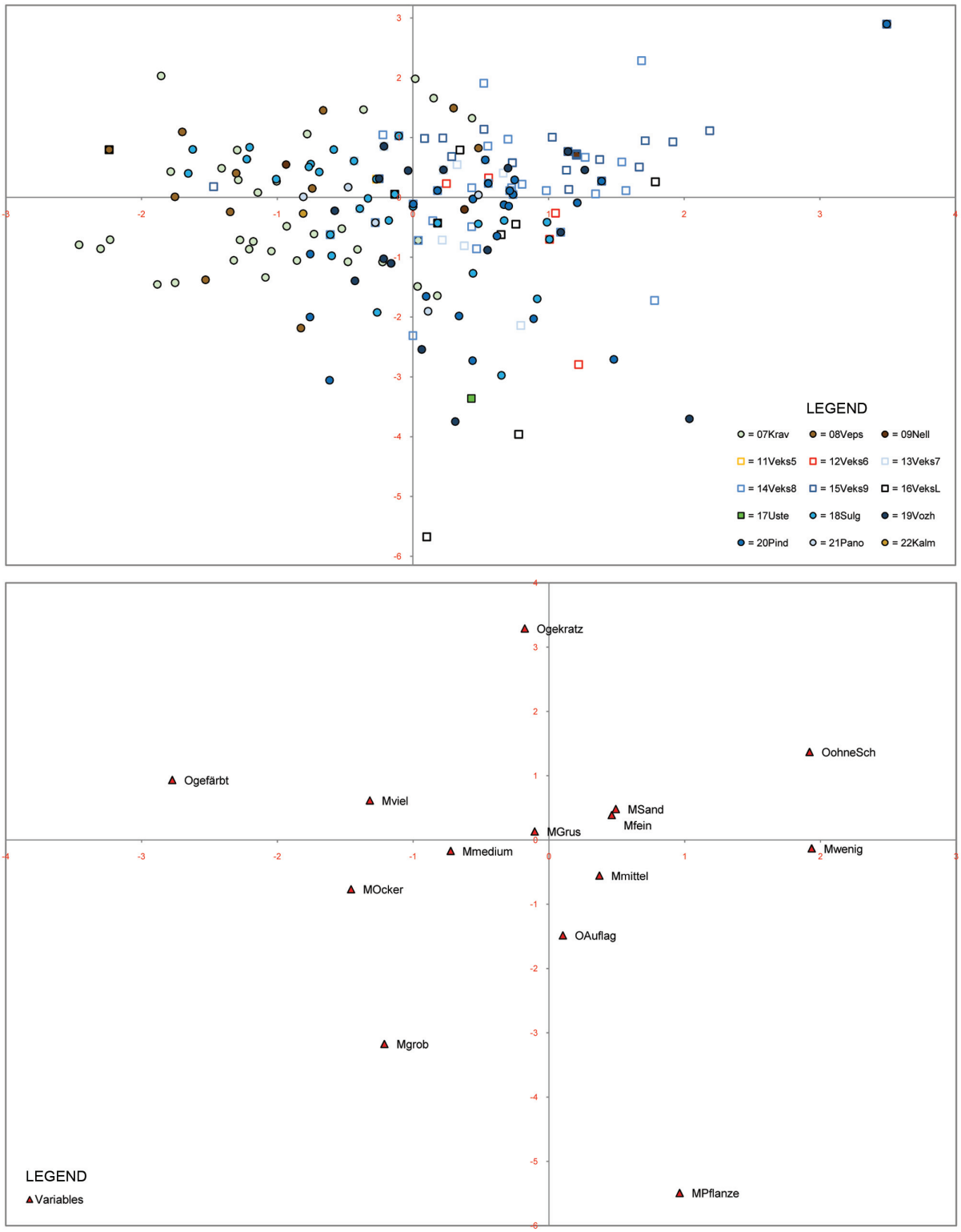

Fig. 10. Correspondence analysis of the technological characteristics for the northern groups, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tab. 3).

not represent an actual parabola in the sense of manifesting a systematic, *i.e.*, chronological sequence, but rather a central cloud with two outlying regions. Although the accuracy of some of the dates is not entirely reliable (*i.e.*, the date from Vozhmarikha 26, which is probably too young: *Piezonka 2008.91–92*), the general impression is that of an unsystematic distribution of older and younger dates in the left arm.

A different picture emerges when the central agglomeration of Sperrings and Ka I:1 vessels which con-

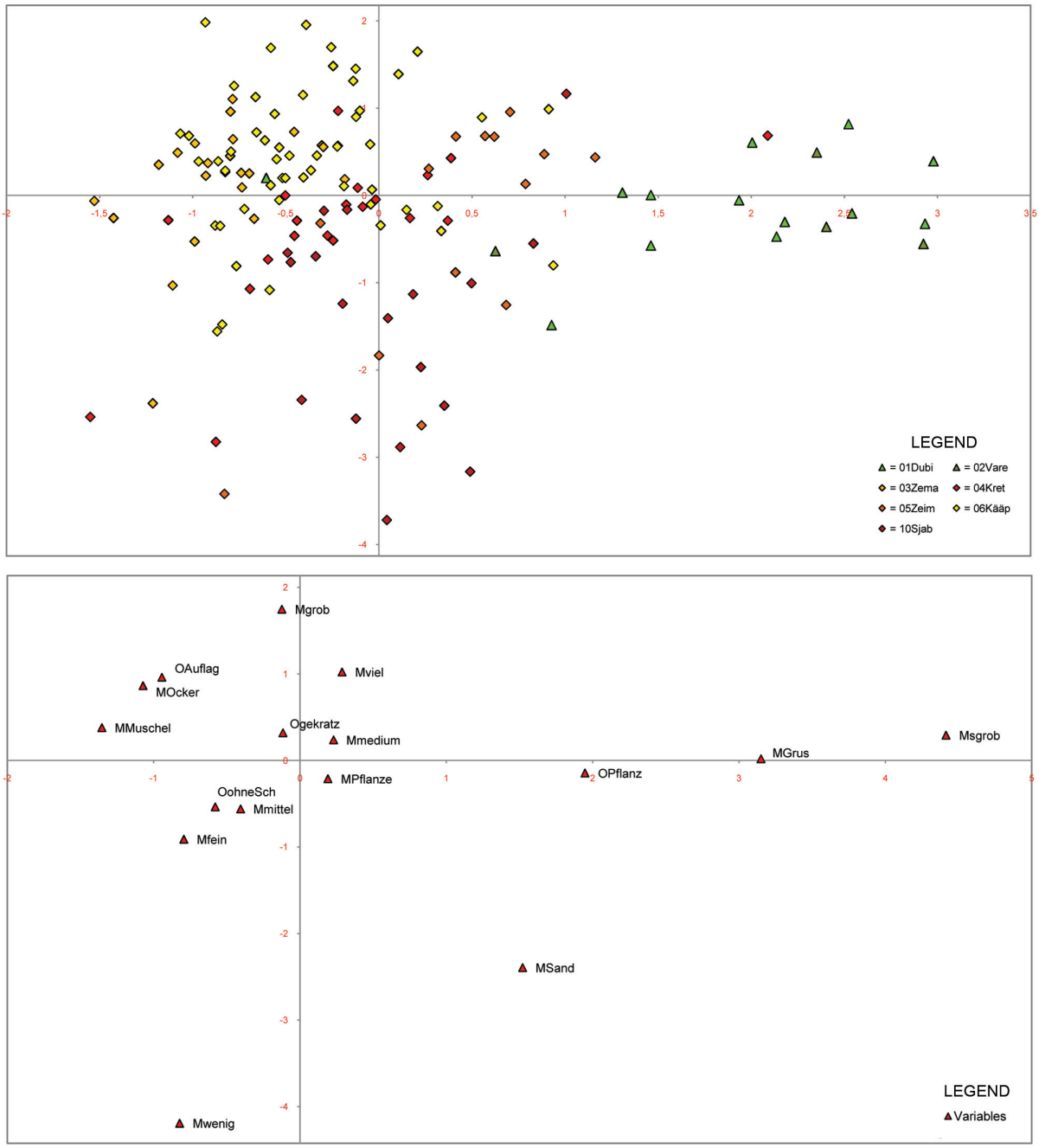

Fig. 11. Correspondence analysis of the technological characteristics for the southern groups, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tab. 3).

centrated in the zero region in Figure 13 are taken out of the calculation, thus resulting in a comparison of only the Sukhona sites of Veksa 3 and Ust'e Borozdy, and Säräisniemi 1. The correspondence analysis of such a data set does result in a true parabolic point scatter, indicating continuous development (Fig. 14). Its right arm again starts with vessels from the two lowermost layers of Veksa 3, which typologically encompass an early, sparsely decorated ware, and pottery ornamented with long comb stamps which is related to the middle phase of the Upper Volga culture. Close to the crossing point of the two axes of the diagram, there follows a concentration of vessels from the upper layers of Veksa 3 intermixed with some Säräisniemi 1 pots, and the left arm is made up of only a few more vessels from Veksa 3 and the majority of the Säräisniemi pottery. In the lower part of the diagram, a few outliers are located, representing the Narva-like vessels from Veksa 3 and Ust'e Borozdy, which are of minor relevance for the present discussion. The sequence calculated in the correspondence analysis thus runs from the ceramics from the oldest layers of Veksa 3 via the pottery from the younger strata of the same

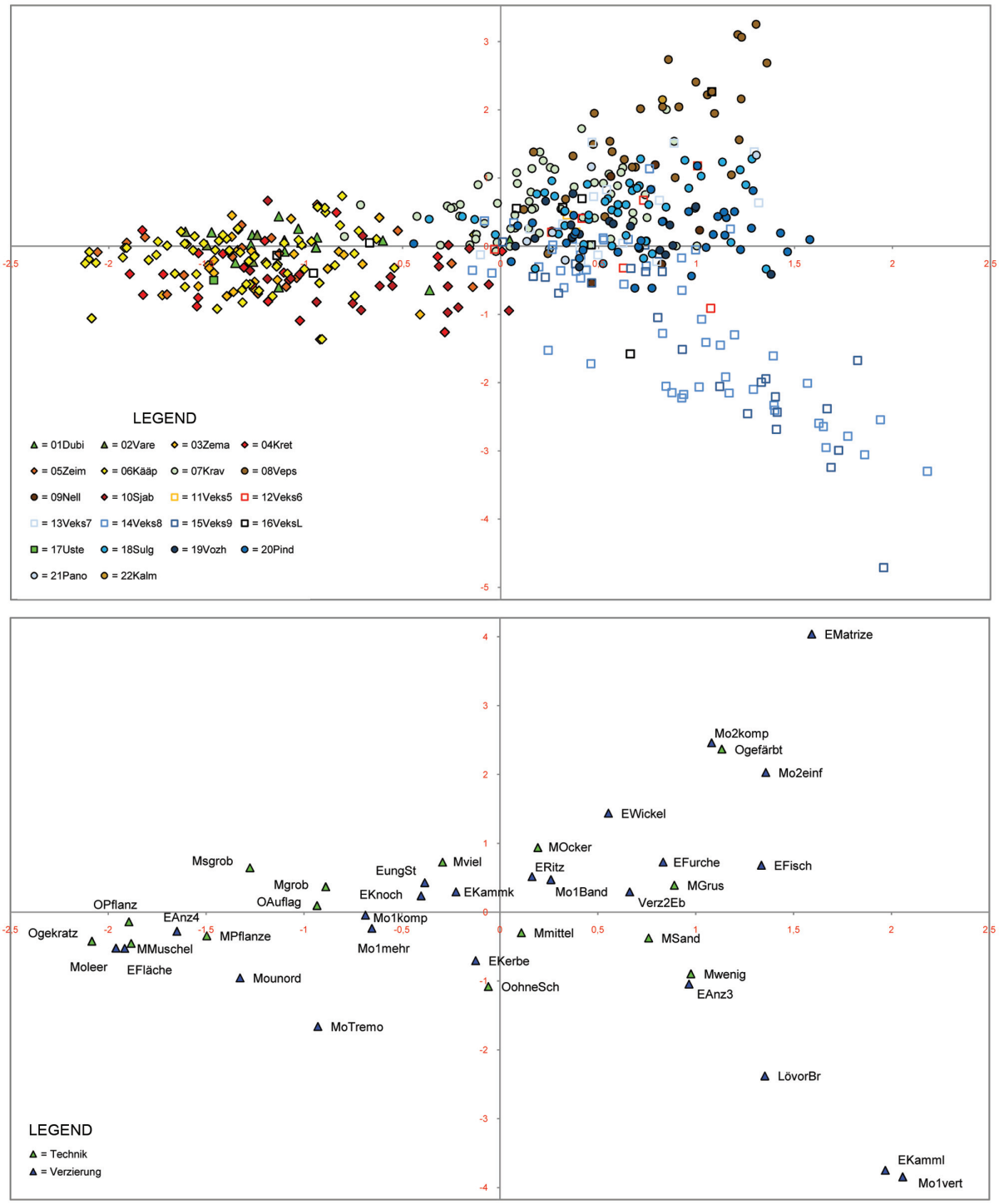

Fig. 12. Correspondence analysis of the decorative and technological characteristics for the entire complex, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 5).

site towards the Säräisniemi 1 ware of north-eastern Fennoscandia. As the possibility of a certain intermixing between the finds from the Veksa layers has to be expected, typologically relevant vessels have been additionally colour-coded in the diagram: the '2nd comb ceramic complex' (yellow) and the 'Northern type' (orange). In this way, the sequence described above is confirmed: both ceramic types are concentrated in the central part of the parabola, with the stratigraphically older '2nd comb ceramic complex' extending farther to the right and the 'Northern type, which is stratigraphically younger, extending farther to the left. Thus the diagram (Fig. 14) indicates a continuous typological development from

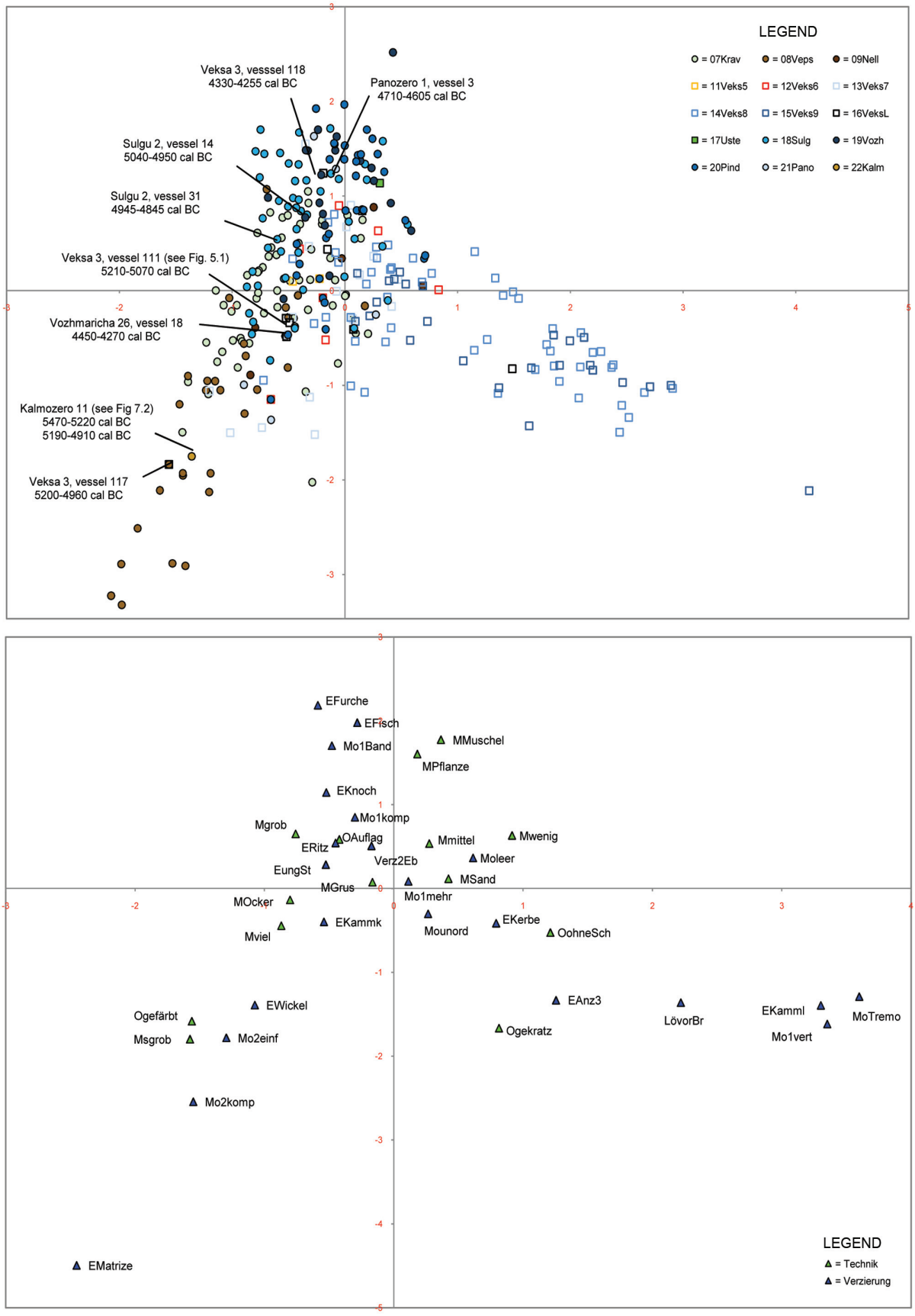

Fig. 13. Correspondence analysis of the decorative and technological characteristics for the northern groups, display of 1st against 2nd eigenvectors, and AMS 14C dates of selected vessels. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 5).

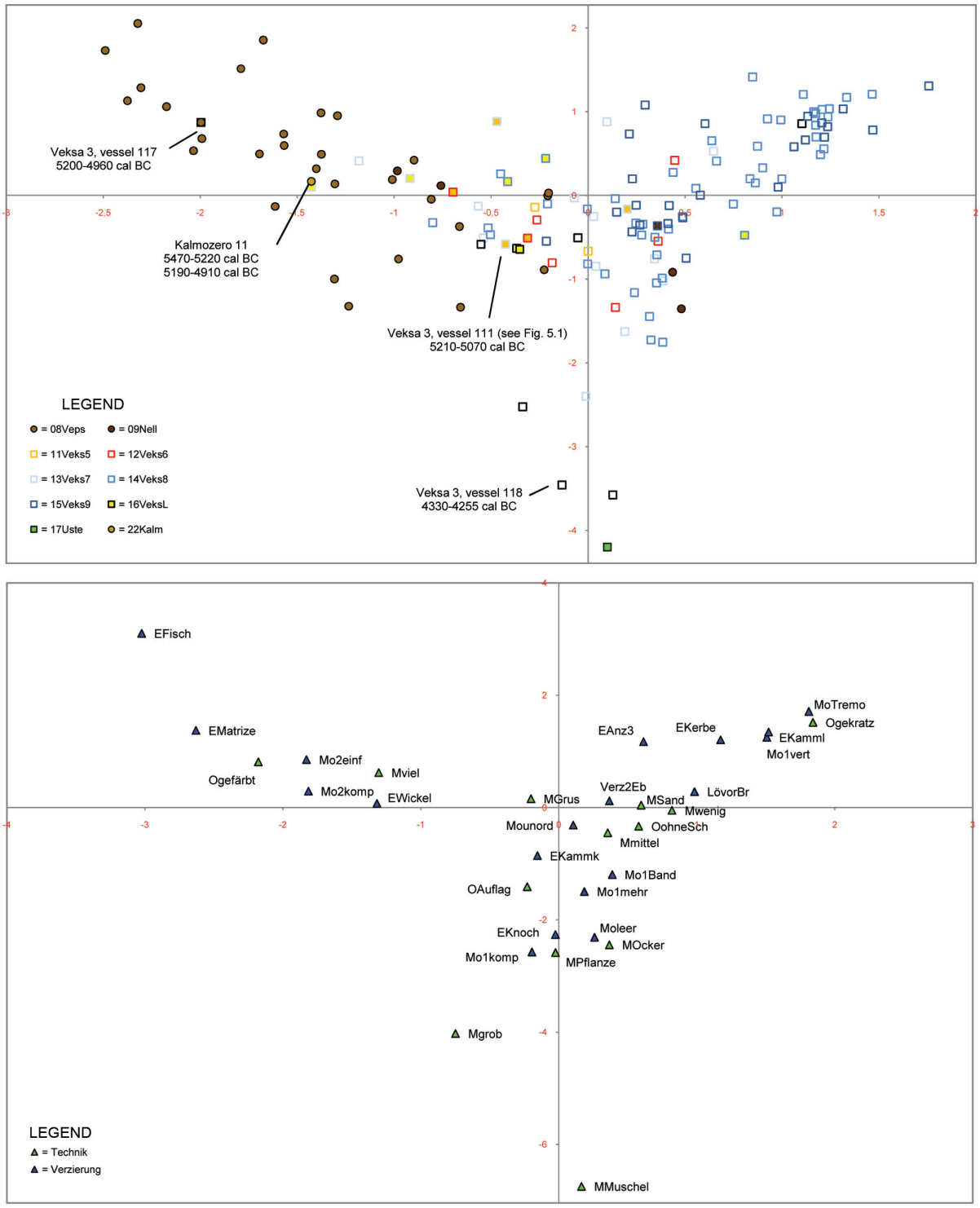

Fig. 14. Correspondence analysis of the decorative and technological characteristics for Veksa 3 and Säräisniemi 1 sites, display of 1st against 2nd eigenvectors, and AMS 14C dates of selected vessels. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 5). Highlighted in the upper diagram: yellow – vessels of the 'Second comb ceramic complex' of Veksa 3, orange – vessels of the 'Northern types' of Veksa 3.

the Upper Volga type pottery of Veksa 3 via the '2nd comb ceramic complex' and the 'Northern type' towards Säräisniemi 1 pottery in the north-western part of the study area. Concerning Veksa 3, this succession is accords with the stratigraphic sequence and, consequently, can be interpreted as a chronological development. The AMS radiocarbon dates of single vessels given in Figure 14 are chronologically very close to each other and cannot be used to verify the hypothesis. However, they do not contradict

Fig. 15. Correspondence analysis of the decorative, technological and shape characteristics for the entire complex, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 4, 5).

it and might have to be understood as an indication of a rapid typological development or, alternatively, a rapid dispersal of the types.

When all three categories of variables, *i.e.*, technology, shape and decoration, are combined in the analysis, the internal structures characterising the data set are represented less clearly than in the described analyses of only the technology and a combination of technology and decoration. This means that, apparently, the shape criteria somewhat obscure the picture. In the diagram depicting the 1st and 2nd eigenvectors (Fig. 15), only some of the early pottery from Veksa 3 forms a clear-cut group dragged away

from the main cloud by the already-mentioned decoration characteristics of long comb stamps and of bands of vertical impressions, and the additional shape variable of a curve in the vessel belly profile. The remaining vessel units form a dense cloud of points which, as usual, is divided into two main areas, the Narva/Dubičiai region and the comb ceramic region, which includes vessels from the younger Veksa 3 layers.

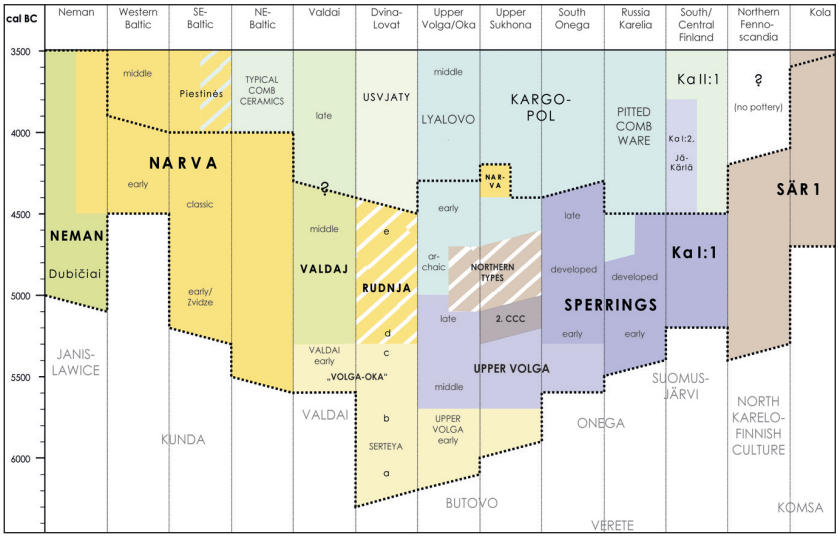

Fig. 16. Chronology of the cultural groups with early ceramics east and north of the Baltic Sea. Coloured: groups with pottery; white: groups without pottery; surrounded by dotted line: Early Neolithic block considered in this study.

The correspondence analysis of the pottery from 17 archaeological sites in the study area has revealed a number of significant, statistically documented results. It was possible to show that the complex investigated is divided into two main entities: a south-western group consisting of Dubičiai type and Narva culture pottery, and a north-eastern group which can be labelled early comb ceramics in a broad sense and which encompasses Sperrings, Ka I:1 and Säräisniemi 1 wares as well as material from the early pottery-bearing layers of Veksa 3 in the Upper Sukhona basin. Thus a hypothesis – already advanced in 1956 by the Finnish archaeologist and pioneer researcher of the Stone Age, Aarne Äyräpää – of the existence of two separate strands in the early pottery development of the North-Eastern European forest zone has now been statistically confirmed (*Äyräpää 1956.35*).

Within the south-eastern group, pottery of the Dubičiai type is distinguished from the Narva ceramics mainly on the basis of technological criteria. For Narva, the statistical analyses have revealed remarkable details of the typological sub-divisions of the ceramics within this culture. Significant differences have been detected between the three complexes of Narva sites in the Lake Kretuonas region in Eastern Lithuania which are located within a few kilometres of each other: The pottery from Žemaitiške 3B, which the excavator Algirdas Girininkas regards as the oldest complex in this region (*Daugnora, Girininkas 1998.223*), has its closest parallels in the ceramics found at the Estonian site at Kääpa and even seems to form a separate technological sub-group with them, while the pottery from Žeimenio ežero 1 only a few kilometres away has clear technological links with the Dubičiai type further south. The pottery of the third Eastern Lithuanian site investigated, Kretuonas 1B, takes an intermediate position between these two poles. Equally interesting are the results of the pottery analysis for Sjaberskoe 3, a North-Western Russian site whose early phase has been associated with the Narva culture. The present study shows that this association has to be reconsidered because, regarding technology and vessel shape, the Sjaberskoe ceramics also have close affinities with the other main group, the comb ceramics entity. At the same time, this site illustrates the existence of smooth transitions between the altogether well-distinguished pottery traditions.

Important results have also been obtained on the internal structure of the north-western main group of early comb ceramic variants. It was possible to demonstrate that the various Early Neolithic groups which can be distinguished at Veksa 3 on the basis of stratigraphy form an integral part of this entity. Very important in this respect is a particular result of the correspondence analysis, namely the possibility of a continuous development from the earliest, Upper Volga-like pottery at Veksa 3 via the younger '2nd comb ceramic complex' and the 'Northern types' towards the Säräisniemi 1 pottery of Northern Fennoscandia. The verification of such a sequence would represent an important step towards solving a central research problem concerning early pottery development in the forest zone regarding the genesis and interrelationship of 'Northern types' and Säräisniemi 1. Moreover, the results of the analysis

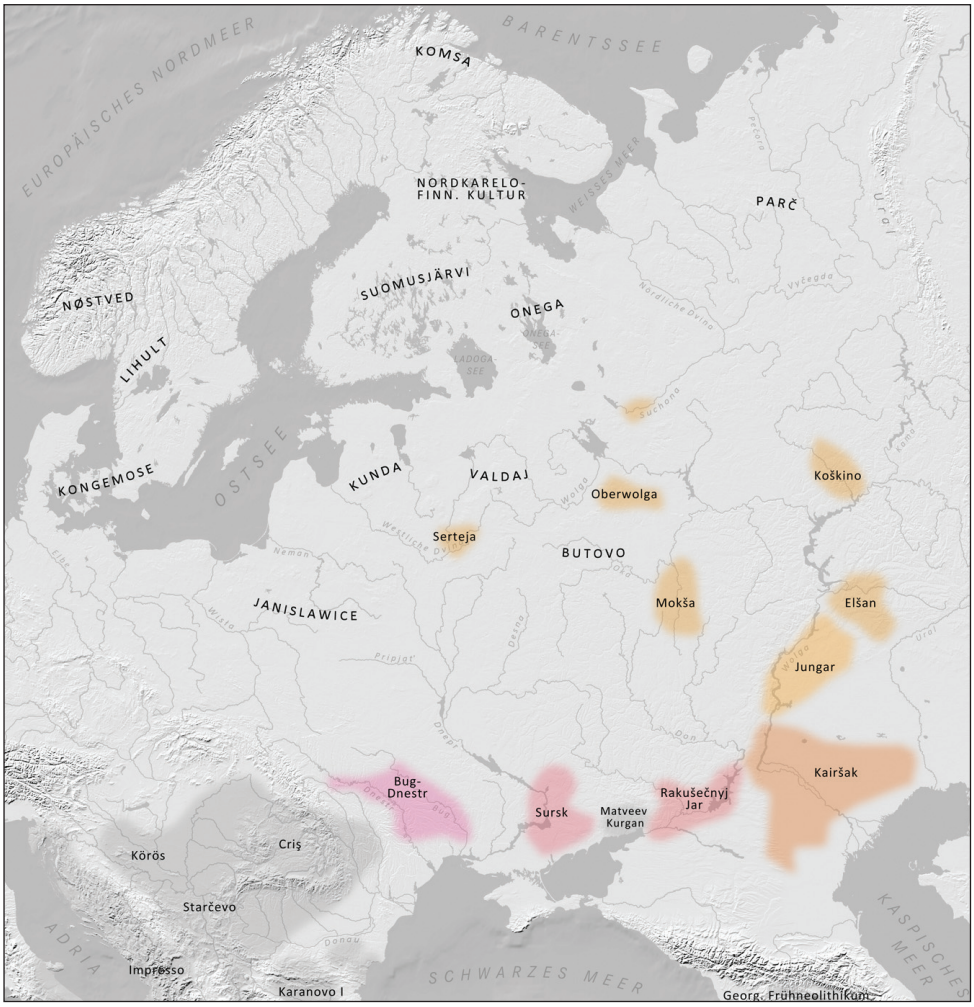

Fig. 17. North-Eastern Europe* c. *6000 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 198*; distribution of hunter-gatherer groups: modified and supplemented after* Kotova 2003 *and* Vybornov 2008*; distribution of farming groups: according to* Müller 2009.Fig. 62*).

suggest that Karelian Sperrings pottery and the closely related Ka I:1 style in Finland stood more or less outside this line of development.

The dispersal of early ceramics into the Eastern and Northern Baltic

When we combine the findings of the above-described statistical pottery analysis with cultural-historical results already published, the following scenario of the emergence and further development of first ceramics groups in the study area and their cultural background can be drawn (Figs. 16–22).

The first pottery reached the study area possibly as early as the last third of the 7th millennium calBC, when the first radiocarbon dates from ceramic vessels and their contexts start to set in between the Volga and Oka rivers and further west in the Dvina-Lovat' region (Fig. 17), although to what extent reservoir effects might have influenced these dates is still under discussion (*Hartz* et al. *in print; Mazurkevich, Dolbunova 2009.80*). The vessels from these early contexts share a number of common features, such as sparse, simple decoration and the frequent occurrence of flat bases alongside the rounded or pointed examples. The earliest ceramics of the Valdai and Sukhona regions probably also belong to this typological entity. On the basis of such pottery from the Volga-Oka and Valdai regions, Yuri B. Tsetlin (*2008*) has defined a new 'Volga-Oka culture', while other authors prefer to associate this ware with the early phases of established archaeological cultures such as Upper Volga and Valdai (*e.g.*, *Timofeev 1996; Tsvetkova 2011*). Future research will have to show whether a singling out of this early horizon is an expedient alteration of the archaeological classification system.

Fig. 18. North-Eastern Europe* c. *5500 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 19*; distribution of hunter-gatherer groups: modified and supplemented after* Karmanov 2008; Kotova 2003; Telegin 1996 *and* Vybornov 2008*; distribution of farming groups: according to* Müller 2009.Fig. 67*).

In the south-western part of the study region, the development continues with the emergence of the Narva culture, the beginning of which is defined by the first appearance of pottery within the Mesolithic Kunda culture substrate (*Kriiska 2009.161– 162*). The earliest dates for this ware stem from North-Eastern Baltic sites such as Zvidze and Osa in Latvia and Kääpa in Estonia and fall around 5500 calBC, while in the South-Eastern Baltic and especially in Eastern Lithuania the earliest pottery vessels emerge some centuries later in the last quarter of the 6th millennium calBC (*Piezonka 2008.98–100*) (Figs. 18, 19). At the same time, Narva typological features also start to influence ceramic production in the Dvina-Lovat' region (Rudnya culture) and – less apparent – in the Valdai area. In the Western Baltic, the first pottery which also belongs to the Narva culture, emerges much later, from the middle of the 5th millennium onwards. The further development of the Narva culture and its pottery differs in the various parts of the distribution area: in the north and east, Narva is replaced by Typical Comb Ware complexes around 4000 calBC, while in the south-west; it continues to exist well into the Late Neolithic (*Brazaitis 2002*) (Fig. 21).

Farther south, by the middle course of the River Neman in the border region between Lithuania, Belarus and Poland, the earliest pottery is represented by the Dubičiai type, which according to the established conception is regarded as the early phase of Neman culture (*Charnyauski, Isaenka 1997*). Based largely on typological observations rather than on the few existing radiocarbon dates which are not very reliable with regards to their contexts, the emergence of Dubičiai pottery probably took place around 5000 calBC or a little before (*Piezonka 2011a.329–332*) (Fig. 19). Approximately half a millennium la-

Fig. 19. North-Eastern Europe* c. *5000 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 200*; distribution of hunter-gatherer groups: modified and supplemented after* Karmanov 2008; Kotova 2003; Matiskainen 2011; Telegin 1996 *and* Vybornov 2008*; distribution of farming groups: according to* Müller 2009.Fig. 68*).

ter, Narva traits start to influence the region from the north. Nonetheless, the Dubičiai type continues to exist up until *c.* 3800 calBC, when the transition to the Lysara Gara phase of Neman culture takes place (*Piličiauskas 2002.133*).

In the eastern and northern parts of the study area, the development of early hunter-gatherer pottery and its cultural context takes another course. Between the Volga and Oka and in the Upper Sukhona basin, the described 'Volga-Oka' phase with its sparsely decorated ware is followed by developed Upper Volga culture ceramics (Fig. 18). These appear just before the middle of the 6th millennium calBC and encompass, among others, vessels decorated with imprints of long comb stamps, which a little later has spread hundreds of kilometres north into the southern Onega basin (*Engovatova 1998; Ivanishchev, Ivanishcheva 2000*). The following developments are especially well deducible from the stratigraphies of the sites in the Upper Sukhona basin. Probably triggered by eastern influences from the Kama- and Dvina-Pechora region, the so-called '2nd Comb Ceramic Complex' (Fig. 4.1, 2) emerges here in the last third of the 6th millennium calBC (*Karmanov, Nedomolkina 2007; Piezonka 2008.82–83*). It might in turn have played a role in the genesis of the next-younger, so-called 'Northern types' (Fig. 4.4), which can be found between Lake Onega, the upper Sukhona and the Upper Volga-Oka region towards the end of the 6th and at the beginning of the 5th millennium calBC (*Piezonka 2008.84*) (Fig. 19). The pottery of the 'Northern types', as indicated by the name, has very close stylistic affinities with the Säräisniemi 1 ware in the far north of the study region (*Zhilin* et al. *2002.44*). The following horizon already belongs to the widely distributed entity of pit-comb wares, which in the Sukhona region is represented by the

Fig. 20. North-Eastern Europe* c. *4500 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 201*; distribution of hunter-gatherer groups: modified and supplemented after* Gurina and Krainov 1996; Karmanov 2008; Klassen 2004; Kotova 2003; Matiskainen 2011 *and* Oshibkina 1996*; distribution of farming groups: according to* Müller 2009.Fig. 71*).

Kargopol' culture, starting in the second quarter of the 5th millennium calBC, while in the Upper Volga-Oka region it is characterised by the Lyalovo culture, the archaic phase of which set in already a little earlier (*Zaretskaya, Kostyleva 2010*) and might have slightly overlapped with the final Upper Volga culture and the 'Northern types' (Fig. 20). According to established local definitions, the end of the Early Neolithic in this region is marked by the transition to the middle Lyalovo culture in the second half of the 5th millennium calBC. At the upper Sukhona sites around this time, the curious appearance of some vessels closely resembling Narva-type pottery can be noted (*Piezonka 2008.82.84*) (Fig. 4.3; see also the highlighted vessel units in Fig. 9). The reasons for, and character of, this typological link is still unclear and needs further investigation. Farther south, in the Upper Volga region, a comparable infiltration of 'Eastern Baltic type' pottery has also noted, although here it seems to be associated with the Late Neolithic (*Zhilin* et al. *2002.75–76*).

Further north, in the Onega region and the Russian part of Karelia, the oldest pottery is associated with the Sperrings culture, which probably started to develop from the middle of the 6th millennium calBC onwards on the basis of the local, aceramic Mesolithic. Only in the very south of the distribution area is it preceded by a ceramic phase connected to the middle Upper Volga culture (Figs. 19, 20) (*Ivanishcheva, Ivanishchev 2004*). Most researchers hold that in this culture the origins of the development of Sperrings ceramics must be sought (*Carpelan 1999.254–256; German 2006*). Some centuries later, in the final quarter of the 6th millennium calBC, pottery manufacture spreads into the southern and central parts of Finland. The earliest ware is called Ka I:1 (= Older Early Comb Ceramic) (*Europaeus-*

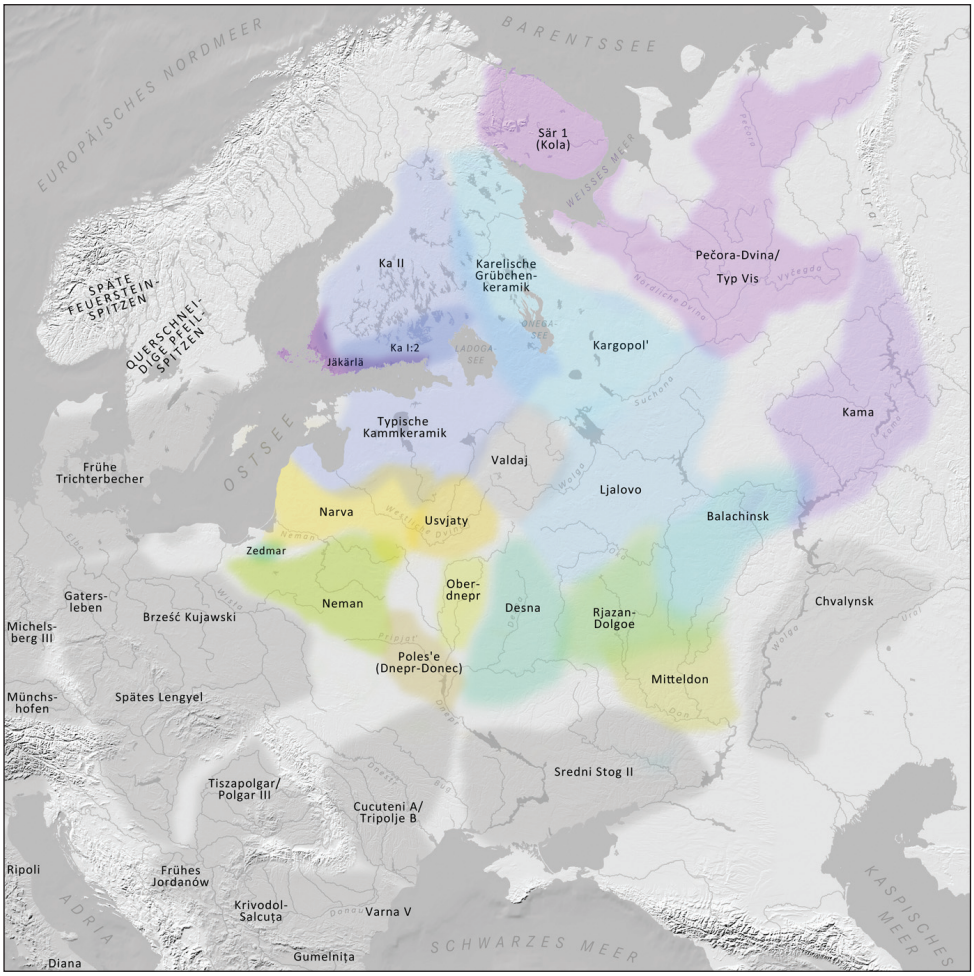

Fig. 21. North-Eastern Europe* c. *4000 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 202*; distribution of hunter-gatherer groups: modified and supplemented after* Gurina 1996; Gurina and Krainov 1996; Karmanov 2008; Kotova 2003; Oshibkina 1996 *and* Pesonen on line*; distribution of farming groups: according to* Müller 2009.Fig. 72*).

Äyräpää 1930) and is typologically closely connected with Sperrings; in the archaeological literature both names are in fact frequently used more or less synonymously as cultural labels for the early Neolithic of the entire region (*Piezonka 2011a.313–314*). In Russian Karelia and the neighbouring regions to the south, Sperrings culture has been subdivided into several phases: after the initial early phase, the first centuries of the 5th millennium encompass the developed stage, and a late phase around the middle of the millennium has been distinguished for the southern Onega region (*German 2002b*), while at the same time further north and east, the early Karelian Pit-Comb Ware starts to develop (Fig. 20) (*Lobanova 1996.103*). Around this time, the developments in Southern and Central Finland start taking another course: on the basis of Ka I:1, the new Ka I:2 and Jäkärlä styles emerge along the southern coast, which are characterised by the absence of pits in the pottery decoration (Fig. 21). Subsequently, from around 4000 calBC, the Ka II:1 (Older Typical Comb Ceramic) style starts to develop, in the ornamentation of which pits form an important element (*Pesonen, Leskinen 2009*).

In the northern parts of Karelia and Finland and the adjacent regions of Norway, the earliest pottery belongs to the Säräisniemi 1 style. As mentioned above in connection with the results of the correspondence analysis, this ware has close typological links with the 'Northern types' distributed approximately one thousand kilometres further south to which it is probably related (Fig. 19). The oldest absolute dates for the Säräisniemi 1 style, however, stem from the northernmost periphery of its distribution area and start around the middle of the 6th millennium. These few early dates, however, might have been distorted by reservoir effects, and the next younger set of da-

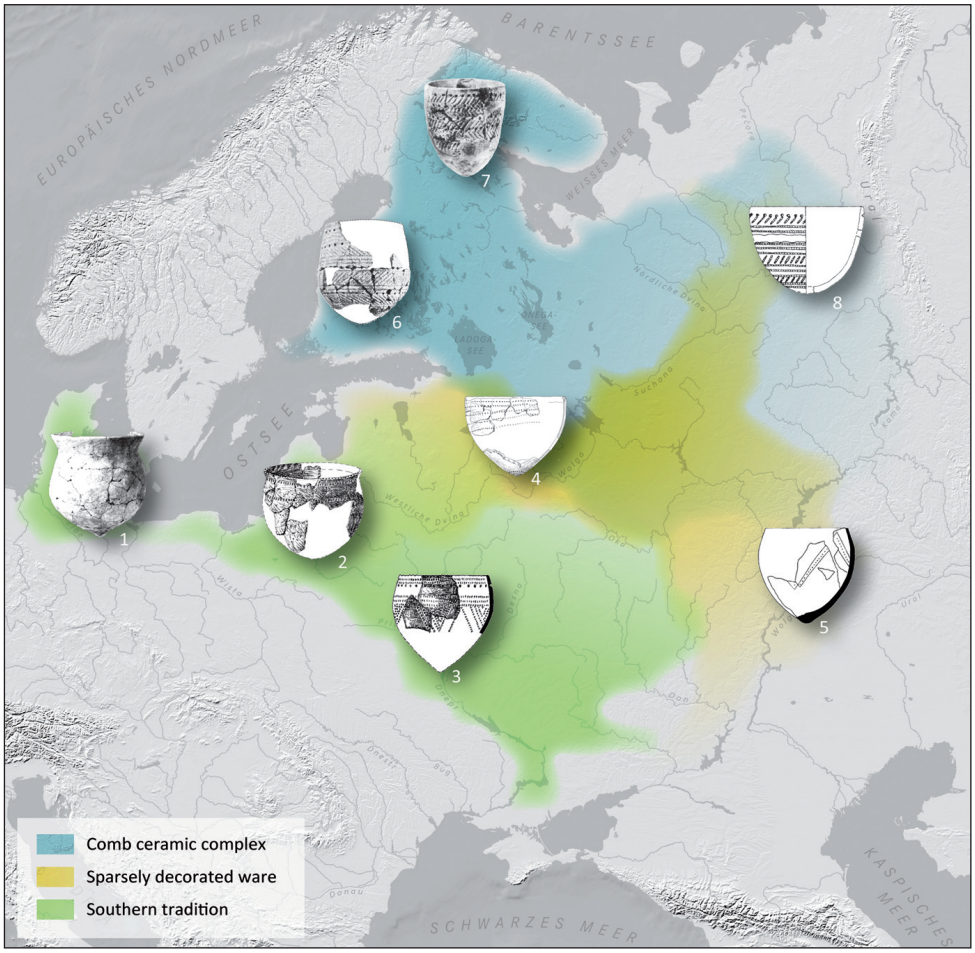

Fig. 22. Three ceramic tradition trajectories influencing the development of early pottery in the Eastern and Northern Baltic region. Displayed time frame:* c. *6000–4500 calBC. 1 vessel of the Ertebølle culture, Wangels, Germany. 2 vessel of the Narva culture, Sārnate, Latvia. 3 vessel of the Dnieper-Donets cultural complex, Luchizhevichi, Belarus. 4 vessel of the Valdai culture, Shchepochnik, Russian Federation. 5 vessel of the Elshan culture, Chekalino, Russian Federation. 6 vessel of the Ka I:1 type, Vargstenslätten, Finland. 7 vessel of the Säräisniemi 1 type, Chavanga, Russian Federation. 8 vessel of the Pechora-Dvina culture, Polovniki 2, Russian Federation (vessel illustrations after* Gurina 1961.Fig. 68 [4]; Gurina 1997.Fig. 28 [7]; Hallgren 2008. Fig. 4.4. [6]; Hartz 2011.Fig. 1 [1]; Karmanov 2008.Fig. 69 [8]; Telegin 1996.Fig. 13 [3]; Vankina 1970.Tab. 73 [2]; Vybornov 2008.Fig. 52 [5]*).

tes from the last two centuries of the 6th millennium calBC seems more reliable (*Piezonka 2008.103*). Säräisniemi 1 pottery, which so far has not been subdivided further, existed according to our present knowledge up until the first centuries of the 4th millennium (Fig. 20) (*Pesonen, Leskinen 2009.302*). In its Finnish and Norwegian distribution area, a hiatus without pottery follows which lasts more than a 1000 years (Fig. 21). A different situation applies to the Kola Peninsula: here the earliest Säräisniemi 1-like pottery makes its appearance comparatively late, around the middle of the 5th millennium calBC, to persist relatively unchanged up until the beginning of the Early Metal Ages (*Piezonka 2008.103–104*) (Fig. 21).

Summarising the evidence of both existing studies and the new multivariate pottery analyses, the cultural history of the 6th and 5th millennia calBC in the Eastern and Northern Baltic region is marked by three main tradition lines triggering and influencing local ceramic development (Fig. 22). The oldest tradition line encompasses sparsely decorated wares, the origins of which reach back to the first half of the 7th millennium calBC in middle Volga region. Via a number of intermediate steps in Central Russia, this tradition probably formed the background for the emergence of Narva culture pottery in the Eastern Baltic around 5500 calBC. A second, southerly tradition reached the study area from the Dniepr-Donets cultural complex of the steppes and

forest steppes in the Northern Pontic region. In the second half of the 6th millennium calBC, it formed the basis for the development of the Dubičiai type as the early phase of the Neman culture, and probably also affected the typological evolution of Narva ceramics. The third tradition encompasses stitch and comb stamp decorated wares with origins in the Volga-Kama region, from where it spread westwards at the beginning of the 6th millennium calBC. On its basis, the Upper Volga culture developed in Central Russia, which in turn formed the basis for the emergence of Sperrings and Ka I:1 farther north. New eastern influences probably triggered the formation of the 'Northern types' in the Central Russian basin and of Säräisniemi 1 pottery in Northern Fennoscandia. Concerning these developments, the period around 5300 calBC was especially dynamic, when changes in the material culture affected almost the entire study area, either it in form of the adoption of ceramic technology in the South-Eastern Baltic and in Finland, or in the form of the emergence of new stylistic features in regions where pottery had already been established (see Fig. 16).

Conclusions

The dispersal of the earliest pottery into the region east and north of the Baltic Sea has until now been understood at best on a very general level. The lack of significant material studies has so far hindered a sound and more in-depth reconstruction of this process and of the typological and chronological developments behind it. For this reason, the research presented in this article is based on a detailed standardised investigation of 17 selected pottery complexes of the 6th and 5th millennium calBC from Lithuania, Estonia, Finland and Russia to follow up problems of typology, chronological trends, and regional trajectories. To reach these goals, correspondence analysis proved to be a useful statistical method to investigate linking and dissociative elements within the investigated ceramics complexes. The method is well-suited to account for already presumed as well as new connections and relations in the dispersal process.

The central results of the study can be summarised as follows: two large traditions lines are distinguished in the investigated material – a southern tradition with Dubičiai and Narva in the Eastern Baltic and neighbouring areas to the south, and a northern comb ceramic tradition including Sperrings, Ka I:1 and Säräisniemi in Karelia, Finland and neighbouring areas. An older tradition preceding these two lines is represented by sparsely decorated wares spreading form the Volga steppes towards the northwest. In addition, for the question of the origin and genesis of the Säräisniemi 1 type, a connection with groups far to the east in the northern Cis-Urals can be suggested, while its relation to Sperrings and Ka I:1 seems less prominent. The results presented in this paper underline the potential of detailed ceramic analysis for understanding the typological developments and interrelations even in such a vast region as the one considered here, as they enable new and differentiated insights into cultural changes among hunter-gatherer groups of the Baltic region in space and time.

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BACK TO CONTENTS

Gentes groups in the structure of Neolithic cultures of the Central Russian Plain

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ABSTRACT – *The possible identification of* gentes *groups in the Neolithic population of the central Russian plain is presented in this paper. For this purpose, a systematic analysis of pottery decoration traditions was performed. We suggest that all studied archaeological cultures had the same social structure, which included two* gentes *groups, but the gens also had a core and a periphery.*

IZVLEČEK – *V članku so predstavljeni različni metodološki nastavki za opazovanje skupin s sorodstvenimi vezmi, t.i.* gentes*, v neolitiku na območju centralnega Vzhodnoevropskega ali Ruskega nižavja. Izdelana je bila sistematična analiza tradicij v izdelavi ornamentov na lončenini. Ugotavljamo, da je imela vsaka arheološka kultura na tem območju enako družbeno strukturo, ki je vključevala dve različni skupini* gentes*, od katere je vsaka imela še svoje kulturno jedro in obrobje.*

KEY WORDS – *Neolithic cultures; pottery decoration; social structure; the central Russian plain*

Introduction

It is very difficult to study the social structure of Neolithic communities on the basis of archaeological materials, but circumstances sometimes arise that allow for such an analysis, as was the case in this research. But first the factual basis of this study will be characterised briefly, because the reliability of our conclusions depends directly on its volume.

The analysis included a total of 3600 ceramic vessels from more than 200 excavated Neolithic sites; of these, 10 sites belong to the Volga-and-Oka culture, 32 sites to the Upper Volga culture, 59 sites to the Pit-and-Comb Pottery culture, 47 sites to the Volosovo culture, 20 sites to the Thin Rare-Pit Pottery culture, and 41 sites to the Rare-Pit Pottery culture (*Tsetlin 2008.29–33*). Although the analysis does not include all the excavated material, we believe that they are adequately representative for our studies in different regions. The Volga-and-Oka culture is not presented in this context, as the pottery assemblage is too small to be statistically relevant.

Analyses of pottery decoration indicate three phases in the developments of the Upper Volga culture (Fig. 1), of the Pit-and-Comb Pottery culture (Fig. 2), and of the Volosovo culture (Fig. 5). We identified two phases in the Rare-Pit Pottery (Fig. 3) and in the Thin Rare-Pit Pottery groups (Fig 4).

The systematic analyses of pottery ornamentation include descriptions of five structural categories: element, pattern, motif, image and composition. Each category is studied separately, but enters as a component in the next. We therefore follow a gradual accumulation of individual features of ornamental traditions in pottery production within a single cultural context. However, our studies of Neolithic ornamental traditions are based mainly on fragmentary pottery assemblages, and therefore the composition of ornaments cannot be studied.

For the study of social structures of Neolithic populations, the structure and proportion of ornamental elements is the most important at the very first level of the analyses, because it provides the most abundant and therefore the most reliable information. We will consider the data consistently for each culture.

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The Upper Volga culture

The archaeological sites between which the similarity of the pottery ornamentation elements is 80% or more constitute a cultural core. In the Upper Volga culture, 20 sites (*i.e.*, 62% from the 32 sites studied) could be defined as core sites. The similarity of the pottery from the core sites and other sites, and also between the other sites, is lower. Moreover, this core is not uniform, since it consists of two groups: group A, which consists of 5 sites, and group B, which consists of 15 sites. The degree of similarity between the sites within each group is approximately 83–84%. Of the remaining 12 sites belonging to this culture, one belongs to group A, and 11 to group B. It is clear that the population of group B dominated the population of the Upper Volga culture.

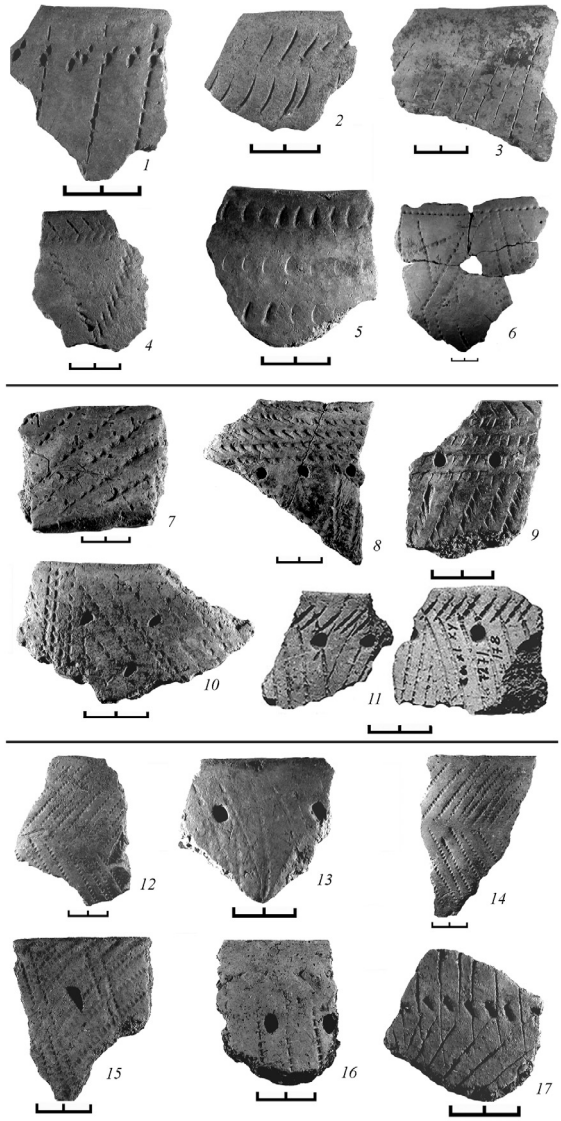

Fig. 1. Upper Volga Pottery culture. Early period (first third of the 5th millennium BC): 1, 2, 4, 5 Vladychinskaya-Beregovaya 1; 3 Vladychinskaya-Borovaya; 6 Vladychinskaya-Beregovaya 2. Middle period (second third of the 5th millennium BC): 7 Sadovyi Bor; 8 Zarech'e 1; 9–10 Maslovo Boloto 2; 1 Sahtysh; 11 Stratigraphic Control Excavation 2 (hereinafter SCE), Horizon 9. Late period (last third of 5th millennium BC): 12–14 Repishe 1; 15–17 Nikolo-Perevoz 1.

It is tempting to assume that the distribution of both groups was geographical. However, this could not be clearly observed (Fig. 6). The group B sites were distributed at regular intervals over the region, while the group A sites meet both in the Klyazma River basin and on the Low and Middle Oka basin.

Pit-and-Comb Pottery culture

In this culture, 34 sites (*i.e.*, 58% from a total of 59 studied sites) reveal a consecutive degree of similarity of 90% and more. Unlike the Upper Volga culture considered above, this culture demonstrates much more uniformity in ornamental traditions. However, here again the core of the culture was not uniform, but consisted of two groups. Group A includes 38 sites, among which 19 form the core of the group, and another 19 sites comprise an additional part of the group (the similarity between them and the sites of the core group is notably lower). Group B includes 21 sites, of which 15 form the core of the culture and 6 are additional sites. Within the core of each group, the average similarity between settlements is approximately 92–93%. In this case, group A predominated among the population of the Pit-and-Comb Pottery culture somewhat more than group B.

Let us consider how the sites of each group (A and B) are located on the central Russian plain (Fig. 2). Although group A sites are more concentrated on the southern part of the plain and group B sites to the north, some sites of both groups shared the same territory, for example at the Low Oka River basin.

The Rare-Pit Pottery group

A total of 41 sites comprise this population group with 30 sites (or 73%) forming the core. The degree of similarity between these sites is approximately 90%, which corresponds to the unity of the Pit-and-Comb Pottery culture sites. As was demonstrated in the previous cases, the core comprises two groups according to the strongest connections. Group A includes 25 core settlements, in which the degree of similarity between the sites is 94%, and 7 additional sites are characterised by weaker connections with-

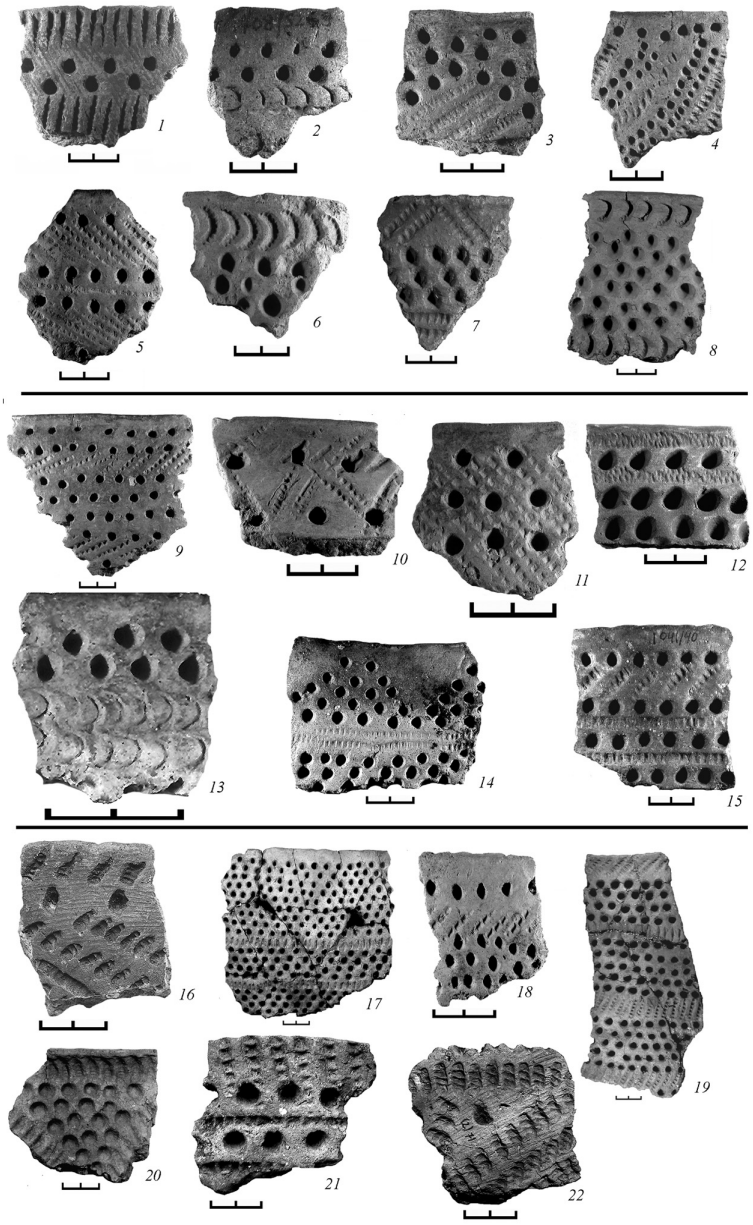

Fig. 2. Pit-and-Comb Pottery culture. Early period (last quarter of the 5th millennium BC – last quarter of the 4th millennium BC): 1 Ivanovskoe 3, SCE–1, Horizon 6; 2–4 Pol'tso 1; 5–6 Gavrilovka 1; 7–8 Plehanov Bor. Middle period (last quarter of the 4th millennium BC – beginning of the 3rd millennium BC): 9 Sadovyi Bor; 10–11 Gavrilovka 2; 12 Vladychinskaya-Beregovaya 1; 13–14 Pol'tso 3; 15 Unitsa. Late period (beginning – second quarter of the 3rd millennium BC): 16 Ivanovskoe 2, SCE–1, Horizon 7; 17–19 Plesheevo 4; 20 Volosovo; 21 Sahtysh 1, SCE–1, Horizon 4; 22 Ivanovskoe 2, SCE–1, Horizon 5.

in this group. Group B includes 9 settlements, and of these 5 belong to the core, with a degree of similarity of approximately 93%. As we can see, group A is more dominant in the population group with Rare-Pit Pottery.

The distribution of settlements with Rare-Pit Pottery of both cultural groups is shown on the map (Fig. 8). According to this data, the settlements of group A were distributed throughout the region, while B group sites are concentrated at its centre. The settlement patterns are not mutually exclusive within this group.

The Thin Rare-Pit Pottery group

A total of 20 sites comprise this population group, and 13 (or 65%) of the sites form the cultural core, since the degree of similarity between the sites is approximately 80% and more. However, a weaker connection between the settlements in the core group can be observed in comparison with the Pit-and-Comb Pottery culture and the Rare-Pit Pottery group. As in the previous cases, the cultural core of the population with Thin Rare-Pit Pottery is not uniform, and consists of two groups: group A with 16 settlements, 10 of which form the core, while group B includes 4 sites, of which 3 sites present the core. The degree of similarity between the sites in the core group A is 86% and 91% between sites in group B. Despite the more compact core in group B, it is possible to conclude that group A predominated among this population.

Let us consider the distribution of settlements of these two groups in the region (Fig. 9). It is clear that the group A settlements extend throughout the territory, while the group B settlements are concentrated around the Yaroslavl Volga basin, with one exception located on the Middle Oka River. Groups A and B do not appear in two separate locations in the distribution pattern.

Volosovo culture

Among the 47 settlements of this culture, 31 sites (66%) are characterised by a high degree of similarity of 80% and more, therefore forming the core of the culture. These sites could also be divided into two groups. Group A includes 22 sites with a degree of similarity of approximately 83%, while a further

12 sites have weaker ties. Group B consists of 9 highly similar sites (the degree of similarity is 85%), forming the core of the group, with 4 additional settlements. Group A predominates in the Volosovo culture population.

The distribution of settlements of both cultural groups on the central Russian plain is shown on the map (Fig. 10). The core of group A is concentrated mainly on the Low and Middle Oka River, while additional settlements also occupy the central part of this territory. In contrast, the core of group B is concentrated in the centre, although some settlements are also located to the south. The two groups are distributed in roughly the same locations on the Russian plain.

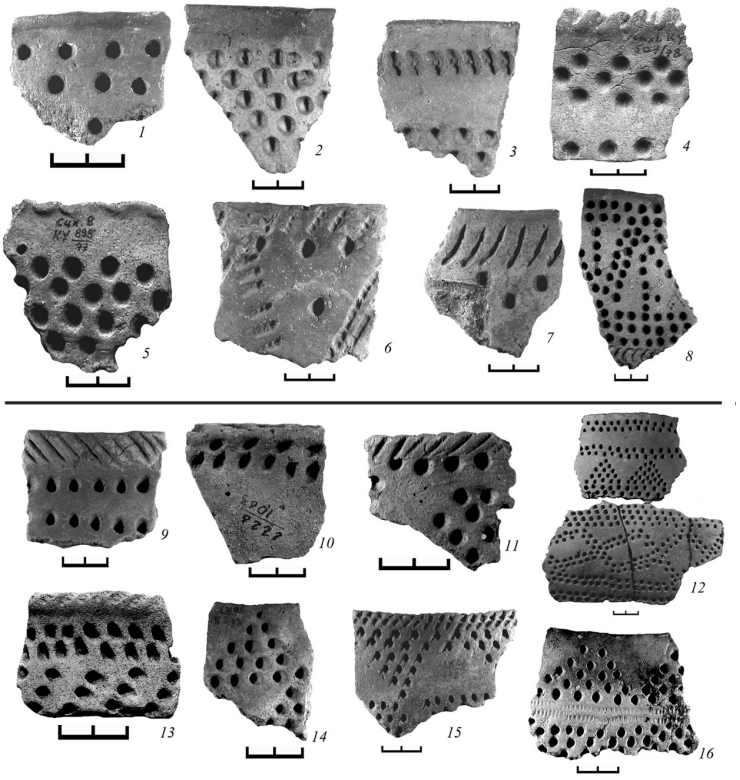

Fig. 3. The Rare-Pit Pottery group. Early period (third quarter of the 4th millennium BC): 1 Panfilovskaya; 2–3 Plehanov Bor; 4 Sahtysh 1, SCE–2, Horizon 6; 5 Sahtysh 8, SCE–1, Horizon 5; 6–7 Repishe 1; 8 Nikolo-Perevoz 1. Late period (last quarter of the 4th millennium BC – beginning of the 3rd millennium BC): 9 Fefelovskaya Pridorozhnaya; 10 Shagara 2; 11 Maslovo Boloto 2; 12 Zarech'e 1; 13 Berendeevo 1, SCE–1, Horizon 3; 14–15 Pol'tso 1; 16 Pol'tso 3.

As a result, our data on the structure and proportion of ornamental elements of vessels permits us to draw the following conclusions. Firstly, each archaeological culture is structured into the cultural core with strong relations between settlements, and the cultural periphery with weaker ties between settlements. On average, a cultural core includes some 65% of settlements and the cultural periphery comprises some 35% of sites. Secondly, each archaeological culture consists of two cultural population groups with specific ornamental traditions, as will be demonstrated later, in which one is dominant and the other recessive. Thirdly, the cultural core and cultural periphery could be identified in each of the population groups. Fourthly, judging by the spatial distribution of the cultures and cultural groups within them the populations of these did not live separately in different regions in the strict sense, but inhabited the same territory.

Next we present the basic features of the ornamental traditions within each archaeological culture or large population group in the central Russian plain.

The Upper Volga culture

Ornamental elements. We begin with a comparative analysis of the structure and proportion of ornamental elements on the pottery of both groups belonging to this culture. For the traditions of group A, undecorated parts on the surface of vessels (54%) and rarer dot decoration (21%) are the most typical ornamental elements. The traditions of the dominant group B were much more varied. Here, the potters equally used a comb ornament (22%) in combination with empty areas on the surfaces (23%). Pit and dot elements of decoration were less common (17% each), as were pin elements (14 %). The general degree of similarity of traditions of these two groups in terms of ornamental elements is 65%.

Ornamental patterns. A different picture can be observed in the analysis of patterns of ornamentation. The potters used mainly dot patterns (group A – 58%, group B – 35%), while comb (group A – 21%, group B – 33%) and pin (group A – 21%, group B – 24%) patterns were used somewhat less. The similarity of the traditions of these groups in terms of ornamental patterns is 77%, *i.e.*, somewhat more than in terms of ornamental elements. Thus, both groups of the Upper Volga culture were quite similar in terms of the use of ornamental elements and patterns on ceramic vessels.

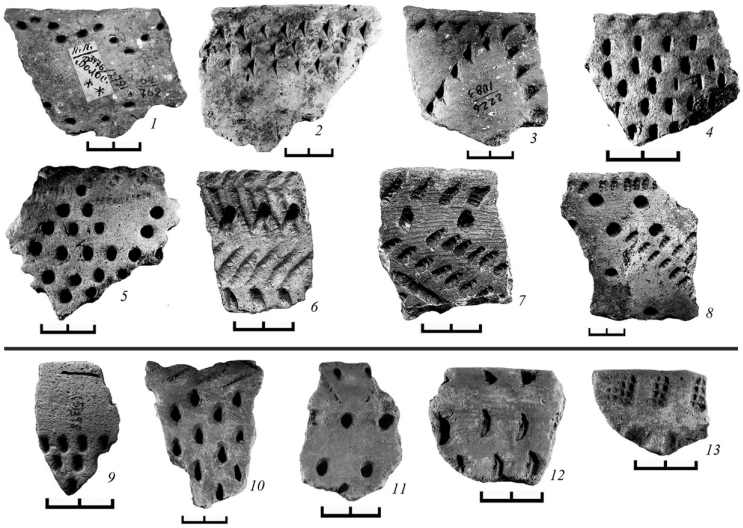

Fig. 4. The Thin Rare-Pit Pottery group. Early period (second quarter – the end of the 4th millennium BC): 1–2 Volosovo; 3 Shagara 2; 4 Maslovo Boloto 2; 5 Unitsa; 6–8 Ivanovskoe 2, SCE–1, Horizon 7. Late period (the end of the 4th millennium BC – the end of the 3rd millennium BC): 9 Ivanovskoe 3, SCE–1, Horizon 5; 10–13 Fefelovskaya Pridorozhnaya.

Ornamental motifs. The distribution of simple ornamental motifs is practically the same as the distribution of ornamental elements, so they are not considered here.

In contrast, 9 kinds of complex motifs in the pottery group A and 22 variants in group B could be identified. The degree of similarity between the groups is only 36% according to these features. However, only a few of these motifs were present on a larger number of finds in this culture. In group A, these motifs are: a dot pattern with parts without ornamentation between them (41%), two kinds of alternate comb patterns divided by parts without decoration (25%), and two kinds of alternating dot patterns (16%). In group B, the most abundant motifs are: alternate pit and comb elements (13%), two kinds of alternating comb pattern (12%), and two alternating dot patterns (11%). The motifs in group B are much more varied than those in group A; there are no predominant motifs and the mass motifs of both groups are different, except one which shows that the histories of each group were quite different.

Ornamental images. Simple images were more widespread in the ornamental traditions of the Upper Volga culture, and complex (combined and crossed) images were used rarely. The simple images consist of two adjoining motifs that include only the same kinds of ornamental elements or patterns. In group A, 15 such images could be identified, and in group B, 19 of the images could be termed simple. In both groups, only 5 combinations of images are present in more than 10%; 3 of these combinations are present in both group A and B, while the remaining 2 combinations are present in only one of the groups (Tab. 1).

The absence of obviously predominant images in the pottery decorations and the lower degree of similarity between the two groups in terms of simple ornamental images (49%) is quite interesting since it correlates with the results of the analysis of ornamental motifs.

In the complex images consisting of different combinations of motifs, 5 variants of these images could be identified, including 4 variants in group A and only one in group B (Tab. 2). The degree of similarity between the groups is only 25%.

To sum up the comparative analysis of ornamental stylistic traditions, the two groups of the Upper Volga culture have similar ornamental elements and patterns in the pottery, but are considerably different in terms of ornamental motifs and images.

Pit-and-Comb Pottery culture

Ornamental elements. In group A, three different ornamental elements are present: the pit (41%) and comb element (26%) as well as an element without decoration (15%). In group B, only the pit (60%) and comb (25%) ornamental elements are present. The degree of similarity of the ornamental elements is approximately 76%.

Ornamental patterns. In group A, 8 kinds of ornamental pattern could be identified, with the comb

	Motifs	Group A	Group B
pit	comb		16
pit	dot	13	
pit	without ornamentation		17
comb	comb	16	11
comb	dot	12	
comb	without ornamentation	16	13
pin	without ornamentation	11	11

Tab. 1. The percentages of simple ornamental images on the Upper Volga culture pottery.

(49%) and pit (25%) decoration elements being the most common. There are 5 kinds of patterns in group B: comb (55%), pit (15%), sickle-shaped (14%) and grooved decoration (13%). The degree of similarity of the two groups is quite high at approximately 82%.

Ornamental motifs. In group A, 22 variants of the complex combined motifs could be identified, of which 3 predominate: the motif of two alternating comb patterns (32%), the motif of pit patterns alternating with parts without ornamentation (14%), and the motif of alternating pit and comb patterns (12%). In group B, 9 variants of such motifs were identified, 3 of which were predominant: the motif of two alternating comb patterns (36%), the motifs of two alternating pit patterns (17%) and of two alternating patterns including various grooved ornamental elements (11%). The degree of similarity between these two groups is 54%.

In the complex crossed ornamental motifs, 14 variants were identified in group A, the two most common being crossed pit and comb elements (54 %) and the motif of two various crossing comb elements (16 %). In group B, 9 variants of complex crossed ornamental motifs were identified, but only one predominates – crossed pit and comb elements (81%). The general degree of similarity of these groups is 67%.

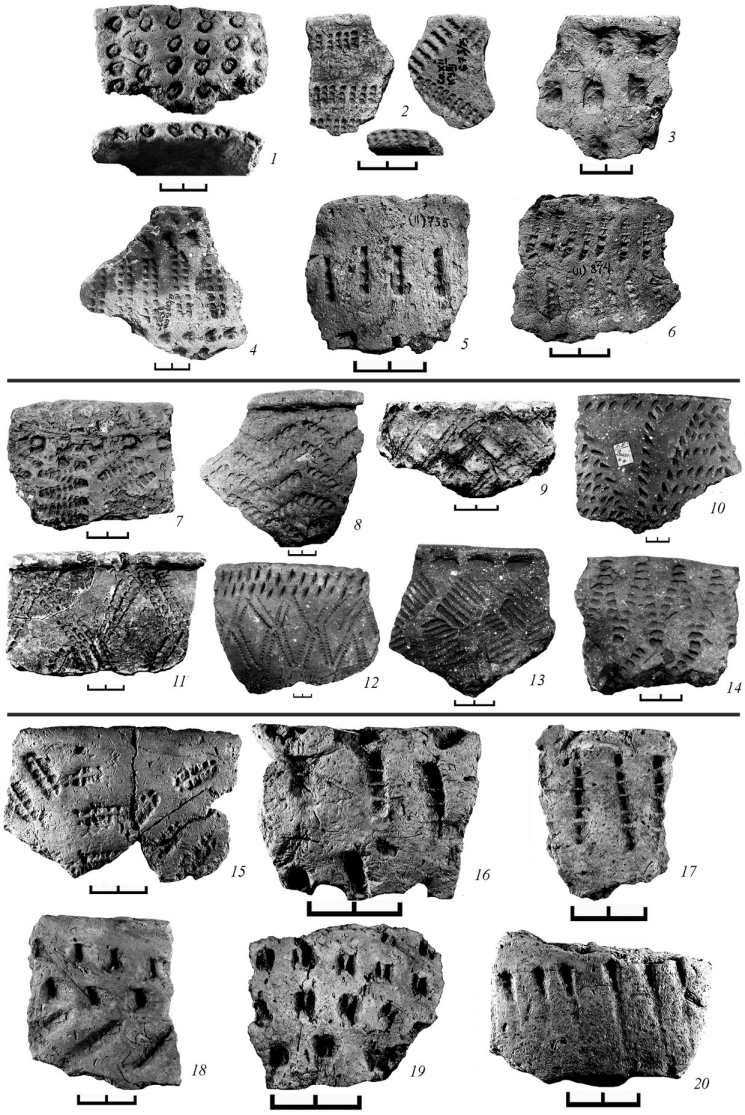

Fig. 5. Volosovo Pottery culture. Early period (last quarter of the 4th millennium BC – beginning of the 3th millennium BC): 1 Maslovo Boloto 2; 2–3 Sahtysh 2, SCE–2, Horizon 1; 4–6 Sahtysh 2, SCE–2, Horizon 17. Middle period (beginning – third quarter of the 3rd millennium BC): 7–9, 11 Volodary; 10, 12–14 Volosovo. Late period (last quarter of the 3rd millennium BC – beginning of the 2nd millennium BC): 15–19 Plesheevo 4; 20 Vashutino 1, SCE–1, Horizon 4.

Ornamental images. Here, simple images are represented by fewer variants: 12 in group A and 10 in group B. Group A includes 3 simple images: pit and comb motifs (51%), pit motif and an area without ornamentation (15%), and sickle-shaped motif (11%). In group B, two variants of the images predominate: pit and comb motifs (51%) and pit and sickle-shaped motifs (19%). The similarity of the two groups of Pit-and-Comb Pottery culture is 85% in terms of simple ornamental images, which was unexpected in comparison with the data from the Upper Volga culture.

Ornamental images consisting of complex combined motifs in group A occur in 30 variants, but only one predominates (36%) among them. In group B, complex combined motifs comprise only 14 variants, 4 of which are most frequent (Tab. 3). The degree of similarity of ornamental images between the two groups from Pit-and-Comb Pottery culture is only 41%.

There were 23 images of crossed motifs in group A and 15 images in group B. In both groups, two ornamental images predominate: the pit motif and the motif with crossed pit and comb elements (26% in

Motifs		Group A	Group B
comb	two dot patterns	16	
pin	pin patterns and parts without ornamentation	**40**	**13**
without ornament	dot patterns and parts without ornamentation	17	
dot patterns and parts without ornament	dot patterns and parts without ornamentation	16	

Tab. 2. The percentages of complex ornamental images on the Upper Volga culture pottery.

group A, 15% in group B), and the comb motif with a motif of crossed pit and comb elements (20% in group A, 48% in group B). The degree of similarity of the two cultural groups in terms of this parameter is 52%.

As we can see, the ornamental traditions of the predominant group A are stylistically more varied than the traditions in group B, and both groups have a high degree of similarity in ornamental elements, patterns and simple images (76–82%), although the similarity of motifs, combined and crossed ornamental images is only 40–60%.

The Rare-Pit Pottery group

Ornamental elements. In this population group we identified two cultural groups with some differences in their ornamental traditions. In group A, 9 different ornamental elements were used; the pit element (42%) and element without ornament (40%) being the most common. In group B, 6 ornamental elements were used, 3 of them being predominant – an element without ornament (44%), pit (23%) and irregular pit elements (21%). The degree of similarity between the ornamental elements is quite high at 74%.

Ornamental patterns. In group A, 6 types of ornamental pattern were used, but the pit ornamental elements (84%) were the most common. In group B, there were 3 types of pattern, with the pit (61%) and irregular pit (28%) patterns being the most common. The degree of similarity between the groups is 74%.

Ornamental motifs. In the two groups, A and B, 12 and 6 variants of motifs could be identified respectively. In group A, the simple pit pattern (11%), the complex combined motifs of two alternating pit patterns (17%) and a pit pattern alternating with areas without ornamentation (53%) were the most common. In group B, two simple motifs had been made with pit (15%) and comb (11%) patterns, and two complex combined motifs were used, one consisting of two pit patterns (36%) and the other with irregular pit patterns alternating with areas without ornamentation (28%). The degree of similarity between the groups is 40%.

Ornamental images. Simple images are represented by 13 variants in group A and 7 in group B. The pit motif and an area without ornamentation are the most common images in both groups (74% in group A and 72% in group B). The degree of similarity between the two groups is 82%.

Only the complex combined motifs were identified in the pottery of both groups, with 20 variants in group A and 8 variants in group B. The pit motif and motif consisting of two alternating pit patterns (17%), and the pit motif and motif of a pit pattern divided by areas without ornamentation (42%) were the most common in group A. In group B, the following 3 images are the most common: the pit motif and the motif of two different pit patterns (25%), the image of irregular pit motif and motif of irregular pit patterns divided by areas without ornamentation (38%), and an image consisting of a empty area and a motif of two alternating pit patterns (20%). The degree of similarity between the groups is 36%.

As we can see from these data, the ornamental traditions of the dominant group A were more varied than those of group B. Additionally, the cultural unity of groups A and B would be reflected in elements, patterns, and simple images (74–82%), and their cultural differences were developed in motifs and complex ornamental images.

Motifs		Group A	Group B
pit	two pit patterns		14
pit	pit patterns and parts without ornamentation		12
pit	two comb patterns	**36**	**28**
comb	two comb patterns and parts without ornamentation		11

Tab. 3. The percentages of images consisting of combined motifs on the Pit-and-Comb Pottery.

The Thin Rare-Pit Pottery group

Ornamental elements. In group A, 9 types of ornamental element were identified, with the irregular pit (27%), comb (11%) ornamentation and pottery without ornamentation (39%) being the most common in the assemblages. In group B, 6 ornamental elements were identified, with the pit (47%), grooved (15%) ornamentation and pottery without ornamentation (34%) being the most common. The degree of similarity between the groups is 53%.

Ornamental patterns. Only 4 ornamental patterns were used in group A, with the irregular pit (67%) and the pit pattern (22%) being the most common. In group B, 3 patterns were used; the most common are the pit (65%), irregular pit (20%) and pin pattern (15%). The degree of similarity between the groups is approximately 51%.

Ornamental motifs. In group A, 2 variants of simple and 6 variants of complex combined motifs were identified, and in group B, 5 variants of complex combined motifs were identified. Four variants of motifs (Tab. 4) were present in each groups. The degree of similarity between the two groups is 53%.

Ornamental images. In group A, 12 types of simple and 8 types of complex ornamental images consisting of combined motifs were identified. In group B, only 6 various simple images and 8 complex images were identified. In total, simple ornamental images in both groups considerably prevailed over complex images, with 67% and 85%, respectively.

We identified 3 simple images in group A and 4 simple images in group B (Tab. 5), and 3 complex images in group A and 6 complex images in group B (Tab. 6). The degree of similarity between the two groups in terms of simple images is 33%, and the similarity in terms of the complex images is 31%.

Thus, we conclude that the dominant group A had more varied ornamental traditions with regard to various stylistic features. The degree of similarity between the two groups of this population is much lower than in other cultures, which shows that the identified culture was less homogeneous. At the same time, some features are common to most cultures, which developed from the affinity of cultural groups. These features become apparent in the fact that the maximum affinity of groups A and B is identified in elements (53%), patterns (51%), and motifs (53%), and the lowest percentage is identified in ornamental images of pottery (33% and 31%).

Volosovo culture

Ornamental elements. In group A, 10 variants of ornamental elements were identified, and in group B, 8 variants were identified; 4 variants of the elements were present in both groups. In group A, the

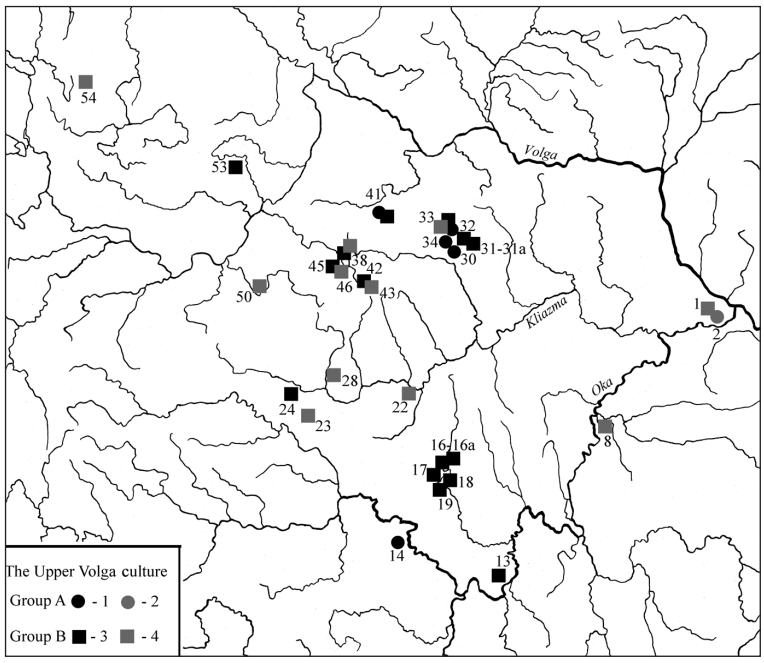

Fig. 6. The Upper Volga culture settlements. Group A: 1 – Core settlements: 14 Fefelov Bor; 30 Sahtysh 1, SCE–1, Horizon 8; 32 Sahtysh 2, SCE–1, Horizon 9; 34 Sahtysh 8, SCE–1, Horizon 6; 41 Ivanovskoe 7, SCE–2, Horizon 6. 2 – Peripheral settlement: 2 Gavrilovka 2. Group B: 3 – Core settlements: 13 Odoevskie fermy; 16 Shagara 1; 16a Shagara 2; 17 Vladychinskaya-Beregovaya 1; 18 Vladychinskaya-Beregovaya 2; 19 Vladychinskaya-Borovaya; 24 Biserovo ozero; 31 Sahtysh 1, SCE-2, Horizon 11; 31a – Sahtysh 1, SCE–2, Horizon 9; 32 Sahtysh 2, SCE–1, Horizon 7; 38 Ivanovskoe 3, SCE–1, Horizon 9; 41 Ivanovskoe 7, SCE–2, Horizon 3; 42 Berendeevo 1, SCE–1, Horizon 7; 45 Pol'tso 2; 53 Yazykovo 1, SCE–2, Horizon 10. 4 – Peripheral settlements: 1 Gavrilovka 1; 8 Sadovyi Bor; 22 Bogdarnya; 23 Maslovo Boloto 2; 28 Zarech'e 1; 33 Sahtysh 2, SCE–2, Horizon 20; 38 Ivanovskoe 3, SCE–1, Horizon 6; 43 Berendeevo 2a, SCE–21, Horizon 2; 46 Pol'tso 3, Nikolo-Perevoz 1; 54 Repishe 1.

Motifs	Group A	Group B
irregular pit patterns	12	
two alternating pit patterns	16	**35**
pit pattern and parts without ornamentation		25
two alternating irregular pit patterns	22	
irregular pit patterns and parts without ornamentation	**28**	22
two alternating pin patterns, divided by parts without ornamentation		15

Tab. 4. The percentages of ornamental motifs in the Thin Rare-Pit Pottery group.

irregular pit (12%), comb (22%), framed element (11%) and pottery without ornamentation (27%) are the most common; and in group B, the irregular pit element (11%), comb (52%), grooved ornamentation (12%) and pottery without ornamentation (12%) were the most common. The degree of similarity between the groups is 65%.

Ornamental patterns. In group A, 8 types of patterns were identified, with the comb ornamentation (56%) and the framed ornamental elements (26%) as the most common. In group B, 9 types of pattern were identified, among which 5 were the most common: irregular pit elements (16%), comb (37%), grooved (13%), framed (12%), and cord elements (13%). The degree of similarity of the two groups is 67%.

Ornamental motifs. Complex combined motifs predominated in both groups: 19 motifs were identified in group A and 9 motifs in group B. Complex crossed motifs were seldom used. In group A, the motif of two alternating comb patterns (26%) is the most common, and in group B, comb patterns divided by parts without ornamentation (23%), two alternating comb patterns (26%), and two alternating pin patterns (12%) were the most common. The degree of similarity between the two groups is 63%.

Ornamental images. Simple and complex ornamental images were identified on the pottery of both cultural groups. The simple images dominated in each group, but they are presented by fewer variants than the complex images. Twenty-two variants of simple images were identified in group A, with the two different comb motifs (15%) and the comb motif and zone without ornamentation (22%) being the most common. In group B, 12 variants of simple images were identified, and 3 were applied more often: images of irregular pit and comb motifs (13%), images of two various comb motifs (31%), and images of comb motif and unornamented zone (17%). The degree of similarity between the groups is 55%.

In both groups, complex combined images were the most common, since 45 variants in group A and 12 variants in group B were identified. Among them, the predominant images were the comb motif and motif of two alternating comb patterns (13%) in group A, and 5 images in group B: images including

Motifs		Group A	Group B
pit	groove		14
pit	without ornamentation	13	**51**
irregular pit	without ornamentation	**50**	19
comb	without ornamentation	16	
groove	groove		14

Tab. 5. The percentages of simple ornamental images in the Thin Rare-Pit Pottery group.

Motifs		Group A	Group B
pit patterns, divided by parts without ornament	without ornamentation		**27**
two alternating irregular pit patterns	without ornamentation		13
pit	irregular pit patterns, divided by parts without ornamentation	18	19
pit	two alternating irregular pit patterns	24	
irregular pit	two irregular pit patterns, divided by parts without orna ornamentation ment	**28**	13
pit patterns, divided by parts without ornament	pit patterns, divided by parts without ornamentation		13
two pin patterns, divided by parts without ornament	two pin patterns, divided by parts without ornamentation		13

Tab. 6. The percentages of complex combined ornamental images in the Thin Rare-Pit Pottery group.

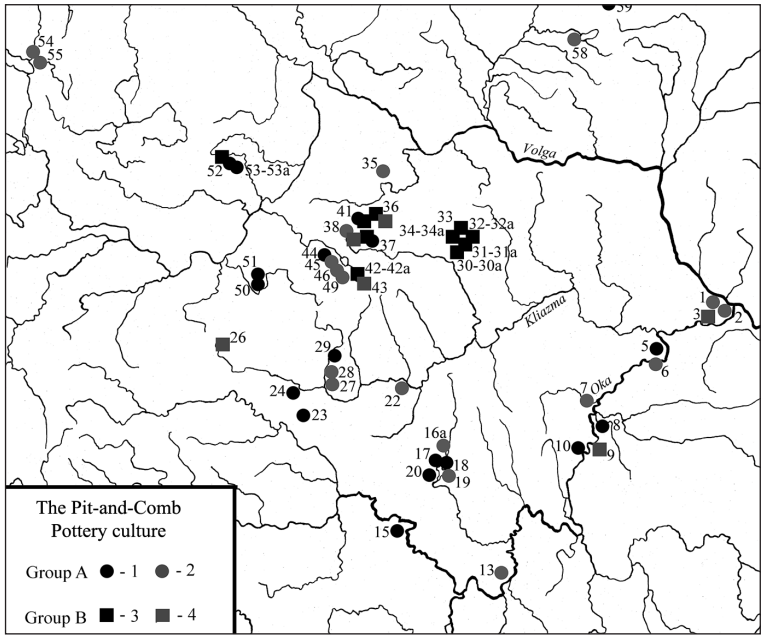

Fig. 7. The Pit-and-Comb Pottery culture settlement. Group A: 1 – Core settlements: 5 Podboritsa-Zapadnaya; 8 Sadovyi Bor; 10 Panfilovskaya; 15 Fefelovskaya Pridorozhnaya; 17 Vladychinskaya-Beregovaya 1; 18 Vladychinskaya-Beregovaya 2; 20 Chernaya Gora; 23 Maslovo Boloto 2; 24 Biserovo ozero; 29 Zarechenskaya-torfyanaya; 37 Ivanovskoe 2, SCE–1, Horizon 5; 41 Ivanovskoe 7, SCE–2, Horizon 5; 44 Pol'tso 1; 50 Nikolo-Perevoz 1; 51 Nikolo-Perevoz 2a; 52 Yazykovo 1, SCE–1, Horizon 9; 53 Yazykovo 1, SCE–2, Horizon 7; 53a Yazykovo 1, SCE–2, Horizon 4; 59 Fedorovskaya. 2 – Peripheral settlements: 1 Gavrilovka 1; 2 Gavrilovka 2; 6 Podboritsa-Sherbininskaya; 7 Plehanov Bor; 13 Odoevskie fermy; 16a Shagara 2; 19 Vladychinskaya Borovaya; 22 Bogdarnya; 27 Bol'shoe Bun'kovo; 28 Zarech'e 1; 35 Unitsa; 38 Ivanovskoe 3; SCE–1, Horizon 4; 45 Pol'tso 2; 46 Pol'tso 3; 49 Plesheevo 4; 54 – Repishe 1a; 55 Repishe 1b; 58 Umilenie. Group B: 3 – Core settlements: 30 Sahtysh 1; SCE–1, Horizon 7; 30a Sahtysh 1, SCE–1, Horizon 4; 31 Sahtysh 1, SCE–2, Horizon 6; 31a Sahtysh 1, SCE–2, Horizon 27; 32 Sahtysh 2, SCE–1, Horizon 7; 32a Sahtysh 2, SCE–1, Horizon 5; 33 Sahtysh 2, SCE–2, Horizon 19; 34 Sahtysh 8, SCE–1, Horizon 5; 34a Sahtysh 8, SCE–1, Horizon 3; 36 Vashutino 1, SCE–1, Horizon 2; 37 Ivanovskoe 2, SCE–1, Horizon 7; 41 Ivanovskoe 7, SCE–2, Horizon 3; 42 Berendeevo 1, SCE–1, Horizon 3; 42a Berendeevo 1, SCE–1, Horizon 5; 52 Yazykovo 1, SCE–1, Horizon 6. 4 – Peripheral settlements: 3 Gavrilovka 3; 9 Volosovo; 26 L'yalovo; 36 Vashutino 1, SCE–1, Horizon 5; 38 Ivanovskoe 3, SCE–1, Horizon 6; 43 Berendeevo 2a, SCE–1, Horizon 4.

motifs of two alternating comb patterns and motifs of comb pattern and parts without ornamentation (16%); images of framed motifs and motifs of alternating comb and framed patterns (15%); images of comb motifs and motifs of alternating pit and comb patterns (12%); images of comb motifs and motifs of comb patterns divided by parts without ornament (11%); and lastly, images of two motifs consisting of various alternating pin patterns (11%). The degree of similarity between the groups is 17%.

The predominant pottery group A of the Volosovo culture is characterised by more varied cultural traditions, but at the same time the recessive group B had a high number of ornamental traditions. The reasons for this phenomenon are not clear. Nevertheless, it is obvious that they due to certain processes in development of these two groups. The unity of Volosovo ornamental traditions can be seen in the high similarity of ornamental elements, patterns and motifs (63–67%), but with a distinction in the uniqueness of ornamental images, since the degree of similarity of images is between 17–55%.

We present below the results of the comparative study of ornamental traditions of the cultural groups in the population of the Upper Volga, Pit-and-Comb, and Volosovo cultures and the large groups of the populations with Rare-Pit and Thin Rare-Pit Pottery distributed on the central Russian plain. The unity of ornamental traditions within a culture is characterised by a great similarity of elements and patterns, and the specificity of the cultural groups is shown in the distinctions in complex ornamental images. Ornamental motifs and simple images occupy an intermediate position among these features. In some cultures, they heighten the unity of ornamental traditions, while in others their unity becomes weaker. For example, ornamental motifs on Thin Rare-Pit Pottery and on Volosovo culture pottery are closer in terms of cultural features, and the simple images of ornamentation play the same role for the Pit-and-Comb Pottery culture and for the Rare-Pit Pottery group.

As shown above, every Neolithic culture on the central Russian plain included two cultural groups with their own pottery ornamental traditions. Each of the groups included a core – sites with very similar ornamental traditions – and a periphery, which included the sites of a certain group which are characterised by considerably less similarity. Moreover, the

sites of both groups of the same culture were not settled in a certain micro-region – some sites of both groups were grouped together in different areas of the culture's territory.

According to ethnographic sources, this core-periphery phenomenon occurred among the Tasmanians (*Kabo 1986.27*), the Australians (*Kabo 1986. 40, 49, 55*), the San/Bushmen in Africa (*Kabo 1986. 140, 145*), the Hadza of northern Tanzania (*Kabo 1986.157*), and so on. Thus, conditions when settlements of various cultural groups were grouped together could have been of short duration (for example, exhaustion of food resources, *etc.*), and also due to the absence of well-marked group territory, and also ties between various cultural groups. We identified the same situation in our analysis of the data on decorative stylistic traditions on the central Russian plain.

Each cultural group on the central Russian plain consisted of a cultural core that included very close relatives (probably consanguine kin) and a cultural periphery consisting of more distant relatives (perhaps *affines*). Let us turn to ethnographic data which present the same picture, as we can see from the Óna (a people living in Tierra del Fuego), the San/Bushmen, the Australians (*Kabo 1986.164, 166–167*), the Netsilik and the Polar Eskimo communities (*Kabo 1986.195*) and others. The core of Netsilik and Ingulik Eskimos communities included 70% of its population (*Kabo 1986.185, 193*). The proportion of consanguineous kin and *affines* in tribal communities with unilocal exogamic marriage is about 75% and 25% according to A. I. Pershits (*Bromley 1981.183*). Thus the people in the core group are the keepers of communal cultural traditions, which is why they are more ethnically distinct. These ethnographic facts permit us to interpret the archaeological data in the same way.

According to the ethnographic classification (see *Bromley 1973; Murdock 2003; White 2004*) the main social and economic units of ancient society were the family, *gens*, community, and tribe, each of which had specific functions. The basic function of the family is reproduction and education before marriage. The main functions of the *gens* is in maintaining rules of marriage and relationship lines, and also in preserving the relics of the patrimonial territory, *i.e.*, it has primarily social functions. The functions of the community are more complex: on the one hand, the community is the owner of a certain hunter-gatherer territory (economic function), while it also consists of the core (including about 70% men and women) and of *affines* (men under a matrilocal gens and women under a patrilocal *gens*). The tribe is a specific ethnic unit including numerous fractional social groups (families, *gentes*, and communities).

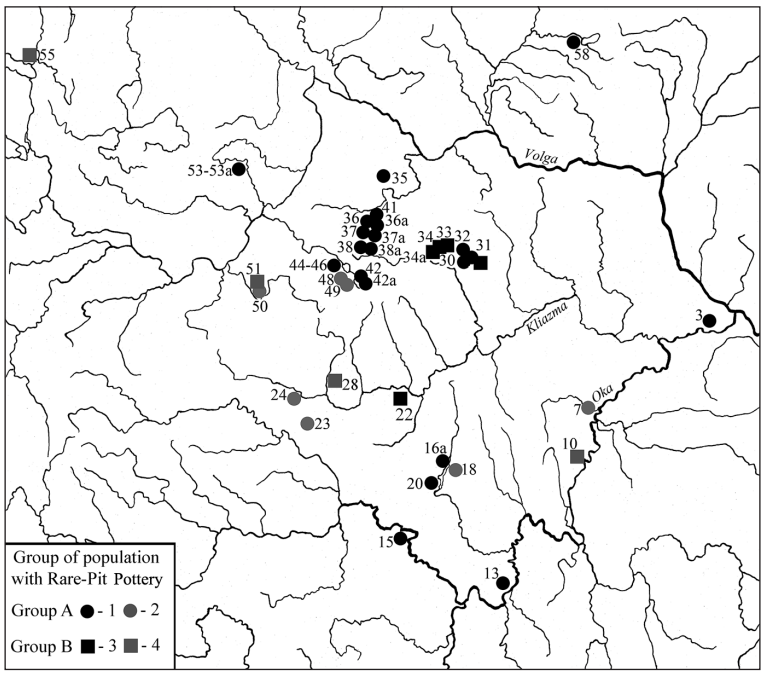

Fig. 8. The Rare-Pit pottery group settlements. Group A: 1 – Core settlements: 3 Gavrilovka 3; 13 Odoevskie fermy; 15 Fefelovskaya Pridorozhnaya; 16a Shagara 2; 20 Chernaya Gora; 30 Sahtysh 1, SCE–1, Horizon 3; 31 Sahtysh 1, SCE–2, Horizon 3; 32 Sahtysh 2, SCE–1, Horizon 6; 35 Unitsa; 36 Vashutino 1, SCE–1, Horizon 2; 36a Vashutino 1, SCE–1, Horizon 6; 37 Ivanovskoe 2, SCE–1, Horizon 7; 37a Ivanovskoe 2, SCE–1, Horizon 6; 38 Ivanovskoe 3, SCE–1, Horizon 5; 38a Ivanovskoe 3, SCE–1, Horizon 4; 41 Ivanovskoe 7, SCE–2, Horizon 3; 42 Berendeevo 1, SCE–1, Horizon 5; 42a Berendeevo 1, SCE–1, Horizon 3; 44 Pol'tso 1; 45 Pol'tso 2; 46 Pol'tso 3; 53 Yazykovo 1, SCE–2, Horizon 7; 53a Yazykovo 1, SCE–2, Horizon 3; 58 Umilenie. 2 – Peripheral settlements: 7 Plehanov Bor; 18 Vladychinskaya-Beregovaya 2; 23 Maslovo Boloto 2; 24 Biserovo ozero; 48 Plesheevo 2; 49 Plesheevo 4; 50 Nikolo-Perevoz 1. Group B: 3 – Core settlements: 22 Bogdarnya; 31 Sahtysh 1,SCE–2, Horizon 6; 33 Sahtysh 2, SCE–2, Horizon 19; 34 Sahtysh 8, SCE–1, Horizon 5; 34a Sahtush 8, SCE–1, Horizon 3. 4 Peripheral settlements: 10 Panfilovskaya; 28 Zarech'e 1; 51 Nikolo-Perevoz 2a; 55 Repishe 1.

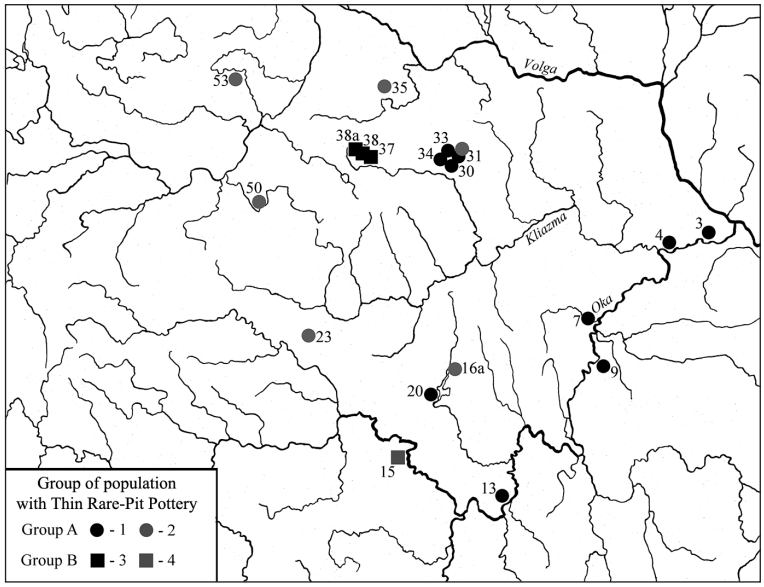

Fig. 9. The Thin Rare-Pit Pottery group settlements. Group A: 1 – Core settlements: 3 Gavrilovka 3; 4 Volodary; 7 Plehanov Bor; 9 Volosovo; 13 Odoevskie fermy; 20 Chernaya Gora; 30 Sahtysh 1, SCE–1 Horizon 3; 31 Sahtysh 1, SCE–2, Horizon 3; 33 Sahtysh 2, SCE–2, Horizon 19; 34 Sahtysh 8, SCE–1 Horizon 3. 2 – Peripheral settlements: 16a Shagara 2; 23 Maslovo Boloto 2; 31 Sahtysh 1, SCE–2, Horizon 7; 35 Unitsa; 50 Nikolo-Perevoz 1; 53 Yazykovo 1, SCE–2, Horizon 3. Group B: 3 – Core settlements: 37 Ivanovskoe 2, SCE–1, Horizon 7; 38 Ivanovskoe 3, SCE–1, Horizon 3; 38a Ivanovskoe 3, SCE–1, Horizon 5. 4 – Peripheral settlement: 15 Fefelovskaya Pridorozhnaya.

According to the data on various traditions and cultural groups on the central Russian plain, we conclude that the culture population groups overlapped, with distincitive *gentes* (or *phratries*), reflecting the dual structure of primitive tribes. As the *gentes* and tribal communities were usually exogamous, their settlements could not be grouped compactly within the common tribal territory, as this would hinder marriage ties between the various *gentes* of the tribe. According to the ethnographic data, people tried to conclude marriages with members of neighbouring *gentes*. This is also proven by the fact that the husband had the right to hunt in the wife's tribal community territory (*Kabo 1986.54*).

A comparison of the degree of similarity of elements of cultural ornamental traditions between coexisting cultures and between the patrimonial groups within

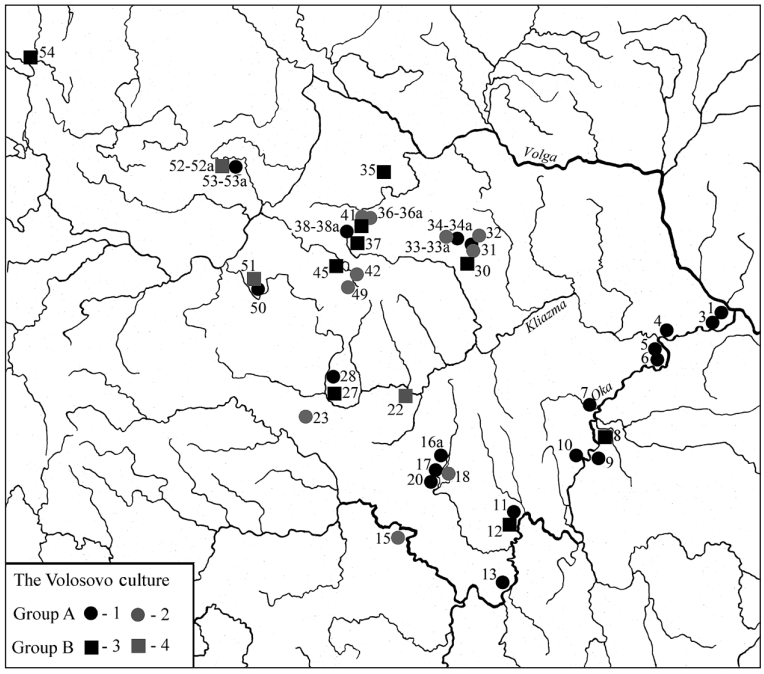

Fig. 10. The Volosovo pottery group settlements. Group A: 1 – Core settlements: 1Gavrilovka 1; 3 Gavrilovka 3; 4 Volodary; 5 Podboritsa-Zapadnaya; 6 Podboritsa-Sherbininskaya; 7 Plehanov Bor; 9 Volosovo; 10 Panfilovskaya; 11 Iberdus 1; 13 Odoevskie fermy; 16a Shagara 2; 17 Vladychinskaya Beregovaya 1; 20 Chernaya Gora; 28 Zarech'e 1; 31Sahtysh 1, SCE–2, Horizon 4; 34 Sahtysh 8, SCE–1, Horizon 5; 34a Sahtysh 8, SCE–1, Horizon 3; 38 Ivanovskoe 3, SCE–1, Horizon 3; 38a Ivanovskoe 3, SCE–1, Horizon 5; 50 Nikolo-Perevoz 1; 53 Yazykovo 1, SCE–2, Horizon 3; 53a Yazykovo 1, SCE–2, Horizon 5. 2 – Peripheral settlements: 15 Fefelovskaya Pridorozhnaya; 18 Vladychinskaya-Beregovaya 2; 23 Maslovo Boloto 2; 31 Sahtysh 1, SCE–2, Horizon 6; 32 Sahtysh 2, SCE–1, Horizon 5; 33 Sahtysh 2, SCE–2, Horizon 13; 33a Sahtysh 2, SCE–2, Horizon 17; 36 Vashutino 1, SCE–1, Horizon 4; 36a Vashutino 1, SCE–1, Horizon 2; 41 Ivanovskoe 7, SCE–2, Horizon 3; 42 Berendeevo 1, SCE–1, Horizon 3; 49 Plesheevo 4. Group B: 3 – Core settlements: 8 Sadovyi Bor; 12 Iberdus 2; 27 Bol'shoe Bun'kovo; 30 Sahtysh 1, SCE–1, Horizon 4; 35 Unitsa; 37 Ivanovskoe 2, SCE–1, Horizon 7; 41 Ivanovskoe 7, SCE–2, Horizon 5; 45 Pol'tso 2; 54 Repishe 1. 4 – Peripheral settlements: 22 Bogdarnya; 51 Nikolo-Perevoz 2a; 52 Yazykovo 1, SCE–1, Horizon 7; 52a Yazykovo 1, SCE–1, Horizon 2.

Connections between cultures/groups	*Similarity (in %)*	*Connections between* gentes *groups within cultures/groups*	*Similarity (in %)*
Upper Volga culture vs. Pit-and-Comb culture	48.8	Upper Volga culture	65.0
Pit-and-Comb culture vs. Rare-Pit group	55.6	Pit-and-Comb culture	76.0
Pit-and-Comb culture vs. Thin Rare-Pit group	50.1	Rare-Pit group	74.0
Pit-and-Comb culture vs. Volosovo culture	44.8	Thin Rare-Pit group	53.0
Rare-Pit group vs. Thin Rare-Pit group	72.8	Volosovo culture	65.0
Rare-Pit group vs. Volosovo culture	48.8		
Thin Rare-Pit group vs. Volosovo culture	53.2		

Tab. 7. The percentages of similarity between co-existing cultures and between gentes groups within them according to ornamental traditions.

them yields further information (Tab. 7). Judging by this data, the similarity of ornamental traditions of various archaeological cultures is lower than the similarity of traditions between patrimonial groups within each culture, with one exception, in the similarity of traditions between the Rare-Pit and the Thin Rare-Pit Pottery groups (72.8%). This is not surprising, since the status of these groups is not quite clear yet.

Thus, we conclude that most of the Neolithic cultures on the central Russian plain reflect endogamous tribal organisations, each of which included two patrimonial (or phratrial) population groups with specific features in their pottery decoration traditions.

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BACK TO CONTENTS

Plastic raw materials in Neolithic pottery production[1]

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ABSTRACT – *The paper is dedicated to the investigation of various natural silts as the most ancient type of raw material used in pottery production. The authors describe the specific features of the composition of plain and mountain silts, and discover the same features in ancient ceramics from different regions in Russia. It can be concluded that silts were the earliest raw material used, a tradition that faded away during the evolution of pottery production.*

IZVLEČEK – *V članku predstavljamo raziskave različnih vrst naravnega mulja, ki predstavlja najstarejšo vrsto surovine za proizvodnjo lončenine. Opisujemo specifične značilnosti sestave mulja, dosegljivega tako v ravnini kot v gorah, ter jih primerjamo z najstarejšo lončenino iz različnih regij v Rusiji. Sklepamo, da predstavlja naravni mulj najzgodnejšo vrsto surovine za izdelavo keramike, in da se je ta tradicija proizvodnje lončenine sčasoma izgubila.*

KEY WORDS – *natural silt; raw material; ceramics; pottery traditions*

Introduction

The raw materials used in pottery production can be formed into various shapes after damping, and can preserve their shape after drying. Three main kinds of raw materials are used in pottery production: mineral-organic (such as silt), organic (such as dung), and mineral (such as various kinds of clay). Some results of the study of silt as a raw material for the production of pottery will be considered here. Attention will be paid primarily to two questions: first, whether silt was indeed used as a raw material in ancient pottery production; and second, what are the capacities of modern approaches in studying this type of raw material.

The main focus is on initial and early Neolithic pottery production in the Elshanska and Low Volga in the Volga Basin, the Rakushechnuy Yar culture in the Low Don basin, and in the Bug-and-Dnieper, Dnieper-and-Donetsk and Surskaya cultures in the forest-steppe and steppe zone of Eastern Europe.

Comparative studies of silts and ancient pottery

Little attention has been paid recently to plastic raw materials used by ancient potters. The opinion that potters used clays as their main plastic raw material almost everywhere since the Neolithic Period persists to this day among archaeologists. In the course of ancient pottery analysis in the last two decades some facts have come to light that obviously contradict this view. This was most evident during the testing of natural inclusions in the pottery paste of Neolithic ceramics in Eastern Europe (*Vasilyeva 1994*).

1 This is a modified and updated version of the paper originaly published in Russian language, 'Bobrinsky A. A., Vasilyeva I. N. 1998. On some peculiarities of plastic raw materials in the history of pottery production. Problems of North Caspian Basin History. Samara: 193–217'.

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The analysis of pottery from the Bug-and-Dniester, the Dnieper-and-Donetsk and the Low Volga cultures with a binocular microscope showed that the pottery contained various inclusions in addition to clay particles, which we classify here into six types:

❶ Many plant prints from earth, water and underwater origin, including long prints (up to 5cm long) of narrow tangled plants (Fig. 1a, 1b) were identified as filamentous algae (*Department of Botany at Samara State Pedagogical University, personal communication*).

❷ Pieces of up to 0.5cm of sharp and more often round-edged mollusc shells were discovered in the pottery. Shell fragments of *Limnaea staglnalis* and *Planorbis planorbis*, bivalve molluscs that occupy rivers and lake shores have been discovered in Low Volga Neolithic pottery (*P. Y. Yasyuk, Department of Zoology at Samara State Pedagogical University, personal communication*).

❸ Whole shells (up to 0.6cm long) of the small volute of Valvata piscinalis (Fig. 2) were present in the pottery. These species occupy the shoreline area of rivers, lakes and ponds, clean soil or aquatic plants.

❹ Single scale (Fig. 3), vertebrae (Fig. 4), and rib prints of fish and their remains were also identified in the pottery.

❺ Round pieces of fine clay about 1–2mm in diameter are present.

❻ Various kinds and proportion of sand with grains smaller than 1mm were distributed non-uniformly in the pottery samples.

The natural inclusions in Elshanska pottery have a different composition. The following inclusions could be identified in the paste: (i) large amounts of sand (32–35% according to the data obtained by X-ray diffraction), including fine sand (less than 0.5mm) and often grey and black sand also; (ii) small amounts of plant prints, plant tissue (detritus), and sometimes long narrow plants (tangles); (iii) single pieces of shell with round edges; and (iv) occasional fish scale and bone prints.

Our comparative studies of natural inclusions in various kinds of clays show that such organic materials are virtually absent from them. Therefore, we can conclude that ancient potters used various silts and

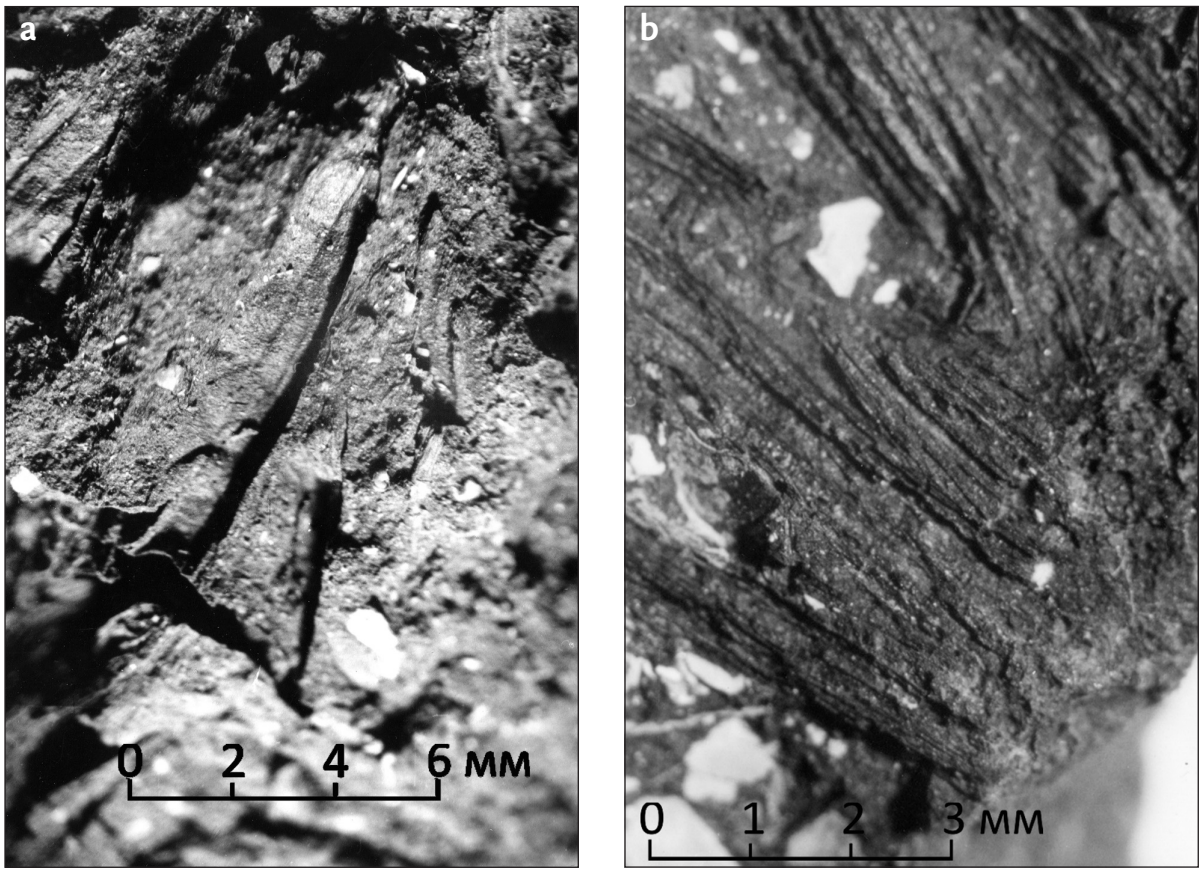

Fig. 1. Plant imprints in pottery paste (a Kair-Shak III settlement , b Tenteksor I settlement).

Fig. 2. Snail shell* Valvata piscinalis *in pottery paste. Kair-Shak III settlement.

sapropels as the main raw material for the production of pottery, not natural clays. The same characteristics of silt are described in the geological literature, where silt is defined as a fine-grained waterlogged precipitate of sedimentary rock. In natural conditions, it is fluid, becoming solid after drying. In terms of granulometric composition, most silt is pelite sedimentary rock. According to Klenova's classification, silt is sediment (soil) that contains approximately 30–50% of mineral particles smaller than 0.01mm (*Geological Dictionary 1978.284*). Silts are comprised of mineral and organic matter; the mineral component includes clay particles smaller than 0.01mm and sand-siltstone particles bigger than 0.01mm in size. The proportion of sand and siltstone particles varies and depends on how the silt originates. Evidently, this is the reason for the variation in the qualitative composition and proportions of sand in pottery from the same culture. Moreover, silt contains iron oxides, which appear as small red-brown coloured spots or small ironstone grains of marsh ore. Carbonates in the form of white inclusions that react with 10% hydrochloric acid, but sometimes also separated pebbles and big grits can also be found in the silt. The organic components of silt include floral and faunal remains. The plant particles are comprised of roots, footstalks and leaves of aquatic and subaquatic plants (Fig. 5), fragments of wood and bark, parts of inflorescence, footstalks, leaves, seeds and fragments of plants. Animal particles include small shells and molluscs, the chitin exoskeletons of insects, various grubs and worms, fish scales, bones and the like.

To determine whether silts were used in primitive pottery production, we performed special field and laboratory experiments over the course of a few years to study the composition and characteristics of various natural silts. The experiments involved: (i) silt collection in various rivers and lakes from shallow waters and at various depths; (ii) silt sieving with water; (iii) microscopic study of the qualitative composition of various silt fractions; (iv) the preparation of standard samples in special moulds, which were dried and fired at 450°C and 750°C. In addition, we made vessels from various kinds of dried, powdered, and dampened silts. The various silts were collected in shallow water from the River Ahtuba near the Kairshuck II site (Astrahansaya region), from bayou lakeshores, and the bottom of the Samara and Volga rivers (Samara region).

After washing finds with water in sieves, we obtained various fractions of silt in five different size ran-

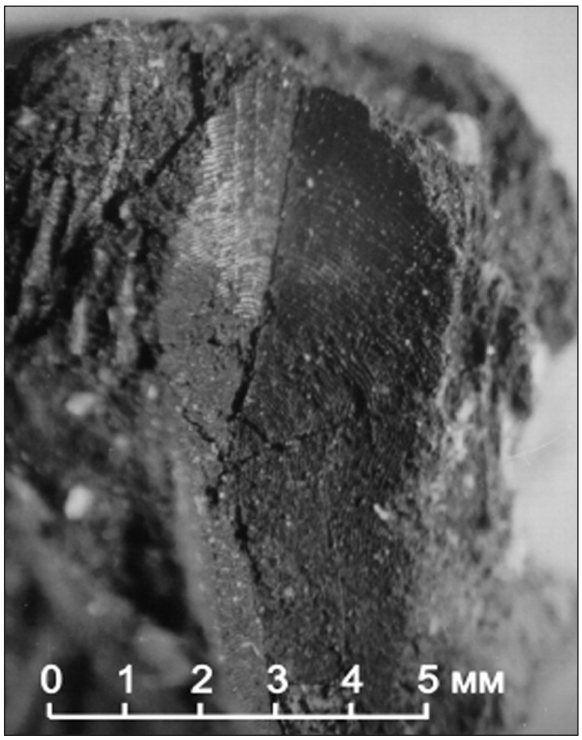

Fig. 3. Fish scale imprint in pottery paste. Kair-Shak III settlement.

ges: (i) more than 4 mm, (ii) 2–4mm, (iii) 1–2mm, (iv) 0.5–1mm, and (v) 0.25–0.5mm. The first fraction includes round pieces of fine clay, coarse and whole floral and faunal remains. The second fraction had the same composition, but the organic remains were somewhat destroyed and partly decayed. The third fraction consists of small round particles of fine clay, various coloured sand, some of which was partly sharp-cornered, various plant particles (such as pieces of wood and bark, algae, scapes and long leaves of aquatic plants, clots of blue-green transparent and plain algae, seeds and fragments of empty glumes, and a quantity of indeterminate floral pieces), and faunal remains (whole snails and shell fragments, pieces of chitin from insect exoskeletons, fish scales and grubs). The fourth fraction was largely the same. The fifth fraction included a great deal of sand, very small pieces of fine clay and the smallest plant remains.

Part of the finest fraction of silt was dissolved in a large volume of water. As a result, a thin layer of very fine clay formed on the top; the lower layer consisted of sand, clay particles in the form of lenses and layers, very fine plant particles, and a considerable amount of red-brown spots (iron compounds). During this study, we discovered that their particular characteristics could be connected to their origin. Thus, the silts from shallow water in rivers and ponds inhabited by birds and animals included more glutinous mass that consisted of small decomposed plant particles and other organic matter such as bird feathers, footstalks, fish scale *etc*. Silts from the bottom of ponds usually include fish scale, sand and clay particles and some addition of small vegetation. This is why the overall composition of silts depends heavily on its local conditions.

The water of stagnant basins (such as lakes, ponds, bogs) contains large quantities of plankton, algae (Fig. 5), worms, molluscs, slugs, maxillopods, and blue-green algae rich in iron. In addition, there is a sizeable quantity of clay soil. All these bottom sediments generate a creamy deposit known as the pelogenous layer. Lower layers of black or grey sapropel contain almost no natural plant or animal remains. The sapropel layer is more homogeneous and dense than the upper pelogenous layer. Lamination is one of the main features of silt.

In the next stage of the experimental study, we made standard samples of silt (10cm long and 1cm^2 square) cleaned of coarse organic and mineral inclusions. The samples were dried for 2–3 days to eliminate surplus water, fired at 450°C and 750°C, and studied under a binocular microscope. The comparative analysis of the natural composition of standard samples and the Neolithic pottery revealed a close resemblance.

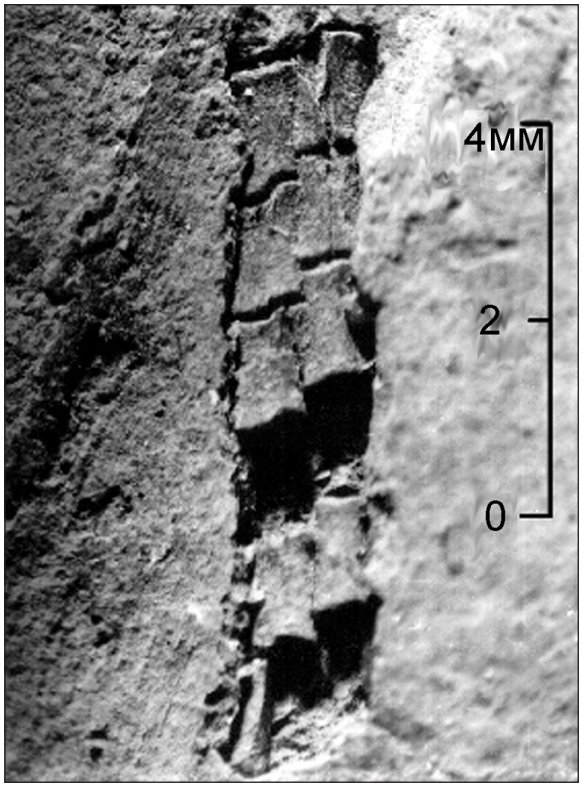

Fig. 4. Fish vertebras in pottery paste. Kair-Shak III settlement.

As a result of this study, we can establish a system of main attributes for the determination of natural silt as a raw material in pottery production:

❶ The presence of round insoluble pieces 1–2mm in size of fine high plastic clay in the pottery paste.

❷ Unequal distribution of plant remains and natural sand in pottery paste (which is typical of natural silts) and the presence of more compact clay parts due to difficulties in mixing the pottery paste.

❸ Significant variety of qualitative composition and proportions of natural sand in the pottery paste of a single vessel and in contemporary pottery. The composition of silts usually depends on the mineral and organic riverbank formation.

❹ Considerable amount of ferriferous inclusions.

❺ Plant prints in the silt raw material are narrow, flat, long (up to 5cm), and often twisted. They have

no traces of cutting by teeth, which are characteristic of dung remains.

❻ Presence of organic material of animal origin: fish bones and scales (Fig. 6), grubs, worms *etc*.

❼ Presence of shell pieces, mostly small and with rounded edges, in combination with medium-sized and larger pieces (up to 4mm). Complete snail and bivalve shells can also be present. Silt deposits with high amounts of broken and round shells are rare in nature, which is why the use of this kind of raw material reflects a special pottery tradition. It is possible that the tradition of adding high amounts of broken shells as temper to ceramic paste appeared and was distributed among the populations of the Srednestogovskaya, Khvalynskaya, Samarskaya cultures from the Eneolithic Period. For example, some of the Neolithic pottery includes small snail shells 5–7mm in size (at Kair-Shak III, Tenteksor I, Vishenki II).

❽ One of the special features of Neolithic pottery made from silt is the foliation of sherds. An experiment showed that the main reason for this is daubing of the mould with thin silt patches. This mode of vessel construction was discovered at settlements of the Low Volga culture. The walls of the vessels are approximately 1cm thick.

Fig. 5. Algae agglomeration in natural silt.

It is important to consider all attributes of silts in the study of ancient pottery, as individual attributes are not enough to qualify the raw material as silt. However, this does not mean that all pottery sherds will reveal fish scales or worm prints and so forth. But these individual attributes should be connected to other special features as discussed above.

Thus, as a result of comparative studies of natural silts and Neolithic pottery, we conclude that ancient potters used various silt raw materials (as well as natural clays) for their production of pottery. These differences are very important, since they reflect the various cultural traditions in pottery production that were characteristic of different cultural groups of ancient populations.

Pottery technology

For a better understanding of these facts, pottery technology should be considered as a source of historical information based on archaeological and ethnographical data. The history of pottery technology reflects general and concrete-historical evolution processes. The former have a unidirectional tendency in their evolution and develop in any pottery tradition. On the other hand, the latter appear in various regions and chronological periods: they could exist over one or several generations of potters and appear and vanish suddenly. Such processes always destroyed evolution, increasing or reducing its pace.

Now four types of general processes in pottery technology evolution are known: the first concerns the potters' skills of self-organisation; the second shows the evolution of potters' knowledge of raw materials; the third – in terms of the thermal treatment of vessels; and the fourth is connected to the different modes of pottery-making (*Bobrinsky 1999*). The selection of plastic raw materials is an indispensable technological task for potters during pottery production. These skills could be characterised in various (pre)historic situations as being highly stable or highly variable. These facts reflect the beginning of changes in the cultural material of native populations as the result of the arrival of foreign potters.

It is also necessary to remember that clay as a raw material can have one of four functions in pottery paste: (i) as a mineral temper (< 40% in volume) in combination with other plastic and non-plastic inclusions, (ii) as a special copulative raw material (40–60%) with other kinds of temper and/or natural inclusions, (iii) as the principal raw material (60–

90%), and (iv) as a single raw material (90–100%) in pottery paste (*Bobrinsky 1978; 1993*). Therefore, to determine the function of plastic raw materials, we need to know its proportion in pottery paste.

The latter three functions of clay are the most important, because different pottery industries existed on these bases in prehistoric and historical periods. All these functions of raw material are known in different regions (in Eastern Europe, in Siberia, in the Near and Far East, and in Central Asia), and therefore can be considered universal in the history of pottery technology.

In the comparative study of archaeological and ethnographical data, Bobrinsky discovered that potters' ideas about clay as a raw material developed in two directions – upwards and downwards. The duration of each direction lasted at least a few thousand years. The progress in both directions included three states of development – unformed, partly formed, and fully formed (*Bobrinsky 1993*). The unformed state is characterised by the first and second functions of clay; the partly formed state is characterised by the third function of clay and the fully formed state by the fourth function of clay as a raw material. These various states reflect a general chain in the development of pottery production on the one hand, and deep cultural differences between holders of these pottery making traditions on the other.

These general features should be considered in the study of ancient populations. In result all pottery production with unformed ideas about raw material (functions 1 and 2) is called proto-pottery (PP), productions with partly formed ideas (function 3) is called 'archaeo-pottery' (AP), and productions with fully formed notions (function 4) comprise the so-called 'neo-pottery' production (NP). These basic tendencies characterise only an upward evolution, but a downward tendency is also present in pottery traditions in ancient populations. This begins with the fully formed state (function 4) and results in the unformed stage (functions 1 and 2). It is also important to note that certain kinds of raw materials could change in both tendencies, and other types of raw materials can change only downwards. All these main tendencies have been discovered in ancient pottery traditions.

We will now attempt to make some preliminary observations on the evolution of the use of silt as a raw material in ancient pottery productions. Silt deposits (A) obviously define two initial directions in

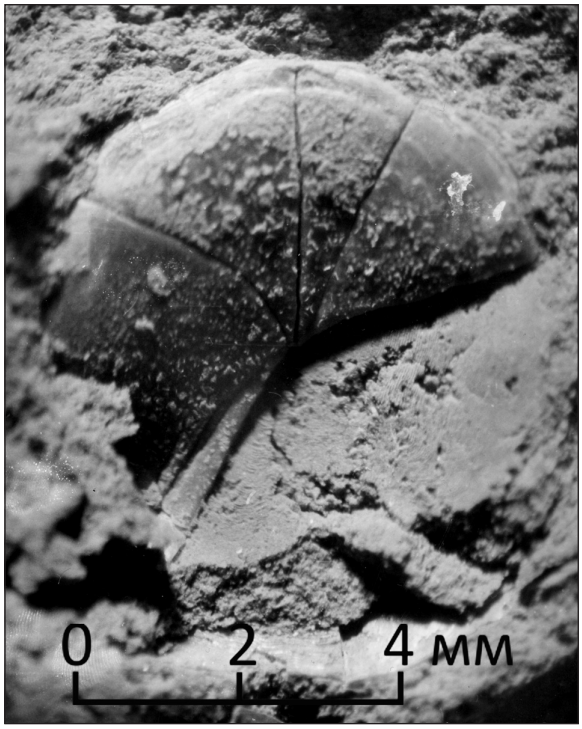

Fig. 6. Fish scale in natural silt.

the selection of raw materials for pottery production. The first direction is connected to the use of silt from shallow waters (rivers, lakes, *etc*.) found on plains, and the second is connected to the use of mountain silts deposited mostly in sub-mountain and mountain rivers. Thus, these directions reflect the environment in which silt could be collected. Plain silts (A1 type) are usually rich in aquatic plants organic remains, round particles of fine clay, pieces and complete shells of small molluscs, sometimes with fish scales and pieces of fish bone, *etc*. A small amount of large and medium-sized sand is usually comprised of rounded mineral grains. Mountain silts (A2 type) include small amounts of organic inclusions (less than 10%), round clay particles, and considerable quantities of rounded sand from soft and hard rocks. Irina Vasilyeva considers these silts to be silty clays.

These attributes of various kinds of silts are not complete. Among plain silts (A1) some may resemble sapropel or clays. Sapropel usually contains a considerable quantity of very fine round sand (<0.5mm) and small amounts of clay particles; the clays include a considerable quantity of clay particles and small amounts of coarse sand. Neither direction has been sufficiently studied; in Russia only two large regions with plain silts (the Volga basin) and mountain silts (the Altai) were used by potters for a long period.

In the history of pottery technology, the tradition of using silts as raw material developed downwards. According to the archaeological data from Eastern Europe, this general tendency developed over three stages: (i) the fully formed stage was especially characteristic of the Neolithic Period and Early Bronze Age; (ii) the partly formed stage is less typical of the Neolithic Period and more typical of the Bronze Age; and (iii) the unformed stage is characteristic of the period from the Bronze to the Early Iron Age. Certain difficulties arise in identifying the use of silts in the partly formed and unformed stages of pottery production (functions 2 and 1). But these stages can be recognised in the use of sand and broken rock temper in pottery pastes. This conclusion is based on a common rule known from ethnography. When potters move to a region where their traditional raw materials are not available, they begin to replicate these materials artificially by adding sand, broken rock, broken shell, or other kinds of temper to the pottery paste.

Conclusions

With all of these data in mind, we can conclude that silts were among the first kinds of raw materials used by ancient potters, and this obviously happened a long time before the creation of pottery technology. We also assume that silts were widely used without special thermal treatment. Bobrinsky (*1999. 84*) labelled such production as pre-pottery production A and divided it further into two stages: pre-pottery production A1, in which plain silts are used, and pre-pottery production A2, in which mountain silts are used.

During the investigation of the earliest ceramic samples from the Northern Caspian region (Kair-Shak III site, 6th millennium BC), it became clear that the pottery paste, aside from plain silt, included some kinds of special organic solutions with various properties. One sample is characterised by a dried glossy (not oily) surface with small black crystals, and another by an oily and fatty surface. There are many such traces in pottery that sometimes included fragments of shells covered by such surfaces. All the vessels had been re-fired and the firing experiments showed that to heat pottery with an oily surface to a red-hot state 5–8 minutes were required, but 96–98 minutes of heating were required for pottery with a dry slim surface. In the second sample, the red-hot colour attained a depth of only 1mm on the outer and 0.4mm on the inner surface. This suggests that vessels with this type of organic solution in the paste were not yet intended for special firing.

It is quite possible that the silt traditions were relics of the pre-pottery production stage. Examples have been discovered in Neolithic pottery in sites from the North Caspian basin, the Volga basin, and some north-western regions of Russia (for example, the Usviytu site in the southern part of Pskov region). While these data are still fragmentary, because the method of red-firing time determination was not known until recently, it is now possible to revaluate the finds from these regions.

Pre-pottery productions can be considered as substrates. They include two types (A1 and A2) on the one hand, and products with function 4, where silt is the only raw material used, and function 3, where silt is the main raw material, on the other. The next step in pottery technology development is connected to proto-pottery production, in which silt was used in the same role, but vessels were already subject to special firing. In the so-called 'archaeo-pottery' and 'neo-pottery' productions, silts were no longer used, since they had been supplanted by organic materials such as temper and clays as the main raw material. Here the downward tendency of silt development was manifested in a gradual decline in its use.

As a result of the study of evolutionary changes in ideas about silts in pre-history and the history of the creation of pottery technology, we can single out two types of pottery production in which silts had different leading functions. The first one is comprised of the so-called pre-pottery ware A1 and A2; the second includes proto-pottery productions A1 and A2, in which silts were the principal raw material or only raw material, as in the pre-pottery production. In conclusion, we regard previous notions regarding raw materials used by ancient potters with some criticism. These data will help to expand our understanding of modern ways to use ancient pottery technology as a source of historical and cultural information.

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A technological study of Hassuna culture ceramics (Yarim Tepe I settlement)

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ABSTRACT – *The article presents the results of a comparative technological analysis of Hassuna culture pottery from Yarim Tepe I (6th millennium BC) from the lower and middle horizons. The technological stages of selecting the clay and organic materials, the composition of the clay paste and the surface treatment, but also certain issues related to the ornamentation and firing of the pottery are presented in the article.*

IZVLEČEK – *Članek predstavlja rezultate primerjalne tehnološke analize lončenine kulture Hassuna iz spodnjih in srednjih horizontov najdišča Yarim Tepe I (6. tisočletje pr. n. št.). V članku predstavljamo tehnološke stopnje, ki vključujejo izbor gline in organskih primesi, izdelavo lončarske mase ter obdelavo površine, pa tudi okraševanje in žganje lončenine.*

KEY WORDS – *Mesopotamia; Hassuna culture; pottery technology; animal dung-temper*

Introduction

Yarim Tepe I is a settlement of the Hassuna culture (6th millennium BC) located in the Sinjar valley some 7km south-west from the town of Tell-Afar in Northern Iraq. The settlement was investigated between 1969 and 1976 by the Soviet archaeological expedition of the Institute of Archaeology to the Near East under the leadership of Rauf M. Munchaev and Nikolai Ya. Merpert. Excavations in the 6m thick cultural layer identified 12 construction horizons, reflecting all of the stages in the development of Hassuna culture (*Munchaev, Merpert 1981.18–155; Merpert 1993*). The culture spread through the region of Northern Mesopotamia from the Tigris basin and Hatra district in the east and southeast, to the River Khabur in the west. All stages in the development of Hassuna culture are represented within the territory of the Sinjar Valley (*Elias 2003.9*). Hassuna pottery was first identified by M. Mallowan during excavations at the Acropolis of Nineveh (Tell Kujundjik) in 1931. The material was present in the layer near the bedrock and named 'Ninevien I' in accordance with the archaeological periodization of the site.

In 1943, S. Lloyd and F. Safar began a study of the multi-layered settlement tell Hassuna, located about 30km south of the city of Mosul and 12km west of the Tigris River. The finds were associated with the more complete and coherent cultural sequence from which their name derives. Just over 5m of cultural deposits were identified in the excavated area of the settlement.

The excavators drew upon diverse and extensive information about much older (and at that time more well-known) Pottery Neolithic in Northern Mesopotamia and proposed a division of the cultural layer into two stages: *standard* and *archaic* Hassuna (defined on the basis of pottery morphology and decoration) (*Lloyd, Safar 1945*).

The excavations of the Soviet archaeological expedition of the Institute of Archaeology at Yarim Tepe I were a significant and important stage in the study of Hassuna culture. The results obtained by the expedition confirmed the division of the Hassuna culture settlements of Eastern Jezirah into the standard

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and archaic stages, but also provided new insights into the existing data and enabled a deeper understanding of the culture's historical development. As at other sites in the Near East and elsewhere, ceramics account for the vast majority of the excavated material from Yarim Tepe I. Although these finds have been studied only typologically in the past, they are now being subjected to arhaeometrical studies at the Institute of Archaeology in Moscow in a comparative study of some technological features of the pottery of the archaic Hassuna and the transition to standard Hassuna at Yarim Tepe I. The ceramic samples consist of fragments of 50 vessels: 25 from the lowest construction horizon of the site (XII) and 25 from the horizon marking the transition to standard Hassuna (VII) (*Munchaev, Merpert 1981.90*). The vessel assemblage is comprised of a range of formal types, such as bowls (22), jugs (5), jars (14), basins (8) and storage vessels (Fig. 1). These were defined in accordance with the formal classification system proposed by Munchaev and Merpert (*1981*).

The study of the ceramic material was conducted in accordance with a methodology developed by Alexander A. Bobrinsky (*1978*). The following steps of the technological process were investigated in this study: the selection of raw materials (step 1), processing of raw materials (step 3), preparation of pottery paste (step 4), surface treatment (step 8), pottery decoration (step 12), and firing (step 9).

In the study of clay selection, the degree of ferrugination of the clay, degree of plasticity and composition of natural inclusions were determined. When considering organic temper, these were classified according to their type and methods of processing. The study of pottery paste determined the character and concentration of the temper. In addition, the surface treatment of the vessels and types of decoration were investigated. In the study of firing, the approximate temperature and duration was established. Direct analyses of ceramics included: re-firing of samples in a muffle furnace under identical conditions to determine the relative degree of ferrugination of the clay; examining the vessels fragments under a stereo microscope (MBS–10); conducting special experiments to provide data on the composition of organic materials originally present in the pottery paste (*Petrova 2011; 2012*).

Analysis of raw materials

The clay served as the main raw material for pottery production and was used in a dry condition. Seven types of clay deposits were identified in the examined material, varying in their degree of plasticity and ferrugination, and in the concentration of natural limestone inclusions (Fig. 2).

In horizon XII (archaic Hassuna) three types of clays were used (the degree of clay plasticity was determined according to data published in *Lopatina, Kazdym 2010.47, 52*):

❶ Clay with a moderate degree of ferrugination and high-plasticity with fine-medium round natural sand (0.1–0.25 and 0.25–0.5mm), white and light grey, and with small amounts of fine or a combination of fine and coarse limestone inclusions (rounded, light grey/white and friable).

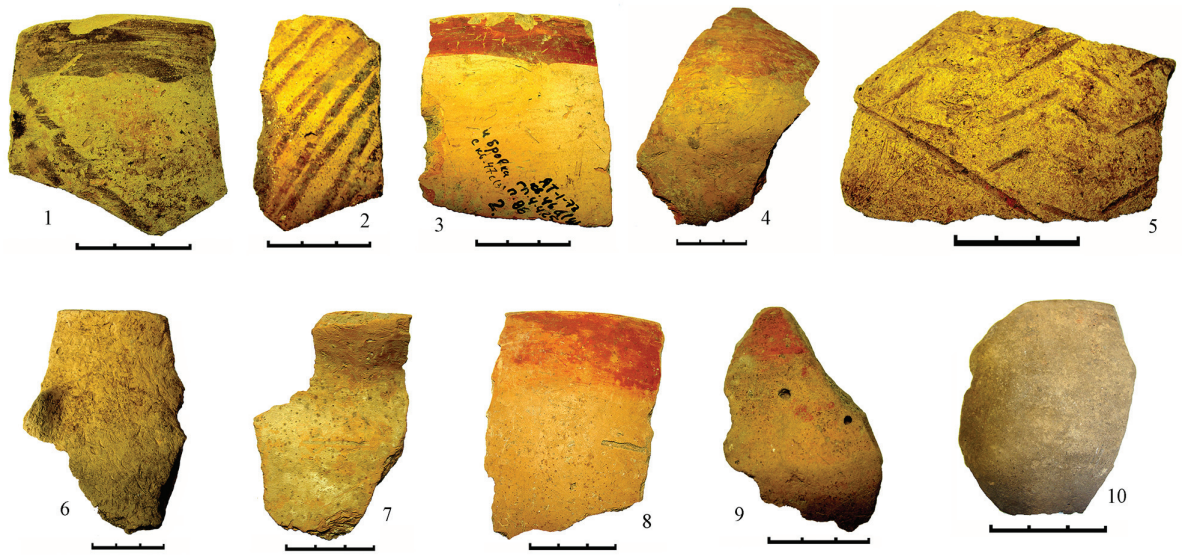

Fig. 1. The analyzed pottery fragments from Yarim Tepe I. 1–5 horizon VII; 6–10 horizon XII.

❷ Clay with a moderate degree of ferrugination and high plasticity with a large quantity of fine limestone inclusions.

❸ Clay with moderate degree of ferrugination and moderate plasticity (with a small amount of fine and medium rounded quartz sand, 0.1– 0.25 and 0.25–0.5mm), white/light grey colours in concentrations of no more than 1:5 and high concentrations of fine limestone inclusions.

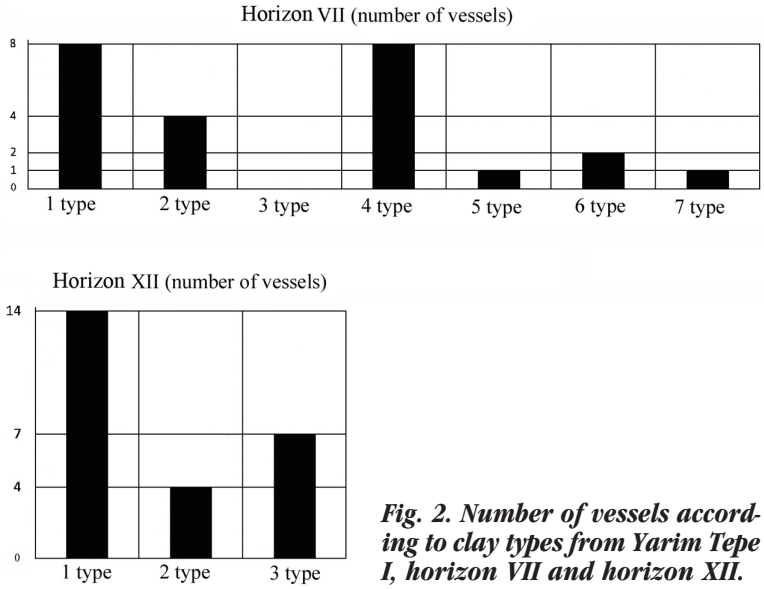

Fig. 2. Number of vessels according to clay types from Yarim Tepe I, horizon VII and horizon XII.

It is important to emphasise that in accordance with Bobrinsky's (*1999. 25–26*) approach the features of the clay resources described above allow us to conclude that local potters collected clay for pottery within one of the areas, but exploited various clay deposits.

The first type of clay was used most commonly for the manufacture of bowls and basins (29%), and jars and jugs (21%). The other types of clay had more specific formal distributions. The second was used predominantly for the manufacture of bowls (75%), and the third for the production of jars (71%).

The first type of clay, as described above, was used continuously by local potters through the transition to standard Hassuna (Horizon VII). The second type was also identified, but with some differences in the mineralogical composition (some fragments were seen to contain red sand in addition to the white and light grey inclusions). Again, this type was used solely for making bowls. The third type of clay was not identified.

Alongside the old clay deposits, it was possible to identify the exploitation of new kinds of resources at this time, a number of which were characterised by weakly ferruginated base clay. In total, a further four types of clays were identified in the analysis:

❹ Weakly ferruginated clay with high plasticity, containing a small quantity of fine or a combination of fine and coarse limestone inclusions.

❺ A mixture of weakly ferruginated clay with high plasticity and crushed, dry, moderately ferruginated clay. This fact reflects the beginning of the mixing processes of bearers of different pottery traditions. In this clay, a small quantity of fine or a combination of fine and coarse limestone inclusions was also present.

❻ Moderately ferruginated clay with moderate plasticity (with a large quantity of small limestone inclusions), distinguished from the third type by the presence of inclusions of sandstone and individual grains of sand (these were represented as conglomerates consisting of particles of different colours – white, grey, red).

❼ Weakly ferruginated and high plasticity clay with sandstone inclusions (including conglomerates) and a large quantity of small limestone inclusions.

In this horizon (VII), the fourth type of clay was used for the manufacture of a range of vessels types: bowls (63%), jars (12%) and jugs (25%). In the lowest horizon (XII) only the first kind of clay was used. The fourth type of clay was probably local to the site. The three last types of clay are found only in the manufacture of bowls. The sixth and seventh types, containing sandy conglomerates, were considered significantly different from the local natural types.

Thus, in the analysis of skills in the selection of raw materials, we can come to the following conclusions. First, the use of different types of clay and clay deposits, both in the archaic Hassuna period and through the transition to standard Hassuna, suggests that several potters or groups of potters were working within the settlement. Secondly, we can conclude that the first four types of clay, used in the production of 85% of the vessels found at the site, were probably of local origin. As will be shown below, they were made in most cases with traditional methods of paste pre-

paration and decoration. Thirdly, the last three types of clay are probably not local to the site. Vessels made of these clay fabrics are in the minority (they present only 8% of the total sample) and differ both compositionally and in their method of decoration. The clays of the sixth and seventh types, judging by the presence of natural sandstone inclusions, probably originated in the foothills near the archaeological site. This suggests that a population with a new pottery tradition appeared in the settlement in the transition to standard Hassuna.

Analysis of paste preparation traditions

Most of the investigated vessels contained organic temper (*e.g.*, plants) but it was difficult to identify them as there are no sufficient analysis of organic temper in pottery available. Bobrinsky paid considerable attention to elucidating the nature of different organic tempers in ceramics, specifying a number of characteristic features which can help determine the nature of such material (*Bobrinsky 1978; 1981a; 1981b; 1989; 1999*). These studies were continued by Yuri B. Tsetlin (*1993; 1999; 2003*), Irina N. Vasilyeva (*Bobrinsky, Vasilyeva 1998*) and Natalia P. Salugina, who presented data from an unpublished experiment dealing with the study of organic remains from animal dung.

However, despite being repeatedly analysed the problem of appearance and identification of organic temper in prehistoric pottery remains unresolved.

As part of the identification of organics in pottery from Yarim Tepe I, a series of experiments was carried out with different types of organic temper containing the following plant residues: fresh grass, hay, straw, and the dung of large (cattle) and small (sheep and goats) livestock (both in dry and humid states). Two sets of experimental samples were made from levigated clay – dried, crushed and finely sieved – with one or more of the organic materials listed above (in total, 20 combinations were analysed). The first set was used to form small vessels, while the second was used to make flat clay plates with prints on their surface. Both sets were fired in an oxidising atmosphere in a muffle furnace at two temperature ranges: up to 300°C and 800°C. A set of conclusions could be drawn from comparative microscopic and trace analyses of the experimental samples with the finds from Yarim Tepe I.

It was found that the pottery from Yarim Tepe I could be divided into two groups (Fig. 3). The first was made from a mixture of clay and dry dung (presumably from small ruminants) and coarse plant temper. In this regard, it is necessary to note that sheep and goat bones prevailed in the osteological assemblages from Yarim Tepe I (*Munchaev, Merpert 1981.149*). The presence of dung in the paste was identified by the following attributes: (i) the appearance of very small plant residues of up to 0.5mm long and 0.1–0.2mm wide with smooth, rounded edges; (ii) the appearance of a split along the grain particles of leaf plates and stem 1–5mm long and 0.2–1.5mm wide (corresponding to groups of plant residues Nos. 1, 2 and 4 as described by *Bobrinsky 1999.18*). Both these types are associated with plant residues that have passed through the gut of herbivorous animals. Marked crop residues predominate in the first type of temper, which included the dung of small livestock, which is extremely rare in the dung of large livestock. In addition, in some cases round cream-colored pieces that were not present in the natural clay were recorded; this is associated with specific secretions present in the animal dung (*Bobrinsky 1999.19*). The addition of dung to the paste strengthens the resulting pottery.

All the experimental samples in our study that were tempered with hay, straw and grass were not robust irrespective of the firing temperature and had numerous cracks and therefore broke easily. On the other hand, the samples tempered with dung from either large or small livestock exhibited considerable mechanical strength even at low concentrations. Bobrinsky repeatedly drew attention to the fact that the addition of organic temper (especially from poultry litter and the dung of small ruminants) leads to a stone-like state and considerably strengthens the clay even after drying in the air. The use of animal dung in the past also reduced the amount of shrinkage during drying and firing (*Bobrinsky 1999.86–87*). The second group contained very little plant remains in small concentrations.

The first group was dominant in the ceramics of the archaic Hassuna horizon (XII) and was identified in 23 vessels (or 92%). The concentration of dung in the paste is very significant, ranging from 20% to 40% of its total volume, while the concentration of coarse plant residues in some cases is approximately 40%. Regarding the degree of humidity, this coarse plant material could be identified as hay, dried or fresh grass, so it is possible that dry conditions prevailed in the archaic Hassuna horizon. The coarse plant material was probably already present in the dung when it was collected. These types of artificial

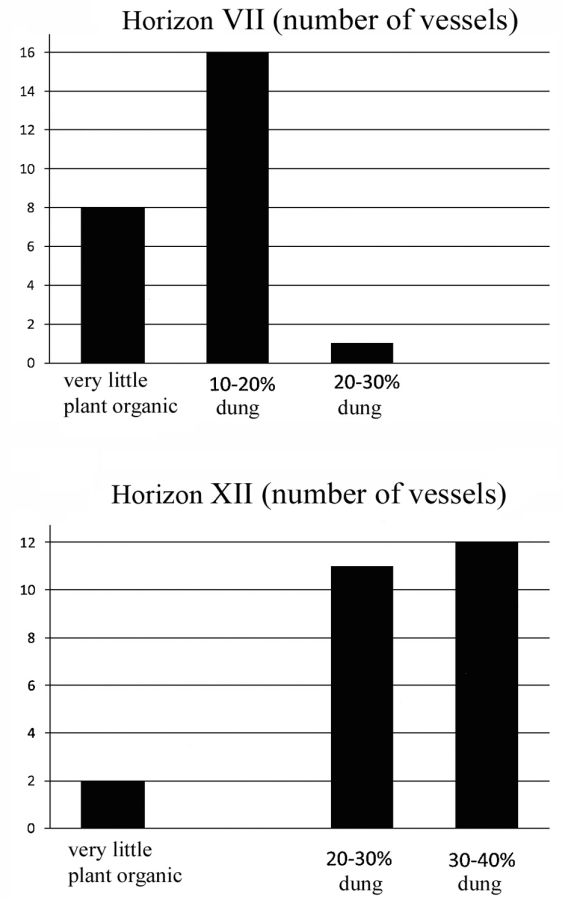

Fig. 3. Number of vessels according to the pottery pastes from Yarim Tepe I, horizon VII and horizon XII.

temper were identified in various forms in both fine and coarse pottery with no clear association with any particular vessel types. Only two thin-walled cups from horizon XII fell into the second group with small and rare plant residues in the paste.

This situation changed significantly during the transition from archaic to standard Hassuna. In horizon VII, 17 vessels of different shapes (68%) belong to the first organic-tempered group. However, they contain a much lower concentration of dry dung from small livestock, typically around 10% or less (the percentage can be higher in rare cases, ranging from 20–30%). The concentration of dry grass residues no longer appears to be a random association with the dung and varies according to the type of vessel: 10–20% in thin-walled products (jars and bowls) and 20–40% in more coarse items (thicker-walled vessels such as jars and pans). The dry plant residues in the paste were also different from those recorded in ceramics from the lower layer of the site, being much more consistent in form. The residues typically end and, where it was possible to determine their size, they were between 10–17mm long and 1–2mm wide. Further research is required to determine whether the form of these plant residues were the result of some special processing technique and were added consciously to the paste or were accompanied by the dung and its treatment. Plant stems cuts were encountered in the experimental samples, where the cut hay (or straw) was added to the paste, but it is difficult to prove that prehistoric potters used similar processing techniques. Nevertheless, it is important to emphasise that this composition of pottery paste was recorded in all of the pottery types that we studied. The second group, in which the paste contained little or no plant material, consisted of eight vessels (or 32%), all of which were thin-walled bowls. Thus, it may be noted that the transition from archaic to standard Hassuna was characterised by a significant change in the paste preparation by local potters. Although the old technology continued, it was much less used. The spread of new technology can be seen in the use of finer paste, which accounts for a significant share of the assemblage.

This trend is even more evident if the materials from Yarim Tepe I are compared with the materials from the earlier sites in the Sindjar Valley, previously studied by Bobrinsky. Older pottery from proto-Hassuna sites (Tell Sotto and Cultepe) was also characteristically dung-tempered, but had very high concentrations of organic temper (up to 70%, mostly around 60%). By the time of the archaic Hassuna, as seen in the lower layer (XII) at Yarim Tepe I, the concentration of dung organics in pottery had fallen below 40% and, as already noted, the transition to standard Hassuna was marked by a further reduction in concentrations to between 10 and 30% (Fig. 4).

The analysis of pottery surface treatment

Potters used a variety of surface treatments and decoration such as smoothing, polishing, coating (with an additional layer of clay) and slipping as we observed in the pottery from Yarim Tepe I. The latter three types of surface treatment are considered separately in the discussion of vessel decoration techniques. Apart from the vessel bases, which were characterised only by coarse smoothing, the pottery surfaces from horizon XII were typically smoothed carefully. Moreover, the smoothing lines have a definite orientation in all cases, often running diagonally from the rim. In contrast, the vessels from horizon VII are mostly characterised by a more horizontal smoothing direction. Whether this suggests the development of pottery technology or the chan-

ging preference of potters is a subject for future research.

Analysis of pottery decoration techniques

In addition to polishing and coating and the application of a slip as surface decoration, the use of ochre as a colorant, the use of plastic relief decoration and incisions are also worth mentioning (Fig. 5).

Red colour was added after firing on cups and jars in 55% of all vessels from horizon XII in the period of archaic Hassuna. The traces of a poorly preserved coarse coating (presumably of lighter clay) applied after firing either to one or both surfaces of the vessels was only rarely recorded (in 23%). On some bowls and jars smoothing is supplemented by polishing of the dried surface (18%). Plastic relief decoration was identified on only one vessel.

The pottery of the later horizon VII presents a different picture. Most of the pottery, except for basins, have traces of painting with red colour (ochre) applied before firing or painting with brown colour applied after firing. It is interesting to note that the brown colour, which is typical for bowls, was composed of non-local raw materials. This colorant was identified in only one jug of the 'local' pottery group. The brown paint on the pottery surface changed to red when re-fired in a muffle furnace at 850°C as was discovered in our analysis. Consequently, the colour differences noted on the pottery surfaces were not associated with the use of various mineral dyes, but reflect the fact that the brown colorant was applied after firing. A thin layer of light-coloured slip was identified on bowls and jars of local production in 31% of the vessels. It is important to emphasise that bowls, which were considered non-local, had no slip applied to their surface. Perhaps the technology of coating the pottery surface with a slip was the result of local traditions connected with the desire to improve the surface quality. Polishing and incisions were identified together on only one cup. The use of decorative incisions on bowls is also related to products that, judging by their composition, were not made locally, which is particularly true for those with a weakly ferruginated clay body.

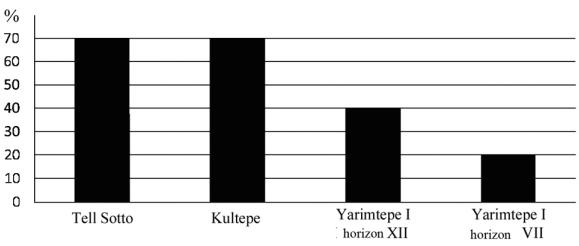

Fig. 4. The frequencies of the presence of dung in the pottery pastes from various Neolithic sites.

Thus, it may be noted that the transition from the archaic to the standard Hassuna period was again characterised by a significant change in the traditions of pottery decoration. The decoration techniques such as the use of brown, ochre paint and incisions, which in most cases were associated with 'non-local' fabrics, were of particular interest.

The study of firing technology

Due to our pottery analysis we can make some comments and observations about the conditions and the firing characteristics. The external and internal surfaces of most pottery are calcined, while the middle layer has a light grey or slightly reddish colour. The boundaries of transition between the firing horizons are often indistinct. Thinner pottery sherds are calcined throughout. The features observed suggest that the pottery was fired after a long soaking time, at temperatures above 650°C in an oxidising environment, and with slow cooling of the vessels within the firing structure (*Bobrinsky 1999.96*).

This information is consistent with the technical capacities of the furnaces found at the settlement. In horizons IX, VII and V the remains of small updraft pottery kilns with firing chambers approximately 0.7–1.25m in diameter were discovered (*Tsetlin 2004.412–413*). It is probable that such kilns were used for firing smaller vessels.

These characteristics were typical of the vast majority of the assemblage; only two locally made vessels (one from each horizon) showed evidence of a different firing sequence. These vessels attested to a final stage of firing in reducing conditions, as they are grey in the centre with a darker, sharply defined horizon on both surfaces (varying in thickness from 0.1 to 1–2mm). Whether this was connected to any additional surface treatment could not be determined.

Discussion

The technological study of the Hassuna ceramics from Yarim Tepe I allows us to present some preliminary conclusions. On the whole, the general scheme of development of Hassuna culture – originally recorded at the eponymous site Tell Hassuna and further defined by excavations at Yarim Tepe I – was sup-

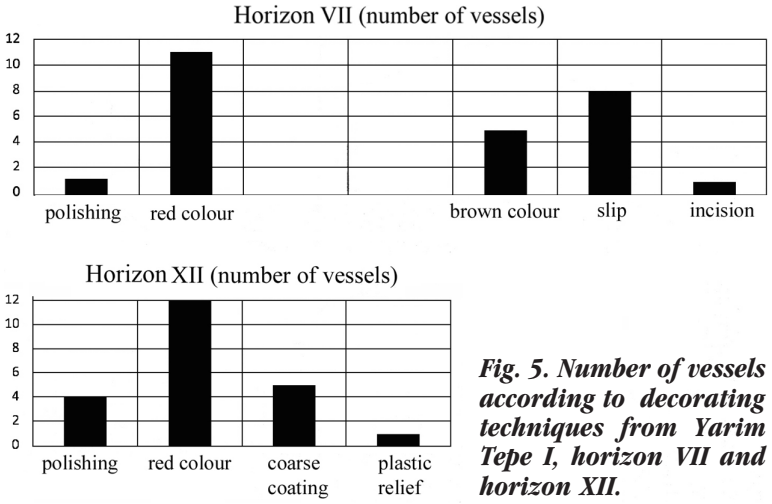

Fig. 5. Number of vessels according to decorating techniques from Yarim Tepe I, horizon VII and horizon XII.

ported. By comparing the pottery from different horizons (XII and VII) it has been possible to contribute further to our understanding of the process of transition from the archaic to the standard stage of Hassuna culture. Specifically, we discovered that within the archaic Hassuna horizon (XII) two pottery technologies were in use. The population of the first (most prevalent) system, which had its roots in the immediate locale, used three types of local clays with the addition of dung from small livestock in significant concentrations (about 20–40%) in combination with coarser plant materials as temper. For pottery decorations red paint, clay plastered vessel surfaces, and polished and relief decorations were used. For the second system, considered to be non-local in origin, only one clay source (the first type) was used, which was also the main resource for pottery. Red ochre paint was used for decoration.

During the transition to standard Hassuna in horizon VII, the situation changed significantly. At this time, vessels made from non-local clay resources begin to appear that are connected to the second system of pottery technology, individual examples of which had been used here in earlier periods. These products were decorated with brown paint and incisions and should probably be classified as a cultural import.

Thus, we can conclude that in the earliest period of settlement, the population was not uniform in their traditions. At least two systems of pottery technology can be identified in the various traditions of selecting and manipulating raw materials used for pottery production. One of these systems was clearly predominant and more archaic. It had its roots in this region and was already discussed by Bobrinsky during his study of the earlier sites at Tell Sotto and Kultepe (*Bobrinsky 1989.27–334*). The second system of pottery technology came to the settlement from the outside. A consideration of a number of technological factors suggests that there was a gradual process of synthesis of both traditions. This is seen particularly in the use of a mixture of two different clays and the gradual reduction in the concentration of dung temper in the paste, as well as in some of the methods of decoration. It must be noted that the results obtained here are still preliminary. We hope that a future studies of the large pottery collections from Yarim Tepe I will add further details and clarify these conclusions.

ACKNOWLEDGEMENTS

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Not meant to last: mobility and disposable pottery

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ABSTRACT – *Discussions of the emergence of pottery have often focused on the development of durable vessels among sedentary societies. However, there is increasing appreciation of the fact that early pottery was sometimes used by mobile groups, such as Late Pleistocene hunter-gatherers in East Asia and perhaps Late Neolithic pastoral nomads in the Near East. Pottery that was not intended to have a long use-life,* i.e. *disposable pottery, could have been used to resolve some of the conflicts between pottery production and a mobile way of life, including scheduling conflicts, length of production episodes, portability and scale of production.*

IZVLEČEK – *Diskusije o pojavu lončenine so bile pogosto usmerjene v študije o razvoju obstojnih posod med stalno naseljenimi družbami. Vendar pa se v zadnjem času vedno več pozornosti posveča tudi dejstvu, da so lončenino uporabljale tudi mobilne skupnosti, kot so pozno-paleolitski lovci in nabiralci v vzhodni Aziji ter morda tudi pozno-neolitski pastoralni nomadi na Bližnjem vzhodu. Lončenina, ki ni bila izdelana z namenom dolge uporabe, tj. lončenina za kratkotrajno uporabo, je morda služila reševanju neskladnosti med proizvodnjo lončenine na eni in mobilnim načinom življenja na drugi strani. Te neskladnosti so med drugim odpravljali z načrtovanjem dejavnosti, s krajšim časom proizvodnje, prenosnostjo in z obsegom proizvodnje.*

KEY WORDS – *pottery; disposable pottery; mobility; East Asia; Near East*

Introduction

A number of recent publications indicate that the emergence of pottery remains an important topic in Old World archaeology (*e.g.*, *Barnett, Hoopes 1995; Gheorghiu 2009; Jordan, Zvelebil 2009a; Rice 1999; Yasuda 2002*). Models from a range of theoretical perspectives have been proposed to explain why people began using fired clay vessels (*Brown 1989; Rice 1999*). A recurring theme implicit in some of these models is that pottery developed as a durable container that was intended to have a long use-life. But is it possible that early pots were not always fashioned with longevity in mind? Were pots sometimes used for a short period, perhaps to achieve a single, specific task, and then discarded? Accepting that the origins of pottery was likely complex and varied, this paper explores the potential roles of 'disposable' pottery in early pottery-using groups and speculates that disposable pottery may have particular advantages for mobile groups.

Pottery origins and mobility

Explanations for the adoption of pottery come from a variety of perspectives (*Rice 1999*). However, many recent discussions have stressed either the functional advantages of pottery or its potential role as a prestige object. Functionalist explanations typically consider pottery an adaptation for food preparation, and focus on its benefits as a watertight and vermin-proof storage container, or emphasise its role in new culinary contexts (*Rice 1999.6–10*). Such explanations suggest that the introduction of new foodstuffs or the benefits of cooking food in a more efficient way – through the direct application of heat

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– provided the stimulus for the adoption of pottery as a functionally superior container.

Explanations that consider the prestige value of pottery have built primarily on the work of Brian Hayden (*1995; 1998*), who argues that early pottery played a role in ritual feasting displays, especially in the context of increasing resource intensification. Feasts allowed aggrandising individuals to impress or mobilise others and thereby influence socio-economic relationships. As a new and presumably difficult item to make, pottery would have had prestige value that could enhance the status of its owner. During feasts, pottery – and especially fine, decorated pottery – could be used to display or serve prestige foods, such as oils or alcohol. Hayden (*2009*) suggests that undecorated and seemingly utilitarian vessels can be explained from a prestige perspective if they were involved in the preparation of these foods.

These two kinds of explanation – functionalist and prestige – differ in significant ways, yet in both there is an emphasis on well-made pottery that was presumably intended to be durable. For functionalist explanations, there is an expectation that early pottery should be sufficiently well-made in order to fulfil its functional roles as a cooking or storage container. While there may have been early phases of experimentation characterised by cruder vessels (*e.g.*, *Brown 1989*), the development of pottery should be towards well-made, functional vessels, as potters become more familiar with the craft. Explanations that consider pottery to be a prestige technology typically focus on fine, decorated wares that would have been the result of a significant investment of time and resources in order to produce an object that would convey the status of its owner, especially during feasting events. A less well-made pot would not convey this message as convincingly. If early pots were made to cook prestige foods, rather than serve them, or stand as prestige objects in their own right (*Hayden 2009*), they should be well made in order to operate in this capacity. Indeed, they may have needed to be more efficient cooking vessels than those implied in functionalist models if prestige foods were more difficult and demanding to prepare or less familiar to the people preparing them.

Both kinds of models have also tended to focus on pottery production by sedentary groups. Functionalist models have looked at the new foods made available by agriculture, particularly in the Near East and parts of Europe. Alternatively, they consider the relationship between pottery and the intensive exploitation of specific resources by relatively sedentary complex hunter-gatherers, such as grasses, nuts, fish or shellfish. Likewise, prestige models have tended to focus on pottery use and feasting among complex hunter-gatherers exhibiting emerging social inequalities and limited residential mobility (*Hayden 1995. 258*).

Indeed, there are a number of reasons why pottery may seem to be an unattractive container option for mobile groups:

❶ Pottery is easiest to make during warm and dry times of the year. While mobile groups may be able to move to areas with suitable raw material sources for pottery production, to do so at the appropriate time of year may be difficult, due to scheduling conflicts with other activities (*Arnold 1985.120*).

❷ Pottery production can require a significant investment of time, being protracted over several days or weeks. Specific raw materials may need to be procured and processed, including clay, temper, and fuel. Forming a vessel can require multiple production stages separated by lengthy periods of drying. Sufficient drying time is also crucial prior to firing, as otherwise the vessel may not survive the firing process. It may be difficult for mobile populations to remain in one place while these steps are being completed and, compared to the production of other container technologies, pottery is difficult to move prior to completion (*Arnold 1985.119; Brown 1989*).

❸ In addition to being difficult to move during production, pottery is arguably difficult to transport after completion. Compared to some other containers that would have been available to early pottery users, such as basketry and skin bags, pots are heavy and more fragile. Some have argued that these properties would make them an unattractive container option for mobile groups (*e.g.*, *Driver, Massey 1957. 231; cf. Arnold 1985.110*).

❹ There may be limited demand for containers in mobile groups with low population sizes. One of the main advantages of pottery over other container technologies is that time, materials (especially fuel), and effort are saved by producing multiple vessels at once (*Brown 1989*). Small groups that do not require many pots cannot take advantage of this economy of scale. Jelmer W. Eerkens (*2008.310*) suggests that in arid regions the limited availability of fuel would make small-batch firing particularly inefficient.

Despite these limitations, there is clear evidence that mobile groups do sometimes use pottery. Arnold's (*1985.Tab. 5.3*) analysis of pottery making and sedentariness indicates that 25% of nomadic groups make pottery, as do 75% of partly sedentary groups. In some cases, mobile groups may not make pottery themselves, but will use pots acquired from sedentary communities (*Beck 2009*).

How can mobile groups resolve the conflicts associated with pottery production and a mobile lifestyle (see also *Eerkens 2008; Simms* et al. *1997*)? One way of dealing with the limitations of heavy, breakable pottery, and resolving scheduling conflicts associated with pottery production is for a group to become more sedentary. It is possible that in some regions, pottery and sedentism developed in tandem. However, at many early pottery sites, there is little evidence for permanent settlement, and sedentism was seasonal at best (*Rice 1999.24*). The earliest experiments in pottery during the East Asian Late Pleistocene were by hunter-gatherers that were probably quite similar to the mobile groups of the preceding Palaeolithic in terms of social organisation and economy, and they likely maintained a high level of residential mobility (*e.g.*, *Habu 2004. 248; Kaner 2009.107*; see below). Similarly, early Holocene pottery in North Africa was likely produced by relatively mobile hunter-gatherers (*Close 1995.23*). In later periods, mobile groups may have resolved production conflicts by acquiring pottery from sedentary populations (*Beck 2009*), but this was not an option for the earliest pottery users.

Another, less dramatic, way that mobile groups can accommodate pottery is through caching vessels. This resolves the issue of carrying around heavy, breakable vessels, although caching does not obviously alleviate problems associated with production scheduling conflicts. Eerkens (*2008*) demonstrates that mobile groups in the American western Great Basin cached pots. Caches in the region are sometimes found, especially in caves and rock shelters, and the uneven distribution of sherds across the landscape indicates that pottery was not carried into upland areas and was likely cached in the lowlands (*Eerkens 2008.314*).

A third option for resolving the conflict between pottery and mobility is to design vessels with mobility in mind. Philippe Crombé (*2009.485*) suggests that hunter-gatherers in Western Europe might have made pots with pointed rather than rounded bases because they are "*easier to carry on the back, the hip or to transport in a canoe*". Eerkens (*2003. 734*) indicates that in the western Great Basin, pots associated with residentially mobile groups were thinner and smaller than those of more sedentary groups, making them lighter to carry, in addition to being efficient cooking vessels in an area with limited fuel sources. Using fibre as temper can increase the porosity of a vessel and therefore reduce its weight, making it lighter to transport (*Skibo* et al. *1989*), while perforations and appendages can serve as handles, making a pot easier to carry (*Beck 2009. 331*).

Another option that has rarely been discussed is to make vessels that are not intended to have a long use-life; in other words, to make disposable pottery. Simms *et al.* (*1997*) suggest that there may be an overall lower investment in pottery manufacture by more mobile groups, resulting in pots with shorter use-lives. They note a correlation in the eastern Great Basin between high residential mobility and thick-walled vessels made with little preparation of temper, which they take to be indicators of low investment in pottery manufacture. While they interpret a short use-life as a disadvantage that needs to be balanced against other factors, such as labour costs, material costs, and portability (*Simms* et al. *1997.782*), is it possible that in some contexts pottery with a short use-life was a calculated response to a mobile way of life? If pottery was intended to be disposable, a short use-life should not necessarily be considered a drawback.

Disposable pottery

Most discussions of pottery in archaeology have taken the position that pottery was typically produced with durability and longevity in mind. James M. Skibo and Michael B. Schiffer (*1995.82*), for example, state that:

"*Unless potters build obsolescence into the design (as in car brakes or pantyhose), they generally want vessels to last as long as possible. This is especially true when pots are manufactured on a household, part-time basis for local use*".

This is likely true in many cases of pottery production and perhaps in most cases of pottery production by sedentary populations (but see below). However, the statement should not be uncritically applied to all cases, and it is worth considering the potential significance of disposable pottery in certain contexts.

Indeed, disposable pottery is not unknown from archaeological or ethnographic contexts, although, in fact, most examples derive from sedentary groups rather than mobile ones. For example, in the Kathmandu Valley, Judy Birmingham (*1975.386*) notes the use of disposable pots that are characterised by 'their careless workmanship and thin walls'. These are used in both religious and domestic contexts; the latter include tea and rakshi cups that are thrown away after use. Monica L. Smith (*2008.225*) suggests that deposits of string-cut bowls found between structures at the 3rd century BC to 4th century AD site at Sisupalgarh in eastern India may be comprised of single-use vessels. During the Middle Minoan III and Late Minoan IA periods on Crete, undecorated 'conical cups' were made rapidly and sometimes carelessly, perhaps for acts of token hospitality involving the offering of small amounts of food or drink to guests. These wheel-made vessels may have been used only once before being discarded (*Knappett 2011.120; Rupp, Tsipopolou 1999*). During the Uruk period in Mesopotamia (4th millennium BC), relatively crude, bevel-rim bowls were made in large numbers, perhaps to be used as bread moulds (*Chazan, Lehner 1990; Millard 1988*). These may have been produced cheaply in anticipation of demand and, if the demand decreased or failed to materialise, disposed of after a short time or even without ever being used (*Goulder 2010.358*).

While the above examples are concerned primarily with the discard of mass-produced pottery that was probably made by specialist potters, there has also been limited discussion in archaeology of smaller-scale pottery production involving vessels with intended short use-lives. However, this discussion has tended to focus on social or ritual uses of pottery rather than its domestic or utilitarian ones. For example, Karen D. Vitelli (*1999*) implies that potters at the Neolithic site of Franchthi Cave in Greece may not have been overly concerned if their vessels crumbled or spalled shortly after manufacture, because it was the process of making pots that was important, rather than the resulting product. She suggests that shamans made pottery as a 'magical' transformative process, and as part of this process a pot that survived firing but then started to crumble or spall shortly after might have had 'great mystical potential' (*Vitelli 1999.193*). In a different scenario, Hayden (*1995.261*) suggests that fine, prestige vessels could be dramatically broken during feasts as displays of wealth, potentially not long after their manufacture. As an example, Anne B. Gebauer (*1995.108*) suggests that in southern Scandinavia, decorated Funnel Beaker pottery was sometimes produced specifically to be smashed during rituals at megalithic tombs and causewayed camps in demonstrations of wealth and status. The symbolic impact of its destruction likely derived from the fact that it was a prestige rather than practical object (*Hayden 1998*).

Discussions of small-scale production of potentially disposable pots with more utilitarian or domestic roles are largely absent. The difficulty of identifying disposable, utilitarian pottery produced at the household level is likely part of the reason for this. In cases of mass production by specialist potters, disposability can potentially be identified by abundance and depositional context, as at Sisupalgarh (*Smith 2008*). Numerous, similar vessels found in a single deposit may be interpreted as disposable, especially if some appear to be intentionally broken. However, in the earliest stages of pottery manufacture, production did not typically result in great numbers of pots, and vessels were more likely to have been discarded in small numbers or individually. In this context, the identification of a pot as disposable is unlikely to be straightforward, and indeed, it may be inherently challenging. Pots that were not designed to last may preserve less well than ones made with durability and longevity in mind, so evidence may be scant. However, it is unlikely that true obsolescence would have been built into early disposable pottery, as this would require more effort than a pot that is intended to be thrown away is likely to receive. Therefore, disposable pots and ones that were fashioned with longevity in mind may both survive in archaeological deposits. Differentiating them is a challenge for the archaeologist.

It is perhaps best to think of a disposable pot as one to which the user was not attached, or was willing to discard, rather than one that was designed to fail or disintegrate after a set amount of time. Disposability, then, may be more a perception of the maker and/or user than a quality inherent in a particular pot. But as a point of departure for studies that aim to explore the potential role of disposable pots in the context of small-scale domestic production, it is useful to consider the kinds of vessel that people might have been willing to discard. In the context of early production, it is likely that little effort would have gone into producing a disposable pot and little effort would be made to preserve it. Many early disposable pots, then – at least those not made as prestige objects for destruction or deposition in ritual contexts (*Hayden 1998.14*) – could have been

expediently produced, with little preparation of raw materials and little care taken in their forming and firing. This would generally result in a friable, uneven, low-fired and undecorated vessel. This gives a somewhat different picture of early pottery production than the ones implied by some functionalist or prestige models of pottery production. As noted above, these models suggest that early pottery should have been directed towards the development of well-made vessels to fulfil functional roles or to serve as prestige objects.

It is worth noting here that not all 'coarse wares' should be considered expediently produced and certainly not all should be considered disposable. Many cooking pots and storage vessels that could be described as coarse were undoubtedly intended to have long use-lives and were carefully designed to fulfill their functional roles. Indeed, coarse and 'ugly' vessels can have specific qualities that make them functionally superior to their 'fine ware' counterparts (*Skibo, Schiffer 1995.83*). In broad categories of pottery types, expediently produced pots may exist as a separate category alongside other coarse wares and fine wares, although the boundaries between any such groupings are likely to be somewhat artificial and difficult to define.

While there has been little discussion of disposable pottery use by non-sedentary groups, and particularly disposable utilitarian pottery use, it may be interesting to speculate how disposable pottery may have helped to resolve some of the conflicts between pottery production and mobility, including scheduling conflicts, production time, portability and, to a certain extent, scale of production:

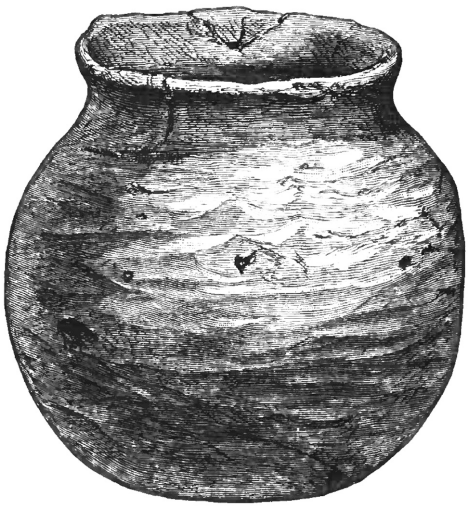

Fig. 1. Craggan from the Isle of Lewis (*Mitchell 1880.Fig. 20*).

❶ If pots are not intended to be durable, potters may not be overly concerned about waiting until the optimal time of year to produce them. Although it may be better to make pottery during the warm, dry summer months, especially if vessel durability is a primary goal, vessels can be produced at other times and in environments that are cold and humid. For example, in coastal Alaska, prehistoric groups made pottery despite living in a cold and wet climate that was seemingly unsuited to the task (*Harry, Frink 2009*). The kinds of low fired and 'ugly' vessels that can be produced during the cold, wet times of the year may be potential candidates for disposable pottery, although there is no specific indication that the Alaskan examples were meant to be disposable.

❷ Making this kind of pot may not involve a significant investment of time, allowing their producers to maintain a high degree of mobility. While some potters do invest a substantial amount of time in making a pot, others do not. For example, Arthur Mitchell (*1880.26–8*) describes 19th century pottery production on the Isle of Lewis. Certain vessels (called craggans) were produced quickly, with little preparation of materials and using no special tools (Fig. 1). Despite the cool, humid environment of the Outer Hebrides, vessels were only dried for a day and they were fired in the household hearth, alleviating the necessity to construct any special or dedicated firing installation.

❸ The fact that pots may be relatively difficult to transport, being heavy and breakable, would not be a problem for mobile groups if they were not concerned about keeping them during residential moves. Pots could simply be discarded prior to relocation. Edward L. Ochsenschlager (*1974*) observes that Hadij Bedouin of southern Iraq would fashion vessels and other objects from unfired clay. While these could potentially survive for years and were sometimes mended, they would be left behind when the campsite was moved (*Ochsenschlager 1974. 164*). Mbuti foragers in the Democratic Republic of Congo acquire pots from settled groups when they are camping in the latter's villages (*Turnbull 1965. 36*), but upon returning to the forest they leave most of these behind (*Turnbull 1965.Fig. 10*). Low-fired vessels could have been treated in similar ways by early pottery-using groups.

❹ The economy of scale proposed by James A. Brown (*1989*) suggests that a primary benefit of pottery is that making pots in batches reduces the

amount of time and resources required per individual vessel, making them a cheap alternative to competing container technologies such as baskets or stone bowls. However, an expediently-produced, disposable pot may be considered 'cheap' even if made singly, since there is minimal initial investment of resources and little room for optimising the production process. Vessels like Mitchell's craggans did not require lengthy periods of drying between stages of manufacture and were fired in hearths that are also being used for other purposes. The production of this kind of vessel will benefit less from Brown's (*1989*) economy of scale than the production of vessels that were the result of higher investments of time and energy, which could be optimised through bulk production.

Case studies

Identifying potential case studies of the small-scale production of disposable early pottery by mobile groups is hampered by 1) the inherent problems of identifying disposable pottery (discussed above) and, in some cases, 2) difficulties with identifying the sites of mobile groups. The sites produced by mobile groups may be difficult to locate if they are small or ephemeral. Furthermore, because the presence of pottery at a site is sometimes interpreted as an indicator of sedentariness, even if the sites of mobile pottery using groups are located, they might not be identified as such.

However, as a point of departure for further examinations of disposable early pottery use by mobile groups, I propose two (speculative) cases where a reinterpretation of the evidence could lead to fruitful discussions of disposable pottery.

East Asia

Despite a long tradition of viewing pottery as part of a 'Neolithic package' that also included agriculture and sedentism, it is now clear that the world's first pottery was not produced by sedentary farmers, but rather by Late Pleistocene hunter-gatherers in East Asia (*Jordan, Zvelebil 2009b*). Early dates for pottery come from southern China at around 18 300 to 15 430 calBP (*Boaretto* et al. *2009*) and Japan and the Russian Far East around 16 230 calBP (*Keally* et al. *2003; Kuzmin 2006*). Much of the earliest pottery in these regions is undecorated and rather coarse. For example, Lu (*2010.18*) describes early pottery from Zengpiyan as low-fired (probably below 250°C) and often plain, and suggests that the marks and impressions preserved on vessel surfaces are not decoration but, rather, traces of the manufacturing process that were not subsequently removed (Fig. 2). The earliest phase of pottery production in Japan is also characterised by undecorated wares (*Keally* et al. *2003*).

This kind of pottery is often attributed to an early experimental stage of production when potters had yet to realise the full potential of the craft (*Brown 1989*). However, it is not inconsistent with the kind of expediently produced pottery that I suggest was, in some cases, made to be disposable. It should be noted that not all early pottery from East Asia is undecorated. For example, at Xianrendong in southern China, pots were sometimes decorated with U- or V-shaped impressions along the rim, often with a lower band of circular impressions running around the vessel (*Zhang 2002*). Pottery from the region also shows some attention to paste preparation, with ground quartzite often being added as temper, although this can be rather coarse and poorly sorted. The co-occurrence of potentially expedient vessels and more carefully made decorated pots suggests that there was not always a straightforward experimental stage of pottery production that progressed directly into more developed traditions. Rather, it seems that potentially expedient pots were sometimes made alongside ones that were more carefully manufactured, suggesting that potters intentionally chose to make expedient pots and were not simply limited by their technological know-how.

In some parts of East Asia, it is possible that the emergence of pottery coincided with a shift to a more sedentary way of life. In southern Kyushu, seasonally sedentary settlements develop around the same time as early pottery during the Incipient Jōmon period, and by the subsequent Initial Jōmon period some settlements were occupied throughout the year (*Pearson 2006*). However, the overall trajectory towards increasing sedentism remains some-

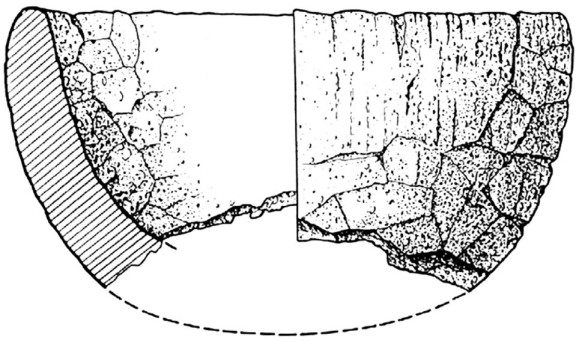

Fig. 2. Early pottery from Zengpiyan, southern China (after* Lu 2010.Fig. 2*).

what unclear for the broader region and was likely rather complex. It is probable that in some areas the first pottery users were quite mobile (*e.g.*, *Habu 2004.248*), with greater sedentism developing only at a later stage of the Pleistocene-Holocene transition. In central Honshu, Simon Kaner (*2009.107*) suggests that the earliest undecorated pottery was made by people who were still very mobile. It was not until the next stage of pottery production, when decorated vessels became more common, that people began to range less widely (*Kaner 2009.109*).

Near East

Early pottery use by mobile populations is not necessarily restricted to hunter-gatherers. Nomadic pastoralism represents another mobility strategy that could incorporate disposable pottery. In the southern Levant, the emergence of pottery marks the start of the Late (or Pottery) Neolithic period (*c.* 6500–5200 BC). Sheep and goats form a dominant part of the faunal assemblages from this time, suggesting that nomadic pastoralism may have been an important part of the economy. Ilse Köhler-Rollefson (*1992*) has argued that nomadic pastoralism developed in eastern Jordan as a means of alleviating the environmental pressures caused by animals grazing around large habitation sites, such as 'Ain Ghazal. Herders would remove their flocks from the site at certain times of year to graze in the steppe to the east. This resulted in a 'disarticulated' society comprised of both settled farmers and mobile herders who would leave the sites for extended periods of time (*Rollefson, Köhler-Rollefson 1993.39*). While the specifics of this model have been debated (*e.g.*, *Betts 2008*), it does seem that farming and herding were two parts of the Late Neolithic economy, and the occasional interaction between farmers and herders could possibly account for some of the pottery recovered from Late Neolithic sites.

At the Late Neolithic site of al-Basatîn in northern Jordan, excavations have produced some evidence for a small but relatively settled group, including sickles and ground stone objects for harvesting and processing grain, and the remains of pigs, which are not usually associated with nomadic communities (*Kadowaki* et al. *2008*). However, architecture at the site is somewhat ephemeral, perhaps consisting of stone platforms covered by tent-like structures (*Kadowaki* et al. *2008*), and sheep and goat bones dominate the assemblage. Although it is not certain, this could be interpreted as a more mobile component within the settlement or, perhaps, the development of the site included multiple stages, some of which included more temporary occupations (see *Bernbeck 2008*). Pottery at the site includes some relatively fine vessels, including small numbers of thin-walled and highly burnished pottery, but it also includes some coarse (even 'ugly') and probably hastily made vessels that are so friable they cannot be washed without risking disintegration (Fig. 3). Examining the fabric of this material shows that pots were sometimes made with little preparation of raw materials; they had no temper added and were made with unlevigated clay. A possible interpretation is that these were expediently produced vessels used by a more temporary and mobile component of the group. When this component relocated with their flocks, perhaps to the highlands to the east, they could have left these disposable pots behind. The difficulty of identifying ephemeral pastoral campsites makes it difficult to establish whether Late Neolithic nomadic groups also made pottery when away from larger settlements, although it is worth noting that Late Neolithic sites in the eastern desert rarely contain pottery (*Betts 1998*). This interpretation is admittedly speculative, but it is a direction that may warrant further consideration.

Beyond mobility

While this paper emphasises the role of disposable pottery in resolving some of the conflicts between pottery production and mobility, the idea of disposability may contribute to addressing some other issues related to early pottery production. For example, Vitelli (*1999*) has questioned why potters would have experimented with adding calcite or shell temper to pottery. These additions can provide some functional benefits to a vessel if added in the right combination, but they can also cause a pot to mar or crumble entirely, making it difficult to "*explain why*

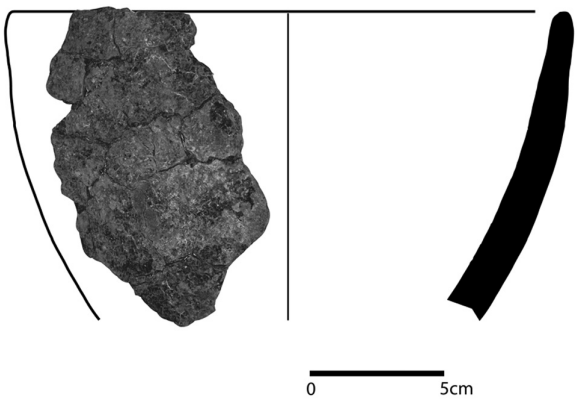

Fig. 3. Late Neolithic rim sherd from al-Basatîn, northern Jordan.

it ever occurred to anyone to try that combination in the first place, and to persist until they came up with the right proportions" (*Vitelli 1999.193*). As noted above, her answer is that a pot that marred or crumbled some time after manufacture may have been interpreted in terms of the mystical properties of the shaman-potter. Another possibility is that pots were only intended to be used for a short time, perhaps for a specific domestic activity. If they fell apart when this activity was completed, it may not have been a particular concern for the potter and/or user. In this case, calcite or shell temper may have been no more risky than any other additive. The discovery that certain combinations of clay, temper and firing conditions resulted in pots that did not crumble could have been an unintended consequence resulting from the preservation of some vessels and not others.

Prudence M. Rice (*1999.21–3*) has noted that early pottery is frequently found in riverine or coastal environments. One explanation for this pattern is that people were drawn to the rich food resources available in such areas. Ultimately, this resource abundance could tether groups to specific locations, resulting in increased sedentism, which could facilitate pottery production. An alternative explanation is that mobile pottery-producing groups were attracted to riverine environments because these could provide relatively predictable sources of the raw materials required to make pottery – clay, water, and fuel. If pots were repeatedly being produced and discarded, then a predictable source of raw materials would be beneficial when a group moved to a new location and wanted to quickly form a new pot. Of course, these two explanations are not mutually exclusive, and it is highly likely that groups were drawn to riverine and coastal locations for a broad range of products (*Jordan, Zvelebil 2009b.59*). It is worth pointing out, however, that the earliest pottery production in East Asia predates the onset of climatic amelioration events that presumably led to increases in riverine food resources (*Taniguchi 2006*). It seems that there was not a straightforward progression from an increase in riverine resources to sedentism and the production of pottery.

The idea of disposability may also help explain why the 'experimental' stage of pottery production seems to last so long. Brown (*1989*) suggests that the widespread adoption of pottery should be preceded by an experimental stage characterised by expedient production techniques, and indeed, in some areas, pottery that could be described as expedient existed for centuries or millennia before the emergence of finer wares. But Oyuela-Caycedo (*1995.134*) notes that "*pottery could have been invented in such a short period of time that its development would not even be perceived in the archaeological record*". The time lag may be explained if crude, expedient pottery was not, in fact, experimental, but rather had advantages over finer and seemingly more sophisticated wares. While such 'ugly' pottery may have some functional advantages for cooking (*Skibo, Schiffer 1995*), the low investment of time and material resources required for disposable pots may have been another advantage. Disposable pots should not require great investments of time or resources to make or maintain, and do not have to be accommodated in residential moves.

Building on this, it is worth pointing out that many early pottery assemblages are quite small. For example, for the earliest phase of the Incipient Jōmon of Japan the average number of recovered sherds per site is only 28 (*Keally* et al. *2003.9*). This low number may suggest that very early pottery was a barely sustainable technology and one might question how it managed to survive and develop into larger scales of production. However, if many early vessels did not preserve because they were not designed or intended to be durable, the actual number of pots made by early potters could have been higher (but see above). These higher numbers could indicate a more sustainable level of early production, which helps to explain why pottery eventually became such a widespread phenomenon.

Conclusion

It is becoming increasingly clear that the factors contributing to the emergence of pottery varied from region to region, depending on specific ecological, economic and social conditions (*Hoopes, Barnett 1995*). The reasons for the emergence of pottery in East Asia were likely rather different from those that led to early pottery in North Africa, the Near East, or anywhere else. Therefore, any broad statements about the importance of disposable pottery may not be relevant in all areas. However, in general terms, I suggest that there may be some particular advantages to disposable pottery for mobile groups. Considering these advantages may contribute to a better overall understanding of the emergence of pottery, especially among mobile groups. The fact that disposable utilitarian pottery seems to be relatively rare in recent contexts does not mean that it was absent in the distant past. Perhaps pottery came to have a greater perceived permanence only as it be-

came a more embedded element of material cultural traditions, or perhaps traditions of disposable pottery persisted as populations shifted to more sedentary lifestyles but have yet to be fully recognised.

While disposable pottery may have been a component of early pottery production, it is difficult to say how important this component was. As noted above, it is difficult to quantify disposable pottery, as it may not readily survive, and at the same time, disposable pots that do survive may be difficult to differentiate from ones that were intended to have a long use-life. While I have argued that disposable pots, at least those with more utilitarian roles, may be characterised as expediently-produced vessels exhibiting a low investment of time and resources, this is not to say that all expediently produced vessels should be considered disposable. Some coarse, low-fired vessels may have been valued and kept for their properties as cooking vessels (*Skibo, Schiffer 1995*). But a longer use-life should be demonstrated rather than assumed. Evidence for a long use-life might include repair holes or evidence that pots were transported from their locus of production. In such cases, disposable pottery may not have been a significant part of the ceramic repertoire, or people may have produced it alongside vessels that were intended to be more durable. Given the inherent flexibility of pottery as a craft, it should perhaps be unsurprising that a single group of people should approach it in multiple ways. It is also worth pointing out that disposable pots, like 'ugly' pottery in general (*Skibo, Schiffer 1995.83*), should not be considered irrelevant to broader social or economic processes. Carl Knappett (*2011.143*), for example, demonstrates how the simple, standardised, and probably disposable Minoan conical cup could have played an important role in carrying Cretan Palatial consumption practices across social networks in the southern Aegean.

This paper deals with how disposable pottery could fit into the technological traditions of mobile groups. Further work is needed to describe the diversity of early pottery assemblages and to explain why pottery developed in certain contexts, both among settled groups and more mobile ones. It might be revealed that disposable pottery was a minor and relatively unimportant element in a rather complex process; it may also turn out, however, that the apparent permanence of pottery derives partly from the fact that fired clay vessels, and more often parts of vessels, can survive for very long periods. In some cases, this permanence of pottery may not have been intended by the people who made and used it.

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BACK TO CONTENTS

Models and scenarios of the Neolithic in Central Europe

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ABSTRACT – *The Neolithic in Central Europe can no longer be characterised as comprising a compact population of a single society in which organisations and subsistence strategies were homogeneous. Despite the apparent uniformity of the pottery, the period was characterised by a mosaic of small communities that differed in both economic and social organisation for almost two millennia. These genetically diverse communities inhabited geographical spaces of varying size, from regions to micro-regions to single settlements. The polymorphous modes of exploiting natural resources ensured successful long-term survival, even when the results of the emerging farming economy were uncertain and unreliable in some groups.*

IZVLEČEK – *Srednjeevropskega neolitika ni več mogoče povezovati z enovito populacijo in homogeno organizirano družbo z enotno strategijo preživetja. Kljub navidezni uniformnosti lončarskih produkcij, so se v času skoraj dveh tisočletji oblikovale majhne skupnostih, ki so se razlikovale tako v družbeni ureditvi kot gospodarskih strategijah. Genetsko različne skupine so bile naseljene v prostorih različnih velikosti, od regije in mikro regije do posameznega naselja. Mnogolična izraba naravnih virov je zagotavljala dolgoročno preživetje, tudi takrat, ko so bili učinki razvijajočega se kmetovanja negotovi.*

KEY WORDS – *Central Europe; Neolithisation; Bohemia; palaeoeconomy; settlement patterns*

The cultural-historical model

In the latter half of the 20th century, synthetic work on the origin and development of the Neolithic in Central Europe was based on the idea that the spread of the Neolithic lifestyle was connected with the migration of people from regions which had already undergone Neolithisation – the notion of demic diffusion – proceeding through several successive stages from the Near East to Anatolia and the Aegean, and then in two directions, north to the Carpathian Basin and west to the Mediterranean. Before 5500 calBC, in northern Transdanubia, the early Starčevo Culture, perhaps under the influence of the emerging Vinča Culture, gradually transformed into the earliest Linear Pottery Culture, which then spread further to north-western and eastern Europe: "*From centres in Transdanubia and lower Austria, the LBP began to expand into the loess territories of the central European uplands*" (*Kaczanowska, Kozłowski 2003.245*).

In the 1980s, these basic theses were further supported by anthropological research (*Vencl 1982. 650*), which confirmed a general trend of migrations along the diagonal south-east–north-west axis through Europe. As early as the 1970s, gradual improvements in genetic studies of European populations led to the creation of a model known today as the wave-of-advance (*Ammerman, Cavalli-Sforza 1984*). The aim of this model was to provide an alternative to older theories that posited an autochthonous origin for the European Neolithic, which were based on structural-anthropological concepts and linked to the nationalism of the mid-20th century (*Ammerman 2003.13*). However, today's palaeogenetic

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research can be seen from the distance as having its own problems that could affect the archaeological theories derived from it (*Cavalli-Sforza 2003.302–306*).

Most cultural-historical concepts explicitly or implicitly included the idea that Neolithic cultures are identifiable with certain population groups with distinctive pottery who moved through Europe, carrying the Neolithic with them. Because archaeological evidence of older settlements is scarce, it was assumed that these Neolithic groups expanded into territories abandoned by the previous populations, where they laid the foundations of, for example, a new cultural landscape. These theories of Neolithisation had their own inner logic, did not contradict modern ideas of prehistoric society, and were in accord with the prevalent concept of a progressive linear development that led directly to later historical entities in Europe.

The cultural-historical model of the origin and development of Central European Neolithic society can be compared with the geographical-cultural model of Epipalaeolithic development in the Levant, which led to the emergence of a Neolithic society in the Natufian period. This model was developed over a long period by the Lyon School (*Aurenche* et al*. 1981*) and can be divided into four steps: (i) the discovery and geographical location of prehistoric cultures in a given period, (ii) a finer categorisation of cultural groups, (iii) the drawing out proposal of a hierarchy of these groups by comparing their content and determining centres of evolution, and (iv) observing the changing geographical location of these centres over a given period (*Delage 2004.105*). This model has been debated, and its historical core is believed to be rooted in the philosophical tradition of the European Enlightenment. The evolutionary progress-based view of history included the idea that history is an unequivocal process heading towards the improvement of the human condition, which is measurable by intellectual and political maturity and technical progress.

Applied to archaeology, the criticism of such a concept of history consists of rejecting all notions of history as a gradual and linear development towards a predictable future. Therefore, today's archaeological work questions interpretations that state that "*traits (architecture, pottery, domesticated animals and plants, life in villages* etc.*) once invented and found valuable in reference to modern Western Civilization will always be kept and passed from one generation to another ... and from one civilisation to another*" (*Delage 2004.106*). It then becomes quite ineffective to explore and describe Neolithic society either in ethnographic terms used for pre-state rural societies, or contemporary terms such as trade, contacts, mobility and hierarchy. It is more desirable to explore the socio-economic conditions of group identities, which would lead to the reconstruction of Neolithic communities identifiable by house or gender particularities, or by local and regional strategies for creating social groups (*Asouti 2006.106*). In this respect, the mobilisation and intensification of the entire network of relations between individual elements of Neolithic society play an important role. Temporal and spatial changes in social conditions, together with their local manifestations, could have become the basis for a complete reconstruction of social organisation in the Neolithic, although little of the research on Neolithic settlements seems useful so far.

In the separate spheres model of the aceramic Neolithic (Fig. 1), which shows a division of the Levant into regions of farmers, herders and hunters (*Bar-Yosef 2002*), the cultural-historical concept meets the socially-defined division of territory. It proves impossible to abandon entirely the archaeological classification of regions based on morphological comparisons of different artefact types, and replace this with a purely socio-economic classification, because the archaeological method does not permit this. On the one hand, contemporary anthropological models offer no guidance for studying the Neolithic (*Perlés 2001.305*). On the other hand, all reflections on the social organisation of the Neolithic, as opposed to later hierarchical societies, are essentially based on interpretations of the available cultural-geographical classifications of Neolithic architecture and rituals (*Kuijt 2000.315*).

Reflections of this kind must necessarily rely on visible archaeological artefacts, as is well documented by the elaborate interpretations of long-distance trade in, and barter with, obsidian and other raw materials needed in the chipped stone industry. This is true of the Near East (*Asouti 2006.102–104*), the Aegean (*Perlés 2001; Tangri 1989; Runnels 1989; Halstead 1999*) and the Carpathian Basin (*Mateiciucová, Małecka-Kukawka 2007; Whittle 1996*). The generalising nature of archaeological finds – first the chipped stone industry, then pottery – does not permit the identification of real social groups. Rather, it creates an illusory classification of space and creates an impression of uniformity, thus con-

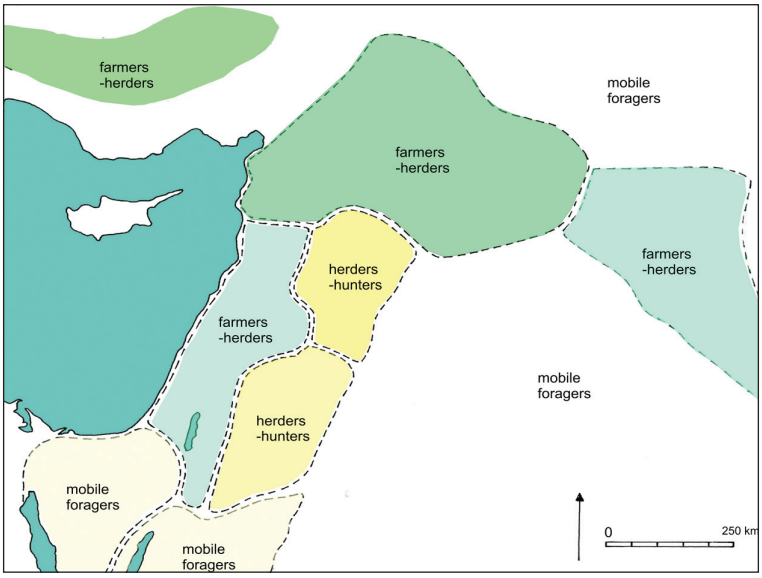

Fig. 1. Near East. Pre-pottery spheres model (after* Bar-Yosef 2002; Asouti 2006*).

cealing the subtleties of the social identities of the populations.

The Bohemian scenarion in the context of Central Europe

Let us assume that the original population of Bohemia did not disappear, as has been thought previously, but that Neolithisation was the result of long-term contacts between the original population and inhabitants of regions already Neolithicised, such as the Carpathian Basin. Anthropologists distinguish between at least two stages of such contact. The first stage is mere exchange in the social sphere; the second is a change of system for economic reasons (*Verhart, Wansleeben 1997.66*). Applying this view, the earliest Linear Pottery occurred in the second stage of contact. In Bohemia, this dates to around 5700/5500 calBC, which means that the first stage must have occurred before that time, although so far this has been undetectable and indiscernible by archaeological means. If this is the case, the original Mesolithic society must have become differentiated between 6000 and 5500 calBC, creating socio-economically distinct spheres among the original populations (Fig. 2). The original hunter-gatherer society then survived only in regions unsuitable for farming, which the cultural-historical model also conceded (*Vencl 1982.654*).

The first Neolithic population did not carry out a large-scale and continuous colonisation of a new type of landscape, but rather seized a small number of isolated optimal locations, as is evident in the Polish lowlands until the 3rd millennium BC (*Nowak 2009.451–461*). The synchronous density of settlements at the beginning of the earliest Linear Pottery phase was substantially lower than a complete map of the Neolithic population shows. The relatively rapid occupation of the main areas suitable for farming used to be considered as evidence of rapid and massive colonisation. However, the low density of the initial settlements might also have reflected the low density of the previous population (*Pavlů, Květina 2008*). Pre-farming populations were much more scattered than settled populations. However, because of their greater mobility, hunter-gatherers, populations used larger areas. Therefore, at the time when the first groups started to settle in permanent houses, only a few locations within a large area were settled.

It is my opinion that the original population partly transformed into a new population of farmers and partly moved into areas less suitable for farming. The border between the Mesolithic and the Neolithic is not a clear-cut line in a region, but rather a mosaic of regions with different kinds of populations. This is because different groups of the original population reacted differently to contact with the neighbouring *Neolithicised* populations of Moravia and the Carpathian Basin. Comparing the scope of the earliest Linear Pottery localities with that of all the Mesolithic localities reveals a clear geographical division of Bohemia into groups of localities that can be interpreted as settlements of newly arrived farmers, or of mobile hunter-gatherers, or possibly even of the first herders (see *Vencl 2007.80* for a different interpretation). Around 5500 calBC, farming groups occupied territories in eastern and north-western Bohemia and smaller regions in central and south-western Bohemia. The hunter-gatherer groups were remnants of the domestic population who had not adopted the settled lifestyle and retained their subsistence strategies in areas unsuitable for the first farmers. The herder groups can be interpreted as that portion of the original population of northern (*Šída 2007*) and eastern Bohemia who adopted only cattle breeding from the Neolithic lifestyle, thus creating the first herder communities, of a sort. This interpretation offers a wider socio-economic picture of the 6th millennium BC.

It is also my opinion that a scenario of scattered population groups with different economic structures is more acceptable for the Czech area than the hitherto prevalent idea of cultural and economic uniformity. The co-existence of social groups with different modes of production is accepted today in the Near East, from the Epipalaeolithic until the beginning of the ceramic Neolithic. Even with reference to European regions, this model is probably the most acceptable, although it is still difficult to prove by archaeological means. Throughout the entire Central European Neolithic, the ratio of the original population to the Neolithicised newcomers changed constantly. It is impossible to rule out that small groups, comprising one or two families, were arriving from distant territories not as colonists or ambassadors of a new means of subsistence, but as part of the general mobility of that time. The demographic processes are mirrored indirectly in the development of active decorative styles of Linear Pottery, and later Stroked Pottery, which are observable both qualitatively and quantitatively. However, throughout the entire Neolithic period of approximately 1400 years (5700/5500–4300 calBC), it is also impossible to rule out a resurgence for some reason of the social influence of the original population (*Pavlů, Květina 2008*). These changes might have been the background to further stages in the development of Central European society, both in its beginnings and later.

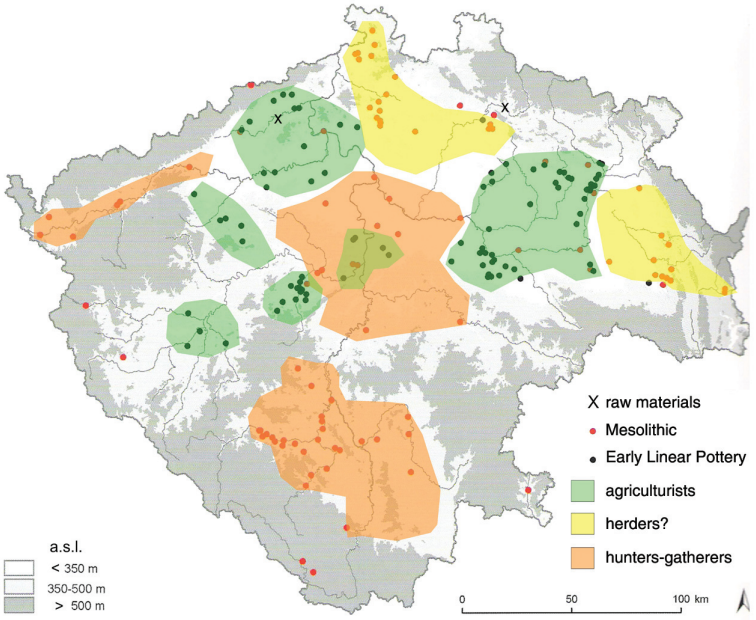

Fig. 2. The reconstruction of Bohemian spheres at 6000–5500 calBC (after* Pavlů 2011*).

It is generally assumed that the demographic composition of the newly emerging Neolithic population incorporated some parts of the original population, especially women, as evidenced by analyses of late Linear burial sites (*Price, Bentley 2005.211*). Women, being important agents and participants in social activities, which undoubtedly included pottery making, inevitably carried their cultural characteristics into the Neolithicised society. Pottery decoration in general might have been one of these characteristics. Because in many regions and many developmental stages Neolithic symbolism was a continuation of an older symbolism, it is still hard to tell which elements of the decorative symbolism in Linear Pottery are pre-Neolithic. Therefore, a disrupted style in pottery decoration might reveal not only chronology (*Čižmář 1998.135*) but also the influence of women from the original population who lived in Neolithicised groups.

I think it is most likely that the intensity of the original influence varied throughout the Neolithic. During the development of the Linear Pottery Culture, its social significance in the new system was weak, until it gained strength towards the end in the Šárka type. The ensuing cultural change, giving rise to Stroked Pottery Culture, brought a new stylistic concept of pottery decoration that abandoned the richly structured ornamentation of Linear Pottery. This, in a sense, was a return to the older, pre-Neolithic, stylistic concept of a passive style of ornament. The same can be said about settlement changes. A good example is the now classic find of a Neolithic house in Stvolínky (*Zápotocká 1999*), which was first thought to indicate a late colonisation of a territory which had not undergone Neolithisation. However, assuming that groups of hunters or herders had been using the territory for a long period before, the Stvolínky house can be explained as the first archaeologically visible evidence of such a group founding a settlement.

Types of settlement

The overall situation of the Neolithic in Central Europe, represented by the earliest Linear Pottery around 5700/5500 calBC and its continuation until around 4000 calBC, can no longer be viewed as being characterised by a compact population of a single society in which organisations and subsistence

strategies were homogeneous. A more detailed exploration of its archaeological content shows clearly, despite the apparent uniformity of the pottery, that it consisted of a mosaic of small communities with differences in both economic and social organisation for almost two millennia. These genetically diverse communities inhabited geographical spaces of varying size, from regions to micro-regions to single settlements. Even their interrelations were necessarily diverse, from mutual independence to various degrees of co-operation, to cope with local hostility, competition and enmity. An eclectic approach to using natural resources ensured successful long-term survival even when the results of the emerging farming economy were uncertain and unreliable in some groups.

The basic unit of Neolithic society remained the house, or household, inhabited by one or two families, as confirmed by the fact that the central areas of houses in Bylany are either single or double (*Modderman 1986*). According to Pieter Van de Velde (*1979; 1990; 2007.238*), houses could be grouped into yards or wards, which are larger economic units within a settlement. It is generally agreed that the layout of Neolithic settlements was determined by the principles of a social order, whether or not the form and details of the order are known to us. A yard organisation is believed to have existed at the settlements of the Aldenhoven Plateau (*Lüning 2005*), where this model serves as a basis for a detailed chronology of the settlements (*Stehli 1988; Stäuble 2005*). The theoretical division of houses is demonstrated by the example of the Geelen JKV site in the Netherlands. Here, the chronology relies less on pottery and more on the developmental typology of the interior structure of the central areas within houses (*Van de Velde 2007*). In Bylany, no such grouping into higher units has been observed, which is why its chronology is based exclusively on pottery analysis (*Pavlů 2011*). The assumed genealogy of houses, as demonstrated above regarding supplementary ornamentation, does not delineate any long-term housing space.

The existence of a single dominant person cannot be assumed, since it is not supported by any evidence from the settlements and burial sites. It is more likely that there were many individuals, both men and women, who for various reasons enjoyed a higher social status in a settlement formed by a co-operating group of houses. In Bylany, large houses with special architecture (*Soudský 1966*), which have been observed only in periods with an exceptionally high number of houses, could have served as the short-term residence of the leading family who organised the co-operation of the many inhabitants. This house might have hosted various social events and ceremonies that otherwise took place outdoors, if at all. This leads us to the conclusion that, throughout the development of a larger settlement area, such as Bylany in the Linear Pottery era, no long-term stable social structures were created to perform functions at a level higher than that of houses and families. This brings us back to the idea of the relative social self-sufficiency and independence of basic family units. Of course, these primary social units would have engaged in necessary economic co-operation, probably based on kinship ties, either real or mythical.

The existence of an even higher level of social organisation is sometimes inferred from the configuration of settlements within an entire region. There are two extreme variants of such a configuration. The first is a row in which settlements of varying size and importance form a string along a watercourse (*Modderman 1986*), with settlements usually 1km apart, or more widely spaced, with settlements approximately 5km apart (*Coudart 1998. 25*). The watercourse serves as a natural communication route. The second is a network where settlements are distributed throughout the entire region across the natural network of watercourses. Among other things, this network can provide a basis for exploring multilateral social relations (*Classen 2005.122*). In both variants, there is a hierarchy of large settlements, small settlements and solitary houses, although these are chronologically diverse. The network model gives rise to the idea of a socio-economic hierarchy that is bound to a certain centralised activity, usually the acquisition and distribution of an important raw material or goods (*Zimmermann 1995; Kneipp 1998*). In addition to these configurations, there is also the nuclear family arrangement (*Petrasch 2003.512*), for which there is evidence at the large settlements of the Kutná Hora region (*Pavlů, Rulf 1996; Pavlů 2005*) (Fig. 3.). This might correspond to the idea of two exogamous groups of inhabitants related by moiety. Van de Velde (*2007. 237*) interprets two parts of the Geelen-JKV site in a similar way.

The creation of parent and child settlements can be dated back to the first colonisation (*Petrasch 2003*), provided that we apply the older model of a single colonisation wave populating the whole of Central Europe with the Linear Pottery culture over a short

period (*Frirdich 2005*). Relations with the original inhabitants might have been mirrored, on the one hand, in the territorial distribution of the oldest Linear Pottery settlements, and, on the other hand, in the methods of co-operation and limits of competence of various subsistence strategies (*Frirdich 2005.102*). It is also necessary to take into account the varying degrees of mobility of individual communities and, above all, the varying degrees of their co-existence and integration. It could be assumed that the original inhabitants who did not adopt settled farming retreated to regions such as southern Bohemia that suited their own lifestyle, but were unsuitable for farmers. However, it is impossible to rule out co-existence and close co-operation within a single site. If that were the case, several distinct groups would have created their own autonomous neighbourhoods, distinguishable only by the types of animal bone, for example, but using the same kind of pottery, as at Cuiry-lès-Chaudardes (*Hachem 1994*). It is uncertain whether the farming, herding and hunting families were even more closely integrated at the level of houses within a settlement. An interpretation of different Linear Pottery house types, analogous to that of circular and rectangular houses in the Levant (*Verhoeven 1999.214*), stating that three-part houses were inhabited by farmers, two-part houses by herders and single-part houses by hunters-gatherers, remains only a hypothesis for future consideration.

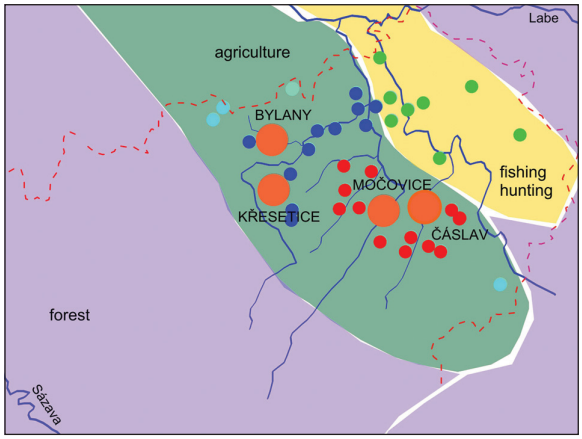

Fig. 3. Kutná Hora region. Interpretation of the different economic-social sub-regions (after* Pavlů 2011*).

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Towards reassessing the Neolithisation process in Western Iran

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ABSTRACT – *The multi-proxy evidence from Lake Zeribar indicates the possible impact of the Younger Dryas on Western Iran. By the end of this episode, the region was affected by rising temperatures and ensuing environmental enrichment, which could have resulted in changes in the settlement pattern from mobility to more sedentism* c. *9500 BC. It is proposed that semi-sedentism led to population growth and ensuing food management in the region, which finally encouraged people to domesticate plants and animals around 8000 BC. This paper will briefly discuss the three 'why', 'how' and 'when' questions in investigating the Neolithisation process in western Iran.*

IZVLEČEK – *Paleookoljski podatki z jezera Zeribar kažejo na možen vpliv mlajšega driasa na dogajanja v zahodnem Iranu. Dvig temperature ob koncu tega obdobja je v regiji povzročil okoljske spremembe, ki so morda vodile v spremembo poselitvenega vzorca. Okoli 9500 BC so stalna naselja nadomestila mobilne tabore. V članku predlagamo, da so občasna stalna naselja omogočila populacijsko rast in upravljanje s prehrambnimi viri, ki je okoli 8000 BC vključevalo kultiviranje rastlin in domestikacijo živali. V članku se sprašujemo zakaj, kako in kje je potekal proces neolitizacije v zahodnem Iranu.*

KEY WORDS – *Younger Dryas; Neolithisation; western Iran; food resource management; early domestication.*

This article is dedicated to Professors
Frank Hole and Peder Mortensen.

Introduction

In 1959–60, western Iran was one of the first regions in the Near East where early domestication was investigated (*Braidwood* et al. *1961*). Robert Braidwood carried out excavations at the Sarab and Asiab sites near Kermanshah, although these were only partially published. Braidwood left the region to southeastern Turkey, but he paved the way for subsequent researchers. In the 1960–70s, Peder Mortesen (*1975*) carried out soundings at Tapeh Guran and Philip Smith (*1976*) and Judith Pullar (*1990*) directed excavations at Tapeh Ganj Dareh and Tapeh Abdul Hosein, respectively. In the Lowlands, Frank Hole devoted his work to Tapeh Ali Kosh (*Hole* et al. *1969*), Chogha Sefid (*Hole 1977*) and Tapeh Tulaii (*Hole 1975*). Helene Kantour also excavated Chogha Bonut in a small area, which was later continued by Abbas Alizadeh (*2003*) in the 1990s. Political problems resulted in a shift in research to the western Fertile Crescent, finally leading to a paucity of information about the early Neolithic in Iran in comparison with other regions. Archaeological research, however, has indicated a gap in time between late Epipaleolithic settlements and those of the early prepottery Neolithic in the highlands of western Iran. There is no absolute date from the Epipaleolithic sites, and based on the chipped stone industries, their relative dates have been attributed to the very long time span of the Zarzian tradition, *c.* 20 000–12 000 BP, although sites such as Warwasi rock shelter, Ghar-i-Khar, Mar Ruz and Mar Gurgalan Sarab date to the more recent stage of the Zarzian industry (*Mortensen 1993.168*). According to absolute dating, the earliest Neolithic sites, including Asiab (*Howe 1983*) and Ganj Dareh (*Smith 1990*), date to the second half of

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the 9th and 8th millennia BC. Worth mentioning are the newly obtained AMS dates from Central Zagros, which push Asiab back to the early 9th millennium (*Zeder 2008.254*). Recent excavations at Sheikhi Abad, Chogha Golan and East Chia Sabz have confirmed settlements from the mid-10th millennium to the early the 7th millennium (Fig. 1). Regarding the lack of absolute chronology from late Epipalaeolithic sites, they may have even been abandoned earlier than the estimated date. If so, we can imagine a long gap between the latest Epipaleolithic and the earliest Neolithic sites in the Zagros highlands, which coincides with the Younger Dryas, *c.* 11 000–9500 BC. Given the main focus of this paper is on the Neolithisation of western Iran, the discussion of the Neolithic period will be beyond its purview. Due to the focus on western Iran, or more precisely, Central Zagros, the evidence from other regions of the Near East cannot be discussed here.

The Younger Dryas and its possible impact

The Younger Dryas (YD), which was first identified in the pollen record of northern Europe, was a global climatic phenomenon with a dry, cold climate (*Moore, Hillman 1992*); it has been identified by spikes in oxygen isotope ratio samples taken from deep waters around the globe (*Munro 2003.51*). During the Late Glacial, as the temperature rose and the glaciers began to retreat, tundra vegetation was replaced by birch and pine woodland; these trends began during the Bölling and Alleröd pollen phases; then in the ensuing YD, the temperature fell sharply, the glaciers advanced again, and the woodlands retreated south, giving way to open tundra characterised by *Dryas Octopetala*, from which the name of the episode is derived. The term YD has been applied not only to the advance of Dryas-dominated tundra in the far north of Europe, but also to other changes in vegetation induced by the episode in regions such as the Pacific and Greenland discovered through core analyses (*Moore, Hillman 1992.482–483*). Although different studies have suggested a more or less varying time span for the YD, it has been placed within 11 000–9500 BC (*Bar- Yosef, Belfer-Cohen 2002.56*). During this interval, relatively arid conditions in central Turkey are also inferred on the basis of sediment records, indicating low lake levels on the Konya plain and high diatom-inferred salinity in Lake Tuz (*Snyde* et al. *2001.743–744*). The pollen analyses from the Ghab cores and Lake Huleh showed a significant impact of the YD on the environment of the Levant (*Moore, Hillman 1992*). These fluctuations are consistent with the interpretation of the records from Lake Van inferred from pollen and sediment geo-chemistry (*Snyde* et al. *2001.744*). In Iran, paleoclimatic information giving some clues from the Younger Dryas came from Lake Zeribar (*Wasylikowa 2005; Wasylikowa* et al. *2006*) in the west, although other studies were undertaken at Lake Urmia (*Djamali* et al. *2008b; 2008c*) and new sediment cores extracted from lakes Almalou (*Djamali* et al. *2009*) and Maharlou (*Djamali* et al. *2008a*). Both the old and new studies on the coring results from Lake Zeribar indicate cold, dry conditions in the transition from late Pleistocene to early Holocene. High values of $\delta^{18}O$ are interpreted as indicators of dryness, which caused low lake-water levels and increased salinity (*Stevens* et al. *2001*).

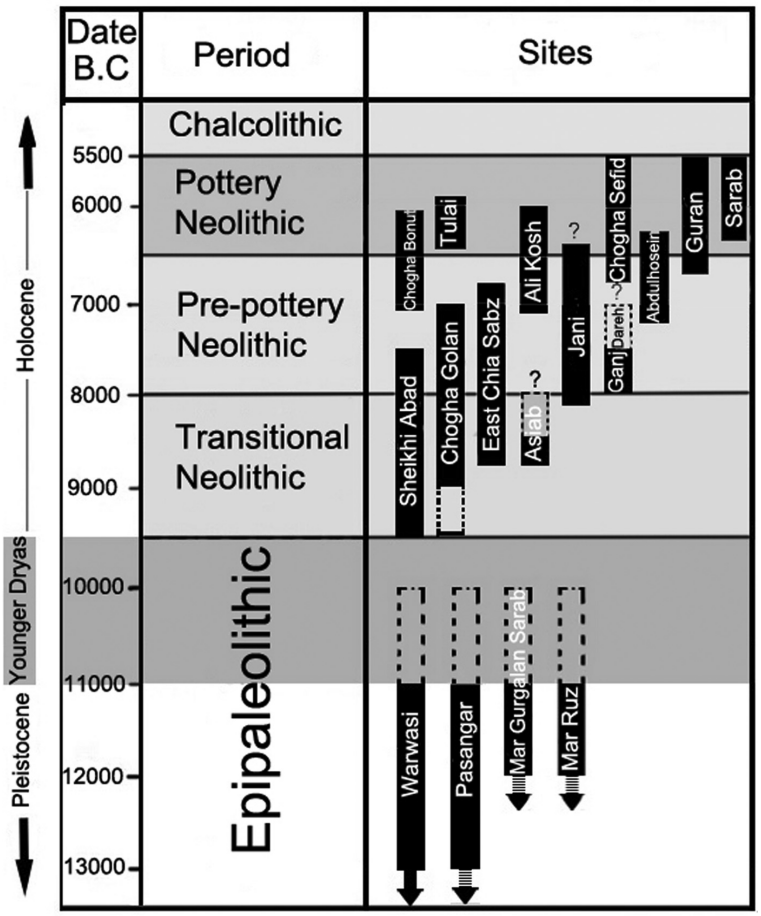

Fig. 1. Chronological chart showing the time span of prominent sites from the late Epipaleolithic to late Neolithic in western Iran.

Saline diatom and halophytic species *Ruppia maritima*, *Salicornia europaea* and *Suaeda* sp. also appeared. The limitation on the growth of the relatively thermophilous aquatics *N. marina* and *C. demersum* suggests a reduction in temperature (*Wasylikowa* et al. *2006.482*). Falling water levels have also been recognised in the frequent occurrence of *Chenopodium Rubrum* and the spectacular reduction in cereal pollen (*Hole 1996.264*). The occurrence of *Gyraulus crista* in the mollusc assemblage may suggest falling temperatures, while the presence of the land snail *Oxyloma elegans* is accordance with the reconstructed fall in water levels (*Wasylikowa* et al. *2006.489*). Previous studies found no arboreal pollen in the lakes (*van Zeist 1967; van Zeist, Bottema 1977*). Palaeo-limnology shows that the climate was stabilised by the rising temperature and the occurrence of arboreal and plants at *c.* 11 700 BP (*Wasylikowa* et al. *2006*), which is relatively synchronous with the end of the YD (Fig. 2).

Thus, the appearance of YD in western Iran is proposed, which affected people life's as coincided with the identified settling gap in the highlands. In the Levant, late Natufian societies returned to greater mobility during the episode (*Goring-Morris, Belfer-Cohen 1997; Bar-Yosef, Meadow 1995*), and some scholars believe that the first farming began in this period (*Bar-Yosef 1998; Bar-Yosef, Meadow 1995; Moore, Hillman 1992*). The C3 plants such as cereals were affected by the reduction in CO_2, which resulted in the low growth of emmer, einkorn, barley and rye in their natural habitats. Therefore, in Bar-Yosef's opinion, the three different responses of more mobility, movement to the northern Levant and farming fertile land such as riverbanks might have occurred (*Bar-Yosef 2002.116*). In western Iran, archaeological evidence suggests the abandonment of highland sites such as Warwasi, Mar Gurgalan Sarab, Pasangar in the late Epipaleolithic, and it seems that the populations living at these sites were faced with shrinking resource productivity during the YD, and therefore moved to the more favourable lowlands. Hole states that the severe conditions in the YD may have stimulated more intensive utilisation of food sources, which probably resulted in new modes of food management such as increasing the ability to harvest, store and process plant foods, as well stimulating the growth of desired species and perhaps control and protection of caprine herds (*Hole 1996.271*). However, apart from in the Levant no evidence has yet been discovered to indicate lowland occupation in western Iran during the YD, and we need to wait for further research.

Transition to the Neolithic

As discussed above, little doubt remains that the YD was a powerful climatic phenomenon that affected southwest Asia, both in the Levant and the Zagros.

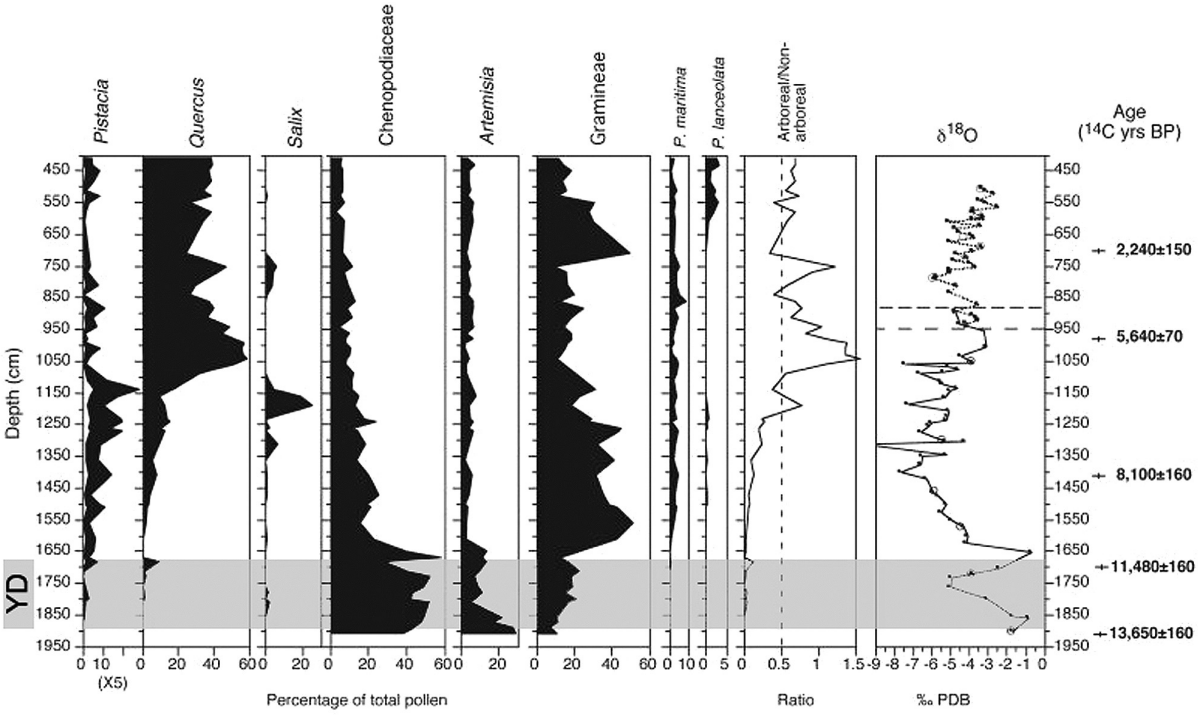

Fig. 2. Pollen percentages and $\delta^{18}O$ values of Lake Zeribar, showing the YD time span (after* Stevens *et al.* 2001.750, Fig.3*).

It seems that this interval ended just after the beginning of a period of solar insolation resulting from changes in the earth's orbital parameters (*Hole 1996. 267*). According to paleoclimatic reconstructions, by the end of the YD, temperature and precipitation ratios had increased and CO_2 levels had risen from 190ppm to 250ppm, which all resulted in the growth of vegetation and the ensuing environmental enrichment (*Richerson* et al. *2001*). The climatic improvement is also indicated by the replacement of steppe with woodland at the onset of the Holocene (*van Zeist, Bottema 1991*), which created conditions under which plants were grown, and finally encouraged a more sedentary settlement pattern in western Iran than that suggested for the Levant (*Bar-Yosef, Belfer-Cohen 1992*). The recent archaeological fieldwork in the Central Zagros has shown the beginning of new settlements just after the end of the YD at *c.* 9500 BC. The basal layers of Tapeh Sheikhi Abad indicate seasonal occupations (*Matthews* et al. *2010*). It seems that the availability of resources prompted a gradual change from mobility to semi-sedentism and, finally, sedentism in the region, which could have resulted in population growth. An increase in the degree of sedentism encouraged population growth, via shorter birth intervals, which put pressure on food supplies and other resources in the immediate vicinity of semi-permanent or permanent settlements (*Bellwood 2005.23*). Based on the evidence from Central Zagros, more settlements appeared around the early 9th millennium BC, such as Chogha Golan, East Chia Sabz and possibly Asiab and Sarab-e Qareh Daneh[1] (Fig. 3), which could be an indication of population growth. It should be noted that these sites yielded deposits of ashy layers which could be a sign of seasonal occupation, but indicates a greater tendency to sedentism than before (*Darabi* et al. *2011*).

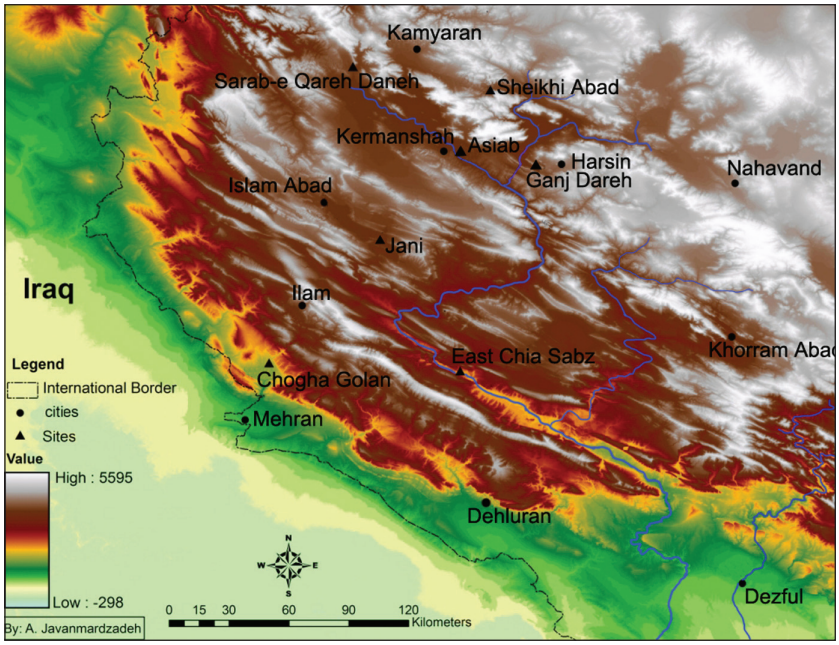

Fig. 3. Map showing the distribution of transitional Neolithic sites in western Iran, 9500–8000 BC.

By the mid-9th millennium BC, permanent settlements might have appeared, which resulted in the appearance of architecture, although some people were still living semi-permanently (Fig. 4). The pressure on resources that we can infer, was caused by population growth that led to the management of nearby species, which are called 'animal management' and 'cultivation'.

It has been generally believed that domestication occurred over a long period (*Bar-Yosef 1998; Tanno, Wilcox 2006*) which finally resulted in morphological changes in species. Melinda Zeder placed the beginning of plant and animal domestication at the same time, around 9500 BC (*Zeder 2011*). Also, a genetic analysis of the modern wild ancestor of goat has shown that western Iran was one the earliest areas in which goat domestication took place (*Naderi* et al. *2008*). It seems that during the transitional Neolithic, caprines changed behaviourally, not morphologically, which led to changes in their gene pool (*McCarter 2007*) around 8000 BC at the beginning of the Neolithic period. Animal remains from Tapeh Asiab show a kind of animal management at the site (*Zeder 2001.68*). This could also be the case at Ganj Dareh E, where Brian Hesse identified a high concentration of young male goats (*Hesse 1978*). Moreover, such concentration is also visible among the animal remains from Sheikh-e Abad and East Chia Sabz. Other sites have not yet

1 Sarab-e Qareh Daneh was sounded by the late A. M. Khalilian in 1996, which indicated a less than 50cm of ashy deposit (*Khalilian 1996*); the materials have not yet been studied but techno-typologically the chipped stones have mainly been based on flake production, which suggests a transition to blade production as the main character of M'lefatian tradition.

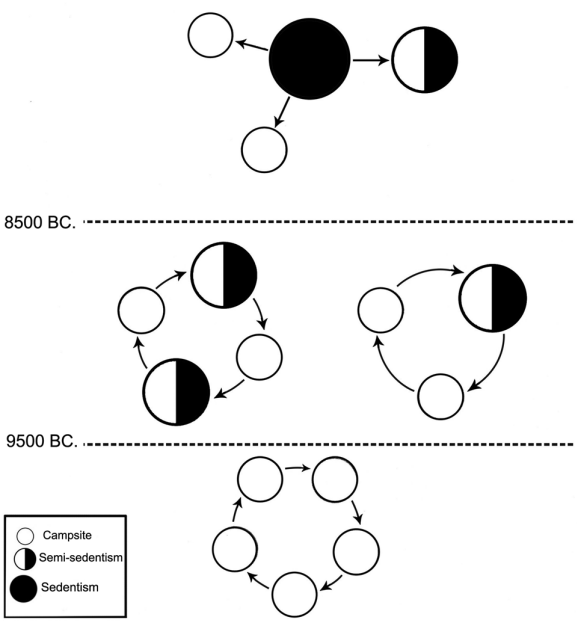

Fig. 4. An explanatory model illustrating settlement patterns from the late Epipaleolithic to the beginning of the Neolithic in western Iran (redrawn from* Mortensen 1972.294, Fig. 1*; modified).

yielded detailed information on animal bones, although the preliminary reports indicate a concentration of *ovicaprids* in comparison with other species. The recent evidence of barley from Chogha Golan and hulled wheat from East Chia Sabz suggests intensive cultivation, with the first signs of morphological change towards domestication by 8100 BC (*Riehl* et al. *2011*). At Ganj Dareh, domesticated barley rachis remains became more numerous later than at the Chogah Golan and Chia Sabz settlements. Based on these newly found domesticated plant remains, it would be reasonable to place the beginning of the Neolithic at around 8000 BC, although further data are required. Indeed, the main difference between the Neolithic and Transitional Neolithic is the appearance of morphological changes in species which are known as fully domesticated species. These new results of recent excavations have significant roles in reassessing the Neolithisation process in western Iran – they could push back the earliest settlement formation to the mid-10th millennium BC, a fact which undermines the assumption that "*... because of the seasonal stress the people who were living during the YD on the resource, they began to rise the agriculture in southern Levant (*McCorriston, Hole 1991*) and then when better climate arrived and shifted toward the north and east, people followed and eventually arrived in Iran, where the land had apparently been essentially abandoned for some millennia, and Ganj Dareh, Ali Kosh and other similar sites are evidence of this movement into Iran*" (*Hole 1999.22*). On the basis of the newly found domesticated plants in the Central Zagros from *c.* 8000 BC, as the result of a long period of cultivation within the region, an independent origin for the beginning of agriculture could be proposed. Genetic studies have also shown multiple origins of domestication throughout the entire Near East (*Naderi* et al. *2008; Salamini* et al. *2002; Zeder 2006; 2011*) which could lead us to assume a Neolithisation process of local origin in western Iran, although the earliest area for species management and then domestication was probably a wider region extending from western Iran to southeastern Turkey, the 'eastern wing' of the Fertile Crescent.

Lastly, the occurrence of different cultures in the Near East is reflected in different Neolithic cultural materials (*Kozłowski, Aurenche 2005*) and each regional culture had its own characteristics (*Kozłowski 1994.143–144*). In terms of chipped stone, the Neolithic industries originated from the Zarzian tradition in western Iran (*Kozłowski 1999; Olszewski 1994*), while the PPNA chipped stone industry is believed to derive from an earlier Natufian culture (*Bar-Yosef 1996.208; Simmons 2007*). Considered together, the new materials from Central Zagros undermine the notional primacy of the Levant which places the origin of agriculture in the Levant and regards other eastern and northern regions as the outcome of this process.

Conclusions

Archaeological evidence has already suggested a relatively long gap between the late Epipaleolithic and the earliest Neolithic sites; the main reason for investigating this gap is the occurrence of the YD in West-

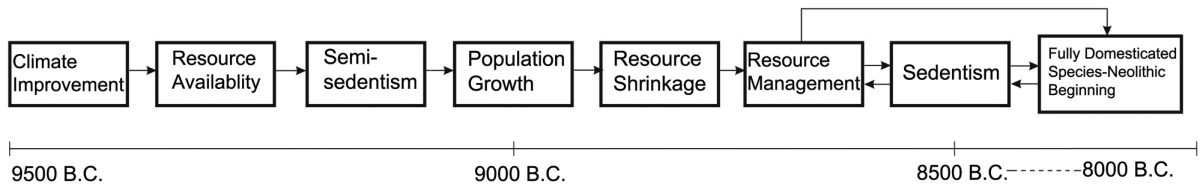

Fig. 5. An explanatory model illustrating the Neolithisation process in western Iran.

ern Iran, which resulted in the abandonment of late Epipaleolithic sites and forced people to move to the lowlands. Recent research in the Central Zagros shows that by the end of YD the region had been re-occupied as the result of climate improvement and the ensuing availability of resources. The increasing number of settlements indicates population growth and a gradual change from mobility to sedentism, which finally led to the establishment of permanent societies at *c.* 8500 BC. It seems that during the 9th millennium BC, the societies of Central Zagros began to manage food supplies to feed their growing numbers, which finally resulted in the full domestication of species such as caprines and cereals at *c.* 8000 BC (Fig. 5). Although this sequence needs further evidence, it shows that the Neolithisation process occurred within a time span of 1500 years and was the result of internal forces.

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Periphery or land of cultural dynamics: rethinking prehistoric South China

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ABSTRACT – *South China has been viewed as a periphery in the archaeology of China. However, excavations and the application of multi-disciplinary approaches since the late 1990s facilitate a better understanding of the environment and resources, cultural chronology and diversity, and the dynamics between South China and adjacent areas, including the occurrence of pottery, the expansion of farming and the co-existence of different subsistence strategies. Prehistoric South China is a landmass where the cultures of the Yangzi River Valley interacted with local cultures; it also facilitates the cultural dynamics between the Yangzi River Valley and Southeast Asia.*

IZVLEČEK – *Kitajski arheologi so področje južne Kitajske do sedaj razumeli kot periferno območje. Vendar pa izkopavanja in uporaba več-disciplinarnih pristopov od poznih 90. let 20. stoletja omogočajo boljše razumevanje okolja in naravnih virov, kulturne kronologije in raznolikosti ter dinamičnih odnosov med južno Kitajsko in sosednjimi območji, ki se, med drugim, kažejo tudi v pojavu lončenine, širjenju poljedelstva in s soobstojem različnih subsistenčnih strategij. V prazgodovinski južni Kitajski so bile kulture iz območja doline reke Jangce v stiku z lokalnimi kulturami. Novi pristopi omogočajo tudi razumevanje kulturnih dinamik med dolino reke Jangce in Jugovzhodno Azijo.*

KEY WORDS – *South China; pottery; foraging; farming; cultural dynamics*

Introduction

In the literature of China's archaeology, 'South China' can refer to a landmass from the Yangzi River Valley to the South China Sea (*i.e.*, *Wang 1997*), and is called *Huanan* or *Zhongguo Nanfang* in Chinese, both terms literally mean 'South China'. The term 'South China' can also refer to an area ranging from sub-tropical to tropical latitudes, approximately latitudes 18° and 25°N, and longitudes 105° and 122°E, within the border of the People's Republic of China, and to the south of the Five Mountains, which demarcate the Yangzi River Valley and South China (Fig. 1). In the latter context, it is called *Lingnan* (literally, 'south of the mountains'); it is sometimes also called *Huanan* (*i.e.*, *Institute of Archaeology, Chinese Academy of Social Sciences (CASS) 2010*) in Chinese, which can be confusing. In this paper, the second definition is used.

Archaeological work in South China commenced in the 1920s. An Italian missionary Fr. Rafeal Maglioni conducted an archaeological survey in coastal Guangdong in the 1920s (*Guangdong Institute of Archaeology 2000.2*), while a British civil servant, C. M. Heanley, was collecting stone artefacts in Hong Kong at the same time (*Meacham 2009.10*). In 1928, the first archaeological team of the Central Government of the Republic of China – the Archaeological Section of the Institute of History and Philology of the Academia Sinica – was established in Guangzhou (or 'Canton' in English) (*Guangdong Institute of Archaeology 2000.1*), which still serves the same function in Taiwan today. Systematic excavations and surveys have been carried out in South China to search for prehistoric remains since the 1930s, particularly for the fossils of apes and early hominids,

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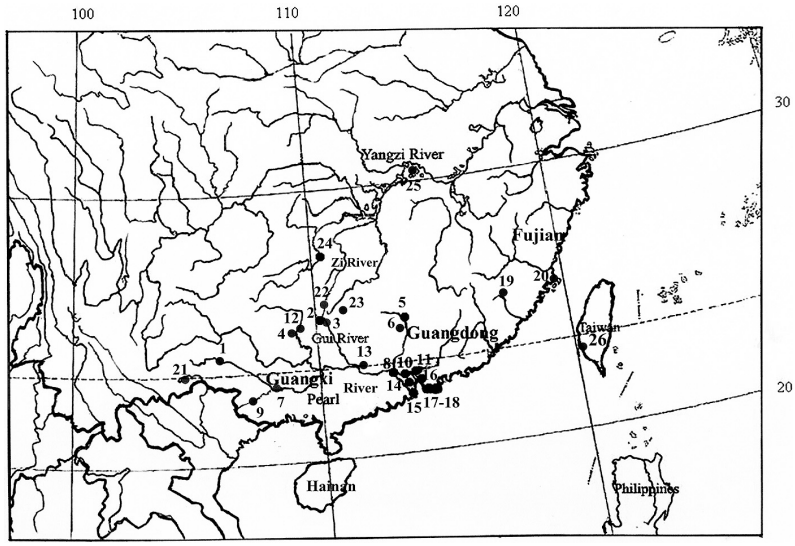

Fig. 1. Archaeological sites mentioned in the text. 1 Baise (Bose). 2 Dayan. 3 Zengpiyan. 4 Liujiang. 5 Maba and Shixia. 6 Niulandong. 7 Dingsishan. 8 Yinzhou. 9 Zhiren Cave. 10 Youyugang and Xiqiaoshan. 11 Jinlansi and Wanfu'an. 12 Bailiandong and Liyuzui. 13 Fengkai. 14 Youyugang. 15 Macao. 16 Yuanzhou. 17 Xiantouling. 18 Sham Wan, Yung Long, Sha Ha and other archaeological sites in Hong Kong. 19 Zhangzhou. 20 Keqiutou. 21 Gantuoyan. 22 Xiaojin. 23 Yuchanyan. 24 Gaomiao. 25 Tangjiagang. 26 Nankuangli.

and associated archaeological remains, in order to study the origin and evolution of human beings (*Zhang 1983*). To date, hundreds of archaeological sites and find sites have been discovered in South China, dating from the Palaeolithic to the Qing Dynasty (AD 1644–1911). For example, archaeologists have discovered more than 100 sites where cobble implements have been found; more than 400 Neolithic sites; over 20 historic settlements dating from about 2500 to 1000 bp; about 10 ancient kilns; more than 90 cemeteries and 8 localities of ancient rock art in Guangxi Zhuang Autonomous Region (Guangxi) (*Jiang 1992; Xie* et al. *2011*). Even in Hong Kong, which is only *c.* 1000km² in area, more than 200 archaeological sites dating from *c*. 6500 to *c*. 300 bp have been found (*Lu 2007.36*).

On the other hand, this area has been viewed as a periphery in terms of pre/historic cultural development compared to the Yellow River and Yangzi River valleys. As the earliest states and the majority of the united dynasties in ancient China established their capitals in the Yellow River Valley from approximately 4000 bp, the Yellow River Valley has been labelled as 'the cradle of Chinese civilisations' in antiquity, historical and archaeological studies in China. When Chinese archaeologists began fieldwork in mainland China in the 1920s with the objective of discovering the origin of Chinese civilisation in order to enhance Chinese national and cultural identities, they also focused on the Yellow River Valley (*Lu 2003a*). The development of archaeological studies and consequently the discovery of many prehistoric remains in the Yangzi River Valley after the 1970s have illustrated that the Yangzi River Valley was a primary centre of rice domestication in the world associated with vigorous cultural changes (*Lu 2006b; 2012a*), so it has become another focus of archaeological studies in mainland China since then, whereas South China has been perceived as a region occupied by hunter-gatherers, and cultural development is regarded as static in the pre- historic era. This academic mindset reflects a discourse of unilineal cultural evolution derived from Lewis Morgan (*1877*) and Marxism; the latter has been the dominant theoretical framework in the archaeology of mainland China since the 1950s (*Lu 2003a*).

Although substantial archaeological data are available, neither the chronology and cultural changes in this region, nor the cultural dynamics between South China and adjacent areas, were very clear up to the early 1990s. In 1996, the Institute of Archaeology of the Chinese Academy of Social Sciences (CASS) began to work with local and foreign archaeologists in this region. Three caves and one shell midden site located on a river terrace have been excavated or re-excavated. Supported by funds from the central and local governments of China and the Research Grant Council of the government of Hong Kong Special Administrative Region (HKSAR), multi-disciplinary approaches of floatation, pollen and phytolith analysis, zoo-archaeological and physical anthropological studies, chemical analysis of pottery, starch residue analysis and use-wear studies of stone and organic implements have been applied in order to retrieve more holistic data on the past environment, resources, the interaction between nature and human culture, and cultural changes in prehistoric South China, as well as cultural exchanges and/or human diaspora between South China and the Yangzi River Valley, particularly regarding the manufacturing of pottery,

the expansion of rice farming and the co-existence of foraging and farming societies in this area.

The nature and settlement of South China

South China consists of Guangxi, Guangdong, Fujian and Hainan provinces, as well as Hong Kong and Macao, and covers a total area of over 565 000km² (*Editing Committee of China's Physiography 1984*). The northern part of South China is mountainous, with certain limestone landscapes and many caves, providing natural shelters for prehistoric humans. Plateaus, basins and river valleys dominate the central part of South China, while small plains, river terraces and deltas are major geomorphologic features in the south. The Pearl River, the longest and biggest river in the region, is connected in its middle section to the Yangzi River by smaller rivers such as the Zi and Xiang (Fig. 1), and in its upper course to the Mekong and Hong rivers. Being a sub-tropical to tropical area, average precipitation is between 1400 and 2000mm, and annual average temperature is between 20 and 22°C (*Editing Committee of China's Physiography 1984*).

According to pollen, phytolith, faunal and chemical analyses of the limestone deposits in South China, the climate has been relatively stable for roughly the last 200 000 years. The Last Glacial Maximum (LGM) had a certain impact on South China, particularly between 25 600 and 15 800 bp, when temperatures and precipitation declined significantly (*Yuan* et al. *1999*), and the sea level dropped between 155 to 80m below the present level, with the neotectonic movement being considered (*Jiao 2007.38*). After the LGM, the climate became warmer and moister, but there were cold periods between 13 000 and 12 600 bp and about 10 800 bp, when the lowest annual temperature might have dropped to 9° Celsius in northern South China, although it was not as cold as the climate during the LGM (*Yuan* et al. *1999*). After 10 000 years bp, the climate became warmer again and was similar to that of the present; the sea level rose and reached the highest level at approximately 7500–4500 bp, which is probably about 2.5m higher than at present (*Jiao 2007.39; Yuan* et al. *1999*). Thus the coastal area might have become uninhabitable, and the earlier archaeological remains in this area might have been destroyed. However, the sea level dropped, reaching its current level *c*. 4000 bp (*Jiao 2007.39*). Unfortunately, precise data on the temperature and precipitation of prehistoric climates for the whole region are not available at the moment.

Archaeological work and data collected by archaeobotanic and zooarchaeological analyses indicate that both floral and faunal resources were very rich in this region in terms of both quantity and diversity (*Editing Committee of China's Physiography 1984*). Broadleaf evergreen trees dominate the local flora today, many of which produce edible nuts and fruits (*Editing Committee of China's Physiography 1984*). After being exploited by humans for thousands of years, there are still some two thousand species of wild plants, more than 130 species of mammals, over 150 species of reptiles, approximately 300 species of fresh-water and marine fish, and over 500 species of birds in South China today (*Editing Committee of China's Physiography 1984*), while animal remains found in archaeological sites indicate that more wild species would have been available to human beings in prehistoric periods. The seasonal stability of, and relatively easier accesses to, natural resources facilitated an affluent way of life for foraging societies in prehistoric era (*Lu 2010*).

Faunal remains found at several sites in South China provide more information on the palaeoclimates and natural resources. The Stegodon-giant panda fauna occupied South China in the Pleistocene and Holocene periods, consisting of several species of deer, wild boar, the Chinese bamboo rat, monkey, elephant, rhinoceros, Tapirus, porcupine, and chimpanzee, with a species of porcupine, bamboo rat, giant panda, rhinoceros, wild boar and several species of deer being the most frequently found remains in natural deposits and archaeological sites (*Institute of Archaeology CASS* et al. *2003; Wu, Wu 1999*); many of these species are now either extinct in South China (such as the rhinoceros and elephant), or are very rare (such as deer, wild boar, primates and giant panda). Animal species of this fauna usually live in sub-tropical to tropical habitats, so it seems that the climate in South China was relatively warm and humid from the middle Pleistocene to the Holocene, although with fluctuations. Various species of freshwater shellfish have been widely found in archaeological sites dating from *c*. 12 000 to *c*. 4000 bp in South China (*Institute of Archaeology CASS* et al. *2003; Lu 2010*), and marine shell fish have been found in cultural deposits in the coastal area (*Jiao 2007; Lu 2007*), indicating the abundance of water and edible resources in fresh and marine water.

To summarise, South China is a landmass with abundant sunlight, water and natural resources, an ideal habitat for humans. The peopling of South China

can be traced back to the Pleistocene era, but the precise dates of the Palaeolithic remains are still under debate. It has been claimed that two 'Acheulean-like hand-axes', along with other lithic implements, have been discovered in the Baise (or Bose) Basin, Guangxi (Fig. 1) since the 1970s, and date to 0.7–0.8 million years ago based on the date of Australasian tektites found in association with the stone tools; and that these implements illustrate the migration of *Homo erectus* from West to East Asia (*Hou* et al. *2000*). However, this conclusion is not convincing for three reasons. First, all three 'bifacial hand-axes' (*Hou* et al. *2000.1624*) are surface finds and none are from archaeological strata (*Lin 2002.75*). So far, no typical 'hand-axes' have been found in archaeological strata (*Lin 2002.75*), not even in the large-scale excavation in the same Basin in 2004, according to this author's observation. Further, typologically similar pebble tools were found in two cultural layers in the 2004 field season (*Lu 2006a*), illustrating the long existence and technological stability of the lithic industries in this area, and questioning whether typological variants alone can be used to date the stone artefacts. Second, the date of the 'hand-axes' is very problematic. While the tektite distributed in Guangxi is indeed dated to 0.7–0.8 million years ago, this does not correlate with the date of the stone implements (*Koeberl* et al. *2000*), since people living in different periods could have selected and used it as raw material. Hundreds of small flakes of tektite and intact tektite nodules associated with pottery, stone and organic artefacts have been found in the bottom layer of Dingsishan, an open site near the present Nanning City, Guangxi (Fig. 1), and the date of this layer is about 11 000 bp (*Fu 2002a*).[1] The discovery at Dingsishan clearly illustrates that the Australasian tektite in Guangxi does not exclusively exist with 'Palaeolithic' tools; that the date of the tektite does not correlate with the date of the stone implements at Baise, just as the date of sandstone or flint do not correlate with the date of the associated stone implements found in other places of the world. Finally, the 'hand-axes' found in Baise are morphologically different from Acheulean hand-axes found in Europe and Africa. As pointed out by Lin and He (*1995.124–131*), while all the edges of Acheulean hand-axes have been modified and can be used as working edges, the bottom edges of many Baise 'hand-axes', which should be the main working edge of an axe, have not been modified at all. This morphological difference indicates that prehistoric toolmakers in South China might have assigned different functions to this type of tool (*Lu 2006a*). This question requires further study, particularly use-wear analysis. Corvinus (*2004*) has concluded that a true Acheulean tradition has not been identified at any Palaeolithic sites in China, including South China.

This issue is not only about the earliest inhabitants in South China, but also closely related to the origin, evolution and migration of humans, to whether *Homo erectus* migrated from Africa to East Asia, or the species developed in East Asia (*Corvinus 2004*). It is also related to the migration of modern human beings (*H. sapiens sapiens*) to East Asia and whether the migrants replaced indigenous inhabitants (*Wu 2006*). To date, no human fossils have been found associated with the stone implements in the Baise Basin. The earliest human fossils found in South China to date are from Guangdong and Guangxi respectively. A fragmental human skull found in Maba, northern Guangdong Province in 1958 has been identified as archaic *Homo sapiens* and dated to approximately 120 000 bp (*Wu, Wu 1999*). A mandible and two teeth identified as a transitional specimen between archaic *H. sapiens* and *H. sapiens sapiens* were found recently in the Zhiren cave, Guangxi, and dated to between 100 000 and 110 000 bp (*Liu* et al. *2010*). Another skull found in Liujiang, Guangxi has been identified as *H. sapiens sapiens* and dated to between 40 000 and 12 000 bp (*Wu, Wu 1999*) (Fig. 1). According to physical anthropological studies, both fossils bear some physical features of the Neanderthals, indicating a possible human diaspora and gene flow from Western Asia to South China in the prehistoric era (*Wu, Wu 1999; Wu 2006*).

Based on genetic studies, some geneticists have argued that *H. sapiens sapiens* migrated from Africa and entered South China between 60 000–18 000 bp, moved to North China and eventually replaced the indigenous population (*i.e.*, *Ke* et al. *2000*). However, the recent discovery at the Zhiren cave, Guangxi, challenges this argument. It is argued that human evolution from archaic to modern *Homo sapiens* might have been continuous in East Asia; the two species might have co-existed in South China, and Africa might not have been the only place for the origin of modern humans (*Liu* et al. *2011*).

Geographically, South China is connected to South, East and Southeast Asia. Fossils of giant apes have

1 In fact, tektite nodules can still be picked up, occasionally by surface collection in Guangxi.

been found in South China since the 1930s (*Wu 2006*), illustrating that this landmass was indeed a suitable habitat for primates. Although there is no evidence for the existence of *Homo erectus* in South China, future archaeological discoveries may provide more information on this issue. Recently discovered data mentioned above seem to suggest that the peopling of South China can be traced back to at least some 120 000 bp, and various species or sub-species might have co-existed in the region (*Liu* et al. *2011*). Apparently, it is a very important region with regard to the issue of prehistoric human evolution and global diaspora, and should not be viewed as a periphery.

The prehistoric chronology of South China

To construct a chronology of a region is to define and divide, albeit arbitrarily, phases of cultural development in a given area within a given period of time, the division being based on certain characteristics of each phase. The purpose of building a chronology is to facilitate intra- and cross-cultural analysis, and to examine natural and human/cultural dynamics from sequential and horizontal perspectives. This has been the task of archaeologists around the world for decades. The chronological framework of South China has been discussed by several scholars (*e.g.*, *Fu 2004; Jiao 1994; Wang 1997*). However, the task remains difficult.

The first difficulty is the application of specific terms to archaeological remains in South China. While 'prehistory' is usually defined as the period before the formation of the state and the invention of writing, which ended around 4000 bp in the Yellow River Valley and the lower Yangzi River Valley (*Institute of Archaeology CASS 2010.799– 801*), the application of this term in South China is problematic, as no indigenous written language was invented in South China. According to a historian living in the 2nd century BC in the Yellow River Valley, no centralised polity, but various chiefdoms, existed in South China up to the 3rd century BC, and it was the First Emperor of the Qin Dynasty (221–206 BC) who dispatched 500 000 soldiers to conquer the region in 218 BC, and annexed it to the Qin Empire *c.* 215 BC (*Sima 2nd century BC 2006.662–665*). For this reason, the end of 'prehistory' in the archaeology of Hong Kong has been set at around 2200 years with this conquest. However, the majority of archaeologists working in South China still set the end of the 'prehistory' at around 4000–3500 bp (*i.e.*, *Institute of Archaeology CASS 2010*). Although this can be criticised as viewing the Yellow and the lower Yangzi River valleys as a standard and core area of cultural development, and other regions as peripheries, the date of 3500 years bp will still be used in this paper in order to avoid confusion.

Furthermore, the application of the terms 'Palaeolithic' and 'Neolithic' to archaeological remains in South China also causes debate. Originating from Europe and based on the lithic industries in Europe and Africa, these terms have been used to distinguish phases of cultural development in China based on three criteria: the procurement of raw materials, techniques of core reduction and retouch, and typological variations of final products (*Gao, Norton 2002.397*). However, the prehistoric stone tools found in the landmass called China today are almost completely different from those found in Africa and Europe, so the application of these terms in China is not always suitable (*Gao, Norton 2002*). What is more, according to this author's observation and manufacturing experiments conducted in South China since 1999, the raw materials, manufacturing techniques and typological attributes of the cobble tools dating from the Palaeolithic Baise implements to the lithics found in the Neolithic sites in South China remain quite stable. Some archaeologists judge whether stone implements can be attributed to the Palaeolithic or Neolithic according to strata and degree of weathering (*Xie* et al. *2011*), but this is not very convincing. At this stage, it is almost impossible to use only these criteria to construct a chronology of an 'early, middle and upper Palaeolithic' in South China, and it seems that only the chronology from the Upper Palaeolithic to the Neolithic is more reliable, with cultural changes and some absolute dates, as will be discussed below.

In fact, the definition of the Neolithic in South China is no less controversial. In Western Asia and Europe, the Neolithic is characterised by the presence of sedentism and agriculture, but this is not the case in China, where pottery is produced much earlier than the occurrence of sedentism and agriculture. Pottery was manufactured *c.* 12 000 bp, but sedentism and agriculture did not appear in South China until *c.* 6500 bp (*Lu 2010*); thus, the presence of pottery is used as a defining feature of the Neolithic (*Lu 2010.37–38*).

The second difficulty is absolute dating. Absolute dates are important references for the construction of a chronology, but as many archaeological remains have been found in limestone areas in South China, where 'dead carbon' can contaminate radiocarbon

dating samples, the absolute dates of these assemblages are problematic, as the dates tested by radiocarbon dating can be at least one thousand years older than the actual dates (*Yuan* et al. *1990; Lu 2010*). Therefore, the construction of a local prehistoric chronology has to rely on the presence of new artefacts and/or other cultural changes, ranging from settlement patterns to subsistence strategies, with absolute dates as references.

Based on archaeological data in Guangxi, the following prehistoric chronology in western South China has been proposed by Fu (*2004*):

❶ As already noted, the dating of the Upper Palaeolithic is more convincing. The local Upper Palaeolithic is characterised by the co-existence of cobble stone tools and small flakes, the latter occurring at approximately 20 000 bp at Bailiandong in Guangxi (Fig. 1). The archaeological remains from this period are found in caves.

❷ The transitional period from the Upper Palaeolithic to the Neolithic witnessed an occurrence of ground organic tools, including bone and shell tools, and fired clay found in Dayan, Guangxi, dated to *c.* 12 000 bp or slightly earlier. The archaeological remains from this period are found in caves.

❸ The early Neolithic is characterised by the occurrence of pottery around 12 000 bp in Dayan and Zengpiyan near the city of Guilin city (Fig. 1), associated with the manufacture of edge-ground stone tools and intensified collection of freshwater shells. The majority of archaeological sites are in caves, but some remains are found on river terraces or open ground from *c.* 10 000 bp.

❹ The middle Neolithic saw appearance of ground stone implements around 8000–7000 bp, as well as ground organic tools made of shell, bone, antler and teeth, and the beginning of rice cultivation in northern South China *c.* 6500 bp. More archaeological sites are located on river terraces, hilly slopes and coastal areas.

❺ The late Neolithic is a period when farming expanded into South China, and the majority of deposits are open sites on river terrace, hills or seashores (Tab. 1) (*Fu 2004*).

Dates	Representative sites	Associated fauna	Artefacts	Subsistence strategies
Upper Palaeolithic (20 000–15 000 bp)	Phase I of Bailiandong and Dayan, and phases I–II of Dushizi caves.	Stegodon-giant panda fauna, with extinct and extant species.	Flaked pebble choppers, chopping tools and scrapers *etc.* Small flakes at Bailiandong.	Wild animal remains; no shells.
Transitional period (15 000–12 000 bp)	Phase II of Bailiandong, Dayan and Dushizi caves.	Extant species dominate with a few extinct species.	Flaked and perforated pebble tools, small flakes in Bailiandong; ground bone and antler tools, two pieces of fired clay found in Dayan.	Wild animal remains; some crushed shells.
Early Neolithic (12 000–8000 bp)	Phase III of Dayan and Dushizi, phases I–IV of Zengpiyan; phase I of Dingsishan.	Extant species.	Flaked and perforated pebble tools; ground stone tools occurred at around 9000–8000 bp; ground organic tools; pottery.	Wild animal remains, large amount of shells, remains of tubers (including taro) and (wild) rice.
Middle Neolithic (8000–5000 bp)	Phase V of Dayan and Zengpiyan, phase I of Xiaojin.	Extant species.	Flaked and perforated pebble tools; ground tools of stone and organic materials; pottery; burials.	Large amount of shells and wild animals; domesticated rice remains found at a few sites.
Late Neolithic (5000–3500 bp)	Mainly open sites but also in caves.	Extant species.	As above.	Shells and wild animals; domesticated rice and millet found at a few sites.

Tab. 1. A cultural chronology summary of prehistoric western South China (Sources:* Fu 2004; Jiao 1994; Lu 2010*).

Apart from the occurrence of small flakes, the transitional period from the Palaeolithic to the Neolithic in western South China also witnessed changes in subsistence strategies, particularly the collection of freshwater shells. In the Zengpiyan and Dayan cave sites in northern Guangxi, freshwater shells have been found in cultural deposits dating to *c.* 12 000 to 5000 bp (*Fu 2002b*). On the other hand, at the Dingsishan site in southern Guangxi (Fig. 1), freshwater shells have been found in layers dating to approximately 8000–7000 bp, but not from both the early deposit dating to *c*. 10 000 bp and the late cultural layer dating to *c*. 6000 bp (*Guangxi Team of the Institute of Archaeology CASS* et al. *1998*), when rice was probably cultivated at that time by a sedentary group (*Zhao* et al. *2005*), who remained hunters-gatherers, as large amounts of wild animal bone have been found in the same cultural deposit (*Fu 2004*).

The prehistoric chronologies of Guangdong, Fujian and Macao are less clear. In Guangdong, apart from the Maba skull, human teeth and artefacts have been found in Fengkai, northern Guangdong (Fig. 1), and are dated to *c*. 79 000 bp (*Lu Z. 2004.429*). Several cave sites have also been found in northern and central Guangdong, but the absolute dates of these sites are not clear. At approximately 7000 years bp, sand bar deposits occurred off coastal Guangdong, Macao and Hong Kong, represented by the Xiantouling site in Shenzhen (Fig. 1), where the remains of on-the-ground house and pile-dwellings, cemeteries, pottery and stone tools dating to *c*. 6800 to 5000 bp have been discovered (*Institute of Archaeology CASS 2010.497–500*). The white ceramics of the early phase and the painted red pottery of the late phase of the Xiantouling assemblage bear some similarities to the Gaomiao and Tangjiagang cultures in the central Yangzi River Valley respectively, in terms of colour and decorative motifs, suggesting cultural dynamics between South China and the Yangzi River Valley in the prehistoric era (*Institute of Archaeology CASS 2010.497–500; Lu 2011a*), but the details of this assemblage have not been published.

Fujian is located in eastern South China. Flaked pebble tools have been found in Zhangzhou (Fig. 1) and tentatively dated to the Palaeolithic, but the absolute date is not certain (*Lu Z. 2004.429–430*). A few Neolithic sites dated between 6000 and 5500 years were located in the 1980s, represented by the Keqiutou site (Fig. 1), where ground and flaked stone tools – many of them made of pebbles – marine shell and bone implements, as well as pottery and one piece of a jade slotted ring have been discovered (*Institute of Archaeology CASS 2010*). However, the relation between the Zhangzhou pebble tools and the Keqiutou assemblage is not known, and the chronology in Fujian remains unclear (*Jiao 2007*). Whether the aforementioned rising and falling sea levels during the Holocene was a causal factor remains to be investigated.

Situated on the southern coast of South China, only one prehistoric site has been excavated in Macao, yielding stone implements, slotted rings and pottery; the assemblage is dated to between 4000–3500 bp (*Tang, Cheung 1996.46–104*). In Hong Kong, no reliable Palaeolithic remains have been found to date; the earliest Neolithic remains are dated to approximately 6500 bp, and the late Neolithic ends at *c*. 3500 bp (*Fu 2006*). As the earliest pottery found in Hong Kong is technologically and morphologically similar to the early pottery found in Xiantouling (Fig. 1), the earliest prehistoric inhabitants of Hong Kong might have come from the nearby Shenzhen area; neutron activation analysis is being carried out by the author and her team to test this hypothesis.

In summary, at present the prehistoric chronology in South China can be reliably set at the Upper Palaeolithic. The beginning of the Neolithic in Guangxi is marked by manufacture of pottery, followed by the occurrence of ground tools made of stone and organic materials, while the late phase of the middle Neolithic in Guangxi and the late Neolithic in Guangdong and Hong Kong are marked by the occurrence of plant cultivation (Tab. 1). Generally speaking, archaeological deposits from the Upper Palaeolithic to the middle Neolithic, and occasionally, to the late Neolithic, have been found in caves; archaeological remains dating from the early Neolithic onward have been located either on river terraces, seashores, or hilly slopes. Burials have been found in Dayan and Zengpiyan (Fig. 1) dating from approximately 8000 bp. Cemeteries dating to *c*. 8000–7000 bp have been found in Dingsishan, and those dating between approximately 5500 and 4000 bp have been found in northern Guangdong, the Pearl River Delta and coastal areas in Fujian and Hong Kong (*Fu 2004; Institute of Archaeology CASS 2010; Jiao 2007; Meacham 2009*). The earliest house remains dated to about 6800 bp have been found in Xiantoulin, southern Guangdong, while pile-dwelling remains dated to about 6000 bp have been found in Xiaojin, northern Guangxi; house remains and kilns have been found in northern Guangdong and Fujian, both dated to approximately 5000 bp (*Fu 2004;*

Institute of Archaeology CASS 2010.709–714). Whether sedentism in South China only began at *c.* 6800 bp, or whether the current archaeological data are biased due to the difficulty of identifying traces of pile dwellings during fieldwork, and the effects of the changes in sea levels between 7500 and 4500 bp on the prehistoric cultural development in South China, are questions that require much further study.

Diverse settlement patterns

As mentioned above, South China consists of limestone hills, plateaus, river deltas and seashores. To date, traces of human settlement have been found in all the geographical settings. Briefly, by 15 000 bp, prehistoric people lived in limestone caves in northern South China; by 10 000 bp, people had begun to occupy river terraces along the upper reaches of the Pearl River, represented by the Dingsishan assemblage (Fig. 2); and by 7000 bp, the Xiantouling people had reached the southern coastal area; after 6000 bp, people occupied the eastern coast and Hong Kong Island (Fig 1 and 3). However, this general picture of the peopling of South China may not be very accurate, as the marine transgression between 7500 and 6000 bp might have destroyed some coastal settlements during that period.

While the majority of settlements found after 7000 bp in the nearby Yangzi River Valley are open sites on river terraces or hills, some groups in South China still lived in caves as recent as 3000 years ago, such as represented by the Gantuoyan occupants (*Wei 2002*). In summary, between 6500 and 3000 bp, people settled in caves, on river terraces, hilly slopes and sand dunes in South China, illustrating a diverse settlement pattern, which might have related to their various subsistence strategies, but more work is required on this question.

This diversity of settlement pattern raises a question: are cave dwellers always mobile? Traditional wisdom in the archaeology of China tends to confirm this. However, caution may be required for the Gantuoyan assemblage. If they were farmers, they must have been sedentary, as rice farming requires sedentism (*Lu 2012a*). If the rice and millet grains found in Guantuoyan were results of exchange and/or trade, as no phytolith or use-wear analysis has been conducted at Gantuoyan to prove that farming was practiced, then their degree of sedentism can be questioned, although it seems quite difficult to assume that they were mobile, judging from the very rich artefacts and moulds for bronze casting in Phase II of the Gantuoyan site (*Wei 2002*). On the other hand, it is not uncommon to find sterile deposits between cultural layers at open sites in coastal South China and Hong Kong, indicating discontinuity of settlement. The settlement patterns in prehistoric South China are apparently quite complicated, as different types of settlement co-existed.

Toolkits

The toolkits found in prehistoric South China are dominated by pebble tools from the Upper Palaeolithic to the Neolithic, while flakes and tools of organic materials occurred after *c.* 15 000 bp (Tab. 1). The most commonly found raw materials of pebble tools are pebbles of granite, sandstone, quartz and quartzite, and the most common types of tool are points, scrapers, drills, and choppers and chopping tools. These implements are morphologically similar to contemporaneous stone tools found in the Yangzi River Valley and Southeast Asia (*Higham 1996*), but it is not yet clear whether this is the result of similar environments and subsistence strategies, or whether prehistoric cultural and human dispersal played a role.

Although cobble tools dominate the stone industry in prehistoric South China, small stone flakes produced by direct percussion with a hard hammer have

Fig. 2. The Dingsishan site (Courtesy of the Guangxi Team of the Institute of Archaeology of the Chinese Academy of Social Sciences).

also been found at the Bailiandong and Liyuzui sites in Guangxi, dated to approximately between 20 000 and 10 000 bp, and the majority of flakes are chert (Tab. 1) (*Fu 2004; Jiao 1994; Wang 1997*). It is claimed that some small flakes found in Bailiandong might have been made by press flaking (*Jiang 2009. 118*). As no use-wear analysis has been conducted on these flakes, their functions remain unknown, but they apparently differ morphologically and technically from the microblades produced by indirect percussion and/or press flaking, which form part of the composite tools found in the Yellow River Valley, Northeast Asia and North America, and dated from the Upper Palaeolithic to the Bronze Age, or from approximately 22 000 years to about 4000 bp (*Lu 1998a*). The manufacture of the small flakes and the co-existence of cobble and flake lithic industries in South China from the Upper Palaeolithic to the early Neolithic might have related to changes in subsistence strategies, but more studies, particularly use-wear analysis, are required to address this question.

Fig. 3. The Sha Ha site in Hong Kong (Photo by the author).

Archaeological experiments and rock studies conducted by the author in Zengpiyan also show that the prehistoric occupants of Zengpiyan had a regular behaviour pattern when making stone tools, or the *chaîne opératoire* (*Grace 1997*), from raw material procurement to manufacturing. Today, there are 9 types of mineral and rock cobble in the Li River near Zengpiyan, the majority of which are granite, sandstone and quartzite, with small amounts of slate, limestone, quartz and shale cobble (*Lu 2003b*). As the local geological structure should not have changed in the last 20 000 years, it can be inferred that the quantity and types of rocks and mineral pebbles available to the prehistoric occupants should have been similar. By comparing the quantity and types of cobbles available in the Li River and the raw materials of the stone implements found in the Zengpiyan cave, it is clear that the prehistoric occupants selected sandstone as the major raw material for making tools, and granite as the major raw material for hammers and hand-stones for tool-making. Petrologically, this selection makes perfect sense. Measured at Mohs 7, granite is harder than sandstone, which measures at Mohs 5.5. The granite found in Zengpiyan and the Li River is a medium-to coarse-grained rock, consisting of feldspar, quartz, and amphibole, which make the rock's hardness uneven and the structure unstable when flaked (*Lu 2003b*). It is also very difficult to produce a sharp and relatively straight working edge when using granite, mainly due to its coarse grains and unstable structure, while sandstone is softer, and much easier to flake to produce a sharp and relatively straight working edge, as the grains are much finer and the structure more even (*Lu 2003b*). On the other hand, measured also at Mohs 7, quartzite is too hard to be flaked, which may explain why it was not selected by the Zengpiyan occupants (*Lu 2003b*). This pattern of selecting raw materials remained from phases I to V of the Zengpiyan archaeological assemblage, or from about 12 000 to 7000 bp, showing a stable human behaviour pattern in terms of exploiting the natural resources.

The techniques of producing pebble tools are not complicated, and remained relatively stable over a long period of time. Unlike the flake industry in Europe, cobbles were directly used to make tools, no 'cores' were produced, and there was no '*primary*' or '*secondary reduction*' (*Grace 1997*) in the process. According to the author's experiments in Zengpiyan and Hong Kong, cobble tools can be produced very efficiently. Each cobble tool is made from a single piece or half a piece of a pebble, and if a pebble of suitable size is procured as raw material, the tool-maker first has to decide which part of the cobble to use as a working edge; the tool-maker then uses direct percussion with a hard hammer to re-

move the cortex of that part, and after a few retouches, a cobble tool is finished. It takes only about 19 minutes to produce a hand-pick by a female, or a 'point', and about 9–16 minutes to make a chopper and chopping tool by the same person (*Lu 2003b*), whereas it takes several hours to produce a fully-ground stone axe (*Chan 2005*). As cobbles of variable sizes are so abundant in rivers and on seashores in South China, the cobble tools may look technologically 'primitive' and not standardised, but they can also be viewed as evidence of prehistoric people's efficient use of natural resources in South China and adjacent areas. The lengthy presence of the cobble tools also indicates cultural continuity in terms of stone tool making in this region.

Small flakes produced by direct percussion appeared by about 15 000 bp in Guangxi (Tab. 1). The initial results of archaeological experiments by the author conducted at Zengpiyan suggest that the techniques used to produce flakes are similar to those used for the cobble tools, but the functions of these flakes are not clear.

Ground tools made of bone, shell, antler and animal teeth were produced after 15 000 bp, followed by ground stone axes, adzes and spades by about 9000–8000 bp (*Fu 2004*). Archaeological experiments have been carried out in Guangxi and Hong Kong to produce replicas of the ground axes, adzes, knives, and spades since the late 1990s. The results of the experiments show that the productivity, or time spent on making one replica, depends on the maker's age, sex, build, and previous experience and skills. A middle-aged man who worked in the building industry as a labourer can produce a fully ground stepped stone adze in five to six hours, while a young female, who has been a white-collar professional, requires 8–10 hours to produce a similar product (*Chan 2005*). However, for prehistoric workers, the time and effort required would have been much less, because the young generation could always learn from the elders, while people making replicas today have to learn by themselves from trial and error.

According to the experiments, the manufacturing process of ground stone tools consists of the following steps:

❶ Select raw materials usually in the catchment area of the archaeological site, which is about 5km from the site, or a distance of an hour's walk. However, sometimes people could go farther. For example, the prehistoric Sha Ha occupants preferred a type of red sandstone, and they could travel to another small island about 10km away from the site for this raw material (*Chan 2005*). To reach the island, some kind of boat or canoe must be used, so the presence of the unique sandstone also indicates that boats or canoes must have been made and used by 4000 bp in Hong Kong (*Chan 2005*).

❷ Rough out the raw materials by direct percussion with a hard hammer.

❸ Transport the rough-outs to the site.

❹ Shape the roughed out items by retouch, and finalise the product by grinding with sand and water (*Chan 2005; Lai 2011*).

Apart from cobble and ground stone tools, it is noteworthy that microblades and microcores identical to those found in the Yellow River Valley, Northeast China, Inner Mongolia, Japan and Northeast America between 18 000 and 4000 bp, have been found in Xiqiaoshan, which is a dead volcano located in the Pearl River Delta (Fig. 1) (*Zeng 1995*). The microblades in the Yellow River Valley and North China usually measure between 0.8 to 1cm wide, and less than 5cm long (*Lu 1998a.86*), and can be produced by press flaking, indirect percussion using a deer antler as a medium, and direct percussion using a deer antler as a soft hammer (*Zhao 2011*). According to archaeological experiments, it took a young person about six months to master the technique and be able to produce the tiny blades (*Liu J. Z. personal communication*), so it is not an easy technique, although a prehistoric craftsman might have been able to learn faster, as he/she could observe the master of the group, while archaeologists today can only learn by themselves.

According to Liu (*1990*), the *chaîne opératoire* for producing microblades starts with the selection of very fine-grained raw materials, followed by preparing the platform before knapping, and finally, direct or indirect percussion. A microblade industry has never been found in the middle and the lower Yangzi River Valley (*Lu 1998a*). It is still unclear how this technique and industry could have reached the heart of South China without leaving any traces on its 'migration' route, and whether this indicates migrants from the north (*Lu 1998a*). No composite tools with microblades have been found in South China, so the function(s) of the microblades and microcores found in Xiqiaoshan are also unknown.

The manufacturing of tools made of bone, antler, shell and teeth also indicates not only technological, but also changes in subsistence strategy in South China. Manufacturing experiments suggest that drills, needles and points made of bone were produced by direct and indirect percussion using a hard hammer, piercing, and finally, grinding; while implements made of antler, shell and teeth were produced by piercing and grinding (*Lu 2003b*). This process shows the application of indirect percussion and grinding as new techniques in South China in the Neolithic period. Use-wear and residue analysis has been conducted by the author on tools found in Zengpiyan, and the initial results suggest that some implements were used for collecting or processing taro (*Lu 2003c*). However, more studies are required on this matter.

In summary, the toolkits in prehistoric South China were dominated by cobble tools up to the terminal Pleistocene, when flakes and implements made of organic materials occurred after 15 000 bp, followed by the manufacturing of ground stone tools at around 8000 bp (*Fu 2004*). The results of starch residue and use-wear analyses of some stone and organic tools found in Guangxi and Hong Kong indicate that these implements served various functions, ranging from chopping, butchering, cutting, digging, collecting shells, to wood-working and taro processing (*Chan 2005; Lu 2003b; 2003c; Lai 2011; Yang 2010*). While all these are activities of hunter-gatherers, as well as farmers, as farming and foraging are not mutually exclusive (*Lu 2006b*), the exploitation of taro is particularly noteworthy, as wild taro is widely found in South China, and domesticated taro has been an important crop in this region for many years. Genetic and archaeological data suggest that taro was domesticated in Papua New Guinea around 9000 bp (*Neumann 2003*), but genetic studies also suggest that there are two genetic centres of taro in the world, one in the Pacific and another in continental Southeast Asia (*Lebot 1999*). The taro found in Zengpiyan might have been part of the Southeast Asian gene pool, thus the origin and/or development of taro's cultivation and domestication in South China are important topics for further studies.

The occurrence of pottery

Approximately 15 000 to 12 000 bp or earlier, people living in the Russian Far East, the Japanese Archipelago, North China, the middle and lower Yangzi Valley, as well as in Guangxi, South China, manufactured pottery almost simultaneously (*Lu 2010.1*), and probably independently. The occurrence of pottery over such a huge landmass within so many different natural and cultural contexts is a very good example of human agency, which means the ability to make decisions and take actions to create new technologies (in this context, pottery) to suit differing natural and cultural needs, and to create a new 'institutional fact' (cited in *Renfrew, Bahn 2008. 499*). Further, as pottery was produced from the cold to the sub-tropical ecozones in East Asia, and served extremely diverse functions (*Lu 2010; Ikawa-Smith 1976; Tsutsumi 2000*), it is also a good example of how people in different environments can develop the same technology, thus disproving the idea of 'environmental determinism'.

While pottery found in South China may not be the earliest, it is the most 'primitive' in terms of manufacturing techniques, and the potsherds demonstrate a clear sequence from fired clay to earthenware, to true pottery. As noted above, two pieces of fired clay have been found in Dayan dated to the transitional period of between 15 000 and 12 000 bp (Tab. 1) (*Fu 2004*), showing human beings' attempt to mix clay and water in order to create a new material. Disintegrated potsherds with walls up to 2.9cm thick and mixed with crushed but unselected calcite particles as tempering agent were found in the lower layers of Zengpiyan and Dayan caves in 2003, and dated to between approximately 12 000 and 10 000 bp (*Fu 2004*). Some of the calcite grains are more than 0.2cm in diameter (*Lu 2010*). The pottery was manufactured by hand pinching, and the firing temperature was probably below 250°C, as indicated by a firing test (*Wu* et al. *2003.658–659*), so they are in fact earthenware. These earthenware sherds have been found in association with cobble stone tools, tools of organic materials, large amounts of shell and animal bone in both Dayan and Zengpiyan (*Fu 2004*).

The results of archaeological experiments indicate that freshwater gastropod shells must be cooked, so the meat of the shellfish can be released and consumed, otherwise the shell must be crushed in order to get to the meat. Baking the shellfish over a hot stone plate may serve the same purpose, but it requires much more fuel, and the amount of shells that can be placed on a flat plate is also limited. Furthermore, the cultural layers at Dayan show that shell remains found without pottery were all crushed, while those found with pottery were all intact, showing that the way of consuming shellfish changed completely after the appearance of pottery. All

these facts suggest that the need to cook shellfish was probably one of the main impetuses for the manufacture of pottery in South China *c*. 12 000 bp (*Lu 2010*).

The walls and decorative techniques and motifs of pottery found in Zengpiyan dating from *c*. 12 000 to 7000 bp have been carefully studied, and a series of archaeological experiments was carried out in 2003, with the objectives of understanding the production process, the tools used for production and decoration, and the intention of decoration as a cognitive aspect of prehistoric potters in Guangxi, South China (*Institute of Archaeology CASS* et al. *2003; Lu 2010.32–33*). According to these studies, the production technique developed from hand pinching to slab building from *c*. 12 000 to 11 000 bp (*Fu 2004.198*), and firing temperatures increased to between 800°–840°C by *c*. 10 000–9000 bp in Zengpiyan, which are similar to the firing temperatures of contemporaneous pottery found in the Yangzi River Valley (*Wu* et al. *2003.658–659*). Further, potsherds found in Zengpiyan have also demonstrated that cord marks, which were produced by rolling a wooden or bamboo stick wrapped with grass, were used in the early stage as a formation technique to strengthen and smoothen the walls, but it became a well-patterned decorative motif between 10 000 and 9000 bp (*Lu 2010.33*), and remained a common motif not only in prehistoric Guangxi, but also in other areas of South China and beyond. For example, cord-mark pottery has been found in Guangdong, Fujian and Hong Kong, and the latest pottery bearing cord-marks in Hong Kong is dated to *c*. 4000–3500 bp. The cord-mark is also the most commonly found motif in early Neolithic pottery discovered in North China and the Yangzi River Valley (*Institute of Archaeology CASS 2010*). However, the meanings and significance of this cultural similarity between North China, the Yangzi River Valley and South China are not clear, as similar experiments and observations have not been conducted in other areas for cord-mark pottery.

Compared to the contemporaneous pottery found in the Yangzi River Valley, the earthenware sherds found in Zengpiyan and Dayan seem to be more 'primitive' in terms of the thickness of the walls, coarseness of the tempering agents, and the extremely low firing temperature. The pottery found in Yuchanyan, the middle Yangzi River Valley (Fig. 1), is dated to about 15 000 years or even 18 000 bp (*Boaretto* et al. *2009*), which is much older than the earthenware found in Zengpiyan, and is probably the oldest in China if the dates are correct; however, the formation technique of the Yuchanyan pottery is more 'advanced' than that of Zengpiyan earthenware, as the body is better formed and the structure is more solid, indicating a higher firing temperature. So, was pottery manufactured in the middle Yangzi River Valley before 12 000 bp, and the idea expanded to South China? Or did the Zengpiyan potters invent pottery independently? These are questions for further studies. However, some vessels found in South China dated after 7000 bp bear technical and morphological similarities with those found in the Yangzi River Valley, illustrating cultural interaction between the two regions (*Lu 2010.36*).

Other crafts

Apart from pottery and tools, people living in prehistoric South China also produced other crafts. They manufactured various body ornaments, of which the slotted rings mainly made of crystal, quartz, jade, tuff, and shale are the most commonly found items. Indeed, slotted rings have been found at sites from Siberia, Northeast China, to the Yellow River Valley and the Yangzi River Valley and South China, as well as in Korea, Japan, Taiwan and Southeast Asia, and are dated from *c*. 8000 to 2000 bp. The earliest slotted ring found in South China is from Keqiutou, Fujian, and is dated to about 6000–5500 bp; slotted rings have also been found in Shixia of Northern Guangdong, as well as several sites in Guangxi, Guangdong and Hong Kong dated to between 4500 and 3000 bp (*Yang 2001*). According to burials found in Tung Wan Tsai, Hong Kong, slotted rings were ear rings worn by both men and women (*AMO and Institute of Archaeology CASS 1999*), but at other sites in Hong Kong and in northern Guangdong, sets of slotted rings of different sizes have been discovered (*Qiu* et al. *2008*), so they might have had other functions and/or meanings.

Another important category of crafts is textiles. There were two different types of textile in prehistoric South China – bark-cloth, and woven. Bark-cloth is a unique textile made from trees of the Moraceae family, by peeling, soaking, softening by beating, and sewing the fibres. This textile has been produced by indigenous people in South and Southwest China, Taiwan, and the Pacific region for many centuries (*Ling 1960*). In South China, while eyed bone needles dating to *c*. 10 000 bp in Zengpiyan are evidence of sewing activities, stone bark-cloth beaters have been found in Xiantouling (Fig. 1) dating to *c*. 6000 bp, as well as at other archaeological sites in Hong

Kong, Macao and Guangdong dating between 6000 and 4700 bp, which are the earliest bark-cloth beaters found in China to date (*Tang, Wong 1994*). However, spindle whorls have also been found in Xiantouling that date to *c*. 6000 bp, and in Xiaojin and other sites in South China dated between 5000–3000 bp (*Lu 1998b.62*). As the earliest spindle whorls found in the Yellow River Valley date to 7800 bp, and in the Yangzi River Valley to 7000, and the pottery of both Xiaojin and Xiantouling are technically and morphologically similar to those found in the Yangzi River Valley, it is possible that the spindle whorls, which represent the production of yarn as material, also came from the Yangzi River Valley (*Lu 1998b*).

As the bark-cloth beaters found in South China are the earliest, it is possible that the production of bark-cloth was an indigenous industry in the prehistoric era. On the other hand, yarn production also occurred at approximately the same time, possibly as the result of interaction between South China and the Yangzi River Valley. Between 6000 and 4700 bp, bark cloth and yarn-weaving co-existed in South China. After this period, it seems that bark-cloth became less popular, as the numbers of bark-cloth beaters in archaeological deposits declines.

Affluent foragers

Floatation, residue analysis, zoo-archaeology, and use-wear analysis have been carried out at a few sites in South China to examine the subsistence strategies of the Upper Palaeolithic to the Neolithic era. The floatation work at Zengpiyan collected numerous tuber remains. Although the species of the tubers cannot be further identified, the discovery indicates that tuber plants were important natural resources (*Institute of Archaeology CASS* et al. *2003*).

Starch residue analysis, which was initiated by Western scholars in the 1980s (*Robins, Barton 2006.27–28*), can also provide data for subsistence strategies, and was applied to stone, shell and bone implements dating from 12 000 to 7000 bp found in Zengpiyan in 2003 (*Lu 2003c*), being the first starch residue analysis in the archaeology of China. The result indicates that a stone point, bone knife, pierced shell, stone long flake and stone chopper, dating from phases I to V of the Zengpiyan assemblage respectively, or from *c*. 12 000 to 7000 bp, carry abundant taro starch grains on their surface (*Lu 2003c*). Taking the large amount of tuber remains found through floatation (*Institute of Archaeology CASS* et al. *2003. 286–292*) into consideration, it seems that prehistoric people in western South China had been exploiting taro for thousands of years. But as the starch of wild and domesticated taro (*Colocasia* spp. and *C. esculent* Schott, respectively) cannot be distinguished, it is not clear whether the taro found in Zengpiyan was a wild or domesticated species (*Lu 2003c*).

Use-wear analysis has been conducted on 88 cobble implements found in Zengpiyan (*Lu 2003b*), which is the first use-wear analysis on pebble tools in China. Briefly, only 9 implements had observable microscopic use-wear, and the functions of these implements include butchering (chopping bones) and flaking bones (*Lu 2003b*). More use-wear analyses have been conducted in Hong Kong by three of the author's post-graduate students, focusing on Neolithic cobble points, ground stone adzes and spades, respectively. The use-wear analysis of stone adzes found in Sha Ha, Hong Kong (Fig. 1) shows that fully ground adzes dated to *c*. 4000 bp were used for wood-working, chopping and butchering, and the thinner adzes were even used for mowing (*Chan 2005*). After comparing the use-wear traces of stone points found in three archaeological sites in Hong Kong, it was concluded that the pebble points were used for digging, butchering, picking oysters and other shells, and chopping (*Yang 2010*). Finally, while traditional wisdom assumed that ground stone spades were agricultural tools, use-wear analysis of the stone spades found in Yung Long, Hong Kong suggests that this tool was used for digging sand, as its use-wear pattern was not produced by digging soil (*Lai 2011*). These studies have provided more concrete and tested data not only on the functions of several types of stone tool commonly found in prehistoric deposits not only in South China, but also in the Yangzi River Valley and Southeast Asia, but also on subsistence strategies. Of course, morphologically similar tools in different cultural contexts might have different function, so the uses of these tools in South China may differ from those of their counterparts in other areas. Thus, more use-wear analysis is required for stone tools found in the inland area, as well as in many other places in China, in order to retrieve more tested information on prehistoric cultures and societies.

Zoo-archaeological studies have been carried out at Zengpiyan, Niulandong, Dingsishan, and several other sites, but only the data from Zengpiyan have been fully published. A total of 108 species have been identified from Zengpiyan, consisting of 37 species of mammal, 47 species of freshwater shell-

fish, 20 species of bird, with fish, alligator, soft-shell turtle and crab making up the remainder (*Institute of Archaeology CASS et al. 2003.276–281*). The remains of seven species of deer, one species of pig (probably a wild species) and fish, and tens of species of shellfish dominate quantitatively within the zoo-archaeological assemblage, clearly indicating that these animals were the major food items of prehistoric Zengpiyan residents (*Institute of Archaeology CASS* et al. *2003.334–341*), and showing the diversity and abundance of animal resources for prehistoric foragers.

Based on the results of the aforementioned studies, it seems that foragers in prehistoric South China were quite affluent, as they could exploit a great variety of wild plants, shells, fish and other species of animal, with tuber plants (including taro), shellfish, fish and deer being the major food items. The result of foraging experiments conducted in Guangxi in 1999 suggests that foragers living on shellfish, bamboo roots and tuber plants needed to spend only 2–3 hours daily to gather sufficient food for survival (*Lu 2006b.143*), and another 2–3 hours of work would be sufficient to collect food for another family member, to feed a child, for example. As tubers, shellfish, fish and deer are available all year round, it is unlikely that the affluent prehistoric forager would have had a lean season. The abundance and stability of natural resources for foraging, on the other hand, might have been one of the causal factors hindering the origination and development of farming in South China.

The expansion of farming to South China

The term 'farming' is used here instead of 'agriculture', for agriculture includes the husbandry of animals, but it is still unclear whether animals were domesticated in prehistoric South China. In the 1970s it was argued that the pig remains found in Zengpiyan, Guangxi could be identified as a domesticated species, but this conclusion was falsified in 2003 (*Institute of Archaeology CASS* et al. *2003*). Therefore, only farming activities will be discussed in this paper.

Among the wild plants in South China, one of the most important species is wild rice (*Oryza rufipogon*), the progenitor of domesticated rice (*O. sativa*). According to a national survey conducted in the 1980s, South China is an indigenous habitat of perennial wild rice (*The National Survey Group of Wild Rice 1984*). To date, phytolith remains of the rice genus (*Oryza sp.*) have been found at Dayan, Zengpiyan, Dingsishan and Xiaojin in Guangxi, the Niulan Cave in Guangdong, the Xiantouling site in Shenzhen, and the Sha Ha site in Hong Kong, respectively; rice grains have been found at Xiaojin in northern Guangxi, Gantuoyan in western Guangxi, Shixia in Northern Guangdong, and Sha Ha in Hong Kong, while grains of foxtail millet have been found at Gantuoyan (Fig. 1). The data of Dayan and Xiantouling have not been published, so they cannot be discussed here. Data from other sites are listed in Table 2.

It should be pointed out that the data in Table 2 may not accurately reflect the exploitation of wild rice and other plants; nor can they comprehensively reveal farming activities in South China, for two reasons. First, the majority of South China is covered by red soil, which is relatively acid. For example, the pH value of the soil at several archaeological sites in Hong Kong is between pH 5 and pH 6.5, according to the author's fieldwork. Thus, it is extremely difficult for organic materials to survive, including remains of animals and cereals. Second, the research methods of floatation and phytolith analysis have been applied to only a few archaeological assemblages after the late 1990s. Floatation was applied to the Dayan excavation work in 1999 by Dr. Zhao Zhijun of the Institute of Archaeology CASS, which was the first floatation work in archaeology of China; and the phytolith analysis in Niulandong in 1998–99 is the first application of this approach in the region. Because many archaeological sites in South China have been excavated without floatation, phytolith and pollen analyses, the data retrieved today may not be accurate or comprehensive.

Nevertheless, these data illustrate, although only in a preliminary way, the appearance and expansion of farming in South China. Small amounts of rice phytolith have been found in Dayan, Zengpiyan and Niulandong caves in northern South China, all dated to 10 000 bp. Whether rice phytoliths can be used to distinguish wild and domesticated species is still open for debate, but those found in the three caves are probably phytoliths of wild rice, collected, probably unintentionally, as fuel or for other purposes. The reasons for this argument are as follows:

❶ The amount of rice phytolith within a phytolith profile is very small, or below 1%, while the proportion of rice phytolith found in Dingsishan and Sha Ha is much greater. If rice was cultivated, it is unlikely that so little phytolith would have been found (*Lu 2006b*).

Site	Date	Archaeological assemblages	Remains of rice and/or millet	References
Zengpiyan cave	12 000–7000 bp	Cobble tools, tools of organic materials, pottery, large amounts of wild animals, shells and plants, including tubers (taro); a few burials and hearths; no traces of sedentism.	Phytolith grains of rice husks have been found in deposits dated from 11000 to 7000 bp at between 0.094%–0.559% of the phytolith profile; some phytolith grains darkened.	*Institute of Archaeology CASS* et al. *2003; Lu 2009*
Niulandong cave	16 000–8000 bp	Cobble tools, tools of organic materials, pottery, and large amount of wild animals, shells and plants; one rubbish pit and one possible hearth.	Four phytolith grains of rice husk found in layers dated to between 10900–8300 bp.	*Yingde Museum* et al. *2009*
Xiaojin, on a hilly slope	6500–3000 bp	Remains of houses, kilns, rubbish pits, burials, pottery of various types, some were painted; flaked and ground tools, the latter dominate; spindle whorls.	A large amount of grains of two sub-species of domesticated rice (*O. sativa japonica* and *O. sativa indica*) found in phases II and III.	Archaeological Team of Guangxi and Office of Heritage Management of the Ziyuan County 2004.
Dingsishan, at river terrace	10 000–6000 bp	Cobble tools, tools of organic materials, pottery, a large amount of wild animals, shells and plants, cemeteries.	Phytolith grains of rice and gourd found in the final phase (layer 1) dated to about 6000 bp.	*Zhao* et al. *2005*
Shixia culture, about 17 sites on river terrace, hills, and caves	5000–4000 bp	Over 100 burials showing disparity between rich and poor; pottery of great variety, including coarse and fine pottery, some on a wheel; ground stone tools and weapons (arrowheads), jade rings, slotted rings and discs *etc.*	A large amount of grains of the two sub-species of domesticated rice (*O. sativa japonica* and *O. sativa indica*), as well as rice husks and stalks have been found.	*Institute of Archaeology CASS 2010; Zhu 2001*
Gantuoyan, cave	3800–3100 bp	Ground stone and bone tools, pottery of great variety; spindle whorls, jade implements.	A large amount of rice and foxtail millet (*Setaria sativa*) grains have been found.	*Wei 2002*
Sha Ha, sandbar site	4000–1000 bp	Pile-holes, ground stone tools, coarse and chalky pottery of considerable variety, burials.	Phytolith of the grains of domesticated rice and gourd found in deposits dated to 4000 bp; gains of domesticated rice (*O. sativa*) dated to 1700 bp.	*Lu* at al. *2006*

Tab. 2. Archaeological sites where remains of rice and millet have been discovered[2].

2 There is another site called Guye in the Pearl River Delta where rice grains have been found; but the date of the grains is not certain, so data from this site are not included.

❷ The rice phytolith found in Dayan and Zengpiyan are from hearths, and no rice grains have been found in either Dayan or Zengpiyan (floatation was not carried out in Niulandong) (*Lu 2009*).

❸ Based on the author's cultivation experiments and ethnographic studies in South China, rice cultivators must be sedentary, as they must tend the plant, control the water in the paddy field, and protect the crop from being stolen when it ripens. Regular and consistent water control is crucial for successful rice cultivation (*Lu 2012a*). As sedentism is a crucial factor in rice farming, and it took decades, even hundreds of years to domesticate wild species, it is unlikely that mobile foragers could have been regular rice farmers (*Lu 2012a*).

While rice phytolith found in archaeological sites in South China dated to about 10 000 bp indicates the availability of (wild) rice for prehistoric foragers in this area, the appearance of rice farming seems to have been the result of cultural impact from the Yangzi River Valley. Grains of domesticated rice appear at Xiaojin by *c*. 6500 bp, at Shixia at *c*. 5000 bp, at Gantuoyan at *c*. 4000 bp, and at Sha Ha between 4000 and 2000 bp (Tab. 1). Phytolith of rice leaves has also been found in Xiaojin and Sha Ha, as well as in Dingsishan at *c*. 6000 bp[3]. As rice farming was well-developed in the Yangzi River Valley by 7000 bp, and rice grains could be transported to other places for trade and/or exchange, the co-existence of both rice grains and the phytolith of rice leaves is an important indicator of rice farming activities. Thus, the data in Table 2 show a clear pattern of rice farming expanding from the north to the south of South China. In addition, the pottery assemblages of rice farmers at Xiaojin and Shixia are morphologically and technically similar to pottery found in the Neolithic Yangzi River Valley (*Institute of Archaeology CASS* et al. *2003; Fu 2004; Lu 2011b*), clearly manifesting interaction between peoples in prehistoric South China and their neighbours to the north. However, it is not clear whether these exchanges were brought by migrants or merely a result of an exchange of ideas, as no genetic studies have been conducted comparing prehistoric farmers in the Yangzi River Valley and South China, primarily due to the very poorly preserved, or absence, of human bones found at archaeological sites in both regions.

After adopting rice farming by 6500 bp, prehistoric peoples in South China still maintained hunting, gathering and fishing as important subsistence strategies, as illustrated by the substantial remains of wild animals and plants found at archaeological sites (Tab. 2), and historical records (*Sima 2nd century BC 2006*). Prehistoric farmers co-existed with foragers in South China after 6500 bp, and archaeological data now show that it took at least more than two thousand years for farming to reach the southern edge of South China (*Lu 2011b*). Farming did not become the dominant means of subsistence until after 218 BC, when the First Emperor of the Qin Dynasty (221–206 BC) dispatched 500 000 soldiers to conquer South China and established it as part of the Qin Empire.

If the initial appearance of domesticated rice found in Xiaojin, Guangxi (Fig. 1) indicates the first wave of farming expansion from the Yangzi River Valley into South China, abundant archaeological remains and historical documents illustrate the second wave after 218 BC. After the war, the soldiers of the Qin army settled in South China, bringing with them not only farming techniques and ideas, but also tools (including the ox plough) and cultivars (*Lu 2012b*). With hundreds of thousands of migrants pouring into South China, the local population increased significantly, and farming quickly spread and became an important economic activity. This is manifested by the discovery of cereal remains, fired models of rice fields, iron agricultural tools, bamboo sticks from burials listing cereals among the grave goods, as well as historical documents showing the importance of the ox and plough for the local economics in the 3rd and 2nd centuries BC (*Lu 2012b*). They were so important that when the contemporaneous Changsha Kingdom in the middle Yangzi River Valley refused to sell oxen and iron tools to the Nanyue Kingdom (203–111 BC), which was the polity in South China established by officers of the Qin Army, a war broke out between them (*Sima 2006*).

The lengthy co-existence of foraging and farming in South China is related to the seasonal stability, abundance and diversity of natural resources in South China. As already mentioned, foraging is much more efficient than harvesting wild rice (*Lu 2006b*). Although we have no demographic data on prehistoric South China, ethnographic data from around the world have shown that the population size of people living mainly on foraging tends to be small (*Kelly 1995*). The possible lack of population pressure and abundance of natural resources may explain

3 Phytolith analysis has not been carried out at Shixia and Gantuoyan.

why farming did not originate in South China, although wild rice was indigenous to this area. This also shows that efficiency could have been one of the criteria for the selection of subsistence strategies.

Another cultivar, the foxtail millet, has been found only in Gantuoyan to date. Foxtail millet is a cultivar in temperate ecozones, and was domesticated in the Yellow River Valley and north China by *c*. 8000 bp (*Lu 2006b*). It is not clear whether the foxtail millet found in Gantuoyan resulted from trade or exchange, or cultivated locally. More data are required for this question.

Burials

The method of burying the dead in South China is also diversified, and some burials are quite unique. Four burials have been found in Zengpiyan, two dated to 8000 bp and another two dated to 7000 bp; all the bodies are in a crouched and upright position, each placed in a burial pit (*Institute of Archaeology CASS* et al. *2003.130*). One buried body dated to 8000 bp was covered by 9 limestone slabs, another one dated to the same period was covered by two big shells at the head; one of the burials dated to 7000 bp was covered by 10 stone slabs, but the situation of the last burial is not clear (*Institute of Archaeology CASS* et al. *2003.130–149*). This custom of covering the dead with stone slabs has only been reported in Guangxi so far.

In another site, at Dingsishan, 149 burials dated between 8000–7000 bp have been found. Details of the Dingsishan assemblage have not been published, but according to the brief report, 16 burials were found in Phase II of the Dingsishan assemblage and dated to *c*. 8000 bp, many without grave goods, and a few tombs containing one or two stone or bone or shell implements (*Guangxi Team of the Institute of Archaeology CASS* et al. *1998.14*). The positions of the dead range from flexed and supine, to flexed and prone, to flexed and lying on one side, and crouched; stone slabs have also been found in some tombs (*Guangxi Team of the Institute of Archaeology CASS* et al. *1998.14*). Another 133 burials have been found and dated to Phase III of the Dingsishan assemblage, or *c*. 7000 bp, with only a few or no grave goods, but stone slabs commonly found in the tombs (*Guangxi Team of the Institute of Archaeology CASS* et al. *1998.18–22*). In addition to the four types of position found in Phase II, a disarticulated burial style has been found in Phase III, which means that bodies of this type of burial were disarticulated before being buried (*Guangxi Team of the Institute of Archaeology CASS* et al. *1998.18–22*) (Fig. 4). As all the small bones of the bodies were *in situ* when excavated, it is highly unlikely that they are secondary or disturbed burials. This type of burial has not been reported from any other places in China, or as far as we know in other places of the world. The disarticulated bodies are both male and female; the ages range from teenage to middle-age individuals (*Guangxi Team of the Institute of Archaeology CASS* et al. *1998.18–22*). As no clear patterns in terms of gender or age of the disarticulated dead can be identified, the function(s) and meaning(s) of this burial style is still a puzzle.

As the soil in South China is often quite acid, human bones cannot be preserved well at many archaeological sites. However, some burials such as the aforementioned show the uniqueness of burial customs and beliefs as well as changes. The big stone slabs or shells covering the crouched bodies in Zengpiyan (*Institute of Archaeology CASS* et al. *2003.130*) may indicate local beliefs and/or customs that cannot be understood today. The burials found at Dingsishan, which date to *c*. 8000–7000 bp, still contain stone slabs, showing the remains of this burial custom. On the other hand, stone and organic tools became grave goods in Dingsishan at *c*. 8000 bp, showing that tools were perhaps owned by individuals or small social units.

With the introduction of rice farming, it seems that burial customs also changed. At Xiaojin, three tombs dated to *c*. 6000–4500 bp have been found, two of which were furnished with pottery; another three burials dated to 4000–3000 bp have also been found, two of which were furnished with pottery and spindle whorls (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004.14–22*). As already noted, some pottery of the above two phases of Xiaojin bear technical and typological similarities with contemporaneous ceramics found in the middle Yangzi River Valley, and show both cultural influence from the north and cultural localisation (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004.27–29*), including the use of pottery as grave goods.

The burials of farming societies in Shixia, northern Guangdong, show even more significant changes. Details of the Shixia assemblage have not been published, but it has been reported that a total of 102 burials were found, including large tombs furnished

with over 100 items, many of which are jade artefacts, while the medium-sized tombs contained only tens of items without jade implements (*Zhu 2001*).

Based on data published to date, it seems that the majority of burials dated at *c*. 8000 bp or earlier in Guangxi do not contain grave goods except stone slabs, and occasionally, big shells. Grave goods occur in tombs dated after about 8000 bp, but the quantity is very limited, and the most common items are stone and organic tools such as those found in Dingsishan. Burials of the Xiaojin assemblage dated after 6500 bp were furnished with pottery (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004*), but the quantity and quality of the grave goods have not been published. However, the disparity in terms of tomb dimensions and quality and quantity of grave goods occurred after 5000 bp in some farming societies, as represented by the Shixia assemblage (*Zhu 2001*), clearly shows the social segmentation within the society.

Discussion

Primarily due to the acid soil as an unfavourable natural context for archaeological remains, limited archaeological data and the insufficient application of multi-disciplinary research methods, prehistoric cultures and societies in South China are still poorly understood. However, research conducted after the late 1990s does provide some new and concrete data on the diversity of local cultures, particularly on subsistence strategies and social structures, as well as on interactions between South China and the Yangzi River Valley.

The co-existence of foraging and farming

As I have suggested, the early farmers of South China might have been migrants from the Yangzi River Valley, or local groups receiving cultural influences from their neighbours to the north, as indicated by the similarity of pottery found in Xiaojin and Shixia in northern South China. However, the majority of people in South China between 6500 and 3500 bp, particularly in the Pearl River Delta, remained foragers. Full reports of the archaeological sites in the Pearl River Delta are not available, but large amounts of shells and wild animals, net sinkers and cobble tools have been found at these sites (*Lu 2011b.95–96*), and there is no strong evidence of social segmentation. In Hong Kong, isotopic analysis indicates that people from *c*. 4500 bp to the early 19th century lived on farming and fishing, and prehistoric societies remained quite egalitarian until the 2nd century BC (*Lu 2007*).

In fact, it is not easy to clearly distinguish sedentary from mobile foragers. To date, archaeologists tend to consider shell midden sites in South China as being occupied by hunters, fishers and gatherers, and sites with little shell remains and traces of sedentism as being occupied by farmers. However, archaeological and ethnographic data from North China, the Yellow River and the Yangzi River Valley and South China have demonstrated that foraging and farming are not mutually exclusive; in fact, the two subsistence strategies often co-existed (*Lu 2006b. 149*). In Zengpiyan and Dingsishan, where various research methods have been applied to retrieve as much data as possible, alhough no shells have been found in the last phase of Dingsishan when rice phytolith became very abundant (*Zhao* et al. *2005*), a substantial amount of wild animals has been found (*Fu 2004*), indicating hunting activities. In Shixia, social segmentation and sedentism are very apparent, but it is not clear whether foraging disappeared, as details of the site are not available. Furthermore, many other archaeological assemblages in South China have not been subjected to comprehensive and multidisciplinary examination, so it is not certain whether the occupants of these sites were foragers with farming as a supplementary economy, or *vice versa*, or foragers only. At this stage, we can

Fig. 4. Disarticulated burial at Dingsishan (Courtesy of the Guangxi Team of the Institute of Archaeology CASS).

only say that the cultures in South China between 6500 and 3500 bp were very diverse.

The prehistoric occupants of Xiaojin, Shixia and phase IV of the Dingsishan assemblage dated to between 6500 and 3000 bp were rice farmers with pottery similar to those found in the Yangzi River Valley in the cases of Xiaojin and Shixia, or pottery different from other sites in the case of Dingsishan (*Lu 2011b*). The culture of this group clearly shows influences from the Yangzi River Valley. Whether the Gantuoyan occupants were farmers is not certain, but the prehistoric Sha Ha occupants of Hong Kong, dated to between 4000 and 2000 bp, were farmers using localised pottery vessels and toolkits. It is impossible to identify whether the Sha Ha residents had any genetic connection with the Xiaojin, Dingsishan and Shixia residents, so we can only say that the expansion of rice farming to the Pearl River Delta by 4000 bp seems to have been a localisation process, rather than being driven by new waves of migrants and/or cultural influences from the Yangzi River Valley, which occurred after 218 BC.

Other groups, possibly living mainly on foraging, are represented by the Keqiutou culture in Fujian, dated between 6000 and 5500 BP, characterised by localised pottery vessels dominated by coarse wear and fired at low temperatures, ground and flaked tools, large amounts of wild animal and shell remains, and a few jade items (*Institute of Archaeology CASS 2010.503–504*), the Jinlansi and Wanfu'an sites dated between approximately 6200 and 4800 bp, and the Yinzhou, Yuanzhou and Youyugang sites dated between 5000 and 4000 bp in Guangdong (*Zhu 2001.26–39*), as well as the Yung Long and the early deposit of the Sham Wan sites in Hong Kong (Fig. 1), both dated to between 6000 and 5000 bp (*Lu 2007*). The majority of pottery vessels of these groups differ from those found in the contemporaneous Yangzi River Valley, particularly those dated after 5000 bp. For example, the pottery, burials and toolkits of the Youyugang, Yizhou and Yuanzhou assemblages differ significantly from those of the contemporaneous Shixia (*Zhu 2001.39*). Zhu (*2001.39*) has argued that the Pearl River Delta people at Youyugang, Yinzhou and Yuanzhou were foragers; but after the discovery of rice and gourd remains in Sha Ha, Hong Kong, caution is required for this conclusion, as floatation and phytolith analyses have not been carried out for these sites in the Pearl River Delta.

Ethnographic data may also give us some ideas. There is a community on an outlying island in Hong Kong. According to historical documents and the oral history of the local people, members of the community migrated from the Pearl River Delta and settled here *c.* 200 bp. Before the 1960s, some community members lived on rice farming, others on fishing, and still others on small-scale manufacturing and trading (*Lu 2012c*). All members of the community were sedentary, and many lived in pile-dwelling houses as architecture adapted to the environment, where sea levels fluctuate and tides can occasionally be very high (*Lu 2012c*). Clearly, there are various subsistence strategies within the community, and the way of life can be much more complicated than we think. Would it be possible that similar complexity existed in prehistoric South China? Much more work is required before we can draw a conclusion.

As discussed above, foraging was the dominant subsistence strategy in South China prior to 6500 bp, when farming began. However, foraging and farming co-existed, both inter- and intra-group, for thousands of years before the Qin conquest in 218 BC, and remained so in some island areas up to the 1960s (*Lu 2007; 2012c*). Compared to the cultural development in the contemporaneous Yangzi River Valley, where rice farming originated and spread after 8000 bp, and farming societies had occupied most of the region *c.* 6000 bp (*Lu 2012a*), subsistence strategies in prehistoric South China are more diverse.

This diversity might have related to the abundant and rich floral and faunal resources, which facilitated very efficient foraging, and made farming a less attractive economy. There is no strong evidence for substantial population growth, which could not be sustained by foraging, until BC 218, when half a million Qin soldiers marched into the area. In other words, though farming was introduced from the Yangzi River Valley *c.* 6500 bp, the richness of the local resources and the ways of life of the local people did not facilitate its rapid expansion. It seems that both nature and culture played important roles in this process.

Social structure

The study of social structures has been a topic of archaeology for many decades, with tools, pottery, exotic crafts and burials being the most frequently used evidence (*Renfrew, Bahn 2008*). As many assemblages have not been fully published to date, a discussion of social structures in prehistoric South China can be based only on a few studies in Hong Kong and Guangxi, and is very preliminary.

One of the study criteria is to examine whether there were items for the prestige group or just for the common and daily usage within the toolkits found in prehistoric South China. Use-wear analysis of some of the pebble tools found in Zengpiyan dated from 12 000 to 7000 bp, and three sites in Hong Kong dated from about 5000 to 4000 bp, indicates that they were used for daily activities such as foraging and tool-making in prehistoric era (*Lu 2003b; Yang 2010*), and are not prestige technologies. Use-wear analysis of the ground adzes and spades found in Hong Kong dated to approximately 4000–3500 bp suggests that these items were also used for daily activities such as woodworking, butchering, cutting, and digging sand (*Chan 2005; Lai 2011*), so they do not seem to have been prestige items either.

It is worth mentioning a 'manufacturing workshop' at Xiqiaoshan, Guangdong province (Fig. 1). Discovered in the 1950s and excavated in several seasons since then, thousands of semi products and a few final products of ground stone adzes made of a very fine-grain tuff have been found in 18 localities, associated with microblades and microcores, as well as shells and coarse pottery (*Zeng 1995*). As no remains of houses have been found, the majority of the stone artefacts are not final products, and ground adzes of the same rock have been found in many contemporaneous archaeological sites in the Pearl River Delta, it has been proposed that prehistoric people from different regions came to Xiqiaoshan to use the fine-grained tuff and rough out the artefacts, then took the semi products home for final production (*Zeng 1995*). Dated to between 6000 and 3000 bp, the huge amount of semi products of ground adzes found in Xiqiaoshan indicates centralised production in the prehistoric Pearl River Delta, and shared information, ideas and techniques at the inter-group level.

Ground stone tools, particularly the axes and shouldered and stepped adzes, have been found in many archaeological sites in South China, and sometimes associated with rough-outs and debitages, such as those found at Sha Ha and So Kwuan Wat in Hong Kong. As the raw materials used in different sites in Hong Kong for making ground stone artefacts also differ, it seems that the ground stone tools were produced by people living in different prehistoric settlements, and there is no evidence for the centralised production of stone implements in this region, although people did share ideas and techniques, as the ground stone adzes, axes, spades and slotted rings found in contemporaneous prehistoric sites in Hong Kong are technically and morphologically similar. As the full reports of the majority of sites in South China have not been published, it is unclear whether the situation was similar in other regions.

The social context of the occurrence of pottery in South China has been discussed (*Pearson 2004*). As discussed, the early potters were mobile hunter-gatherers, and archaeological data to date do not indicate distinguishable social segmentation before 5000 bp (*Lu 2010.36; Pearson 2004*). Furthermore, the typological variety of early pottery found remained quite limited, with the cooking cauldron *fu* being the most prevalent vessel from 12000 to 8000 bp, while the sedentary farmers in the middle Yangzi River Valley began to produce new types of vessel, such as pots, bowls and plates, from about 9000–8500 bp (*Institute of Archaeology CASS 2010.167–169; Lu 2010.35*). Therefore, early pottery does not seem to have been a prestige technology (*Pearson 2004*). It is not certain whether cooking shellfish was an important social event (*Pearson 2004.826*), as no special contexts have been found in the remains from Zengpiyan and Dayan.

Nonetheless, pottery was a new implement, an 'institutional fact' (cited in *Renfrew, Bahn 2008.499*), not only because pottery provided a new facility for the extensive consumption of shellfish, which became an important subsistence strategy after 12 000 bp (*Lu 2010*) and remains an economic activity today, but also because it created a new section of craftsmanship and a new basis for specialisation. When pottery was found as grave goods at Xiaojin as mentioned above, it is clear that pottery was not only for cooking purposes, but also symbolised the ownership of private property, either on the individual level or of small social units, although we do not know whether 'families' existed. This is another change that seems to have resulted from the cultural influence of the Yangzi River Valley. A clear disparity of social segments is illustrated by the Shixia assemblage (*Zhu 2001*), but the social structure does not seem to have become as complex as those in the contemporaneous Yangzi River Valley, where specialisation and group conflicts occurred at 6000 bp, and professionalization and powerful individuals appear around 4500 bp (*Institute of Archaeology CASS 2010; Lu 2012a*).

Conclusion

The data shows that prehistoric cultures in South China were very diverse. Before 12 000 bp, affluent foragers occupied the landmass, living in caves on

abundant and seasonally stable natural resources. Some also manufactured pottery *c*. 12 000 bp to facilitate the more extensive collection of shells, as well as other social needs, but it is not clear whether the occurrence of pottery in the middle Yangzi River Valley had any impact on pottery in South China.

An apparent cultural influence from the Yangzi River Valley occurred after 7000 bp, represented by the Xiantouling site at Shenzhen, as the white pottery found bears very close similarities to those found in Gaomiao, in the middle Yangzi River Valley (Fig. 1). As no evidence of farming has been found in Gaomiao, it is not known why and how the cultural influence could have reached coastal South China, and whether this was caused by human dispersal. Nonetheless, by 6500 bp, rice farmers, and/or or the idea of rice farming, had crossed the Five Mountains again and reached South China, first at Xiaojin, then other sites (Fig. 1). The two cultural phases of the Xiaojin assemblage, one dated to about 6000–4700 and another dated to 4000–3000 bp, both having pottery similar to those found in the Yangzi River Valley, but not exactly the same (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004*), clearly illustrate that both the cultural influences from the north and cultural localisation were continuous processes. However, foraging and farming co-existed for a very long period, until after 218 BC, when another big wave of migration and power from the Yellow River Valley brought significant changes.

In addition to the co-existence of foraging and farming, bark-cloth and yarn manufacturing also co-existed for quite a long period, although the latter became more predominant after 4000 bp. A similar change can be observed in burials. Burying the dead with stone slabs seems to have become an indigenous custom by 8000 bp, which gradually disappeared after 6000 bp and was replaced by the custom of burying the dead with grave goods such as tools and pottery. The latter has been commonly found in the Yangzi River Valley among farming societies after 8000 bp, and is related to the appearance of private property (*Lu 2012a*).

Apparently, there were two clusters of cultures in prehistoric South China, the first being the indigenous foraging culture, characterised by mobility, foraging, limited craft production, and an egalitarian social structure; while the latter is the farming culture from the Yangzi River Valley, characterised by sedentism, farming and foraging, increased craft production, and eventually, social segmentation. The farming culture entered northern South China at *c*. 6500 bp, but did not quickly replace the local cultures. It took a long time and gradually expanded to other areas, where foragers managed to continue their life style after the arival of farming groups, and some cultural elements such as pottery were also localised in this process. Thus the period from *c*. 6500 to 3500 bp saw the arrival of cultural influences, with or without human dispersal, from the Yangzi River Valley, the development of the local foraging cultures, and the interaction of the two. The rich local resources enabled people to live on both foraging and farming. As farming did not develop to the same degree as in the Yangzi River Valley, social structure in South China, with the exception of Shixia, remained relatively egalitarian. Consequently, no centralised polity was formed, and the region was ruled by chiefs until 218 BC, when the Qin Army arrived (*Sima 2nd century BC 2006*).

The trajectories of cultural change in prehistoric South China apparently differ from those in the Yellow and Yangzi River valleys; one of the most important causal factors for this difference is the less developed farming economy, which leads to a division of labour, specialisation, social segmentation and many other changes in the Yangzi River Valley (*Lu 2012a*). It is hard to say how much of the lengthy co-existence of foraging and farming was due to the rich natural resources and how much to prehistoric human choices, and much more study of this issue is required.

The prehistoric cultures in South China illustrate another mode of life, another type of interaction between nature and culture, and another type of interaction between different cultures, particularly between the Yangzi River Valley and South China. While it is not clear whether South China always 'received' cultural influence from the Yangzi River Valley, it seems quite clear that cultures in South China also influenced other regions in the prehistoric era. For example, the big and round-bottom pots, cups with stands and lids found at the Nankuangli site in Southern Taiwan, dated to about 4800–4000 bp (*Tsang 2005*), are morphologically similar to those found in contemporaneous South China, and the production of bark-cloth and slotted rings in South China might have influenced Taiwan and Southeast Asia (*Tang, Wong 1994*). In short, prehistoric South China is an area where different cultures interacted, assimilated, localised and developed, and is unique in this cultural diversity and dynamics.

Many questions remain, of course. The prehistoric chronology, the diversity of settlement patterns, interaction between farmers and foragers, and social structures in most areas all await further and many more studies. But it is important to view the region not as a periphery of the archaeology of China, but as important and unique, so that more human and other resources can be used to facilitate further and more in-depth studies.

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BACK TO CONTENTS

Interpretative trajectories toward understanding personhoods in prehistory

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ABSTRACT – *This paper present the genesis of discussions of individual and dividual aspects of person(hood). It discuses actual interpretations of different modes of personhood: individuality and indivisibility, dividuality, partibility and fractality, and permeability in archaeology and anthropology. It focuses on the heterogeneity of past identities in European Mesolithic, Neolithic and Bronze Age contexts.*

IZVLEČEK – *V članku predstavljamo genezo diskusij o individualnem in dividualnem vidiku osebnosti. Analiziramo aktualne interpretacije različnih vidikov osebnosti: individualnost in nedeljivost, dividualnost, (raz)deljivost in fraktalnost v arheologiji in antropologiji. Posebno pozornost namenjamo raznovrstnim identitetam v evropskem mezolitiku, neolitiku in bronasti dobi.*

KEY WORDS – *Prehistory; identity; individual; dividual; personhood*

Prolegomenon

Parallel to Gordon Childe's (*1925*) notions of ranked societies and associated farmer's and craftsman's 'personalities' and male and female 'personages', Marcel Mauss (*1925*) put the concept of the person on the anthropological and sociological agenda in France. The person appears as what he called a 'total social fact', a specific complex of a particular society, and what was later recognised as the Western conceptualisation of the person as a unique and indivisible unity. Mauss began by distinguishing between the terms 'person' and 'individual' and between the social concept of the person and any human being's self-awareness, which he regarded as universal. He contrasted consciousness of the self, an individuality (compounded of an awareness of the body and spirit) with the social concept of a person. The person, he suggested, is a compound of rights, and moral responsibility. He later recognised the archetypes in the classical Greek perception of 'the actor behind the mask', and in the development of Roman law, which 'first dissolved the distribution of personhood on the basis of clan genealogies and reconstituted it on the basis of the citizen's role in the Republic'. The later development within Christian institutions of religion and morality leads to the emergence 'of a system in which the status and attributes of personhood are attached to an inner principle of monitoring and control: conscience and consciousness' (*La Fontaine 1985; Hunter, Saunders 1995*).

Personne morale and bounded, indivisible and autonomous individuals

In a seminal essay '*A category of the human mind. The notion of person, the notion of self*'[1] Mauss (*[1938]1985*) provides 'a summary catalogue' of the concepts of person that had been assumed 'from extremely ancient history to that of our own times'. He proposed an evolutionary trajectory from the

1 Mauss's essay was given in French at the Huxley Memorial Lecture for 1938, and appeared under the title 'Une Categorie de l'Esprit Humain: La Notion de Personne, Celle de "Moi", in the Journal of the Royal Anthropological Institute 68 (*1938*).

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'role' (*personnage*) to the 'moral person' (*personne morale*). The concept of the person, he said in the opening paragraph, "*originated and slowly developed over many centuries and through numerous vicissitudes, so that even today it is still imprecise, delicate, fragile, one requiring further elaboration*".

Mauss began with the 'role-player' (*personnage*), organised around ascribed roles in a bounded tribal society of totemic clans, each clan having a fixed list of names transmitted by recognised procedures, the bearers of a name being reincarnations of their predecessors back to mythical times. They "*installed in their settlements a whole social and religious system where, in a vast exchange of rights, goods and services, property, dances, ceremonies, privileges and ranks, persons as well as groups give satisfaction to one another. We see very clearly how, from classes and clans, 'human persons' adjust to one another and how, from these, the gestures of the actors in a drama fit together. Here all the actors are theoretically the sum total of all free men. But this time the drama is more than an aesthetic performance. It is religious, and at the same time it is cosmic, mythological, social and personal*" (*ibid. 7–8*).

The membership of a clan and the sets of roles within the clan thus conceptualise a person and its social identity. It is the life of the clan which constitutes agency, and personhood (or social identity) is symbolised by the 'ceremonial masks which an actor wears in sacred dramas'. The 'role' played by the individual is extended to the whole group and, society as a whole arrives at the notion of 'role-player'. However, all members of a clan are not necessarily *personages*, and it is not clear whether people who are not *personnages* are 'non-persons' in the same sense as social outcasts.

He continued with the notion of 'person' (*personne*) that he recognised in classical Greek and Latin societies. The institutions of "*the same kind as ceremonies of clans, masks and paints with which the actors bedeck themselves according to the names they bear*" has remained, but the *personne* has became "*more than an organisational fact, more than a name or a right to assume a role and a ritual mask. It is a basic fact of law*". It has become synonymous with the "*true nature of the individual ... moreover, the right to the persona had been established*", and only slaves ('*servus non habet personam*') were excluded from it. And "*to its juridical meaning is ... added a moral one, a sense of being conscious, independent, autonomous, free and responsible*"; the conscious moral person was born (*ibid. 15–17*). In the Latin perception of persona, the emphasis moved from masks to the privileges of those with a right to masks – to the *patres* which represent their ancestors – to anyone with ancestors, a cognomen and family property. The notion of the person as a possessor of rights, a group from which only slaves were excluded, thus appeared. The Stoics had introduced the perception of the person as a kind of private *prosopon*, and contributed a notion of the person as a moral fact that embeds a concept of moral conscience in the juridical concept of a right.

However, it is only with the coming of Christianity and after the rise of the awareness of religious power that "*the true metaphysical foundations of 'personne morale' ('moral subject') became fully established*". The perception of the transition from the notion of 'persona' to the notion of man, that of the 'human person (personne)' Mauss suggested was introduced by the Council of Nicaea pronouncement "*Unitas in tres personas, una persona in duas natura' ... Unity in three persons – of the Trinity – unity of the two natures of Christ* [i.e., one person with two natures]. *It is from the notion of the 'one' that the notion of the 'person' (personne) was created – I believe that it will long remain so – for the divine persons, but at the same time for the human person, substance and mode, body and soul, consciousness and act*" (*ibid. 20*).

The main focus of Mauss's essay is the distinction between the concepts of the individual and the person. By the individual, he means 'the unstructured biological and psychological human being', whereas the person is embedded in social organisations and cultural institutions, and relates to positions, statuses, rights, duties, virtues and traits through which societies organise the lives of their members. He argued against a simplistic conceptual equalisation of the person and individual by describing various societies in which not all individuals are persons, and in which those who are, do not possess personhood as individuals. In clan societies, persons are special constructs of rights, statuses, abilities and traits which are attached to trans-individual entities such as totems, naming systems, masks, ritual genealogies *etc*. These entities are responsible for a distribution of personhood to individuals that may not be universal and permanent. Some individuals obtain their persons through ritual practices in which

they reincarnate the person of an ancestor or spirit. This practice was associated with public rituals and ecstatic dance, and was not an expression of their (inner) selves.

Mauss took the 'modern Western' perception of the person as self to be the marker of a cultural form in which personhood is elaborated and ascribed to individuals. He suggests that our *persona* (*e.g.*, rights, duties, abilities, virtues and traits) is inalienable and rooted in the conscience and consciousness of each individual. This perception relates to the emergence and set of transformations of the notion of the subject that appeared in the contexts of law and morality. The first transformation relates to the emergence of the idea that person(hood) is a status that should be attached to all individuals. Mauss attributes this idea to an archetypal mode of distributing names, genealogies, masks and insignia of personhood, together with their attached rights, obligations and statuses in the Roman period. It was Roman law, he argues, that first dissolved the distribution of personhood on the basis of clan genealogies, reconstituting it on the basis of the citizen's role in the Res Publica Romanorum. The introduction of a new 'universalizing regulatory institution' (*Hunter, Saunders 1995.73*) resulted in the distribution of personhood to individuals and in the appearance of the legal person. Only slaves were excluded from this *modus operandi* of distributing personhood to individuals.

The second set of transformations occurred in institutions of religion and morality. To be a legal person is not yet to be a self, as the attributes of the individual's legal *persona* delimited by a set of legal rights, positions and duties have not been attached to an inner principle responsible for their conduct. Mauss notes that in the context of religious radicalism and economic progress, the Stoics first developed a language of conscience that relates to the practice of establishing an inner regulation of the public attributes of personhood, and that the Puritan ethic constituted a partial dissolution of a system in which individuals acquired their religious persona through the distributive rituals of the church. As Max Weber (*1950.104*) puts it, "*in what was for the man of the age of the Reformation the most important thing in life, his eternal salvation, he was forced to follow his path alone to meet a destiny which had been decreed for him from eternity. No one could help him. No priest, for the chosen one can understand the word of God only in his own heart*". However, for Weber, it was through the 'doctrine of predestination' and dissemination of the 'set of ethical techniques and practices' – labour being one of them[2] – that individuals came to conceive of themselves as objects of their own ethical attention and learned to conduct their lives in the absence of collective guarantees of salvation (*Hunter, Saunders 1995*).

Mauss's perception of the role of social settings in the formation of the self and the evolutionary trajectory from the *personage* to the *personne morale* are related to Weber's 'life orders' and the evolution of authorities that he identified as 'traditional', 'charismatic' and 'legal-rational'. Weber distinguished between class and status, which he identified as the primary basis of social dynamics. While class is based solely on economic power, status is determined by 'life orders' that produce particular types of personhood (*Stillman 2010.51*). The 'life orders' thus became recognised as sets of daily practices and techniques in which the status and attributes of Christian personhood are attached to an inner principle of monitoring and self-control, to conscience and consciousness. Paul du Gay (*2007.53*) noted that "*Weber's Puritan internalizes in the form of an ever watchful inner conscience the public norm embodied in the predestinarian doctrine or code, rather than externalizing that norm in religious ceremonies and images or, for that matter, in a legal system*". The question for Weber was thus not "*how well a particular persona equates with the truth of human experience or subjectivity in general, but how one gets individuals willing and competent to bear that form of personhood which fits the circumstances of a given sphere of life ... Like Mauss, Weber is concerned with constructing a practical account of the ways in which individuals learn to conduct themselves as certain sorts of person, an account that shows the actual 'conducts of life' involved and the technical conditions for producing and deploying them*" (*ibid. 54*).

For Michel Foucault (*1990.10, 11*) 'life orders' and 'ethical techniques' are synonymous with 'arts of existence' and 'techniques of the self'. He suggested that "*those intentional and voluntary actions by which men not only set themselves rules of con-*

2 The old Puritan doctrine states that "*works are not the cause, but only the means of knowing one's state of grace*" and that "*calling and the premium as placed upon ascetic conduct was bound directly to influence the development of a capitalistic way of life*" (*Weber 1950.141, 166*).

duct, but also seek to transform themselves, to change themselves in their singular being, and to make their life into an oeuvre that carries certain aesthetic values and meets certain stylistic criteria". Individuals have been 'subjectified' through a process of 'self-problematisation', and the practices on the basis of which these 'problematizations' are formed that can be seen as 'inventions for taking an interest in oneself as the subject of one's own conduct'. There are different ways, he continues, "*to 'conduct oneself' morally, different ways for the acting individual to operate, not just as an agent, but as an ethical subject of this action*" (*ibid. 26*). Every morality thus comprises two elements: a code of morality and forms of subjectivisation, which are differently balanced in different cultures. The archaeological dimension is embedded in the actual forms of subjectivity which appeared in different contexts at different points in time, he suggests. The 'techniques of the self' thus resulted in the 'Western' perception of individuals that conceive of themselves as objects of their own ethical attention. In the modern West, the attributes of personhood thus have become attached to the conscience and consciousness of individuals, because individuals have adopted techniques for relating to themselves as the subjects of their own conduct and capacities. As Mauss (*1985.19, 20*) suggests, "*our own notion of the human person is still basically the Christian one*" in which the modern conception of 'self' is built on the conception of a unity comprised of "*substance and mode, body and soul, consciousness and act*".

Just before Mauss conceptualised the distinction between individual and person, Alfred Radcliffe-Brown (*1922.284*) introduced into British social anthropology the notion of 'social personality', which he recognised in the social structure of the Andaman islanders. He relates the 'social personality' to the sum of 'those qualities of a person by which he is able to affect the society'. In other words, his 'social value' depends on his (individual) social status. Much later, he made a distinction between the individual and person, stating that "*every human being living in society is two things: he is an individual and he is also a person. As an individual he is a biological organism ... as a person* [he] *is a complex of social relationships*" (*Radcliffe-Brown 1952.193–194*). The statement has been read as a direct adaptation of Mauss's concept of the *personne morale* (*Fortes 1973. 287*).

However, it was Kenneth E. Read (*1955*) who first emphasised the basic Maussian premise that the perception of the individual is exclusive to Western thought. The Gahuku-Gama people in the Highlands of Papua New Guinea, he argued, lack a concept of person. There is "*no essential separation of the individual from the social pattern; social roles and social status are not distinguished from the individuals who enact them*" (*ibid. 276*).

Individual and dividual aspects of person(hood)

Meyer Fortes (*1973; 1987*) took the opposite view, suggesting that all societies have (had) a concept of person. He argued that the notion of the person in the Maussian sense "*is intrinsic to the very nature and structure of human society and human social behaviour everywhere*" (*Fortes 1987.253*). His approach was based on the distinction between the individual and person, and on the conceptualisation of the self as the connection between the 'inner man' and the 'outer', socially formed, person. The person, he suggested, is culturally defined, socially generated and conferred on the individual. Persons are, however, "*kept aware of who they are and where they fit into society by criteria of age, sex, and descent, and by other indices of status, through acting in accordance with these norms*" (*ibid. 282*). It was the Tallensi ethnography in West Africa which allowed Fortes to premise society as the source of personhood, which can confer it on any object it chooses, whether human or non-human, living or dead, animate or inanimate, material or imagined, and above all, on both individuals and on collectivities. However, animals are not persons; only particular animals can be invested with personhood and associated with 'the particular collective person, that is, the clan whose dead elders rise up again'. In this context, the "*personhood comes thus to be in its essence externally oriented. Self awareness means, in the first place, awareness of oneself as a* personne morale *rather than as an idiosyncratic individual. The moral conscience is externally validated, being vested, ultimately, in the ancestors, on the other side of the ritual curtain. The soul, image as it is of the focal element of individuality, is projected on to material objects that will outlast the living person. Person is perceived as a microcosm of the social order, incorporating its distinctive principles of structure and norms of value and implementing a pattern of life that finds satisfaction in its consonance with the constraints and realities ... of the social and material world*" (*ibid. 285–286*).

Fortes suggests that Tallensi person(hood) is dividual and partible. Full person status is perceived as some-

thing attained gradually over the course of a lifetime. Adulthood is the first step in a linear ritual trajectory which the person completes only at death, when it becomes fully incorporated into the total society by accessing the ancestry. Fortes describes the Tallensi person as primarily defined by roles and statuses, and as constituted of detachable parts external to it, but shared by both humans and other living entities (see also *Comaroff, Comaroff 2001; Tsékénis 2011*). The person (individual) and the corporate group are images of one another on a different scale, as 'the descent-based collectivities are perpetual corporate bodies' that replicate on the collective level the model of the person on the individual level. "*Individual and collective are not mutually exclusive but are rather two sides of the same structural complex. The scheme of identification employed for individual persons is the same scheme of identification as serves to distinguish lineages and clans. The mechanics of this pattern is obvious if we bear in mind that the individual person is constantly obliged to be aware of himself and to present himself as a member and representative of such a collective unit. In ceremonial situations,* [*e.g.*, funerals, sacrifices, and the rituals of the 'Great Festivals'] *... no matter what kind of transactions an individual or a group is engaged in, ... the context of the collective interest is always present. But the idea that a lineage is a collective person because it is the perpetuation of its founding ancestor in each of his descendants is seen in other ways too*" (*Fortes 1987.283*).

Mauss's interpretation of the Western notion of the person as self as the sign of a particular cultural elaboration of personhood and a particular cultural mode of distributing personhood to individuals became recognised in anthropology as the "*notion of the 'unitary subject' that is "reflected in cultural (ideological) conceptions of the person derived from Cartesiam metaphysics and bourgeois (capitalist) political theory, which depicts the human person as an isolated, asocial, bounded and homogenous entity*" (*Morris 2000.47*). In archaeology, it has been suggested similarly that "*in the modern, Western world, the human individual is conceived of as a bounded, stable and independent entity, existing prior to and above the social relations into which it enters. The notion of an autonomous and transcendent self consciously shaping its own destiny can of course be traced to the radical individualism and liberal political theory of the eighteenth and nineteenth centuries*" (*Brück 2006.308*).

The notion that the person is a homogeneous and internally consistent entity is certainly not cross-culturally shared. The initial perception of the self in many societies involves an amalgamation of elements brought together through parenthood, marriage, exchange and other interpersonal contacts. Indeed, the 'dividual self' was introduced into anthropology by McKim Marriott (*1976*) as an opposition to the indivisible person. He noted that "*persons single actors are not thought in South Asia to be 'individual', that is, indivisible, bounded units, as they are in much of Western social and psychological theory, as well as in common sense. Instead, it appears that persons are generally thought by South Asians to be 'dividual' or divisible. To exist, dividual persons absorb heterogeneous material influences. They must also give out from themselves particles of their own coded substances, essences, residues, or other active influences that may then reproduce in others something of the nature of the persons in whom they have originated ... What goes on between actors are the same connected processes of mixing and separation that go on within actors. Actors' particular natures are thought to be the results as well as causes of their particular actions (karma). Varied codes of action or codes of conduct (dharma) are thought to be naturally embodied in actors and otherwise substantialized in the flow of things that pass among actors ... Proper separability of action from actor, of code from substance ... that pervades both Western philosophy and Western common sense ... is generally absent: code and substance ... cannot have separate existences in this world of constituted things as conceived by most South Asians*" (*ibid. 109–10*).

'Dividuals' are thus dividual and 'multiply-authored' composites, and their components originate outside of the person. Marriott relates these to 'substance-codes' transmitted between bodies, persons, and castes. Bodily substance and codes of conduct mingle within bodies, but are inseparable from the 'outside' world. The coded substances are blood, cooked food, alcohol, soil, alms and even knowledge. They continually circulate and are transformed through social interactions. The exchange of substances (giving and receiving) affects a person internally, and influences the whole of their social identity, including gender and caste. Actions enjoined by these embodied codes are thought of as transforming the substances in which they are embodied. When a woman marries, her body is considered to be transformed, and so too, is her code of conduct. The 'code' for a particular group or family unit is thought to be car-

ried in the bodily substance shared by persons belonging to that group. Throughout life, each person is internally divided and composed of many different coded substances at once that can be extended from the person through exchanges and given to others. The continuous mixing and separation of elements occurs through processes of parenthood, marriage, trade, feasts, the exchange of services and knowledge and other inter-personal contacts.

Parallel to Hindu 'dividuals', in the New Guinea Highlands, Marylin Strathern (*1987; 1988*) identified the 'sociocentric' Melanesian dividual and partible personhoods as alternatives to 'egocentric' Western indivisible, individual personhoods. Each person is a composite formed of relations with a plurality of other persons. The person can be considered a dividual being, as a composite formed of relations with a plurality of other persons. Melanesian persons are, she argued "*as dividually as they are individually conceived. They contain a generalized sociality within. Indeed, persons are frequently constructed as the plural and composite site of the relationships that produced them. The singular person can be imagined as a social microcosm. This premise is particularly significant for the attention given to images of relations contained within the maternal body. By contrast, the kinds of collective action that might be identified by an outside observer in a male cult performance or group organization, involving numbers of persons, often presents an image of unity. This image is created out of internal homogeneity, a process of de-pluralization, manifested less as the realization of generalized and integrative principles of organization itself and more as the realization of particular identities called into play through unique events and individual accomplishments*" (*Strathern 1988.13*).

In this perception, a person is a product of the gifts, contributions, or detachments of others. Persons are regarded "*as composed of gendered substances, such as father's bone* [*e.g.*, semen] *and mother's menstrual blood, plus lifetimes of donations of embodied and non-substantial labour by other kin and relatives such as food, magical knowledge, ceremonial wealth, land,* etc.". These personal gifts should be reciprocated, for example, "*since my mother contributed womb blood to me during conception and gestation, at appropriate later points I am obliged to give her analogous parts of myself acquired from still other persons*" (*Mosko 2010. 218*).

Thus the "*the widespread 'identification' of women with the growing crops or with the pigs that they nurture is to be juxtaposed to those rather few contexts in which women engage in (external) collective activity. The maternal relationship between a woman and her products appears in an image of internal multiplication and replication. The image is one of a body and its as yet undetached parts. It is the mother, as it were, who grows. Once grown, however, the detached things (food and children) can be used in either a mediating or no mediating manner*" (*Strathern 1988.250*). Indeed, "*identification of the crops with the woman's person lasts only as long as they are also in explicit relation to the ground with which her husband (or son or sometimes brother) is identified. The link between herself and the crop is via her particular concrete work. One could suggest an analogy here with men's contrivances in ceremonial exchange. The unitary connection the identification of the growing plants with the woman who watches over them is a deliberate achievement in this sphere. It operates to a precise effect to bring the plants to maturation. Once the crops are taken out of the ground, they are no longer the woman's own. Instead they are reactivated like the pigs that return to the household in terms of their multiple social sources. (The plants cared for by the wife were nourished by the husband's work on his clan land.) Thus a husband has irrefutable claims on a woman's harvested food, where he would never help himself to her planted gardens*" (*ibid. 165*). It is that "*men thus grow women. And the men do it through the effort they apply to prepare the land to yield food. Food is the product of a relation (husband's and wife's work), but in its encompassing male origin, its source in the soil, can also be thought of as paternal. A cross-sex relation is converted to a unique (same-sex) capacity. And this is the sense in which clans grow persons on its soil, sometimes referred to as its bones. Hence the 'grease' in clan territory that nourishes plants and people is food in male form, though the term itself refers to semen and breast milk alike*" (*ibid. 265*).

A person's composition constantly changes as they both attach others' contributions to themselves and detach personal tokens and capacities to be attached to others. The transactions compose persons, and relations create a chain of sequential reciprocities 'as so many capacities for future agentive action'. Thus for "*children to be produced, the semen that coagulates to form a fetus must be separated from the encasing semen substance of the person's body*

[*i.e.*, that within the collectivising domesticity, the circulation and transaction of semen contributes directly to the 'growth of the brother's and sister's body tissue, and cannot be further transmitted'] ... *What enables them to 'produce' children is the separation which then becomes conceivable between the spouse's internal constitutions (the relation which makes each body both container and contained). Although the husband is thought also to contribute to the wife's body (the container), this is only a contribution. Her body is made largely of paternal material; instead he transmits his own partible substance that becomes contained within the wife's cavity as an entity separate from her encasing paternal body. Given that it is milk, rather than blood, which is the Sambia female version of male substance, there is a parallel between the emptying of the male body through insemination and female breast feeding. While getting rid of milk or semen may underline the vessel-like nature of the body, blood by contrast does not have the property of further flow. It is simply discarded, and in being discarded it is 'bad', in contradistinction to the vital filling and emptying of the semen sac/womb/breast*" (*ibid. 216–217*).

Strathern (*1988.15*) argues that gatherings and ceremonies bring together a whole clan as a dividual person, so that "*the bringing together of many persons is just like the bringing together of one*". It is suggested that clan and person have parallel compositions and conditions of personhood (see *Fowler 2004.28*). Indeed, they continuously move between being one person with many relations (dividual), and being presented as one of a pair in a relationship (partible). Thus "*the condition of multiple constitution, the person composed of diverse relations, also makes the person a partible entity: an agent can dispose of parts, or act as a part. Thus 'women' move in marriage as parts of clans; thus 'men' circulate objectified parts of themselves among themselves*" (*Strathern 1988.324–325*). However, the clan and the person are also internally differentiated in encompassing a series of distinct parts usually disparate from each other (including the people within it, but also pigs and shell goods). But at the same time, we must note that the "*exchange of detached, partible things stands in apposition to the flow of internal (lineal) substance within a single wife-exchanging or wife-receiving unit. Meat, women, and shells flow in exchange across relationships not internally unified by substance ... The conventional separation between internal and external relations is tantamount to the personification of the body itself. For the Melanesian image of the body as composed of relations is the effect of its objectification as a person. In the partibility of its extensions into relations beyond itself and in the internal relations that compose its substance, the body consequently appears as a result of people's actions*" (*ibid. 207–208*).

In the context of the 'substantialization of attributes of persons and things', Cecilia Busby (*1997.274–276*) argues for a distinction in the conceptualisation of persons between Melanesia and South India. Both have been characterised as 'dividuals' in contrast to the 'individuals' of the West, and both have similarly been seen as 'making connections through the exchange of parts of the person, following Mauss's (*1925*) model of gift exchange'. She suggests that the perception of Melanesian bodies as internally divided creates 'an apparent homology between internal and external relations or parts'. The person composed of relations appears to 'extend beyond the skin boundary' and includes objects and persons considered to be objectifications of such relations. In India, however, persons are not internally divided. They contain substances from both the mother and father, but they are not 'separably identifiable in the body'. Persons are 'co-extensive with their skin boundary' and they are not 'partible', she continues. The boundary of the body is fluid, and substance can flow between persons, so that the person can be considered as 'permeable'. She thus makes a distinction between substance as 'a flow from a person' and 'substance as a part of a person' and a person 'who is internally whole and permeable' against those 'who is internally divided and partible'.

Parallel to 'permeable personhood', Nurit Bird-David (*1999*) introduced the concept of 'relatedness' that she relates to the 'totemic thought' and animistic practices of Nayaka forest-dwelling hunter-gatherers of Tamil Nadu in South India. The construction of a relational personhood is made 'by producing and reproducing sharing relationships with surrounding beings, humans and others'. This allows them to sense each other as "*dividuated personalities, each with a relatively persisting way of engaging with others against the relative change involved in their mutual engagement*" (*ibid. S72*). Comments on this paper introduced different perceptions of dividuals, each associated with a different type of social relations: the Melanesian that 'separate-while-connecting' and the Nayaka that absorb (*ibid. S88*). In other words, while south Indian dividuals 'engage in relations which integrate', Melanesian dividuals 'en-

gage in relations which separate elements of their selves and world', and individuals 'engage in relations which alienate'. In this perception, Melanesians are 'separating parts of their person from each other in order to keep up relations with others'. Conversely, South Indian persons are 'integrated with other persons' in terms of personal relations in a way that 'the two bodies have a shared boundary' and so operate 'as a single system'. Individuals are thus interpreted 'as alienated from each other and from their world', and to some extent even from their bodies through their relations with one another (*Fowler 2001.140*). Each of these modes of relations refers to bodily conception and experience.

LiPuma (*1998*) suggests, however, that the Melanesian person, like persons everywhere, has both, individual and dividual 'aspects of personhood'. He argued against the classic distinction between (Western) individuals as bounded indivisible entities possessing fixed innate attributes and engaging in relations of the capitalist possession of land, animals and things, but being in constant opposition to society, and dividuals as constituted in interaction with others, inseparable from the gifts they give and integrated within their world as a 'microcosm of society'. In his view, persons emerge from the tension between dividual and individual relations. It is a misunderstanding to assume either that the social emerges from individual actions or that the individual ever completely disappears by 'virtue of indigenous forms of relational totalization'. To assume that there exists an opposition between societies based on substance and those based on relations (*i.e.*, cultures of dividual persons versus a Western world of individuals), he continues, is not only to accept Western ideological perceptions of the person, but to use that ideology to construct the "*Other as its opposite image*" (*LiPuma 2001.132*). The individuality that is a defining feature of personhood should not be equated with bourgeois individualism. Each person thus negotiates a tension between dividual and individual characteristics, and in all societies, although embedded in different cultural and historical contexts, personhood emerges from the constant reconciling of one with the other. The person is thus to be taken as constituted of multiple identities, and as being a participant in a wide range of social relationships and groups based on locality, kinship, ethnicity, occupation, religious and political affiliations and gender, as well as being intrinsically related to the natural world in varied ways phenomenologically and ecologically (*Morris 2000.47*).

The recognition of 'individualised' personhood in prehistory was recently associated with the individual's task-based skills and capacities. Chapman and Gaydarska (*2011*; see also *Budja 2011*) introduce the kinds of embodied skills and associated social roles that created Mesolithic and Neolithic personhoods. They range from 'hunting' and 'plant-gathering' to 'farming' and 'herding'; from 'stone tool-making' to 'ploughing' and 'dairy producing'; from 'basket-making and string-bag-making' to 'house-painting' skills, *etc*. The acquisition and development of embodied skills and their combinations and competences are key facets of a person's individualisation and participation in social life. The shift from dividual to individual personhood is associated with transition to farming and settlement nucleation, they suggest. This namely leads to a wider diversity of persons with different skills and their linkages to material culture. On the other hand a greater likelihood of new skills combinations leads to more individualised identities (Fig. 1).

The fractal person and Neolithic pottery fragmentation

Fractality is another perception of dividuality introduced into anthropology by Roy Wagner (*1991*). He creates this by converting Strathern's notion of the person, who is neither singular nor plural, into the concept of the fractal person. The perception of fractality is based on "*holography and its fractal dimensionality that replicates its figuration as part of the fabric of the field, through all changes of scale*". He postulates fractality in opposition to singularity and plurality; and suggests that it "*relates to, converts to and reproduces the whole, something as different from a sum as it is from an individual part*" (*ibid. 166*). The basic premise of his work is that 'the person is a totality' of which any aggregation is only a partial realisation. Thus this totality is neither an individual nor a group, but a fractal person, an entity whose (external) relationships with others are integral (internal) to it. He relates the fractal person to the 'great man' system that "*force*[*s*] *us to comprehend a pre-existing sociality, and a pre-existing totality, of which any aggregate can be only a partial realisation. This totality is neither individual nor group but a 'fractal person', an entity whose (external) relationships with others are integral (internal) to it ... The task of the great man, then, would not be one of upscaling individuals to aggregate groupings but of keeping a scale that is person and aggregate at once, solidifying a totality into happening*" (*ibid. 159, 172*).

Fig. 1. A part of the Late Vinča figurine composition at Crkvine. It was suggested that the arrangement of figurines represents the individuals (figurine) within a given community (composition), and each individual role is marked by the tools and weapons (from* Crnobrnja 2011.140, Fig. 9*).

The parallel conversion of the same notion of the person has been effected within post-processual archaeology. John Chapman (*1996; 2000a.28–29*) postulates that fractality relates to 'the entity' with integrally implied relationships, a person that aspires to be individual and corporate at once. The 'fractal or dividual self' is thus a person who is at the same time individual and collective, connected to other people through the extension of artefacts. The postulate is based on a sequence of premises which Chapman anchored to Strathern's (*1987; 1988*), Wagner's (*1991*) and Weiner's (*1992*) notions that: (i) 'persons in gift societies become an artefact of the way in which relationships are handled through the possession and manipulation of things conceptualised as wealth or exchange'; (ii) 'in these societies, a gift exchange is related to personal domination, and there inalienability and enchainment are important'; (iii) 'in some societies, inalienability denotes the absence of property relationship, so they do not have alienable things at their disposal, and they can only dispose of items by enchaining themselves in relations with others'; (iv) 'enchainment is a condition of all relations based on gift, and is thus the means by which persons are multiply constituted'; (v) 'inalienable things are the representations of how social identities are reconstituted through time' (*Chapman 2000a.28–32*). Along with these premises, he puts forward the idea of the blurred human-object boundary by claiming that all things with a cultural value are invested with life (see *Wagner 1991*). That is, they partake of the self and also create it. Valuable items thus take on part of the qualities of their makers, just as the makers embody qualities of skill and resourcefulness in the production process. He actualises Daniel Miller's (*1985*) suggestion that artefacts are characterised as simultaneously a form of natural materials whose nature we experience through practice and the form through which we continually experience the particular nature of our cultural order (*e.g.*, the social relations defining individuals and groups). He proposes that the correlation between the use and deposition of either complete or deliberately fragmented artefacts and the enchained social relationships between persons. While the fragmentation transmits enchained or fractal 'connotations of past makers and owners', the fragments of valued objects show the 'extension of persons' relationships through the inalienability of their valued objects and the transmission of fragments to different individuals in different contexts' (*Chapman 2000a.39*).

In this reading, pottery is suggested as a medium that is 'reliable and effective' for holding persons and groups together 'through the objectification of common traditions often reinforced by symbolic decoration', and for providing 'a mechanism for symbolism of fission and rupture'. Thus complete pots may represent group solidarity, integration and successful constitution, whereas fragmented pots represent rupture, cleavage and friction that leads to dissolution. In Early Neolithic societies, where household and/or local lineage institutions were weakly developed, the only way to maintain social reproduction lay in repetitive social practices, including pot smashing. Thus "*the decision to keep pots whole through daily use is a metaphor for maintenance of social relations through continual renegotiation. Just as the associations of its various uses bring and added value to a vessel, so the enchainment of fractal person to a ramifying group of kin brings*

such people fame and reputation. Conversely, the rupture of those social relations characterising a less sedentary community would have elicited the response of the fragmentation of much valued pottery. But the even more striking collapse of social relations in a seemingly more stable sedentary community's may well have led to the large-scale fragmentation of one of the that community's important symbolic resources-pottery" (*Chapman 2000a.43*).

Along with the (fragmented) vessel that mediates persons' relationships between the living members of society, the human bones are a metaphor for maintaining relations between the living, the deceased and the ancestors. The practice of bone removal to selected domestic or mortuary contexts redefines the social relations between the living and those dead who become ancestors by keeping alive the essence of the dead through the materiality of their bones (*Chapman 2000a.144; 2000b; Chapman, Gaydarska 2007.53–70*).

Chapman's model of personhood thus proposes that the person is a totality of his or her relationships. The fragmentation of objects and bodies, and the extraction of parts from wholes and the re-articulation of fragments in new units is the major mode of social relations through which people and things are constituted. People are not so much individuals as 'dividuals'. Who they are and what they do relate to their transactions with each other, with material culture and with the dead. His thesis pertains first to Balkan Neolithic and Chalcolithic contexts. He argues that many incomplete artefacts, such as pots and figurines, are the result of deliberate breakage, dispersal and deposition. They were used in social exchanges linking persons (dividuals), places and things and, marking relational personhood. He postulated later that fragmentation and enchainment are always linked social practices. Enchainment in this context is believed to comprise the best, and sometimes the only, explanation for deliberate fragmentation (*Chapman, Gaydarska 2007.203; Chapman 2008.188*).[3]

In central and north-western Europe, the link between fragmentation and enchainment was recognised in settlement and in burial Neolithic contexts (*Jones 2005.216*). It has been suggested, however, that the connections between people, places and things are composed in quite different ways in different regions. In each of these cases, we have to be careful about applying a unitary anthropological model of relational personhood, and we need to examine different ways of relating in different historical contexts. Although there is no doubt that in many prehistoric contexts, the deliberate fragmentation of bodies and objects plays an important role in understanding identity (see *Brück 2006; Nilsson Stutz 2003; Fowler 2008*), the notion of the related processes of fragmentation and enchainment has not become broadly accepted in archaeology.

Criticism relates to the manner in which the fragmentation perspective is employed to generalise about a single type of action (fragmentation) leading via a single form of practice (enchainment) to a single mode of relational (dividual) personhood, while not allowing for the possibility of other readings (*Last 2007; Brittain, Harris 2010.590*). Chris Fowler (*2004; 2008; 2010a; 2010b*) instead proposes that multiple forms of both dividual and individual modes of personhood have been constituted through different historical and material contexts. He suggests that people in the past negotiated both individuality and dividuality in different ways within two extremes, of Western individuality and eastern relational personhoods, but all societies provide frameworks for people to negotiate features of both. Inalienability, dividuality and fractal personhood are thus merely parallel ways of describing the same phenomenon on a very broad level, but there is also a range of different strategies and logics of personhood that fall within the bounds of these terms (see below). He suggests "*a range of heuristics including a broad tension between relational, dividual and fractal personhood associated with inalienable relations at one end of a spectrum, and fixed, individual personhood with representational metaphors and alienable relations at the other*" (*Fowler 2004.86*).

A simpler approach to tracing and interpreting past personhoods can be found in the discussions that have run parallel in American anthropology. Porter Poole (*1994.842*) thus suggests that personhood embedded in processes of socialisation and enculturation, "*endows the culturally recognized individual as a social being with those powers or capacities upon which agency depends, makes possible and constrains his or her proper actions, casts him or*

3 The practices are hypothesised recently to be expected in 'all hominin societies' from the very first stone tool making (*Knappett 2006; Gamble 2007.144; Chapman, Gaydarska 2009*).

her as possessed of understanding and judgement ... Although the capacities of personhood may be anchored to the powers and limitations of the human body, they consist fundamentally of the cognitive, emotional, motivational, evaluative and behavioural abilities that are entailed in becoming an actor in community life. Thus, the person is essentially a social being with a certain moral status, is a legitimate bearer of rights and obligations, and is endowed with those characteristics of agency that make possible social action". The discussion actualised the Maussian triad of individual/self/person as "*biologistic, psychologistic, and sociologistic modes*" of conceptualising human beings, and differentiates the individual as a member of human kind, the self as a locus of experience, and the person as an agent in society. To be a person, Grace Harris (*1989.602–605*) postulates "*it means to have a certain standing (not 'status') in a social order, as agent-in-society. Consequently, it is not sufficient to a discussion of personhood to talk about people as centers of experience, selves. To be a person means to be a 'somebody' who authors conduct construed as action ... To focus on human persons as agents-in-society directs attention to systems of social relationships whose participants, performing actions and responding to each other's actions, live in a moral order*". Personhood has a temporal dimension, and "*moving through the moral career, the human being may or may not become fully a person. Even if he or she does become a person, personhood may be partly or fully rescinded later. His or her agentive capacities are bestowed or removed, confirmed or disconfirmed, declared or denied*".

Lewis Binford (*1971*) was the first to introduce the anthropological concept of 'social persona' into archaeology, suggesting that mortuary customs and beliefs were determined in part by representations of the social identities of the individual, and in part by the extent to which other members of the social group recognised responsibilities to the deceased. It is not only that as the number of social roles an individual held during life increased, so too would the number of symbolic representations of those roles, and that they would be adequately mirrored in the treatment of the body, in grave architecture and in grave goods, but also that the variation in the structure of mortuary data reflects the degree of social structural complexity characterising the society itself. The presence of single rich burials has indeed encouraged many archaeologists to construct linear hierarchical models with individuals, chiefs, village heads, located at particular levels in the social hierarchy. Such a perspective increases the emphasis on the powerful élite and individual identity and the autonomy of male heads of lineage or chiefs controlling resources valued for their properties (*Renfrew 1973*). It is perhaps most obvious in Renfrew's (*1974*) interpretation of Neolithic and Bronze Age societies as group-oriented and individualising chiefdoms, respectively. By the end of the 1970s, the interpretative model that begins with an egalitarian period among clan members in the earlier Neolithic, followed by hierarchically organised lineages in the later Neolithic, replaced by influential élite groups of autonomous powerful Early Bronze Age male individuals who control the centralised exchange of prestigious goods, was broadly accepted. Many authors have argued that differences between burials in the quantity and character of the grave goods indicate that social position was based on the ability to acquire and display prestige goods (*e.g.*, *Shennan 1982; Bradley 1984; Thorpe, Richards 1984; Kristiansen 1998*). It has been suggested that the beginning of the Bronze Age correlates with the emergence of an ideology of competitive individualism across Europe. Individuals in these contexts were conceptualised as a bounded, stable and independent entities existing prior to and above the social relations into which they enter. Applying these perceptions of self and personhood, identified as modern Western and associated with an ideology of radical individualism of the eighteenth and nineteenth centuries projected onto the past, was strongly criticised (*Brück 2001; 2006; 2009*).

Heterogeneity of past identities

The concept of personhood has been intensively discussed in prehistoric archaeology in the last decade. Since the notion of 'social persona' appeared, the debate on the relationship between (in)dividuals and the societies of which they form part has had huge implications for the study of identities in prehistory. The numerous works that have been produced on the topic reveal two opposite concepts of individual person and personhood. The traditional perception emphasises that individual person(hood) is a bounded, stable and independent entity, constant from birth, equal to others and unique. In post-procesual archaeology, it represents an inherently fragmented, fluid and relational entity. The person is 'multiply-authored' by social interactions with others before birth and throughout their lives (*Brück 2005; 2006; Fowler 2005; 2010a; 2010b; LiPuma 2001*). However, in discussions on the relationship between the

body and the person, in some cases the individual focuses on the body, and the person is seen as a material entity signified by the boundary of the body, distinct from other individuals (*Meskell 1996; Hodder 1999.138–146*). In others, the person is seen to be composed of relational transactions between and with other persons and communities and thus constituted through rationality. In Fowler's (*2004.4*) definition, a person is "*any entity, human or otherwise, which may be conceptualized and treated as a person. A person is frequently composed through the temporary association of different aspects. These aspects may include features like mind, spirit or soul as well as a physical body, and denote the entity as having a form of agency. Exactly who or what may or may not be a person is contextually variable*". Personhood, therefore, "*refers to the condition or state of being a person, as it is understood in any specific context. Persons are constituted, de-constituted, maintained and altered in social practices through life and after death. This process can be described as the ongoing attainment of personhood. Personhood is frequently understood as a condition that involves constant change, and key transformations to the person occur throughout life and death. People may pass from one state or stage of personhood to another. Personhood is attained and maintained through relationships not only with other human beings but with things, places, animals and the spiritual features of the cosmos. Some of these may also emerge as persons through this engagement. People's own social interpretations of personhood and of the social practices through which personhood is realized shape their interactions in a reflexive way, but personhood remains a mutually constituted condition*".

Who or what may or may not be(come) a temporary person is thus contextually variable, and what each person is depends to a large extent on interactions with other human beings and other beings and things. Personhood is not a cumulative set of fixed, distinguishing individual traits. It is a specific marker for the condition of identity as conceptualised by a given community. The condition is understood and formulated through different modes of personhood: individuality and indivisibility, dividuality, partibility and fractality, and permeability. We mentioned above that individuality refers to the common concept of personal uniqueness that all persons have, but it does not mean that individuals have an indivisible nature. Indivisibility refers to a state of being indivisible, a unitary person. Dividuality relates to a state where the person, the dividual, in this perception is composite and multi-authored. Persons engaged in social relationships with other beings and things owe parts of themselves to others. The person is thus composed of traits or features such as mind, soul, and body that may have different origins or authorships. Partibility, fractality and permeability are synonyms of the dividual person and personhood.

Partibility refers to the reconfiguration of the dividual person in a way that one part or element can be subtracted and given to another person or entity, to whom or which it is owed. Being a multiply constituted person composed of diverse relations makes him, her or it a partible entity, an agent that can dispose of parts or act as a separate part. Melanesian societies are often cited as prime examples: women move in marriage as parts of clans, but men circulate objectified parts of themselves among themselves. The latter refers to the person and personhood as permeated by flows of substances, *e.g.*, qualities that influence the internal composition of the person. Hindu societies in south India are conceived as permeable persons.

Fractality and the fractal person encapsulate the personhood of partibility and multiple composition that are repeated on different scales, from particular persons to larger social groups, clans and lineages, extending from living to non-living beings. Through fractal logic, groups of people may appear as one person constituted through the same relations as single members of the community. In communities where personhood is stressed as a feature of the community and where a clan is a person (a family might be another), not all persons in the community are necessarily human, but other social agents such as 'ghosts, spirits, houses, axes, animals, standing stones' (for details see *Fowler 2004.14–30*).

Personhood thus objectifies how identities shift continuously throughout life and how they are mediated either through small interactions between a few people or large community events, through cooking, eating and commensality, through death and decomposition, and through mortuary exchanges and ancestral ceremonies. All these dynamics are embedded in systems of totemism, animism and naturalism. In a relational world, personhood can be attained and understood only through transactions between people, and between people and things, substances, buildings, animals and other entities. In some social practices, the statuses of humans and animals are inter-

connected through transformations in personhood. In others, the decomposition of bodies and redistribution of body parts and bones are vital to the circulation of energy among all living things. We may hypothesise the life and after-life of a person as an ongoing process in which different personhoods are sought, negotiated and attained. Personhood is not, therefore, a cumulative set of fixed, distinguishing personality traits. LiPuma (*2001.131*) and Fowler (*2005.123*) agree that in all cultures both individual and dividual aspects of personhood co-exist. Each person negotiates a tension between these aspects, especially in constructing his or her own comparative discourses, such as justifications or explanations for action. In all societies, personhood emerges from a constant process of reconciliation of one with the other, and it is a misunderstanding to assume either that the social emerges out of individual action or that the individual ever completely disappears by virtue of indigenous forms of relational totalisation.

Recent discussions in archaeology have focused on the hypothesised trajectory of the Early Neolithic dividual to Early Bronze Age individual personhood. It is broadly accepted that during the Early Bronze Age the treatment of the body changed as collective burials were replaced by single inhumations and cremations in well-defined graves in Atlantic Europe. Mortuary practices were different from the previous Neolithic, and it has been suggested that this defines a new relationship between the living and the dead, along with a perception of the body as a distinct entity (*Thomas 1991; Jones 2002*). The burials of impressive and symbolically significant prestigious goods such as toiletry articles, weapons and drinking equipment (common to individual graves) with male bodies evoke the aesthetics of maleness that relate to the role of the male warrior. It is associated with particular lifestyles in which warfare, body ornamentation, hunting, horses and the consumption of alcohol on the one hand, and control of the centralised exchange of prestigious goods and hereditary positions of power on the other, which it has been suggested are expressions of self-identity in the Early Bronze Age (*Treherne 1995*). The warrior's individual personhood remains broadly recognised as an archetype of both powerful elites and individual chiefs' identity (for a critical discussion, see *Brück 2004; Fowler 2005*).

The moral codex of rules and standards that relates to the notion of the warrior's personhood at the onset of the Mycenaean period was introduced into the discussion recently (*Voutsaki 2010*). When individuals as described by Homer in the Iliad and Odyssey first engage in a practice, they have no choice but to agree to accept external standards for the evaluation of their acts and to agree to follow the rules set out for practice. The main purpose of human agency in heroic societies, where the warrior is the paradigm of human excellence, is to realise the goods internal to practices such as fighting, hunting or feasting. The entire group thus 'celebrates a victorious battle', 'benefits from a successful hunting expedition' or 'enjoys a generous feast' to increase the prestige of the kin and social group, and to ensure the fidelity and reliability of fighting companions and allies. A moral agent is necessarily a social agent in so far as his perception must match that of the group. Morality and social structure in heroic society are thus conflated (*MacIntyre 2007*). Moral standards are always bound up with society as a whole and differ between societies according to each society's respective structure. Each individual has a fixed role resulting from their position in the social network, primarily through their particular ties to an elite community, and each individual has the specific obligations and privileges attached to that position. The warrior's personhood was thus individual and dividual, and as we mentioned above, the identity of the group and the person can have parallel compositions and can move between parallel conditions of personhood.

We suggest a similar reading of shamanic identitiy in a much earlier Mesolithic hunter-gatherer context in northern Europe. Four shaft graves at Oleneostrovskii Mogilnik contained shaman burials that are significantly different from the other burials in terms of grave architecture, treatment of the body and grave goods (*O'Shea, Zvelebil 1984; Larson 2004; Zvelebil 2008*). In contrast to the other 173 graves facing east, these four are shaft graves oriented to the west. They include two males, one female, and one juvenile in a vertical (reclining) position. In the most elaborate shaft burial (No. 100), of a middle-aged man, more than 500 artefacts were placed carefully over and around his body, particularly around the head and shoulders, the pelvic region, and below the knees. This arrangement suggests that some of the pendants were attached to what were perhaps a garment and possibly a headdress. The man was equipped with a quiver that held arrows and a large bone dagger with flint inserts. Beaver mandibles were placed on the body suggesting a shaman's attribute, since beaver mandibles form part of shamans' attire among some Siberian groups. The body was buried in a deep, almost vertical pit. The pit was

covered in ochre, and the body was walled in with large stones. It has been suggested that the deceased was partially exposed for viewing (*Stoliar 2001*) (Fig. 2).

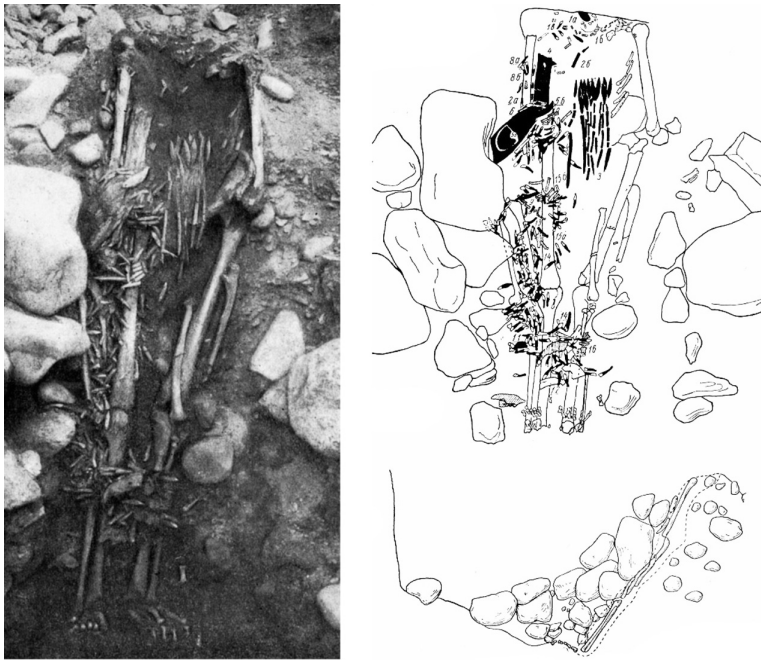

Fig. 2. Oleneostrovskii Mogilnik burial No. 100 (from* Gurina 1956. Figs. 13, 50*). The body was buried in a vertical (reclining) position in an almost vertical pit. The pit was covered in ochre, and the body was walled in with large stones.

Exceptional individual burials attributed to shamans have been found in several hunter-gatherer cemeteries in northern Europe (Janislawice in Poland, Duonkalnis in Lithuania, Vedbæk-Bogebakken, Zvejnieki, Skateholm, Hartikka and Pispa in southern Finland, and Tudozero in northern Russia). They all include interments that are significantly different from standard practice. All the burials are embedded in egalitarian frameworks, but demonstrate the individual status of the deceased and social rank and differentiation to some degree based on achieved, perhaps even inherited, status and wealth (*Zvelebil 2008*). Shamanic agency, on the other hand, relates them to totemic cosmology and animistic practices that dictate relations between humans, ancestors and animals. It can be seen in a continuous flow of substances, human (ancestral) bones and animal body parts between persons (*Ingold 1986; 2000a; 2000b; Strassburg 2000; Nilsson Stutz 2003*). We may assume that a dividual shaman's personhood was attained and maintained through relationships not only with animals, places and spiritual features, but with lineages or clans to the same extent. Both Mesolithic shamans and Bronze Age warriors are persons to be taken as constituted of multiple forms of both dividual and individual modes of personhood, and as participants in a wide range of social relationships and groups.

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BACK TO CONTENTS

Group identities in the Central Balkan Late Neolithic

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ABSTRACT – *The final period of Neolithic Vinča culture, which occupied wide areas in the Balkans, is characterised by large settlements, which were built, judging by the most recent investigations, according to premeditated plan. What was their purpose? Were they autonomous or part of some wider communities? How large was the territory within which people of that time defined themselves as 'we' and where did communities of 'others' begin? The objective of this work is to indicate the possibilities for studying the complexity of group identities in the Late Vinča societies. We take as a starting point the micro-region of Drenski Vis in north-western Serbia, where five Late Vinča settlements have been discovered.*

IZVLEČEK – *Za končno obdobje neolitske kulture Vinča, ki je bila razširjena na širšem območju Balkana, so značilne velike naselbine, ki so bile, glede na najnovejše raziskave, načrtno zgrajene. Kakšen je bil njihov namen? So bile neodvisne ali del širših skupnosti? Znotraj kako velikega ozemlja so se takratni ljudje opredeljevali kot 'mi' in kje so se začele skupnosti 'drugih'? V tej raziskavi želimo pokazati možnosti raziskovanj kompleksnih identitet skupnosti v pozno-vinčanskih družbah. Kot izhodišče služi področje Drenski Vis v severozahodni Srbiji, kjer je bilo odkritih pet pozno-vinčanskih naselbin.*

KEY WORDS – *Vinča culture; Late Neolithic; settlements; group identity; Balkan*

Introduction

Investigations of the Central Balkans Late Neolithic[1] have been continuing for over a century. Although in the last few decades and particularly in recent years, more and more texts which discuss the social organisation of Vinča culture in the territory of Serbia have been published, it must be borne in mind that field investigations in the same period did not progress much further beyond investigations of individual houses. It is important to mention that in Serbia, no Late Neolithic settlements have been investigated completely, or at least to a considerable extent. The eponymous Belo Brdo site at Vinča near Belgrade has been intermittently investigated for over a century. The importance of this site, with vertical stratigraphy encompassing almost the entire life of the Vinča culture, is immense, although neither the area of the settlement, nor its shape, have been confirmed in the literature.[2] Thus we are able to follow the chronological sequence of the entire Neolithic 'culture' in one location, but in fact we can not be sure how big the settlement was. Even when frequently cited Late Neolithic settlements in Serbia such as Gomolava and Divostin are concerned, we have the problem of the size of the entire settlement. At Gomolava, around 35% of the surviving settlement area has been investigated (*Brukner 1988.20*) but we can not even assume its original size, because the Sava River has been eroding the western section of the Neolithic settlement for millennia. The assumed settlement area at Divostin is

1 In this work, I discuss Late Vinča settlements in the territory of Serbia.
2 One of the reasons for this is modern construction works, which covered a large area of the Neolithic settlement.

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around 15ha according to the distribution of surface finds; however, only 1.17% of the entire settlement has been investigated (*McPherron, Srejović 1988*).[3]

On the other hand, there is still another reason why Vinča and Late Vinča settlements have not been fully investigated. The limiting factor was often lack of funding, so the investigations were of a rescue and sondage character, and therefore relatively small areas have been excavated. Still, lack of funds is no excuse for the many decades when a general strategy for investigating Vinča culture was lacking. First of all, I have in mind the lack of organized large and well- planned site surveys (surface prospecting), aerial prospection and the use of non-destructive investigation methods. The data on the distribution, size and chronology of the Vinča sites in Serbia are very meagre and provisional.

Thus we are in a situation to study social relations within settlements on the basis of the contents of investigated houses, which to large extent are actually random samples, since we do not have the following data:

- in which section of the settlement were investigated houses located[4],
- the actual size of the settlement,
- whether the settlement was surrounded by trenches and/or palisade,
- how the size of a given settlement corresponds with the size of neighbouring contemporary settlements,
- what level in size hierarchy within one settlement cluster has the settlement with investigated houses.

The method of geomagnetic mapping was used in prospection of Late Neolithic settlements in Serbia over four decades ago for the first time. This made it possible to grasp the distribution of structures over a larger area within one settlement (*McPherron, Ralph 1970; Mužijević, Ralph 1988; Tringham, Brukner and Voytek 1985.427–428*), but this activity was resumed only at the beginning of the 21st century (*Crnobrnja, Simić and Janković 2010; Arsić, Miletić and Miletić 2011*). Also, I must mention that a few authors have paid special attention to the distribution of the Vinča settlements within certain areas (*Ristić-Opačić 2005; Chapman 1981; 1990*). Nevertheless, these works are also based on insufficient data that was collected in earlier decades without being re-checked in the field and at least partially revised.

I will try in this paper to point briefly to some guidelines which in future investigations could help in seeking answers to questions concerning the organisation of life in the final period of the Vinča culture and could make the recognition of the complexity of group identities in Late Vinča societies possible.[5]

I have found good guidelines in articles dealing with similar questions about the same period and in the immediate vicinity, on the Great Hungarian Plain (*Parkinson 2002; 2006*) and eastern Balkans (*Chapman 1989*), and the work of Constantinos Doxiadis (*Doxiadis 1968; Doksijadis 1982*) had also influenced my reasoning.[6]

The most frequent category according to which it is attempted to grasp the Late Neolithic social organization is the individual house, *i.e.* the household, its internal organisation and the artefacts discovered within. In the organisation of interior and establishing the contents of one house many factors take place (*Kuijt 2002.140*), including standards imposed by customs and religion,[7] already established and generally accepted organisational rules needed to satisfy economic needs and functionality of space of the inhabitants of that distinct house, and finally, personal taste, the affinities and needs of the house owner. Thus, the number of vessels discovered inside the house would actually reflect first of all the needs and possibilities of the occupants of that very house, but it will tell us little about the interaction of its occupants with the occupants of other houses in the settlement.

On the other hand, when the site at Crkvine-Stubline is concerned, a settlement plan is available, which makes it possible to understand relations within the community to a much greater extent.

3 For more on areas investigated at Vinča settlements in Serbia, see *Ristić-Opačić 2005.84–87*.

4 I do not consider geographical positions, but first of all, the functional sections of settlement – centre/periphery, densely built structures/dispersed structures, relation to other houses and public areas and the like.

5 I mean primarily the social aspects of group identity and not sexual, gender, professional and the like.

6 Architect, urban and city planner, founder of the discipline of 'ekistics', the main objective of which is the study of human settlements.

7 The influence of cult and religion on shaping space (house) can be found in ethnological examples worldwide (*cf. Hayden, Cannon 1982.144; Roberts 1996.10–13; Bourdieu 1977*).

A settlement lasts longer than any single house in it, and is permanently enlarged and reintegrated in time. Therefore, the 'imprints' of social processes taking place at a given time in the community creating the settlement could be comprehended only by an understanding of the matrix of the settlement and houses within it. The relations between individual houses and settlement must be observed as reciprocal results. At first, personal affinity in the selection of house location can be observed, but this was the main consideration in establishing of the settlement. On the contrary, providing for community needs was more important even at the very founding of a settlement than satisfying individual needs, so even the initial distribution of structures within a given space must be sufficiently functional for all members of the community.

Increase in house numbers in the settlement resulted, at least where Crkvine-Stubline is concerned, in greater uniformity in their arrangement; the reason for this was adaptation to the needs of community (from economic, social, security and, conditionally, political aspects) (*Doksijadis 1982.48–50*).

Taking into account the facts stated above, the influence of individual or family needs and affinities could be considered as of secondary importance in the creation of the settlement matrix in comparison with the dominant influence of social organisation of the community and relations within the community. The arrangement of the main functions, houses and communications in the settlement depends on the level and mode of organisation, as well as the needs of the community.

Therefore, I believe that with considerable reliability we could take up the examination and study of settlement structure as some kind of material imprint of social organisation of a community which built and inhabited a given settlement.

The settlement as the most discernible highest unity of hierarchy should be the starting point, and we should then continue by planning two subsequent directions of investigation: firstly, to tackle the lower organisational levels within the settlement (house, household, group of houses), and secondly, and much more difficult to understand, the possible higher organisational levels (groups of settlements, micro-regional and regional connections of the settlement) (*Crnobrnja 2011.142*).

If we want to consider the possibility that multi-layered group identities existed, we have to establish how many organisational levels existed in the given society within which people recognised themselves as parts of a wider community, thus sacrificing some individual rights for the benefit of being a member of a community or communities. In this case, we must first engage in a quest for relations existing above the level of the single house or household, *i.e.* the material imprints resulting from activities at those levels.

As a small case study, I will consider the micro-region which Belgrade City Museum has been investigating intensively in recent years – the Drenski Vis plateau. This is a relatively small deluvial-proluvial plain, with a few Late Vinča settlements, including the settlement at Crkvine-Stubline which has been intensively investigated using geophysical methods and, to a smaller extent, by archaeological excavations.

Settlement at Crkvine-Stubline

Location

Crkvine is situated near the village of Stubline, *c.* 40km southwest of Belgrade. It is located in terrain categorised as second river terrace on the very edge of a deluvial-proluvial plain (Drenski Vis 115–120m above sea level) extending in the background (Fig. 1). The settlement is situated on a hill whose axis is oriented in northwest-southeast. From north and east, the hill is surrounded by streams which meet under its southeast end and flow toward the Tamnava River. There are also many springs at the site and immediately next to it. Despite the fact that the settlement is situated at a relatively low elevation (112m above sea level), its position makes exceptional visual communication possible with areas to the south and east, but not with settlements in its background in the area of Drenski Vis.

History of investigations

The general size of the Crkvine-Stubline settlement was first determined by an intensive surface survey. Most of the pottery material gathered on that occasion dates from the Late Vinča period in its final phase (Vinča D), while quite a few fragments date from later periods (Late Eneolithic). An area of 85 000m^2, *c.* 70% of the entire settlement area, was then surveyed by geomagnetic mapping (Fig. 2). On the basis of geomagnetic mapping, positions for placing geoelectric profiles were determined and were measured over a total length of 1250m. It was concluded that the remains of all houses first located by geomagnetic mapping and then confirmed by geoelectric scanning are situated in the physically

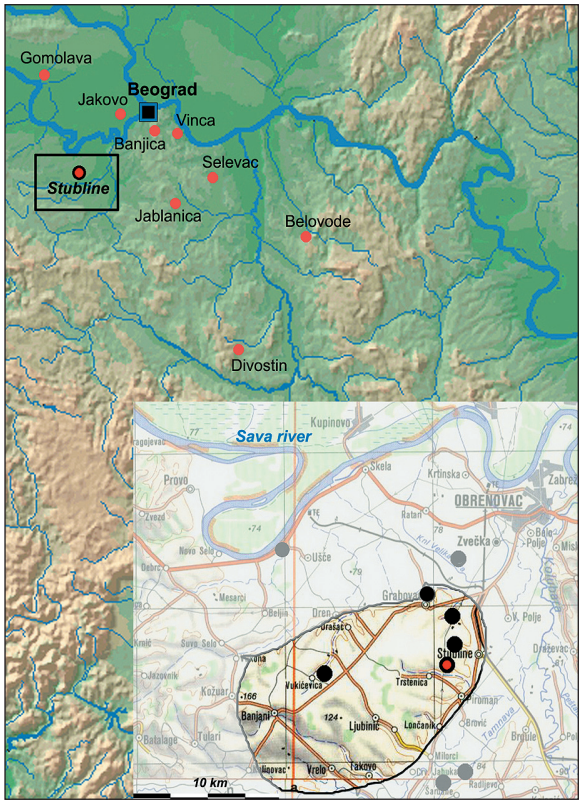

Fig. 1. Geographical position of the Drenski Vis region and Late Vinča sites at Drenski Vis and in the immediate vicinity which have been investigated.

same horizon.[8] The results of the geomagnetic mapping proved to be very reliable, and have been confirmed by excavations in six places, but only relatively shallow structures were precisely registered. Two hitherto investigated houses yielded pottery material from the Vinča D–2 phase (dated at 4650/4600 BC, *cf. Borić 2009*) which corresponds to the material obtained from the surface survey, *i.e.* to material from houses damaged by cultivation. By combining the results obtained by above mentioned methods, we can assume with great probability that all the structures recorded by geomagnetic mapping date from the final horizon of occupation.

Settlement data

On the basis of above-mentioned investigations, I tried to determine the approximate positions of houses within the settlement and their dimensions, taking into account the following principles: I considered as assumed house locations geomagnetic anomalies over 6m long and over 10 nT intensity. Using this method, I reached the following conclusions about the Late Vinča settlement at Crkvine-Stubline just before life at the site ended:

- The settlement covers a relatively large area (*c.* 12.5ha including ditches *i.e.* around 10ha within the trenches).
- The settlement was surrounded by ditches[9].
- From all appearances, the houses detected by geomagnetic mapping date from the last horizon of occupation and were all destroyed by fire.
- In the area covered by geomagnetic mapping, it could be assumed that 219 anomalies represent the remains of houses (Fig. 3).
- The average surface of the anomalies assumed to be houses is 58.3m^2.
- Houses are almost identically oriented (NE–SW) except for few structures.
- Houses in the settlement were built in tightly-packed rows.
- The distances between houses in rows are small, *c.* 2m on average (varying from 1 to 3.5m).
- At a few locations, houses are clustered around rather large open areas resembling small squares (500–1200m^2).
- Houses arranged in rows and blocks around open areas is the basic module of settlement texture.

The relationship between areas with structures and open areas

If we take into account only the area within ditches the ratio between open areas and house occupied areas is 6.8 : 1. If we consider only the area occupied by houses, disregarding the area between the last houses and trenches (7.3ha), the ratio is 5.7 : 1. Nevertheless, this method of calculating occupied areas should be taken with some reservation. Firstly, it should be borne in mind that most of these calculations are based on the picture obtained from a small area investigated within the settlement that is then extrapolated to the entire settlement (*Chapman 1989.35; Porčić 2010.203*). The mistakes might result from such a method can be seen in Fig. 4. When the construction index within the settlement is examined, a few other things must be taken in consideration. First, the houses are separated by small spaces (1–3m, on the average 2m), so we can also assume that the spaces between them were occupied, as it was hardly sufficient for storing goods and passing between the houses. Secondly we do not know how many houses in the settlement had

8 The upper levels of house remains are at a depth of 20–60cm.

9 A trace indicating yet another double ditch negated by the row of houses from the previous occupation horizon was encountered near the centre of the settlement. It seems that this ditch had surrounded the settlement in some earlier phase of occupation.

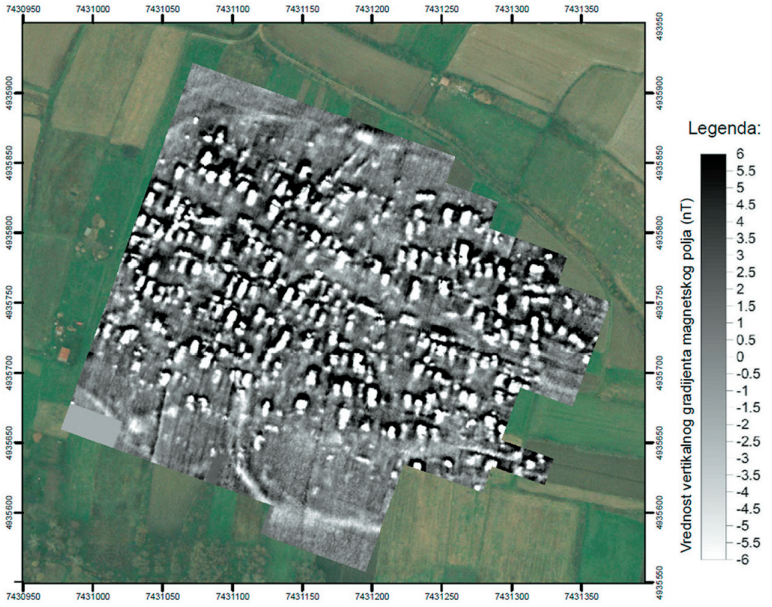

Fig. 2. Crkvine-Stubline, magnetometric plan.

an upper storey or attic.[10] Even if the upper storeys of the houses were used only for storage, they contribute to relieving the house floor area. Thus plot ratios (area occupied by structures in relation to the settlement area) are no longer the only issue here; the total floor area ratio (floor area of ground floors and storeys of houses/structures in relation to settlement area) as well as the total occupation of space (besides the houses within the settlement, there were also passages, rubbish pits and heaps and material stored outside the houses) also need to be taken into account. This information should certainly be taken into account in cases when house floor areas are used in calculations (*cf. Porčić 2011.323*). When all this is taken into account, it is not difficult to understand that most of the space outside the houses was also occupied. Therefore, little space remains for to confirm John Chapman's assumption of a 'house and garden' concept, according to which the area around houses could have been used for gardening, and this was based on the ratio between the areas with structures and open areas within the settlement (*Chapman 1989.38*).[11]

Fig. 3. Assumed house disposition in the settlement at Crkvine-Stubline according to magnetometric readings.

Spatial organisation and the organisation of life in the settlement

The space occupied by one settlement includes not only the area where houses were built, but also the area surrounding the settlement that its inhabitants used for farming and obtaining basic resources (*Chapman 1989.34; Roberts 1996.24–25, 29, Fig. 2.5 and 2.6*), so in considering the organisation of life, all of this space should be understood as a single entity.

When organizational units within the settlement at Crkvine in Stubline are concerned, we can distinguish four levels:

❶ individual houses (assumed 219 structures; Fig. 3), which are arranged in
❷ rows of houses (16 rows with 5–12 houses each could be identified; Fig. 5) and sections of two or more rows could make
❸ groups of houses clustered around open areas (10 such areas from 500 to 1200m^2 each could be assumed; Fig. 6);
❹ houses located on the settlement periphery and not arranged in rows or groups, but distinct from the mentioned organisational units.

Housing density, the identical orientation of the houses and small distances between them, the arran-

10 Late Vinča houses with reliable indications of an upper storey have been discovered at many sites: both investigated houses at Crkvine-Stubline (*Crnobnja, Simić and Janković 2008.20; Crnobrnja 2012*), Parta (*Lazarovici, Lazarovici 2006.373*), Opovo (*Tringham* et al. *1992.361*), Uivar (*Schier 2006.326, 333, Fig. 2*).

11 Small-scale excavations at Crkvine-Stubline in 2011 at one of open areas between the houses revealed that there was a walking area characterised by a layer of packed earth (around 20cm thick) with scattered debris (pottery, bones small lumps of daub).

gement of houses in rows[12] and open spaces between houses at some locations in the settlement indicate almost planned building activity.

But we must also bear in mind that not houses but people lived in the settlement, so we must not disregard their individual and personal needs like inter-audibility and inter-visibility in the settlement (*Chapman 1989.35*) or their non-material values, ideals and emotions (*Whittle 2003.16*). These categories could hardly be recognised by studying artefacts and individual structures, but understanding the area where these people lived offers a better possibility to envisage the above mentioned categories.

How could the people living in a settlement like the one at Crkvine-Stubline have felt? The spaces around the houses were so small that the occupants actually could not have spent a single moment outside the house without meeting their neighbours and they could probably hear their voices all the time they were awake. The activities which could have been carried out around the houses were also limited because of the small distance between them, so the open spaces between the houses, small 'squares', of between 500 to 1200m^2, remained the only suitable areas (Fig. 6). The views within the settlement were also very limited and the view of the occupants of most houses was limited only to the 'square' in front and houses across. All activity outside the houses was carried out in a public, communal area. A similar tendency can be noticed at the level of the entire settlement. The grouping of houses in clusters around open spaces, so-called 'squares', could suggest a division into kinship groups within the settlement. Even if this assumption is correct[13], how strict was the division between such groups either of kinship or other character, and does this mean that the settlement was divided into distinct sub-entities occupied by certain clans or extended families? I sought an answer to this question in the relations between house groups and the assumed disposition of primary and auxiliary communications within the settlement (Fig. 7). I started from the assumption that each house, *i.e.* every group of houses, must have had free and rational access to the settlement entrance and exit. As all farming land was outside the settlement and springs were located near the streams

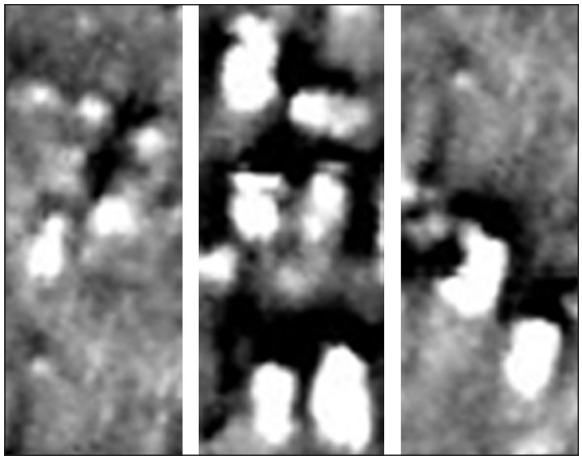

Fig. 4. Three possible examples of house density at Crkvine-Stubline on the basis of excavations without geophysical investigations (20 x 50m).

along its fringes, these were routes which most of the inhabitants had to use many times every day. In order to cover these routes undisturbed on a daily basis the occupants of each house group must have passed through the communal areas of some other groups a few times a day. This suggests that no single group could have laid absolute claim even to 'their' communal area as they had to share it with people from other sections of the settlement. All this leads to the conclusion that all open spaces in the settlement, the so-called 'squares', were more or less public and communal, and hence belonged to the

Fig. 5. Rows of houses in the settlement.

12 The construction of houses in rows and at small distances is also known from a few other Vinča sites: Vinča (*Tasić 2008. 28–29*), Gomolava (*Brukner 1988*), Divostin (*McPherron, Srejović 1988.Pl. IV*), Grivac (*McPherron, Ralph 1970.16*), Banjica (*Tripković 2007.72, 83*), Parţa (*Lazarovici, Lazarovici 2006.228–229; Draşovean 2007.20–21*) and is generally dated to the Late Vinča period.

13 Particularly having in mind most recent DNA analyses from the Late Vinča necropolis at Gomolava that indicate the possibility even of this type of social organization (*Stefanović 2008.97–98*).

Fig. 6. Open areas (squares) surrounded by groups of houses.

Fig. 7. Assumed disposition of main and auxiliary communications within the settlement.

entire settlement. Such a situation is possible in settlements within which there is strong sense of belonging to the community at the settlement level, the feeling of importance of the community at this level, which requires the sacrifice of a portion of individual and family identities for the survival and prosperity of wider community. Such an organisation also assumes a certain degree of hierarchy, the existence of which in the Late Neolithic is usually open to question.

I will not enter into wider examination of the problem of the existence or non-existence of hierarchy in social organisations in Late Neolithic communities in the central Balkans here, but I would like to draw attention to a certain find from Crkvine-Stubline that indirectly suggest the high probability that vertical and horizontal social stratification existed at that time. The unique arrangement of a composition consisting of 43 figurines discovered in a house investigated in 2008 unambiguously indicates that in the mental maps of people of the time there was a sense of complex organisation, which must have existed also in real life in order for it to be materialised in this composition of figurines (*Crnobrnja 2011*).

However, many activities took place outside the settlement: farming, grazing, obtaining essential resources and additional provisions available in the immediate vicinity (wood, water, possibly hunting and fishing).

Cultivable land had a distinct value in farming communities and can not be considered as merely another area of land belonging to the settlement. Cultivable soil is the element which provides crops; special cults and rituals are related to it in all agricultural communities; it has mystical characteristics and is in some way a sacred object.

Therefore, it is very important to direct our considerations to how the inhabitants of large, densely populated settlements like the one at Crkvine-Stubline carried out internal redistribution of cultivable land which was obviously outside the settlement perimeter, and whether they divided the land at all or farmed it communally, dividing only the crops.

If the cultivable land belonged to individual households, there must have been many hundreds of parcels near the settlement. Such a mode of ownership would have been very irrational considering the technology of the time. As a result of an uneven redistribution of land between the families (considering quality and distance of the parcel) conspicuous social stratification would very soon have occurred. Another possibility is that land was cultivated by the combined labour of a few families of the same lineage or from some organisational entity within the settlement (*e.g.*, occupants of house groups around 'squares'). This system of land exploitation and join forces should not be surprising, especially given that even building an average house in the settlement required the joint effort not only of one nuclear family, but at least dozen men in their prime (*Snashall 2002.8; Hofmann* et al. *2009.40*).

On the other hand, such a pattern in the economy and association also assumes the existence of some kind of 'symbolic capital' acquired both by individu-

als as well as the group to which he/she belongs.[14] Cooperative cultivation and division of crops should be understood not only as a joint physical effort resulting only in the division of material gain. This activity also entails joint rituals, the exchange of symbolic capital leading to the reinforcement of the identity of the group/subgroup which carries out work/activities together.

Similar behaviour could be also assumed for the settlement as a whole. Making the ditches which surrounded the settlement required the participation of a very large number of people, if not the entire population that was fit to work for a relatively long period. This volume of work assumes the existence of one or two mechanisms: forced labour or voluntary effort. If we assume some kind of forced labour, this would mean the existence of a distinct group capable of forcing the entire settlement community to work. If we assume voluntary activity, we must assume as well that there was strong sense of identification with the community at the settlement level. Only a strong group identity could have made it possible for people to accept the need to sacrifice and contribute the time and labour of the individual, the family and the group, as well as to invest in certain material goods[15] for the well-being and progress of the entire community. It should be borne in mind that the ditches surrounding and bordering the settlement as well as the act of their construction could have had not only a practical (defensive) but also a symbolic dimension, as some authors have suggested (*Raczky, Anders 2008.37; Chapman, Gaydarska and Hardy 2006.20*).

Either of the two mentioned mechanisms which made investing such a large effort for the communal project of ditch construction possible means that certain at least an initial type of hierarchy was present (*Raczky, Anders 2008.38*).

Settlement cluster

Single permanent settlement regarding its size never makes one self-sufficient entity but belongs to a wider community. Large settlements distinguished by their size are not created only to satisfy the needs of their inhabitants. Large settlements in all periods are also established to satisfy the needs of many small settlements gravitating toward them and simultaneous complex interaction (communication, exchange and cooperation) with lower-ranking settlements (*Doksijadis 1982.73–75*).

The situation we encountered in the immediate vicinity of Crkvine in Stubline is very interesting. Four smaller Late Vinča settlements (covering 1–3ha) lie within a 10km radius, their last occupation horizon being contemporary with the last horizon of occupation at Crkvine-Stubline (Fig. 8). The data on the pedological characteristics of the soil indicate three clearly distinguished possible economic zones:

❶ land suitable for meadows and woodland at Drenski Vis plateau (covering 120km^2),
❷ fertile arable land along the waterways fertilised by flooding every spring (90km^2),
❸ watercourses and marshes abounding in fish in the immediate vicinity.

In the Late Neolithic of the Great Hungarian Plain, discrete settlement clusters of 2 to 7 settlements in which most clusters had one settlement of tell type or one very large horizontal 'super-site' have been recorded by John Chapman (*Chapman, Gaydarska and Hardy 2006.29*), Wiliam A. Parkinson (*2002.410; 2006.43, 53)*, Pál Raczky *(Raczky, Anders 2008.38*).

At the present stage of investigation of sites near Crkvine-Stubline we could not make reliable assumptions about the inter-relations of all these settlements. It might be concluded with certainty that the settlement at Crkvine-Stubline is the largest of them and that settlements are at small distances from each other. The assumed maximum population of somewhat over 2000 inhabitants in the settlement at Crkvine-Stubline (*Porčić 2010.342*) and four more smaller settlements at relatively small distances[16] indicate that a large number of inhabitants was concentrated within a relatively small area in comparison with the assumed population density in the Balkans in the Late Neolithic (*Müller 2007; Chapman 1981.48*) and in the Great Hungarian Plain (*Kalicz 2001.157*). Given the locations of contemporary settlements at Drenski Vis and distribution of cultivable land the question arises as to how the division of resources between these settlements was effected. The co-existence of settlements within a relatively

14 In some modern societies, the existence of the prominent institution of the accumulation of symbolic capital could result in a restriction of the individual by the community to accumulate economic capital (*Bourdieu 1977*).

15 During the construction of defensive ditches, food is provided from private reserves and is not used to satisfy individual or family needs, but the needs of the community.

16 At 1.8 to 6km from Crkvine-Stubline.

small area assumes some kind of agreement between their inhabitants concerning the occupation of farming land, pastures, woodland and hunting grounds. Chapman (*1989. 39*) emphasises that:

"*No matter how large the villages, no matter how complex the exchange and alliance networks integrating these communities, no matter how wide the disparities in communal or individual prestige goods between them, there is no evidence for inter-polity domination at village level in the Balkan Neolithic and Copper Age. Instead, there is evidence for close structural and functional links between parent communities and dispersed farmsteads and between settlements of similar sizes.*"

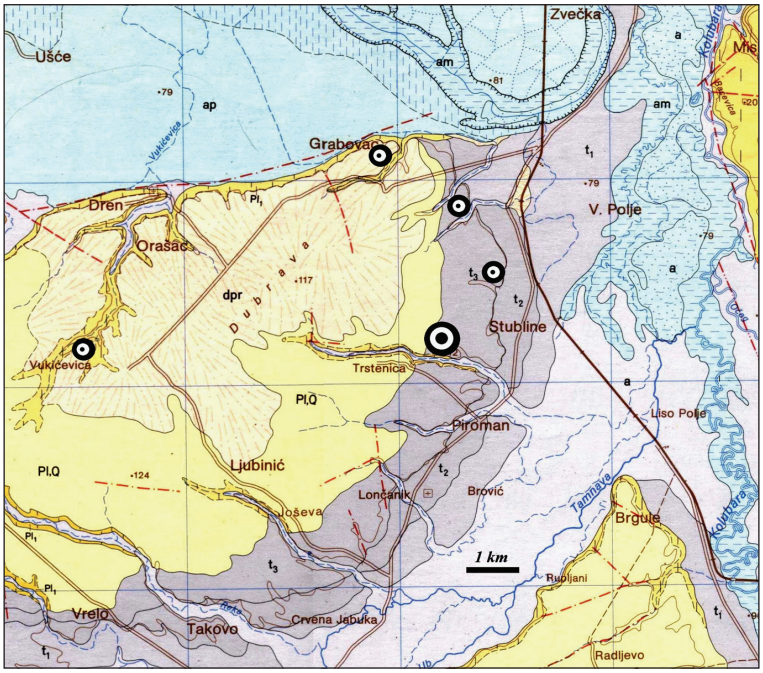

Fig. 8. Location of Late Vinča cultures sites at Drenski Vis (geological map 1:100.000).

If we are to accept this view as probable, the question remains as to how the settlement inhabitants themselves in each such settlement cluster perceived certain types of agreement on co-existence. Was such a relationship sufficient to develop among these people into some sense of belonging to the community created by a few settlements? How were the inhabitants of one such group of settlements perceived by other neighbouring groups of settlements?

Conclusion

I attempted in this work to indicate the possibility of recognising complexities in group identities through an understanding of the basic organisational levels in Late Vinča communities within one micro-region. I will briefly state some preliminary conclusions which perhaps should rather be understood as working hypotheses for future investigations. The levels of social organisation which I identified and which could correspond with certain group identities are as follows:

❶ Single house – belonging to a nuclear family.

❷ Groups of houses surrounding open spaces ('square') – at this level group identity related to lineage or corporate group membership could be assumed.

❸ Settlement – the organisational settlement pattern, assumed communication lines within settlement, division of resources and confirmed communal activities demanding the participation of the entire community bear witness to the existence of a strong group identity at the single settlement level.

❹ Group of settlements – existence of some kind of agreement between settlement inhabitants is necessary for the division of territory and resources; it is not clear whether and to what extent group identity was developed at this level.

It is my view that the sense of belonging to the community, *i.e.* group identity, was strongly developed at the level of house groups within settlements and at the settlement level. On the other hand, whether relations existing within settlement clusters could have created a sense of belonging to the wider community is not known. Was the border within which a sense of collective identity and an exterior of 'others' at the level of single settlements or groups of settlements? What was the potential of large Late Neolithic settlements to establish domination over other settlements or cooperate with them? Can such phenomena in the material culture or landscape be identified, and if so, how? Should we continue to study Vinča culture in order to identify the varieties of material culture in given regions or should we first define the general territorial and social spheres of influence of Vinča culture?

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Social complexity and inequality in the Late Neolithic of the Central Balkans: reviewing the evidence

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ABSTRACT – *The aim of this paper is to review and critically evaluate relevant archaeological evidence regarding recent claims about the social complexity of Late Neolithic societies in the Central Balkans. Theory suggests that the relevant evidence should be related to population size, economic intensification, ranking, and craft specialisation. It is concluded that, although there are indications that inequalities existed and also demographic potential for organisational complexity, there is no unambiguous evidence that institutionalised inequality in the form of complex polities such as chiefdoms or states ever developed.*

IZVLEČEK – *Namen tega članka je pregled in kritična ocena ključnih arheoloških dokazov za nedavno postavljene trditve o družbeni kompleksnosti pozno-neolitskih družb na področju centralnega Balkana. Teoretske diskusije kažejo, da je te dokaze potrebno iskati v velikosti populacij, povečanju proizvodnje, pojavu razredne družbe in obrtni specializaciji. Sklepamo, da kljub kazalcem obstoja družbene neenakosti in demografskega potenciala za organizacijsko kompleksnost ni nedvoumnih dokazov o tem, da se je v tem obdobju kdaj razvila institucionalizirana neenakost v obliki kompleksnih ureditev, kot so poglavarstva ali države.*

KEY WORDS – *social complexity; social evolution; Late Neolithic; Central Balkans; Vinča culture*

Introduction

It is commonly maintained that Late Neolithic and Early Copper Age societies in Europe did not evolve into archaic states of the kind found in Mesopotamia and Egypt. Recently, the question of scale and complexity of Late Neolithic communities in the Central Balkans has been re-opened by several hypotheses about the organisational properties of Late Neolithic (LN) societies in this region: 1) Late Neolithic communities were hierarchically organised (*Crnobrnja 2011; Crnobrnja* et al. *2009; Müller 2012*) 2) Late Neolithic settlements had urban layouts, with houses organised in regular rows (*Crnobrnja 2011; Crnobrnja* et al. *2009; Tasić 2008*), and 3) specialised pottery production might have been present (*Vuković 2011*).

These hypotheses generally imply that LN societies were more complex than previously thought and closer in character to the pre-state or even early state societies of the Near East. In previous studies of the social evolution of LN societies in the Central Balkans a trend of social and economic intensification has been detected (*Bankoff, Greenfield 1984; Chapman 1981; 1990; Kaiser, Voytek 1983; Tringham 1992; Tringham, Krstić 1990*), but no one has claimed that LN communities were anything more than relatively egalitarian kinship-based agricultural societies living in villages. From this perspective, the recent claims might indeed imply a different picture of the Late Neolithic societies in the Central Balkans and take us back to the problem of socio-cultural evolution in the European Neolithic.

In order to investigate this topic in more detail, the primary aims of this paper are: 1) to establish the relevant conceptual framework and relevant dimensions, based on anthropological and archaeological theories of social complexity; 2) to evaluate LN so-

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cieties in the Central Balkans on each relevant dimension. With this approach, we should be able to study the issues of socio-cultural evolution more systematically and understand social structure and social change in the LN of the Central Balkans.

Understanding the social development of LN societies in Balkans is not merely a matter of 'local' interest. The problem of diverging social trajectories in Europe and the Near East is not a new problem; it goes back to the roots of European social archaeology and to the great architect of European prehistory, Gordon Childe (*Sherratt 1989*). Childe was interested in explaining the reasons for this divergence, both empirically and theoretically, by exploring the social development of European and Near Eastern societies (*Chapman 2009; Childe 1958*), and formulating the general mechanisms and archaeological indicators of social evolution towards complex forms of societies such as early states (*Childe 1950; Smith 2009*). The issue of evolution towards complexity has been further elaborated within anthropology and archaeology (*e.g.*, *Blanton* et al. *1996; Carneiro 1970; 1986; 2000; Chapman 2003; Feinman, Marcus 1998; Fried 1967; Johnson, Earle 2000; Kosse 1990; 1994; Marcus 2008; Murdock, Provost 1973; Peregrine* et al. *2004; Price, Feinman 1995b; Price, Feinman 2010a; Service 1971; 1975; Yoffee 2005*). Therefore, the investigation of this problem in the central Balkans has significant theoretical implications for the comparative investigation of the principles and mechanisms of the social evolution of Neolithic societies in general.

Social complexity – conceptual issues

The concept of complexity has a long history in anthropological thought. The social-evolutionary theory of the 19th century was based on the assumption that cultures changed from simple to complex, with the most complex end of this dimension being equated with Western Civilization (*Spencer 1997; Trigger 1998*). Lewis Morgan's (*1877*) developmental sequence of savagery, barbarism and civilization is a classic example of how complexity was conceptualised in the 19th century. In this context, cultural complexity was equated with progress; it was a value-laden, ethnocentric concept.

Neo-evolutionary theory equates an increase in complexity with general evolution as defined by Marshall D. Sahlins and Elman R. Service (*1960*). The general evolution is seen as a sequence of major evolutionary stages: bands, tribes, chiefdoms and states. In the neo-evolutionary scheme, increase in complexity is mainly seen as an increase in social scale and the degree of hierarchy in society.

Attempts have been made to measure complexity by constructing instruments such as socio-cultural complexity scales. Raoul Naroll developed an index of social development, a measure of social evolution and urbanisation, based on an index theory (*Naroll 1956*). His approach was to use specific indicators which have "*low correlations with each other, but high correlations with the phenomenon being measured*" (*Naroll 1956.691*). He used two indicators of social evolution (craft specialisation and organisational ramification) and one indicator of urbanisation (settlement size) to construct a social development index.

Robert Carneiro conceptualised complexity as a *Guttman scale* – an additive scale of cultural traits which could be present or absent (*Carneiro 1962*). Traits were ranked according to their inclusiveness with respect to other traits. A trait which implied the presence (statistically) of several others was ranked higher. If culture A possessed more traits than culture B, it was considered more complex than B. In this way, cultures could be ranked according to complexity. Although Carneiro was criticised for being selective in his choice of cultural traits (*Chick 1997*), the general validity of his approach was indirectly demonstrated on a diachronic sample which showed that cultural complexity measured as a *Guttman scale* does increase through time as expected (*Peregrine* et al. *2004*).

Perhaps the most famous scale of cultural complexity was devised by George P. Murdock. Murdock basically followed Naroll's approach and defined complexity as a composite score of several correlated dimensions: *Writing and records, Fixity of residence, Agriculture, Urbanisation, Technological specialisation, Land transport, Money, Density of population, Level of political integration, and Social stratification* (*Murdock, Provost 1973*).

Garry Chick (*1997*) criticised all these approaches on three grounds: the main problem was that none offered a rigorous definition of the complexity construct – what it is that this construct is supposed to measure. In Murdock's defence, Trevor Denton (*2004*) replied that the cultural complexity scale was never intended to measure a single construct, but to develop a set of criteria to distinguish between stages of development.

The second problem with the complexity scale, noted by both Chick and Denton, was that there was no specified ontology which specified a relationship between other constructs that "*cause and are caused by cultural complexity*" (*Denton 2004.5*). In other words, there was no theory of the causal path and mechanism that linked the indicators and constructs of cultural complexity.

The third criticism was based on the empirical results of the Principal Components Analysis (PCA) of data from the Standard Cross-Cultural Sample (SCSS) (*Murdock, White 1969*), with Murdock's complexity items as input variables (*Chick 1997*). Namely, Chick performed a PCA analysis with *Varimax* rotation on SCSS data and extracted two factors (*Chick 1997. 294*). He interpreted this result as evidence that the items chosen by Murdock do not reflect a single construct, but two independent constructs. Denton accepted the results, but maintained that this was an expected outcome if items were conceived as individual interrelated constructs rather than indicators of a single construct (*Denton 2004*). Denton is right in claiming that PCA results can be interpreted in many ways, but it should be noted that the component loadings shown in Chick's paper (*Chick 1997. Tab. 2*) do not pertain to the original principal components, but to rotated principal components. It is also puzzling that Chick presented the proportion of variance accounted for by the first two *unrotated* components and then went on to interpret the rotated solution. What is more, original unrotated component loadings were never shown in Chick's paper. For this reason, I performed a PCA without rotation on the same SCCS data. Percentages of variance accounted for by the first two unrotated principal components are identical to those reported by Chick (Tab. 1). However, a different picture from that presented by Chick emerges if one looks at the unrotated loading matrix (Tab. 2). It is apparent that all items load positively with relatively high values on the first component, which accounts for the proportion of variance being four times greater than the second. This seems to be consistent with a single construct interpretation, especially given the relatively high *Cronbach's alpha* value of 0.898. So which interpretation is correct, the one-dimensional or two-dimensional?

The results of the PCA *without rotation* and reliability analysis based on *Cronbach's alpha* are consistent with the one-dimensional interpretation of cultural complexity as a single construct, but the results of the PCA with rotation are consistent with the two-dimensional interpretation. It should be noted that the application of the rotation algorithm will *always* result in some solution with more balanced amounts of variance accounted for by rotated factors. From this perspective, it can be claimed that Chick is incorrect in claiming that Murdock's items do not reflect a one-dimensional construct. This problem is analogous to the problem of interpreting the intelligence (IQ) construct: is there a single construct of general intelligence or are there several kinds of intelligence (for an excellent popular account of this problem, see *Gould 1996*). Murdock's complexity scale does measure something, and does so reliably, but the real issue is whether what it measures has a meaningful theoretical interpretation. In this paper, I will align with Denton's (*2004*) position that complexity is not a single construct, but a set of several constructs measured by Murdock's items. We can certainly use a single scale as a summary for all other items for some purposes (*e.g.*, demonstrating the reality of an increase in complexity through time, or ranking societies according to their scale), but for

Principal Component	Eigenvalue	% of Variance	Cumulative %
1	5.282	52.817	52.817
2	1.452	14.517	67.334
3	0.683	6.827	74.161
4	0.607	6.072	80.232
5	0.538	5.377	85.609
6	0.425	4.248	89.858
7	0.311	3.106	92.964
8	0.301	3.008	95.972
9	0.262	2.620	98.592
10	0.141	1.408	100.000

Tab. 1. PCA of the SCCS data; eigenvalues and explained variance.

	Component	
	1	2
Political integration	0.808	0.123
Social stratification	0.796	0.209
Density of population	0.777	−0.395
Technological specialisation	0.744	0.104
Agriculture	0.743	−0.462
Writing and records	0.713	0.481
Urbanisation	0.704	−0.074
Money	0.693	0.113
Fixity of residence	0.686	−0.613
Land transport	0.576	0.622

Tab. 2. PCA of the SCCS data; loading matrix for the first two components.

the purposes of an archaeological investigation of social structure and social change, it is more useful to think of complexity as a multidimensional concept and to evaluate the relevant dimensions independently.

This is essentially in accordance with what archaeologists interested in studying social evolution have suggested – the study of past societies on a set of relevant dimensions concurrently (*Drennan* et al. *2010; Feinman, Neitzel 1984*). This kind of approach is best summarised by Robert D. Drennan and colleagues (*Drennan* et al. *2010.72*):

"*We see no way to avoid recognizing and dealing simultaneously with many dimensions of variability, even though it is conceptually much more difficult than reducing complexity to a few dichotomies or typologies. One way to integrate the information encapsulated in numerous scales of variability is to think in terms of the correlations between dimensions. If high values on some dimensions correspond to consistently high (or low) values on others, these dimensions form 'packages', and knowing that such packages exist gives us patterns to try to make sense of by building theoretical constructs to account for them. To the extent that existing theory implies the existence of such packages, they can be sought in the archaeological evidence as a means to evaluate the theoretical models. The former (bottom-up) way of working by no means contradicts the latter (top-down) approach. They are complementary. Both bring our knowledge of what happened in prehistory together with the theoretical notions that help us understand how it came to happen that way; they come together in the act of empirical evaluation of theoretical models.*"

Starting from this framework, the next logical step is to define the relevant dimensions. If the aim is to explore the degree of organisational complexity of LN societies, it makes sense to use dimensions, which correlate with organisational complexity and can be detected archaeologically. A set of 5 dimensions will be considered in this study: demography, social inequality, economic intensification, craft specialisation, and political strategy (the exclusionary-corporate axis as defined by *Blanton* et al. *1996*).

Archaeological background

The major archaeological phenomenon of the Late Neolithic in the Central Balkans is the Vinča culture, which extended across the region over an area of around 300km^2 (Fig. 1), encompassing Central Serbia, Kosovo, southern parts of Vojvodina, Transylvania, Oltenia, eastern parts of Bosnia and northern parts of Macedonia (*Brukner 2003; Chapman 1981; Garašanin 1973; 1979; 1982*). In calendar years, Vinča culture appears at 5400/5300 BC and continued until 4650/4600 BC (*Borić 2009*). In general, Vinča settlements subsisted on a mixed economy typical of the temperate European climate (see *Barker 1985; Bogaard 2004*): cultivation based on cereals (*Borojević 2006; Bottema, Ottaway 1982; van Zeist 2002*) and animal husbandry dominated by domestic animals such as cattle, pig, sheep and goat, accompanied by wild species such as red deer, roe deer and wild pig (*Blažić 2011; Bökönyi 1988; Dimitrijević 2008; Greenfield 1986; Legge 1990; Orton 2008; Russell 1993*).

Sites from this large geographical area shared a similar material culture (*e.g.*, wattle and daub houses, characteristic black pottery and clay figurines), al-

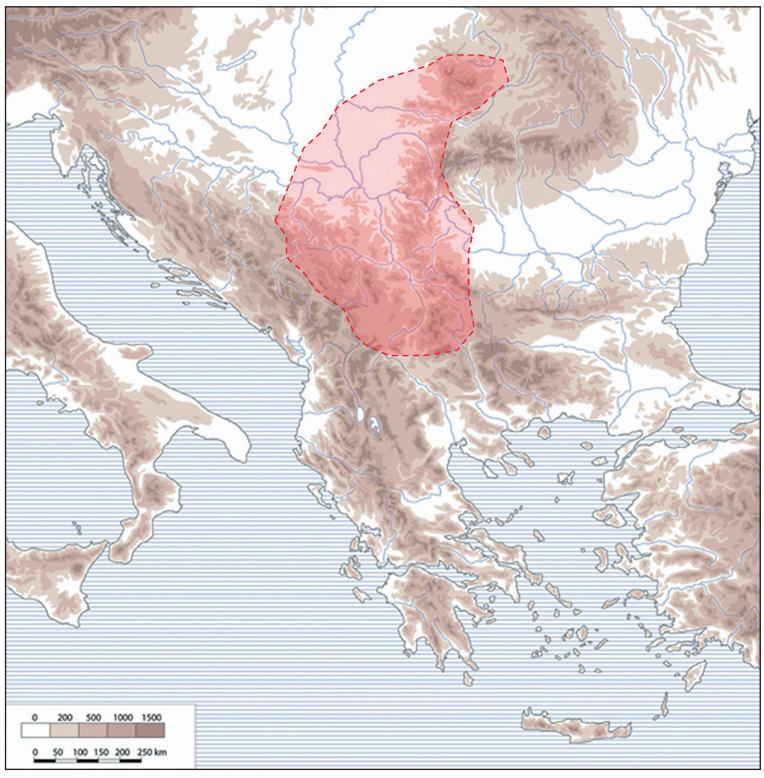

Fig. 1. Approximate distribution of Vinča culture.

though caution should be taken not to conflate this archaeologically defined entity with anthropological and social entities (political, linguistic or ethnic). Therefore, the term Vinča culture should be understood as a technical label.

Reviewing the evidence

Demography

It has been shown in a number of cross-cultural studies that the organisational complexity (often measured by the number of types of political officials, scale of political integration above the local community, or degree of hierarchy and centralisation) of a society is positively correlated with demographic variables such as population size or the population size of the largest community (*Carneiro 1986; 2000; Ember 1963; Feinman 2011; Feinman, Neitzel 1984; Johnson 1982*).

Gregory Johnson (*1982*) offered an explanation for the observed empirical pattern: the ability of a group of people to make decisions by consensus or equal participation is limited by group size. Johnson presented the results of small group studies that suggest that the critical group size is six persons. Above this limit, the group is faced with a scalar stress: humans are unable to process information resulting from the interaction of all group members, which leads to inefficiency in the decision-making process. The problem has two potential solutions: *sequential hierarchies* – the creation of larger basal groups and more levels of decision making (*e.g.*, creating larger households or groups of households which can make decisions by consensus within the group and then send a delegate to negotiate decisions at village level); secondly, *simultaneous hierarchies* – the centralisation of the decision-making process, which results in the rise of managing elites. It should be noted that the number of levels in a sequential hierarchy can be increased only up to a certain point, whereupon the system becomes ineffective because of the long lines of communication between the lowest and highest levels. From this point, simultaneous hierarchy is to be expected.

Efforts have been made to determine the demographic threshold beyond which the organisational change towards complexity (usually toward simultaneous hierarchy) is inevitable. As apparent from Gary M. Feinman's (*2011.41.Tab. 3*) review, most researchers agree that the critical population size is between 2000 and 3000 people. So in the context of this research, we want to know whether the LN communities of the Central Balkans ever reached or crossed this threshold. This is a very conservative test, however, because if the settlement population crossed the threshold, we can be almost certain that hierarchy must have been present. If not, then we have only the absence of evidence, not the evidence of absence, since a community might have consisted of more than a single settlement at the regional level.

To answer this question, population size estimates were made for several LN sites in the Central Balkans with relatively good settlement data. Three estimates are used:

❶ A maximum population size estimate, based on the assumption that an entire area of the settlement was in contemporaneous use. This is obviously a problematic assumption in most cases (*Porčić 2011*). The estimate is derived by multiplying the (estimated) total number of houses by the estimated average household size. The total number of houses is estimated by the simple proportional extrapolation of the number of excavated or surveyed houses to the unexcavated area. For example, if 50% of a site area was detected by magnetometer and 40 houses were detected, the estimated total number of houses for the entire site is 80. The average household size is estimated by dividing the average house floor area by the conversion constant of 7m^2/person (*Porčić 2012a*).

❷ An average population size estimate based on the premise that population size was more or less constant during a settlement's history and that only parts of the settlement were used simultaneously. This estimate is calculated by solving Schiffer's (*1976; 1987*) discard equation, which describes the accumulation of houses in the archaeological record for the systemic number of houses, assuming that the average use-life of houses was 40 years. This estimate was calculated only for sites where the duration of the settlement is known from ^{14}C dates.

❸ Final population size estimates based on the logistic model of population growth (*Porčić 2011*).

The results are shown in Table 3. Population size estimates suggest that the scalar stress threshold was unambiguously crossed only in the case of Divostin and Stubline and only if the least realistic estimation procedure (which assumes that all houses are contemporaneous) is used. It should also be noted that the projection for Divostin is based on 1.17% of the total site area, which makes it highly unreli-

able. Therefore, there is no firm evidence that settlement communities crossed the scalar stress threshold unless the majority of houses at Divostin and Stubline were in contemporary use.

Social inequality – vertical status differentiation

The importance of determining the presence, degree and type of social inequality in a prehistoric society for the study of its social structure and evolution cannot be underestimated. This is best expressed by Douglas T. Price and Gary M. Feinman (*2010b.2*):

"*Social inequality, the organizing principle of hierarchical structure in human society, is manifested in unequal access to goods, information, decision making, and power. Status is the determinant of social position, and status differentiation is the foundation of inequality. A variety of human conditions are used in ordering social hierarchies and in determining status and access. These include age, gender, birth order, class, race, and a number of others. Social inequality is a characteristic of virtually every society on earth today and its history goes back thousands of years. This structure of unequal relations, of status differentiation, is essential to higher orders of social organization and is basic to the operation of more complex societies.*"

Norman Yoffee (*2005.35*) also considers inequalities in economic production and exchange as a necessary precondition for the development of complex society forms such as states.

It should be emphasised that inequalities of various kinds are always present in every human society (*Flanagan 1989*); they may often arise as a result of chance (*Mayhew, Levinger 1976; Mayhew, Scholaert 1980; Pauketat 1996*). So, as Price and Feinman note (*1995a.4*), the real question is not whether inequality was present, but what was the degree and nature of the inequality – *e.g.*, was it institutionalised. This is a traditional issue in social archaeology – to determine the degree of social inequality within a given society. This kind of analysis is usually undertaken with two classes of data – household data and funerary data (*Wason 1994*). The general aim is to determine the magnitude and pattern of inter-household or inter-individual variation in indicators of social status. In household archaeology, these indicators are house size or house area and the attributes of house inventory. In funerary archaeology, the indicators are the attributes of grave construction and grave goods.

The *Gini coefficient* is often used in anthropology and economics as a formal measure of inequality in the distribution of a currency (*Dorfman 1979; Gastwirth 1972; Smith* et al. *2010*). The Gini value of 0 indicates that the currency is perfectly equally distributed, while values close to 1 (the highest value that Gini can attain) indicate that the largest share of the currency is held by a minority of the population. Gini coefficients are calculated for two kinds of 'currency': 1) distribution of house floor areas 2) diversity of grave good materials from the only well-recorded LN necropolis in the Central Balkans at Gomolava Ib (*Borić 1996; Brukner 1980*).

The results for household data suggest that differences in house sizes between households were not great (Tab. 4; Fig. 2). However, at Divostin IIb, the correlation between pottery assemblage size[1] and house floor area is relatively high and close to being marginally significant at the 0.05 level ($r = 0.712$, one-tailed $p = 0.053$, see Fig. 3). More importantly, copper or malachite artefacts are predominantly found in the group of large houses – a single copper bracelet was found in house 14 (*McPherron, Srejović 1988*). This pattern may be interpreted as indicative of incipient ranking (for a detailed discussion see *Porčić 2012b*): larger households have a larger labour force available to intensify production and create surpluses which would enable some households to gain an advantage over others. The association of copper items with large households may indicate their higher status.

The value of the *Gini* coefficient for the diversity of grave good materials from Gomolava

Site	Population size estimate			House data source
	Maximum	Average	Final	
Divostin IIb	8200	1061	868–2684	(*McPherron, Srejović 1988*)
Gomolava	460	53	70–258	(*Brukner 1980*)
Mali Borak	115			(*Marić 2011*)
Stubline	4000			(*Crnobrnja* et al. *2009*)
Uivar	420	44	90–325	(*Schier 2008*)
Parta 7b	823	329		(*Lazarovici* et al. *2001*)
Parta 7c–6	1575	630		(*Lazarovici* et al. *2001*)

Tab. 3. Population size estimates.

1 Pot counts for Divostin houses from Porčić (*forthcoming*); house floor areas from Tripković (*2009b*).

Site	Gini coefficient	Data source
Divostin IIa	0.2	*McPherron, Srejović 1988*
Divostin IIb	0.15	*McPherron, Srejović 1988*
Gomolava Ib	0.14	*Brukner 1980*
Mali Borak	0.11	*Marić 2011*
Parţa 7a	0.14	*Lazarovici* et al. *2001*
Parţa 7b	0.28	*Lazarovici* et al. *2001*
Parţa 7c	0.36	*Lazarovici* et al. *2001*
Stubline	0.24	*Crnobrnja* et al. *2009*
Uivar	0.24	*Schier 2008*

Tab. 4. Gini coefficients for house areas from LN sites in Central Balkans.

cemetery is 0.443. An important fact should be mentioned about the Gomolava graves: DNA analysis showed that these were all male individuals of the same patrilineage (*Stefanović 2008*). The duration of the cemetery was estimated to be approximately 50 years, or two generations (*Borić 2009.227*). This is important information, because it may suggest that, regardless of the inequality or equality of the distribution of grave goods, only one lineage might have had access to the burial area within the settlement.

Economic intensification

Economic intensification is also an important aspect and precondition of complexity. One reason for this is ecological – more food and energy is needed to sustain larger populations. The other reason is social – the elaboration of society and culture requires increases in energy output. For example, processes of vertical and horizontal differentiation in a society produce social positions such as managing officials or craft specialists who do not produce their own food. Their positions need to be supported by the rest of the society, meaning that people who produce food must be producing more to meet the requirements of the entire population. The intensification of production can take many forms, *e.g.*, via technological advance or economies of scale. The consequence is that the domestic mode of production (*Sahlins 1972*) or peasant economy (*Chayanov 1986*) gives way to a production system that produces surpluses.

Lightfoot and Feinman's (*1982*) study provides an excellent example of how these issues can be investigated archeologically. A similar attempt was made to investigate the production of surplus at the LN site at Okolište in Bosnia (*Müller 2010*). Although Müller's study is based on data from a site of the Butmir culture, which is not in the focus of this study[2], it is important to report and discuss its results, given that Butmir culture is also a LN culture of the Central Balkans, analogous in many ways to Vinča. Müller (*2010*) calculated the area of cultivated fields necessary to support each household and also estimated the intensity of agricultural production for each of the seven households identified in the excavated area. The number of quern stones from the household area was used as a proxy measure of the intensity of production. It should be emphasised that the household inventories used by Mül-

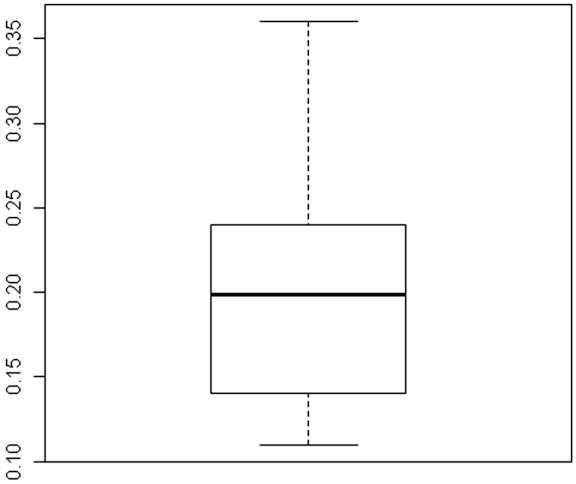

Fig. 2. Boxplot of the Gini coefficients for house floor areas.

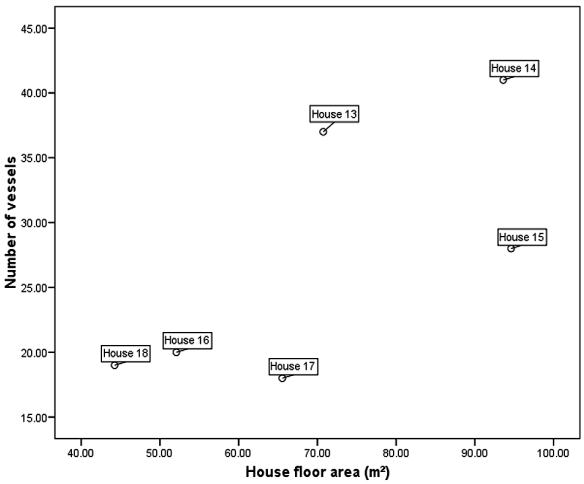

Fig. 3. Plot of house floor area and total number of vessels for Divostin houses.

2 This decision was made for practical reasons only – most of the evidence available to the author comes from the Vinča culture contexts because the Vinča data is from the Republic of Serbia. The Late Neolithic in Bosnia is in many respects similar to the Late Neolithic in Serbia, and a future study should also include sites from this area.

ler were not closed finds from houses, but items found in layers corresponding to the positions of houses, as well as items found in layers between houses (*Müller 2010.54*). In theory an increase in the number of consumers in a household (the area of the house and its immediate surrounding was used as a proxy for household size) should be followed by a proportional increase in the intensity of production[3]. The implication is that all households should be on a single line relating the number of consumers to the level of agricultural production (*Sahlins 1972.110–111*). If intensification had occurred, some households would have under-produced and some would have over-produced, which should be detectable as a deviation from the line – underproducers being under, and over-producers above, the theoretical line. Müller (*2010*) concluded that his results (reproduced in Fig. 4) could be interpreted as evidence of economic and, therefore, social intensification, with low status households becoming dependent upon high status households.

Another approach is to look for evidence of changes in subsistence in the LN of the Central Balkans, especially changes that indicate intensification. It has been observed that, on the whole, the quantity of cattle bones in zoo-archaeological assemblages from LN sites in the Central Balkans tended to increase (*Orton 2010; 2012*). This can be interpreted as intensification aimed at meeting the food requirements of a growing population, but it can also be interpreted as an investment in the social arena. Nerissa Russell (*1998; 1999*) suggested that cattle were probably used as a measure of wealth in these societies. The increase in the proportion of cattle may indicate the accumulation of wealth and competition, which resulted in social inequality or perhaps even the horizontal reorganisation of the community, a possible differentiation of pastoral and agricultural sectors, as suggested by David Orton (*2010*) in a recent paper. It is interesting to note that the presence of transhumance was also hypothesised for LN communities in Bosnia, but it was interpreted as a factor which decreased complexity (*Müller-Scheeßel* et al. *2010*).

Craft specialisation

Closely related to economic intensification is craft specialisation. In a narrow sense, specialisation or a specialised division of labour is what complexity is all about: differentiating the system and increasing the number of connections between its constituent parts. The presence of craft specialisation was established long ago as a key criterion for diagnosing the presence of a complex social organisation (*Childe 1950*). While this observation is valid in general, recent studies have shown that this relation is not so simple, and that specialisation itself is also a multidimensional phenomenon (*Brumfiel, Earle 1987; Costin, Hagstrum 1995; Feinman 1999; Feinman, Nicholas 2000*). For example, a specialist can be independent or attached to a patron; specialised production can be full-time or part-time, small-scale or large-scale. Different social and economic conditions may favour different kinds of specialisation: *e.g.*, independent specialisation may develop as a response to resource diversity and population growth, urbanisation, market development and stable demand, while attached specialisation is related to elites and their need to control production (*Brumfiel, Earle 1987.5–6*), especially of luxury items.

In archaeology, the presence of specialisation is usually diagnosed indirectly by studying the degree of standardisation in technology (*Blackman* et al. *1993; Costin, Hagstrum 1995; Eerkens 2000; Eerkens, Bettinger 2001; Roux 2003*). The most common approach is to study standardisation by looking for the uniformity of raw materials or the variation in met-

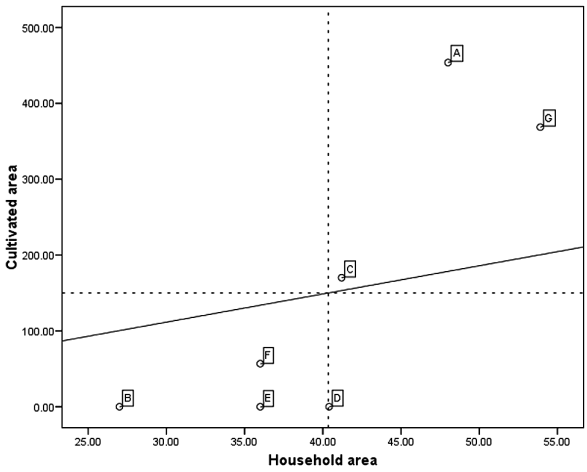

Fig. 4. Expected and reconstructed intensity of agricultural production in LN Okolište (data from* Müller 2010.54, Abb.3*). The solid line is the theoretical line of expected intensity of production conditional on household size; dotted lines intersect at the centroid of the sample, the* x *coordinate being the mean household area and* y *coordinate being the mean expected area of cultivated fields for a given sample of households.

3 Expected intensity of production for each household area was measured by the estimated area of cultivated fields needed to satisfy the needs of a household, while the actual intensity of production was measured as an area of cultivated field calculated as a function of the number of excavated querns within that area.

ric attributes. The general idea of the latter is that low variation (measured by the coefficient of variation) indicates standardisation, while high variation indicates the absence of standardisation. In some instances, this is confirmed by the results of ethno-archaeological research (*Roux 2003*), but it has also been challenged by other ethno-archaeological studies (*Arnold 2000; 1991*). The link between standardisation and specialisation does hold in general, but is not deterministic. However, an additional problem for analysing standardisation in archaeological contexts is the fact that archaeological assemblages are the result of a cumulative process – deposited pottery is produced by different people at different times – so the variation in metric attributes will always be greater because of the cumulative blurring effect (*Blackman* et al. *1993*).

In a recent study, Jasna Vuković analysed the metric attributes of ceramic bowls from two Late Vinča sites, Vinča (the eponymous site) and Motel Slatina. She found that the coefficients of metric attributes were low, especially the coefficients of variation in the ratios of metric attributes, and concluded that this might suggest that specialisation was present in the LN (*Vuković 2011*).

Another technological domain where craft specialisation is an important topic is metal production. The LN communities in the Central Balkans were familiar with copper metallurgy (*Borić 2009; Jovanović 1971; Radivojević* et al. *2010*) from the beginning of the 5th millennium BC. When copper metallurgy is in question, there is no doubt that highly specialised knowledge was absolutely necessary for copper production (*Ottaway 2001*). However, the scarce evidence for copper production at this time cannot be used to estimate the level of specialisation, although approximately 4.7 tons of typologically distinctive massive copper artefacts are known to have circulated in the area (*Chernykh 1978; Todorova 1981*). Traces of copper smelting activities were detected at sites such as Belovode (*Radivojević* et al. *2010*), Gornja Tuzla (*Glumac, Todd 1991*) and Selevac (*Glumac, Todd 1991; Glumac, Tringham 1990*). Multiple exchange networks of raw materials (ores), ingots or finished artefacts within the 5th millennium BC Balkans have been identified through provenance analysis. For instance, metal for typologically identical artefacts from Pločnik (hammer axes) comes from at least four different copper sources from across the Balkans (*Pernicka* et al. *1997*). Similarly, provenance studies show that the metal produced in Belovode was used to make a handful of copper implements discovered in several contemporary sites in the region (*Radivojević* et al. *2010.2785*).

Exclusionary-corporate dimension

One of the key dimensions in the contemporary theory of socio-cultural evolution is the corporate-exclusionary axis, or the distinction between the corporate and network political strategies as presented in dual-processual theory (*Blanton, Fargher 2008; Blanton* et al. *1996*). As defined by Blanton and colleagues (*1996*), exclusionary strategy is characterised by tendencies of political actors to create elite networks and monopolise flows of goods and information. In other words, they base their power on personal dominance and patron-client relationships. This kind of strategy leads to hierarchical and authoritarian social structures cantered on small ruling elites. In corporate strategy, "*power is shared across different groups and sectors in society in such a way as to inhibit the exclusionary strategies*" (*Blanton* et al. *1996.2*). Corporate strategies do not preclude the formation of hierarchy or complex social forms; it is merely that the power is differently acquired and deployed. Blanton and colleagues (*1996*) note that both strategies are present in each society, but one is usually dominant. Therefore, these two strategies do not represent fixed social types; at some point in time, network strategy may be dominant, while at some other point the society can switch to corporate strategy. These two strategies also have material correlates, *e.g.*, in network societies there will be a stronger tendency to signal vertical status through lavish burials, big residences, and prestigious and exotic items (*Blanton* et al. *1996; Drennan* et al. *2010*). For this reason, we should expect to find more conspicuous indicators of inequality in network-oriented groups than in corporate groups.

Boban Tripković (*2009a.292–297*) observed that LN settlements in the northern area of the Vinča culture (sites at Vojvodina and sites close to the Danube) differ from contemporaneous settlements in the south (central and south Serbia). He noted that the northern group is characterised by small houses (implying nuclear family households) and the presence of exotic materials such as *spondylus* and obsidian (see *Dimitrijević, Tripković 2006; Tripković 2004*), while large houses (implying extended or multifamily households) and the reliance on local raw materials are typical of the southern group. Tripković interpreted this pattern as a reflection of the underlying social and ideological differences between these two regions – the southern group hav-

ing relatively closed societies oriented towards corporate and collective values, and the northern group being more competitive and individualising, as evidenced by the creation of networks of exchange for exotic goods. Translated into terms of dual-processual theory, this would mean that there were network-oriented groups in the north, and corporate-oriented groups in the south.

Discussion

In this section, the evidence will be discussed from the perspective of the main research question – where are the LN societies in Central Balkans on various dimensions of social complexity? The central issue turns on the interpretation of the data: if, and to what degree, they indicate complexity and inequality.

Regarding population size and scalar stress, there is evidence that settlements existed with population sizes measuring in the hundreds and with a regular layout of houses reminiscent of urban planning (*e.g.*, Stubline and Vinča). Moreover, there is additional data showing that communal projects such as ditches and palisades were constructed around a great number of LN settlements in the Central Balkans, indicating that people living in the same village constituted a single community (*Tripković 2009a*). But is this evidence sufficient to conclude that these were actually towns or proto-urban settlements? The argument concerning urban planning is not strong, because the key criteria for distinguishing between villages and towns are socio-economic, not spatial. Gordon Childe noted that no specific elements of urban planning can be proved to be characteristic of early city states (*Childe 1950.16*). Given the estimated population size of some sites, there was certainly demographic potential for a hierarchical and complex society. However, there is no unambiguous proof that any of them crossed the scalar stress threshold, which would be a sufficient condition to claim for the existence of social hierarchy in Vinča communities.

It has already been mentioned that the Divostin site included several large households. This is also true of the site at Stubline (*Porčić 2010.261–268*). For both of these sites, the estimated average household size is around 8 persons (*Porčić 2010*). Tripković (*2009b*) demonstrated that the large houses and households at Divostin were a result of the household continuity strategy practices of some households. The creation of larger households through a household continuity strategy could have been a way to accumulate labour and intensify production, motivated by the desire to achieve higher status (*Porčić 2012b*). This interpretation would be in accordance with Crnobrnja's (*2011*) proposition that LN societies in the Central Balkans were hierarchically structured where individuals were unequal in their status. Johannes Müller's (*2010*) study of social inequality in Okolište comes closest to demonstrating such a scenario. However, Müller's study, conceptually ingenious as it is, can be criticised on several grounds:

❶ The analysis does not take into account formation processes; it is simply assumed that the spatial layout of querns in the cultural layer directly reflects their primary context of use and deposition. Such an assumption may lead to a conflation of the systemic and archaeological contexts (*Schiffer 1976; 1985*). This may be a valid assumption in some cases, but given the complexities of the formation processes of LN tells in the Central Balkans (*Chapman 2000a; 2000b; Chapman, Gaydarska 2007*) it would be necessary to demonstrate empirically that the items found within and around houses represent *de facto* refuse or primary refuse, or that secondary refuse from a particular house was deposited in the vicinity of that house.

❷ The validity of the number of querns as a correlate of agricultural intensification is problematic. Why should the increase in agricultural output scale linearly with the number of quern stones?

❸ The way that data are organised might have biased the results. Some houses were not completely excavated, so the demonstrated high correlation between household area and number of querns may be a product of this bias. If the querns were distributed more or less uniformly in the cultural layer, then one would expect to find more querns in larger areas. In this scenario, the number of querns would depend only on the size of an excavated area, producing the same pattern of correlation.

Therefore, socio-economic intensification is a good candidate for explaining the appearance of large households, but it is far from being sufficiently corroborated by empirical evidence. Moreover, the motivation for making larger households might have been completely different. Gregory A. Johnson (*1982*) noted that one way to counter the formation of centralised hierarchies and enable the functioning of a relatively egalitarian decision-making process is to create larger households and thus reduce the number of independent units that need to reach con-

sensus in the process. Taking into account the fact that large houses are usually associated with large sites such as Divostin and Stubline, where scalar stress was higher than in smaller settlements (*Porčić 2010; 2011*), the observed patterns may not be interpreted as a trend towards higher inequality, but as an attempt to avoid centralisation and stratification by creating sequential hierarchies. Additionally, data from sites which were extensively surveyed by magnetometer, like Uivar (*Schier 2006; 2008*) and Stubline (*Crnobrnja* et al. *2009*), show that the Gini coefficients based on the distribution of house floor area are low. After all, it has been shown that the socio-cultural trajectories of societies with large villages can be very different and do not necessarily lead to state formation (*Bandy 2004; 2008*).

There are also two important observations that might suggest that considerable social inequality existed in Vinča culture societies: the association of copper items with the largest houses and the exclusive access to the settlement cemetery for members of a single patrilineage. Caution must be exercised in order not to over-interpret these observations. Firstly, the association of copper items and large households is present only at Divostin and is based on data drawn from a very small number (6) of excavated houses. Secondly, the meaning and function of copper artefacts in LN societies is not fully understood (see *Greenfield 1999; Jovanović 1971; Orton 2008. 268*); they might have been status markers, as hypothesised for the Gomolava necropolis (*Borić 1996*).

The fact that individuals interred at the Gomolava cemetery all belonged to a single patrilineage may be an additional argument for demonstrating inequality embodied through exclusive access to the intramural cemetery for members of a single descent group, but an alternative explanation can also be offered: the patrilineage interred at the cemetery was not privileged, but was the only lineage or the most numerous in the settlement. This would mean that the cemetery population is a reflection of the entire male population of the settlement. There seems to be a good match between the average population size estimate of 53 people, and the number of individuals in the cemetery multiplied by 2 to account for the missing females ($28 \cdot 2 = 56$). These two values are not directly comparable, because the number of people in the cemetery is a result of a cumulative process, but the average male population size can be estimated from the number of interred individuals using the standard formula[4] (*Acsádi, Nemeskéri 1970.65*). The value of this estimate is 20 males, which translates into a total of 40 people when females are taken into account. This is also very close to the average population estimate of 53 people based on the number of houses. However, the hypothesis that the kin group buried in the cemetery was the only lineage in the settlement rests upon the assumption that the population was stationary. Judging by the increase in the number of houses through time in Gomolava, this assumption seems questionable (*Porčić 2010.344–345*). If the population was growing, then the final population size estimate is more realistic, but the number of interred individuals is too small to assume that it reflected the entire living male population. Of course, it is always possible that there is a more trivial explanation, that individuals from other descent groups were buried in the unexcavated portions of the settlement. But even if the hypothesis that a single descent group or parts thereof had exclusive access to this cemetery seems true, this may still be interpreted as evidence of ranking, not necessarily stratification (*sensu Fried 1967*).

The inventory of both the largest house at the site at Divostin (*McPherron, Srejović 1988*) and one of the Gomolava graves included copper bracelets (*Borić 1996; 2009; Brukner 1977; 1980*). The social meaning and function of copper items is closely related to the issue of craft specialisation. Which people possessed the technological knowledge to smelt copper? Does their presence alone indicate the existence of elites or a stable market indicative of political integration above the local community? It is a common assumption that the presence of metallurgy implies hierarchy and elites interested in the control of metal production and distribution, but this view has recently been challenged (*Bartelheim 2009; Kienlin, Stöllner 2009*). There are models, which do not require the existence of elite patrons who commission specialised metallurgists. For example, Stephen Shennan presented a hypothesis, based on *Ricardo's* 'law of comparative advantage,' that entire communities could have specialised in producing metals and exchanged the products for farming produce with farming communities (*Shennan 1999*). In this scenario, elites are not required to sponsor metallurgy; what is needed for such a specialised system is a constant demand for metal products.

4 The expectation of life at birth was assumed to be 26.9 years, which is an empirically derived estimate for the Neolithic (*Acsádi, Nemeskéri 1970*).

Things are also complicated by the potential specialisation of pottery production. Vuković (*2011*) has shown that the variation of several metric attributes is within the range expected for specialisation when cumulative blurring is taken into account. Vuković calculated the coefficients of the variation in ratios of metric attributes, with the result that some of the resulting values were below or close to the *Weber fraction* (3%), which reflects the accuracy of human perception (*Eerkens 2000*). However, the value of 3% was empirically determined only for one-dimensional variables such as length; it is not known if the same error rate applies to the ability to distinguish between shapes. Whatever the case, even if there were pottery specialists in LN villages, production might still have been at the household level and was not necessarily a full-time specialisation (*Vuković 2011*).

Conclusion

The general conclusion of this study is that there is no unambiguous evidence of institutionalised inequality and stratification in LN communities in the Central Balkans, barring fragmentary evidence of social ranking. Although the demographic and technological potential for the evolution of complex and hierarchical societies (*e.g.*, chiefdoms) was present, there is no proof that these developed in the LN of the Central Balkans. Given that LN societies in the northern areas of the Vinča culture were probably network oriented, the eventual development of complex chiefdoms and proto-urban societies would be most readily detectable in this region. No such development has thus far been observed in the archaeological record. The current evidence does not allow us to speak of the LN civilisation, towns or supra-regional polities.

It should be emphasised that the available evidence for almost every aspect of LN societies in the Central Balkans is scarce due to the fact that there have been very few large-scale excavations. The available data barely allows any generalisations. For this reason, scholars interested in this topic should make general claims with great caution, while inferences about the social system should not be based on a single criterion.

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BACK TO CONTENTS

Creating identities in the mortuary arena of the Greek Final Neolithic: a contextual definition of practices in Central and Southern Greece

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ABSTRACT – *It is generally accepted that the Greek Final Neolithic witnessed many social and economic changes. However, few studies have explored the archaeological material of the period in a systematic and fully contextual manner. After analysing new material from a rescue excavation at Proskynas in east Lokris, central Greece, in combination with previous evidence, it is clear that most of our knowledge has come from the funerary domain, where acts of consumption and display of material culture took place. These included the deposition of artefacts in a mortuary context and in pits dug into the bedrock in the vicinity of the graves. The aim of this paper is to provide a contextual approach of the social and mortuary practices of the period in central and southern Greece and discuss their role to the creation of cultural identities. It is also suggested that these collective acts that occur primarily within the funerary domain may also imply a shift of interest from the domestic to the mortuary arena, which emerges as a new place for social negotiation at the end of the Neolithic period.*

IZVLEČEK – *Splošno sprejeto je mnenje, da je v grškem končnem neolitiku prišlo do mnogih socialnih in ekonomskih sprememb. Le malo je študij, ki so se sistematično ukvarjale z arheološkim materialom in konteksti tega obdobja. Po analiziranju novega materiala z zaščitnih izkopavanj na najdišču Proskynas v vzhodnem Lokrisu, osrednja Grčija, in prejšnjih podatkih, je postalo jasno, da je naše vedenje večinoma povezano s pogrebnimi praksami, pojedinami in razkazovanjem materialne kulture. To vključuje tudi polaganje predmetov v grobne kontekste in jame, vkopane v skalno podlago v bližini grobov. V članku se ukvarjamo s socialnimi konteksti in pogrebnimi praksami v tem obdobju v srednji in južni Grčiji in analiziramo njihovo vlogo pri oblikovanju kulturnih identitet. Ocenjujemo, da so skupinska dejanja, ki so se dogajala v okviru pogrebnih praks, morda pomenila odmik od hiše h grobišču kot novem prostoru socialnih delovanj in pogajanj ob koncu neolitskega obdobja.*

KEY WORDS – *Final Neolithic; central and southern Greece; mortuary practices; pits; structured deposition; identity*

Introduction: the chronological background

For several decades in Greek prehistory, a division of the Neolithic and Bronze Age in units of three for each particular period has been established[1]. The Neolithic has been divided into Early, Middle and Late and each of them, except for the last, was further divided into three parts, a system mostly utilised in Thessaly and the Peloponnese (*Demoule, Perlès 1993.398*). Nevertheless, the efforts to group Neolithic cultures according to this tripartite chronological terminology do not seem to depict the reality successfully.

In south-eastern Europe, the millennium that starts at the mid 5th millennium BC forms a period that

1 Wace and Blegen established in 1916–18 a relative chronological system for the Bronze Age on the Greek Mainland, calling it '*Helladic*', in parallel to Cretan finds, called '*Minoan*'.

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does not fit into the classic three-age system, and how it is approached implicitly determines the terminology employed (*Bankoff, Winter 1990*). In Greece, the later stages of the Neolithic spanning from 4500 BC to 3500/3300 BC or 3100 BC (*Andreou* et al. *1996.538; Johnson 1999; Tomkins 2009.127*) are rendered by the German archaeologists (in Thessaly) as belonging to a Chalcolithic period (*Wace, Thompson 1912; Alram-Stern 1996; 2003*), according to the terminology in Asia Minor and the northern Balkan peninsula, while in recent decades, especially for southern Greece, the term 'Final Neolithic' has been used (*Phelps 2004.103*). The term 'Final Neolithic' (hereafter FN) as used in this paper, was suggested by Colin Renfrew (*1972.68–80*) to define the character of a cultural horizon of the last Neolithic phases, characterised by relatively homogeneous pottery assemblages in the areas of Attica, Euboea and the north-western Cyclades (the so-called 'Attica-Kephala culture', named after the excavation at Kephala (Fig. 15.14) on the island of Kea). On the other hand, some scholars (*Zachos 1987.3–5; Coleman 1992a*) prefer the term 'Late Neolithic II', because this period lasted well over 1000 years, covering most of the Late Neolithic.

What is generally accepted, however, is that this extremely long period witnessed many social and economic changes, such as intensive exploitation of the marginal land of the Greek landscape (*Runnels, van Andel 1987; Demoule, Perlès 1993; Watrous 1994; Cavanagh 2004; Tomkins 2008; 2009*), the introduction of metals and metallurgy and wide-range exchange links (*van Andel, Runnels 1988; Perlès 1992.154–155; Broodbank 2000.163*). In terms of pottery, it is characterised by an increase in coarse pottery and vessels fired at very low temperatures, often bearing traces of burning on their surface (*Demoule, Perlès 1993.401; Vitelli 1999.65; Cavanagh 2007*). It is argued that all these new vessels, including a variety of pithoi, jars and deep bowls, would have served new uses, associated with practices of storing and processing food (*Halstead 1995.17; Vitelli 1995.58*).

Most of our archaeological knowledge of this period in southern Greece was based on the excavation of the Kephala cemetery on Kea (*Coleman 1977*) and the cemetery of Tharrounia (Fig. 15.15) on the island of Euboea (*Sampson 1993*), where small built graves were investigated. The rest of our information comprised preliminary reports on material from excavations both at open air sites and in caves of the central and southern Greek mainland and the islands, such as that from the Acropolis North slope (*Immerwahr 1971*), Eutresis (Group II) in Boeotia (*Caskey, Caskey 1960*), Lerna (*Caskey 1957; 1958; 1959; 1960*) and the Franchthi cave in the Argolid (*Vitelli 1999*), the Zas cave on Naxos (*Zachos 1999*) and many other sites, such as those included in Phelps' study of the Neolithic pottery sequence in the Peloponnese (*Phelps 1975; 2004*). The evidence for the Final Neolithic has improved notably through intensive surface surveys (*van Andel* et al. *1986; Runnels, van Andel 1987; Wells* et al. *1990; Runnels* et al. *1995; Cavanagh* et al. *2002*), while new excavated domestic remains include the fortified sites at Zagani in Attica (*Steinhauer 2001*) and Strophylas on Andros (*Televantou 2008*), where occupation seems to continue into the Early Bronze Age (but the material is currently under study).

However, since most of the traditional archaeological research in Greece (*Tomkins 2008.21*) has so far been concerned mainly with describing the pottery style and cultural relations with other regions, few studies of FN archaeological material have explored the relationship between the elements of the material culture of the period in a systematic, focused and fully contextual manner. The recent research at the site at Proskynas in the province of Phthiotis in central Greece, in combination with all previous evidence, proved to be fundamental to a better understanding of the social and mortuary practices of the period. At the same time, it gave rise to further questions and archaeological discussion.

The site at Proskynas, central Greece: a case study

The site at Proskynas (Fig. 1) next to the modern village of that name is located on a low hill of soft limestone in the area of east Lokris in central Greece. The site overlooks a small, fertile valley, while the Euboean Gulf is situated 3km to the north. The wooded foothills of Mt. Chlomon, dividing east Lokris from neighbouring Boeotia, rise immediately to the south.

The area of east Lokris (Fig. 1), a narrow, coastal zone and the south-eastern district of the province (nomos) of Phthiotis, has been a field of interest for archaeologists since the early 20th century. Many rescue and systematic excavations of Bronze Age settlements and cemeteries have enriched our knowledge about the whole period (*Dakoronia* et al. *2002*). Nevertheless, when the investigation of the Neolithic period is concerned, very little has been

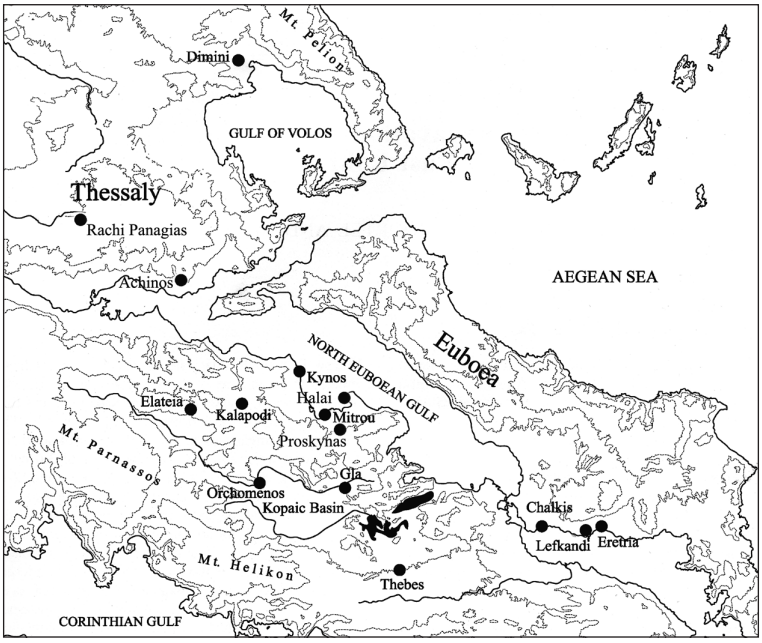

Fig. 1. Map of east Lokris indicating Proskynas and other prehistoric sites (adapted from* Van de Moortel and Zahou 2006.Fig. 1*).

done in this region. A significant site close to the coast of the Gulf of Euboea has been located at Theologos (ancient Halai) (Fig. 1). The earlier excavations were carried out from 1911 to 1935 by Hetty Goldmann and Alice Walker Cosmopoulos (*Goldmann 1940*), while John Coleman's fieldwork in the past 15 years has revealed deposits dating back to the Early and Middle Neolithic (*Coleman 1992b*). Other important sites that usually appear as mounds (*magoules*) have been located in northern Phthiotis and in the western part of Lokris (*Alram-Stern 1996.305–311*), such as at Elateia (Fig. 1). However, archaeological investigation here was limited and its unpublished material is known through Weinberg's (*1962*) preliminary report.

The excavation and occupation phases

The rescue excavation at Proskynas (Fig. 2), covering approximately 1500m^2 and undertaken by the 14th Ephorate of Prehistoric and Classical Antiquities under the direction of Eleni Zahou, before the extension of the main national road, investigated four phases of occupation dating respectively to the Final Neolithic, Early Helladic II, Middle Helladic and Late Helladic periods. Unfortunately, the site had gone unnoticed when the initial construction of the main national road destroyed a large part of it in 1962.

The Final Neolithic remains lay immediately above bedrock on the flat surface of the hill and almost at its centre. On the same area, after a period of abandonment, a settlement was founded in the early Early Helladic II period (hereafter EH) (*Zahou 2004; 2009*), while during the Middle Helladic and Late Helladic period, settlement relocated to the west side (*Zahou 2009.10–13*). This kind of human activity and horizontal shifting on the hill makes Proskynas a non-tell site, in the sense that the area was not as densely occupied as that of the tells (magoules), thus without intensive and extensive rebuilding on the same parts of the hill. The stratigraphy and spatial practices at the site indicate that occupation between the different periods was interrupted for some time (*Zahou, Psimogiannou forthcoming*).

The earliest phase of occupation at Proskynas, *i.e.* the FN, is represented only by burials and pits dug into the soft bedrock. The Neolithic deposit was a

Fig. 2. The rescue excavation at Proskynas, east Lokris (after* Zahou 2009. Fig. 2.2*). All the photos and the drawing plan of the excavation are from the archives of the 14th Ephorate of Prehistoric and Classical Antiquities, Lamia, Greece. The images were afterwards processed by the photographers Ilias Kouvelis and George Maris.

thin, undisturbed stratum[2], only 20cm thick, lying immediately above natural bedrock and containing pottery of different wares, lithics, shells and animal bones. The Final Neolithic in the area of Lokris was until then unknown[3]. In northern Phthiotis, Rachi Panagias (Fig. 1), a tell-prehistoric-site adjacent to the Lake Domokos area has shown occupation levels from the 4th millennium BC according to the radiocarbon dates and the characteristic pottery ware. Examples include bowls of the so-called 'Bratislava type', decorated with patterns of spirals and incised lines and triangles (*Zahou 2002*).

The Final Neolithic archaeological evidence: the burial area

The Final Neolithic archaeological evidence at Proskynas consists of a burial area, where seven burials and a series of pits were investigated. They extend over the hill on the E-W axis. The EH buildings and constructions followed the same orientation and were founded exactly above the FN burial site (Fig. 3).

In the southern part of the excavated area and across the national road, eight pits developed in a row (Fig. 3.pits 16–20, 8–10). The pits (Fig. 4a–b), round or ovoid in shape, with a maximum depth of 0.50m and with a diameter up to 1.50m, were filled with burnt cultural material, such as sherds or large parts of coarse open vessels, bones, shells and obsidian or flint blades. Some pits were coated with clay and after being filled, were sealed with stones. Nearby, and to the north, a number of round postholes, 0.30m in diameter were found which seem to have

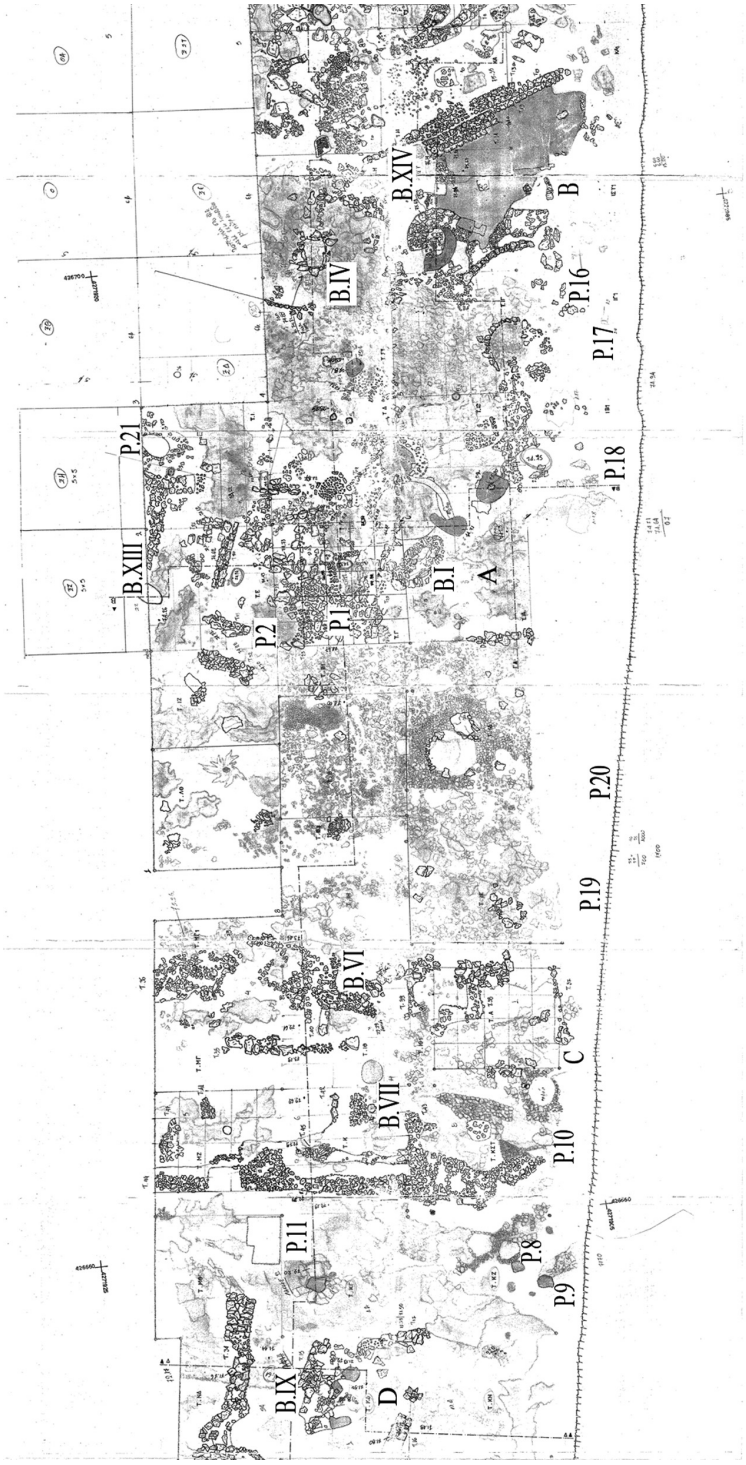

Fig. 3. Location of the Final Neolithic pits and burials under the structures of the Early Helladic II settlement (P. stands for pit, B. for burial; A, B, C, D: EH buildings).

2 The use of bedrock for FN activities is witnessed in many cases in the Peloponnese and central Greece (see discussion in the text below). As was observed, the FN layer in Peloponnesian sites is mostly described as a thin, dark-red or brown stratum lying directly above bedrock (*e.g.*, Aspis Argos, see *Touchais 1980; Alram-Stern 1998.25; Vitelli 1999.99*). This was also the case at Karystos on Euboea (*Keller 1982.12*), several sites in Attica (*e.g.*, Koropi, Merenda, Thorikos, see *Spitaels 1982; Alram-Stern 1996. 216–218; Kakavogianni* et al. *2009*), on Aigina Kolonna (*Felten, Hiller 1996*), on the Cyclades (*e.g.,* Grotta Naxos*, Hadjianastasiou 1988.11–12;* Agia Eirini Kea, *Wilson 1999*) and on Crete (*Nowicki 2008.205*).

3 Final Neolithic pottery has recently been identified (both pers. exam.) at the sites on the islet of Mitrou, Tragana (Fig. 1, see *Van de Moortel, Zahou 2006*) and Kynos, Livanates (Fig. 1, see *Dakoronia* et al. *2002.41–48*).

Fig. 4a-b. Final Neolithic pits.

comprised part of a wooden ditch, given their position in a row and E–W orientation.

Farther to the north of these posts (Fig. 3), five adult men and two children, according to the osteological analysis, were buried. The mortuary practices are characterised by variability, since all the adults were placed in simple pit graves, cut also into the bedrock, while the two children were treated differently. The pit graves were ovoid and shallow, containing only single burials (Fig. 3.burials IX, VI, VII, XIV, XIII). The skeletons of the adults[4] were found *in situ* and in a contracted position (Fig. 5a–b) without offerings or fixed orientation. Adjacent to some of these graves, pits containing cultural debris like those found in the southern part of the hill were also investigated (Fig. 3.pits 11, 21).

In contrast, the burnt human remains of a 15-year-old juvenile had been placed in a burial pot (Fig. 6) that was found in the same funerary area (Fig. 3.burial I), while the second child had been deposited in a rectangular grave, dug into the bedrock, lined and covered with small flat stones (Fig. 3.burial IV; Fig. 7). We cannot be sure about the criteria that determined these choices. Whether or not other members of the Neolithic 'community' of Proskynas received a similar or different type of manipulation after death remains unknown, and the occurrence of more burials on the area of the hill that has not been excavated may be possible. Next to the burial pot, two shallow pits had been cut into the soft bedrock (Fig. 3.pits 1, 2). One contained only burnt soil, while a red-burnished pithoid jar[5] (Fig. 8) was placed in the other, which was lined with stones.

The whole burial site had been sealed with small row stones[6] and every EH building was founded above a FN pit grave, after a period of abandonment (*Zahou, Psimogiannou forthcoming*), as can be seen in the case of Grave IX under Building Delta (Figs. 3, 9).[7]

4 I would like to thank Dr. Anastasia Papathanasiou at the Ephorate of Palaeoanthropology and Speleology, Athens for conducting the osteological study. The samples collected from the adult burials were submitted to the Radiocarbon Laboratory at the University of Oxford and produced radiocarbon dates in the later 5th millennium BC (around 4400–4300 BC).

5 A large number of pithoid jars has been found above the platforms and around the graves of the cemetery at Kephala, Kea (*Coleman 1977.52–53*) and the cemetery at Tharrounia, Euboea (*Sampson 1993.233*).

6 The practice of covering FN burials with a pile of stones is attested at Lerna (*Vitelli 2007.122*) and in the paralia of the Franchthi cave in the Argolid (*Vitelli 1999.90*), in the Kouveleiki cave B in Laconia (*Kontaxi 1996.712*), as well as at other locations (see *Dousougli 1998.136–145*).

7 Early Helladic domestic remains overlapping FN bedrock deposits – sometimes of a mortuary or symbolic character – have also been identified at the sites at Lerna (*Caskey 1960; Vitelli 2007.122*), Voidokoilia (*Korres 1977; 1978*), Ayios Dhimitrios (*Zachos 1987*), Ayia Eirini, Kea (*Caskey 1972; Wilson 1999; Broodbank 2000.218*), Aigina Kolonna (*Felten, Hiller 1996*). See more discussion in *Zahou, Psimogiannou forthcoming*.

The burial area of Proskynas has yielded important ceramic (*Psimogiannou 2008*), faunal and lithic (*Manos 2011*), and molecular[8] (*Veropoulidou 2011*) assemblages. In terms of the pottery, a large number of sherds or partially preserved vessels were concentrated around the graves. The ceramic assemblage of the burial area is large and shows close similarities to styles found in this period in southern Greece and the Aegean, as well as the ceramic material from the pit contexts (Fig. 10).

Fig. 5a-b. Pit burials; a. adult, man, 45 years old; b. adult, man, 30–35 years old.

The pottery represented comprise 'tableware', meaning pots appropriate for the consumption and presentation of food and/or drink, such as cups and bowls, but including larger vessels such as large deep bowls, wide-mouthed jars and pithoi intended to cater both for preparing or cooking food and even for some kind of storage. It is interesting to notice that the largest quantity of pottery was concentrated around the two child burials. In the vicinity of the burial pot, a particularly high concentration of vessels of matt-painted and polychrome ware, mostly cups and fruit-stands, was found (Fig. 11.a,b,c). Coarse vessels, jars or deep bowls were also found nearby. More intriguing, however, is the fact that no two pots are alike, every piece is unique. The drinking vessels of the matt-painted and polychrome ware show high variability and diversity in decoration and may have been used for individual consumption and display (*Pappa* et al. *2004; Urem-Kotsou, Kotsakis 2007.242*). Furthermore, most were found incomplete, something that raises the possibility that these objects were probably never deposited as complete items. The same practice is reported from the Alepotrypa cave, where the human remains of two children were laid on a stalagmite floor and then covered by great quantities of intentionally broken matt-painted and polychrome ware (*Papathanasopoulos 1996b.176; Papathanasiou 2001; 2009*).

The second child at Proskynas had not only received different mortuary treatment – different kinds of pottery ware seem to have been deposited around this grave. Most belong to coarse vessels, showing close similarities to the pottery from the cemetery at Kephala. These vessels include deep bowls (Fig. 12), jars and baking pans (Fig. 13), some bearing red-crusted (Fig. 14) and pattern-burnished decoration, features with a broad distribution throughout the Aegean during this period. One marble figurine of the schematic type[9] had been placed adjacent to the second child's grave, while a lithic pendant had been placed inside.

Final Neolithic social and mortuary practices in context

Looking back: a review of the evidence

The archaeological analysis of the FN material at Proskynas provided evidence to support an interesting discussion of the social and mortuary practices of the period (*Psimogiannou 2008.104–114*). Examination of both old and new archaeological evidence in central Greece, in the Peloponnese and the

8 According to Veropoulidou (*2011*), the shells collected from the pits and burial area were the result of food processing.

9 Similar figurines have been found in the Alepotrypa (*Papathanasopoulos 1996a.225*) and Tharrounia caves (*Sampson 1993. Fig. 201*).

Fig. 6. Burial pot with associated skeletal remains of a 15-year-old child. All the photos of the pottery are by the author.

Aegean islands has indicated that the digging of pits was a common and widespread social practice in the Greek Final Neolithic, since specific cultural elements deposited in pits have been found in a surprisingly wide range of sites (Fig. 15). These pits are described as open-air pits not associated with any architectural or structural remains, filled with burnt material and then sealed with stones. The fact that they were dug into the pure bedrock, on hills of limestone with notable visibility[10], but in most cases without previous Neolithic occupation levels, seems to have been a deliberate choice.

This was the case (see Fig. 15) in Eutresis Boeotia (*Caskey, Caskey 1960.129–137*), in the Acropolis North slope (*Immerwahr 1971.3*, the so-called Neolithic 'wells') and especially at many sites in the Peloponnese, such as in Prosymna (*Blegen 1937. 23–29*) and Halieis in the Argolid (*Pullen 2000*), Tsoungiza in Corinthia (*Pullen 1990. 33; 2011*), as well as Ayios Dhimitrios in Elis (*Zachos 1987.4–48*), Nichoria in Messinia (*Howell 1992*) and Voidokoilia in Pylos (*Korres 1977; 1978; 1979*). In the 1960s, various isolated pits in the bedrock were explored while examining the Hellenistic settlement at Kastro Tigani on Samos (*Felsch 1988*). Similar FN 'wells' filled with cultural debris have also been found recently on east (*Manteli 1992*) and central Crete (*Pylarinou, Vasilakis 2010*). A deposit very much like these was unearthed at the site at Ayia Eirini on Kea (*Caskey 1972.360–362; Coleman 1977.99*). Further north, at Rachmani in Thessaly, some rescue excavations on the western edges of the tell that became synonymous with the Chalcolithic period of Thessaly, since the archaeological research of Wace and Thompson (*1912*), revealed pits dated to the FN filled with sherds, animal and human bones, lithics and shells (*Toufexis 1997*). Similar pits have been investigated recently on a hill at Achinos in the eastern part of Phthiotis (Fig. 1) near the Maliakos gulf (pers. exam.).

Most frequently, however, these pits are reported adjacent to pit graves of the same period, also cut into soft bedrock (Fig. 15), such as at Proskynas, in the Athenian Agora and in the Acropolis South slope (*Immerwahr 1971; 1982; Dousougli 1998.137*), at Thebes (*Tsota 2009*), Lerna (*Caskey 1958.13–137; 1959.205; Vitelli 2007.118–122*) and Franchthi (paralia) in the Argolid (*Vitelli 1999.87–91*), and in the Alepotrypa cave (*Papathanasopoulos 1971*). The same probably holds for the site at Galene in Thessaly (*Toufexis 1997*), where a number of deep and

Fig. 7. Rectangular grave of a 10-year-old child, dug into the bedrock.

10 It is mentioned that the FN sites in the Peloponnese are situated above valley bottoms, overlooking the broader areas (*Alram Stern 1998.75*). The same holds for Proskynas.

wide pits characterised as 'wells' and filled with cultural debris were excavated. Three burials of adults in a contracted position were clustered nearby, while another was found in a pit (*Toufexis 1997. 570–571*). According to a recent overview of the Neolithic evidence at Phaistos on Crete (*Todaro, Di Tonto 2008*), the FN remains under the structures of the First Minoan Palace consist of a series of pits cut into the bedrock and related to a burial in the vicinity.[11]

The creation of a mortuary arena and the practice of pit-digging

The picture that emerges from the above current evidence is the high visibility of mortuary places during the FN period (Fig. 15). Indeed, most of our knowledge of central and southern Greece comes from the funerary domain[12], including the already known cemeteries of Kephala and Tharrounia that comprise built tombs. Of great importance, however, is the appearance in the archaeological record of other mortuary areas[13], where one or more burials were deposited in pits dug into the bedrock. This similar mortuary pattern is witnessed in many locations, some of which have already been mentioned above (*e.g.*, Proskynas, Thebes, the Athenian Agora and the Acropolis North and South slopes, Lerna, Franchthi), as well as at other sites (*e.g.*, Aria in the Argolid (*Dousougli 1998*), Akraifnio, Boeotia (discussed in *Dousougli 1998.139*), Koutsouria in the Argolid (*Protonotariou-Deilaki 1971.10*), *etc.*; see also discussion in *Dousougli 1998*).

To this funerary domain, we can add the deposition of numerous burials in caves in southern Greece (*e.g.*, Tharrounia cave on Euboea, Alepotrypa and Kouveleiki caves in Laconia, the Cave of Pan in Attica and many caves on Crete) that are usually attributed to the FN period. For example, the Alepotrypa cave has provided a concentration of various burial practices (*e.g.*, single and multiple primary inhumations, ossuaries) and more than one hundred individuals have so far been identified (*Papathanasiou 2009*). The presence of the material culture in the Alepotrypa cave is considered to be associated with these graves and ritual activities (*Cavanagh, Mee 1998*; generally for a discussion on caves see *Tomkins 2009*). As has been suggested (*Cavanagh, Mee 1998.11*), the large number of ani-

Fig. 8. Pithoid jar found near the burial pot.

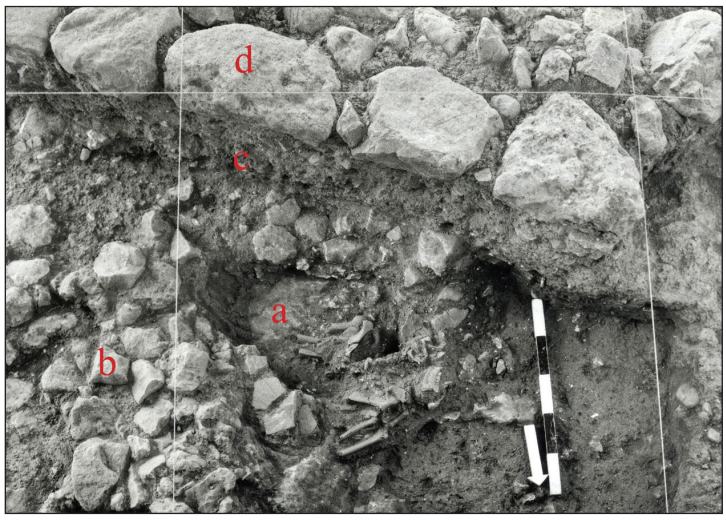

Fig. 9. a. Final Neolithic burial of an adult man, 25 years old, 4496 calBC; b. sealing of the burial; c. discontinuity; d. Early Helladic wall (House D).

11 Pits related to burials in the vicinity dated to the beginning of the EBA were also found in cemeteries on mainland Greece and the Cyclades, such as that of Tsepi, Attica (*Pantelidou-Gofas 2008*) and Ano Kouphonisi, Cyclades (*Zapheiropoulou 2008*).

12 In central and southern Greece there are less 'visible' settlement traces in contrast to burial places. Domestic or building remains, except from Srofylas and Zagani (mentioned above in the text), have also been found at Kephala, Kea and Sfakovouni in Arcadia (*Alram-Stern 1996.264*), and farther north in Microthebes (*Adrymi-Sismani 2007*) and Petromagoula (*Hatziaggelakis 1984*), Thessaly. Most of the material is under study.

13 The use of the term 'burial or mortuary areas' (instead of cemetery) does not exclude the possibility that more burials had been deposited. We have to keep in mind that the presence of a low number of burials may also be due to limited excavated area (*e.g.*, Aria in the Argolid).

Fig. 10. Vessel from pit 10.

mal bones and pots around the burials in the cave probably indicates offerings and the consumption of food, while traces of burning imply that fire formed part of the ritual.

It seems that the presence of cultural and material assemblages in the above burial areas might suggest that important acts of consumption and display took place in the funerary domain during this period (*Broodbank 2000.221–222*). At Proskynas and elsewhere, vessels (not only table wares, but also larger pots) and other artefacts might have been part of special and collective acts involving mortuary rituals or feasting. It is thought that feasting, along with death and burial, is a social activity that is rich in symbolism and defines the boundaries of a group (*Hayden 2001; Wright 2004.76*). Of the material evidence associated with food, pottery appears to be one of the most powerful tools for investigating both the social aspects of consumption and related issues, such as social relationships and social identity (*Appadurai 1986; Tomkins 2007; Urem-Kotsou, Kotsakis 2007*).

Other activities, such as the deposition of material culture, either outside graves (*Broodbank 2000.171*) or in nearby pits, may also have been part of the mortuary practices. As already mentioned, the presence of pits filled with burnt cultural material and sealed with stones in most of these mortuary places is noteworthy. Pits are well-known excavation contexts throughout the Balkan Neolithic and pit-digging had been a widespread and common practice in Greek prehistory since the beginning of the Neolithic. For the most part, these pits have been discussed in terms of human waste disposal and thus usually referred to as 'bothroi' or 'rubbish pits' (*Hutchinson 1935; Blegen 1937; Caskey, Caskey 1960.161*). However, recent evidence from the European Neolithic and Neolithic of Northern Greece have led some scholars to propose that the depositing of certain materials in pits rather than elsewhere must have been a calculated act (*Chapman 2000; Pappa* et al. *2004; Skourtopoulou 2006; Tomkins 2007.189–190; Pappa 2008*), thus constituting an act of structured deposition.[14]

Furthermore, the fact that the contents consist for the most part of incomplete objects (*e.g.*, non-con-

Fig. 11a-b-c. Cups and fruitstands of matt-painted and polychrome ware.

14 For more details see *Chapman 2000*. Also, *Tasić, Tasić 2003.94–95*, for a discussion of a 'cult pit' at Vinča and Sremski Karlovci, where vessels, charcoal, shells and bone fragments had been placed.

joint sherds or large parts of vessels, fragmentary animal bones) has pointed to an interpretation of the smashing of artefacts and deposition of certain pieces in pits as having been deliberate. It is suggested that through this practice of fragmentation and deposition, the end of the life of these objects removed from circulation was accomplished (*Appadurai 1986; Kopytoff 1986; Broodbank 2000.262–263; Tomkins 2009.140–142*), while at the same time the life-history or 'biography' of the pit was completed through its final sealing with stones and/or fire (*Chapman 2000.64; 70–73; Pappa 2008.334–336*).

The repeated and widespread practice of pit-digging and their back filling indicates that the deposition of artefacts in the pits near the graves was not an act of discard, but of careful placement confirming social reproduction. The insistence on pit-digging and high density of structured deposition, as seems to be the case in the aforementioned FN sites, is a special practice probably related to a diverse set of factors. Thus, as Chapman (*2000.82*) has pointed out, the specially structured deposits of the pits discussed above may be integrated into a much wider set of social practices lying at the root of the FN rationality and fundamental to the creation and consolidation of social relations.

Moreover, through these acts of structured deposition and sealing with stones, a form of agency connected to the corroboration of social memory was expressed. According to Rowlands (*1993*), one way of creating memory is through acts such as the deposition and destruction of objects and valuables that become memories in their absence (*Rowlands 1993.146; Hamilakis 1998; Bradley 2000.157*). It is argued that such memory is more emphasised in the

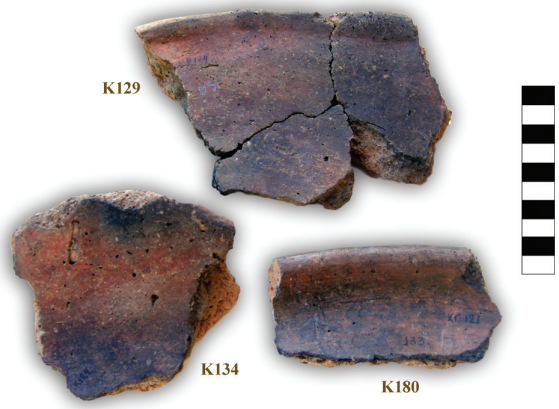

Fig. 13. Baking-pans found around the child grave.

Fig. 12. Coarse vessel found around the child grave.

case of pits cut into virgin soil or bedrock, "*where 'clean' material was removed and replaced by current, 'cultured' material*" (*Chapman 2000.64*), either human artefacts or human bodies (*Sofaer 2006*). The FN sites are mostly 'new' sites (*Darvill 1997.2*) on limestone hills, the pure bedrock of which was chosen (perhaps they were already important natural places[15], see *Bradley 2000.107*) for the deposition of the material culture and the social present of the living, a practice that endowed the sites with cultural significance, new memories and meanings (*Zahou, Psimogiannou forthcoming*).

I believe that the mortuary arena of the FN has to be seen as a social arena (the term is obviously borrowed from *Chapman 1991; 1993; 1997.142*; see

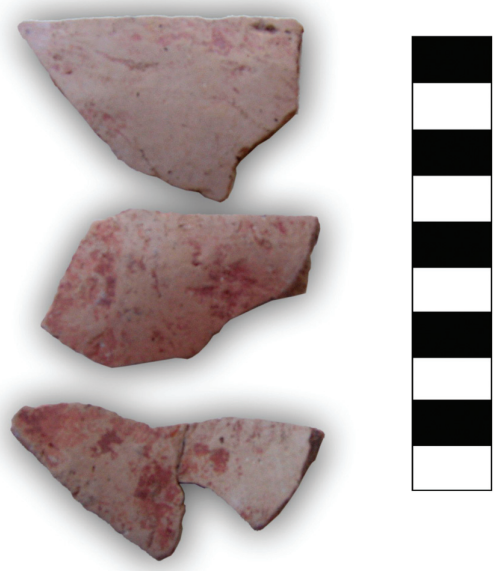

Fig. 14. Sherds of a closed vessel bearing red-crusted decoration.

15 It is not the purpose of this paper to discuss issues related to landscape uses. However, see the discussion in *Tomkins 2009. 134–140*, regarding the role of caves as central ritual sites for interaction during the Late and Final Neolithic periods.

also *Tomkins 2009.142–144*), where – through a shared understanding of symbolic meanings in the mortuary sphere – social identities are negotiated and social integration and cohesion obtained. It has been suggested that every social practice of public ritual reinforces group identity and social memory is a technique for the control of the present, by incorporating the whole group into a common ritual associated with the past and dead ancestors (*Chapman 1993.81; Parker Pearson 1993; Hamilakis 1998*). It is also possible that the social memory of the ritual activity conducted on these mortuary areas endowed them with a special status that contributed to their selection as sites of the subsequent Early Helladic settlements (*e.g.*, Proskynas, Lerna) (*Zahou, Psimogiannou forthcoming*). Thus, the Neolithic past was actively appropriated so as to legitimise the present (*Parker Pearson 1993; Williams 1998*).

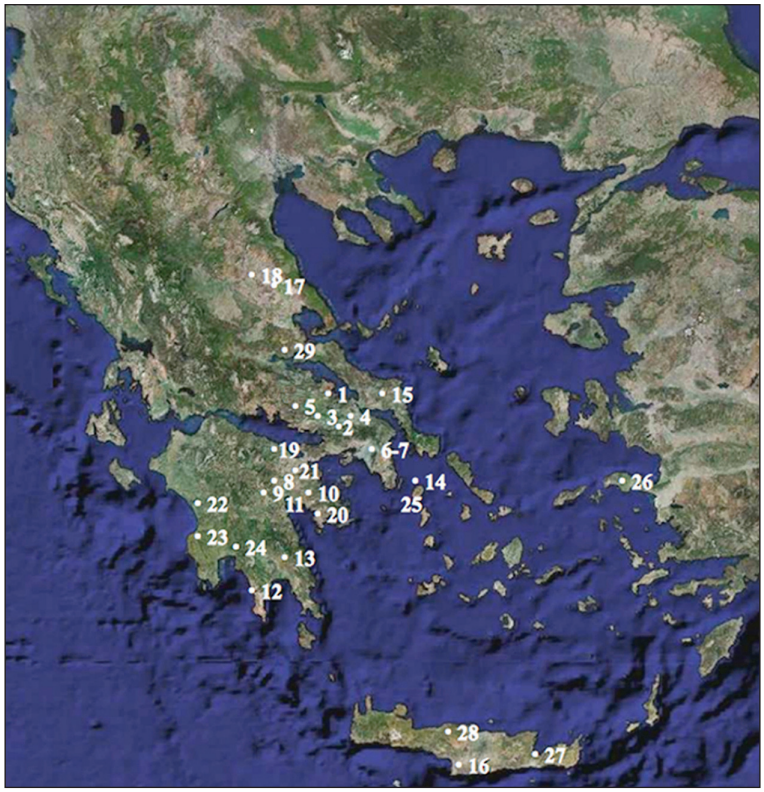

Fig. 15. Map indicating Final Neolithic mortuary and other areas discussed in the text: 1 Proskynas, Phthiotis; 2 Eutresis, Boeotia; 3 Thebes, Boeotia; 4 Akraifnio, Boeotia; 5 Chaironeia, Boeotia; 6 Acropolis North Slope, Attica; 7 Athenian Agora, Attica; 8 Aria, Argolid; 9 Lerna, Argolid; 10 Franchthi, Argolid; 11 Koutsouria, Nauplio, Argolid; 12 Alepotrypa cave, Laconia; 13 Kouveleiki cave A and B, Laconia; 14 Kephala, Kea; 15 Tharrounia, Euboea; 16 Phaistos, Crete; 17 Galene, Larissa, Thessaly; 18 Rachmani, Thessaly; 19 Tsoungiza, Corinthia; 20 Halieis, Argolid; 21 Prosymna, Argolid; 22 Ayios Dhimitrios, Elis; 23 Voidokoilia, Messinia; 24 Nichoria, Messinia; 25 Ayia Eirini, Kea; 26 Kastro Tigani, Samos; 27 Kastelli, east Crete; 28 Gazi, central Crete; 29 Achinos, Phthiotis.

Discussion and Conclusions

The picture that emerges from the current archaeological evidence discussed above, such as the widespread distribution of social and mortuary practices, and increasing spheres of interaction (*Broodbank 2000.156–170*) represented in homogeneous pottery assemblages (*Tomkins 2009.143*) and other artefacts both on the Greek mainland and the islands, is of an 'internalisation' of practices and an evolving and dynamic social and cultural dialogue in which FN communities were intensively engaged. The mortuary areas mentioned above may have served as fields of social discourse for the formation and manifestation of a shared cultural identity, bearing both mainland and island characteristics (*Nazou 2010*). It has been suggested that collective acts of display and consumption of material culture that occur primarily within the funerary domain reflect a strong sense of communality (*Tomkins 2004.56*). At the same time, the individual treatment of the dead, emphasised in Proskynas and elsewhere through the presence only of single burials and the use of non-standardised vessels or the accumulation of prestige goods, laid more emphasis on the visibility of the individual and perhaps on specific members of the community (*Chapman 1993; Broodbank 2000.170–174*). It is likely that it was a context where the identity of a large group of people was being formed and where the inclusion or exclusion of certain individuals was negotiated.

Some scholars have suggested with respect to similar cases (*Hodder 1990.70–99; Chapman 1991.157; 1994.82–84*) that the legitimisation of the mortuary arena as a context for social action may also imply a shift of interest from the domestic to the mortuary arena. In this respect, and taking into account the whole archaeological evidence so far regarding the FN in southern Greece, including the 'low visibility' of domestic remains, it is possible that an entirely new social arena was being created at the end of the Neolithic for the expression of social messages related to continuity, ancestors and the living (*Chap-*

man 1991.160), messages that probably had previously been negotiated and visualised through the presence of the 'oikos' and the predominance of tells (magoules) on the Neolithic landscape (*Chapman 1994; Kotsakis 1999; Nanoglou 2001; 2008*). This broad dispersal throughout the Aegean, manifested in the aforementioned FN practices and probably removed from restricted and communally-held values and beliefs, defined, consolidated and reproduced in earlier times through the repeated materiality of the 'house' (*Tomkins 2004.53–57; Nanoglou 2008.150–154*), may imply that an opening up to the world was also being established and a new, broader cognitive map of social relationships, acting as a unifying web of identity, was being formed (*Wright 2004.66–76*, for a similar discussion).

It has been argued that mortuary rituals were used as acts of display that contributed to the establishment of complex genealogical systems (*Barrett 1990*). The changing social strategies from the end of the Neolithic to the Early Bronze Age and the development of a social complexity have been discussed and explored in various ways and fields (*Renfrew 1972; Halstead 1989; 1994; 1995; Nakou 1995; Broodbank 2000; Tomkins 2004*). The relationships that the living created with the dead, but also the differences that were created between the dead (*Parker Pearson 1993.227*) and the way they were expressed and (re)negotiated by the living, may be indicative of a fundamental realignment and reorganisation of human relations. Of course, there are still several issues to be resolved before we can proceed further with the reconstruction of the mechanisms and details of the process that led to subsequent inequalities. Many of these details are still lacking from the archaeological record, or perhaps we have not yet been able to 'read' them, since (as always happens) they are well-concealed in every aspect of the social life, material culture and human choices that developed throughout this long-lasting period preceding the Bronze Age.

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Place and identity: networks of Neolithic communities in Central Europe

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ABSTRACT – *The multi-layered and multi-scalar nature of the term 'community' makes it a useful tool for both particularistic studies and cross-cultural comparisons, connecting scales of community to regional scales of settlement, exchange and mobility. This paper explores three general themes of community: community as place, as identity and as network. A case study of Neolithic communities in eastern Hungary and Lower Austria demonstrates a spatial and geoarchaeological approach to understanding the relational aspects of places, networks and identity to develop a social archaeology of communities.*

IZVLEČEK – *Večplasten in večnivojski izraz 'skupnost' predstavlja uporabno orodje tako za partikularistične študije kot za medkulturne primerjave, saj povezuje obseg skupnosti z regionalnimi poselitvenimi vzorci, menjavo in mobilnostjo. V članku proučujemo tri glavne teme: skupnost kot kraj, skupnost kot identiteto in skupnost kot omrežje. S študijskim primerom neolitskih skupnosti na območju vzhodne Madžarske in Spodnje Avstrijske bomo prikazali vidike odnosov krajev, omrežij in identitet ter razvili družbeno arheologijo skupnosti.*

KEY WORDS – *community; relationships; geoarchaeology; Neolithic; Carpathian Basin*

> "*We are in community each time we find a place where we belong*." (*Block 2008*)

Introduction

People want to live in a community, and are constantly reminded that we should live in a community. Government agencies develop 'Community Action Plans' to 'empower' people. In medicine and education, we talk about 'communities of practice' and Anglophone archaeology has a new focus on 'community archaeology'. Robert Putnam wrote in his book *Bowling Alone* (*Putnam 1995*) that America has lost its 'sense of community', whilst academic departments and business want to be seen as promoting this 'sense of community'. For example, a press release on a generous donation to the University at Buffalo used the word community four times with at least two different meanings. 'Giving to one's community', the philanthropist views the university as sharing their 'sense of community', and they are pleased to contribute because it 'offers the school a renewed sense of community' (*Cochrane 2009*). Anthropologist George Murdock (*1949*), on the other hand, placed the community with the nuclear family as the only universal social units, making it something difficult to lose.

So what exactly do archaeologists mean when we use the word community? Is community a fundamental social unit? Is it a feeling of shared mores, social ties and dependency (*sensu Neustupný 1998a*), is it tangible, or imagined (*Anderson 1991*)? The frequency and variety with which the term is used shows that it resonates powerfully in our daily lives, as well as in the social sciences. Unfortunately, the term community, like household and process, has been treated as having a common sense understanding. For 'household', this problem has been addres-

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sed over the past decade (*e.g.*, *Borić 2008; Souvatzi 2008; Webley 2008*). There have also been several works in recent years dealing explicitly with community in an effort to define and illuminate this concept (*e.g.*, *Amit 2002; Canuto, Yaeger 2000b; Hutson* et al. *2008; Knapp 2003*). However, work remains to be done if we are to use 'community' coherently, connect the concept to archaeological data (*i.e.*, spatial, temporal and fragmentary), and develop a social archaeology of community. We need to ask ourselves what the conditions for, and perceptions of, community were through time, and we need to explore how we can see evidence for these conditions and perceptions in archaeological remains.

What follows is a discussion of what archaeologists might mean when using the term community – that is, which concept(s) we may have in mind. Community is presented here as multi-layered and a useful tool for interpretations at multiple analytical scales. I present three themes of community that together create a sense of community, and then explore how we can use archaeological data to investigate community.

What do we mean by community?

Archaeologists frequently talk about communities without defining the term, and William Isbell (*2000. 243*) suggests that we eliminate the ambiguities in our use of the concept, because "*the importance of 'community' as a tool for investigation is not matched by its clarity or unambiguous use*". Margaret Stacey (*1969*) argued that it is too awkward to even bother struggling to define, and suggests instead that we use 'local social system', or 'locality studies', terms which are even more awkward. I suggest that while incoherent usage is problematic, the ambiguity inherent in the concept is not the real problem, because community functions at multiple scales and in multiple ways. Therefore, we need to be clear about which scales and which forms of community we are talking about, but removing all ambiguity is both undesirable and impossible.

A second problem is that we often uncritically "*associate the social entity community with the analytical term site*" (*Canuto, Yaeger 2000a.xiii*). A straightforward link between community and settlement seems untenable, although settlements and communities have often been treated as two sides of one coin. Norbert Elias (*1974.xix*) defined community as "*a group of households situated in the same locality and linked to each other by functional interdependencies which are closer than interdependencies of the same kind within the wider social field to which the community belongs*". K. C. Chang (*1968*) used the term settlement as the archaeological correlate for the social entity of 'community'. Chang defined an archaeological settlement as "*the local context wherein the community is presumed to have resided and gone about its daily business*", and "*the physical locale or cluster of locales where the members of a community lived, ensured their subsistence, and pursued their social functions in a delineable time period*" (*Chang 1968.3*). Despite efforts to link communities with settlements, 'site' and 'community' are not necessarily equivalent entities (*Hutson* et al. *2008; Kolb, Snead 1997; Yaeger, Canuto 2000*). Communities, in the archaeological and anthropological sense, are composed of people. Settlements, settlement clusters, 'culture groups' and longhouses are some of the material correlates of community, but even within these archaeological entities subdivisions and variations exist. Moreover, if we move away from site-focused archaeology and examine landscapes, we find other correlates for other kinds of community. For example, Martin Kuna proposed a community area model for Neolithic communities in Bohemia, suggesting the existence of individual groups with spatially restricted activity zones for agricultural plots, houses, burials, storage pits, *etc.* within a communal territory (*Kuna 1991*). Rather than focusing on discrete sites, Kuna connects all of the activity areas within the landscape.

August Hollingshead (*1948*) distinguishes three definitions of community: as a form of group cohesion, unity and action aimed at common interests; as a geographic area with spatial limits; or a socio-geographic structure merging the two. *Gemeinschaft*, a relationship in which individuals are oriented to a larger association as much if not more than to their own self-interest, provides another interpretation linking these forms of community. People in a *Gemeinschaft* abide by common beliefs about the appropriate behaviour of members of the group to each other and to the group (*Tönnies 1963*). Ferdinand Tönnies saw the family as the ideal expression of *Gemeinschaft*, but he expected that community could be based on shared place and shared belief as well as kinship. This suggests that, for Tönnies at least, the community is located primarily in the mind, as the 'sense of community'.

Benedict Anderson (*1991*) introduced the concept of the imagined community as an idea that people hold in their minds and assume is shared by other people

who they perceive as also being members of the community. Anderson argues that some communities are not based on everyday face-to-face interaction between people, yet still function as communities in terms of ideology and (perceived) shared experiences. This approach has been applied in archaeology by Bernard A. Knapp (*2003*) and William Isbell (*2000*). Isbell described two types of community, shared space or residence and shared knowledge and experiences. Communities in this second type are therefore participating in a collective consciousness (*Knapp 2003*). The imagined community bears some resemblance to the moral community and to the social ties and dependencies that Evžen Neustupný (*Neustupný 1998b*) uses to define community areas. Each of these approaches community in a slightly different way, but they have in common the basic principles of relationships, shared experience and traditions. The ways that people can interact within these communities suggest that a network approach may also be useful.

Alasdair Whittle introduces another notion of community in his Archaeology of People, suggesting that 'values, ideas, ideals and emotions' form part of the structure within which people act by providing a 'moral community' or 'moral network' (*Whittle 2003*). This forms over time, through "*long and fractured conversations about a variety of themes, from the contingencies of the present to the abstractions of pasts, otherworlds and 'nature'*" (*ibid. 161*). Whittle (*2005*) expands upon this concept, drawing from work on cultural aesthetics and conviviality by anthropologist Joanna Overing (*2003*). These ideas that people hold, about aesthetics, hospitality, appropriate actions and ideology combine to form a structure within which people do more than simply coexist; they live a sociable life, in Whittle's phrase they are "*living well together*" (*Whittle 2005.64*).

This brief discussion is meant to provide an overview of some of the definition, problems and critiques that have been offered, as a jumping-off point to a discussion of how we might better employ the concept within prehistory. In the following sections, I discuss three broad themes of community – community of place, community of identity, and community of networks. These are all interrelated, and are types that we can identify and discuss with archaeological data.

Community as place

The first and most general meaning is the sense of people having common residence, a community of place; 'locality' for David Lee and Howard Newby (*1983*), the shared space of Isbell (*2000*) or the spatially delimited geographic area of Hollingshead (*1948*). Community of place used in this way implies that people interact, although it does not require that they do. At the same time, community in this sense is not directly linked to the site or micro-regional level of settlement analysis. People who live in close proximity to each other are more likely to share a sense of place, and work together in the construction of place. We also have numerous examples of several local-scale communities combining their labour to construct place, such as with the Hopewell mound builders of the American Midwest (*Dancey, Pacheco 1997*), or Neolithic enclosures in Europe (Fig. 1). The community of place exists at any spatial scale, so long as people conceive of it as their place.

Edward Casey's (*1993*) theory of place suggests that embodied being-in-the-world depends completely on a sense of place. Place is experienced and sensed by people, and the shared experiencing and sensing is how place is culturally constructed. Furthermore, any space that has not been experienced, that is not a cultural place, "*occasions the deepest anxiety*" (*Casey 1993.ix*). Place, therefore, is a powerful element in the way people organise their lives, providing coherence for interacting and making a living. We can also imagine the construction of place in the reconstruction of place. The enclosure at Heldenberg seen in Figure 1 not only provides a device for thinking about spatial organisation within prehistoric communities; it also provides a community of place for the team that reconstructed it, for the people who work there and even a community of people who have visited it.

Community as identity

The second sense is the community of identity, including a shared sense of identity and a basis for collective action. It is this shared sense of being that Tönnies (*1963*) points to when he discusses the existence of three different types of community; the communities of kinship, locality and friendship. For Tönnies, each of these could be analysed, or even observed, individually, as separate entities. Identity is an important part of moral and imagined communities, and communities of kinship or friendship are just two of the potential interrelations making up the larger Neolithic social structure. As archaeologists, we can conceptualise some of the activities and relationships that form a community of identity when we collaborate in multi-national or multi-dis-

ciplinary research projects (Fig. 2). Anthony Cohen (*Cohen 1982; 1985*) argues that the reality of community is tied to the meaning that people give to community symbols, and how people invoke this symbolism in their construction of community identity. This can occur both at the micro-regional and regional scale, and can include that community for whom the archaeological correlate is the 'culture group'. Indeed, in a general way this perspective is the theoretical basis for such concepts as *Kulturkreislehre* (*Rebay-Salisbury 2011*). This sense of identity, the sense of community that is mentioned above and that we use so often in speech, is abstract, but shows itself in concrete ways.

Fig. 1. Communities of place can form through shared habitation, ritual, sport or other activities. The Neolithic enclosure and several houses at Heldenberg in Austria have been reconstructed, creating a place for tourism and linking today with the past.

For example, the sense of identity of many traditional western communities is bound to the local church, and money and time expended in competitive displays of grandeur such as owning a saint's finger bone. In this instance, identity links to place in the sense of community, but the identity is not formed by inhabiting the space, but rather in participating in rites that occur at the place, in assuming a shared worldview (*e.g.*, importance of the finger) and in a shared classification as members of this particular church.

Likewise, a sense of community can perhaps be extrapolated from the ways that task areas are placed, concentric ditches are dug, or sediments are altered. On Late Neolithic tells, each house cluster, delimited by small fences of stakes (*e.g.*, *Horváth 1987; Raczky 1987*), may be one community, whilst all house clusters at a particular site may form another, larger community. Evidence used to extrapolate identity need not come from the built environment; the spatial patternings of other material elements also inform us about activities and the use of space. Changes in the texture, colour and thickness of some areas within the soilscape can delimit space in a very tangible way. This is construction of the cultural soilscape (*Retallack 1998; Wells 2006*), and while it may often have occurred as an unintended consequence of everyday practice (following *Bourdieu 1977*), this in no way weakens the resultant formation of place. On the contrary, changes that develop through living rather than through plan may have an increased symbolic significance. All of these, from changes in texture and physical appearance to those 'invisible' changes in chemical matrix, would have a direct effect on people's conceptualisations of their community and place, thus producing a specific sense of group identity. Finally, shared affordances may contribute to shared ways of performing, thereby augmenting a shared sense of identity.

Community as networks

The third meaning of community applied here is that of interactions and shared characteristics other than geographical location, including occupation, clan affiliation or common ideology; the 'local social system' of Stacey (*1969*). Murdock (*1949.79*) thought of it not only as "*the maximal group of persons who normally reside in face-to-face association*", but also as a "*network of interpersonal relations*" in political, economic and religious roles (*ibid. 82*). Lee and Newby (*1983*) describe this as a community of people linked together in social networks, and Whittle (*2003*) likewise considers the moral community as a network. These networks are profoundly significant for understanding social change; as Christian Peterson and Robert Drennan (*2005.5*) put it, "*it is in this matrix of inter-action that the forces that produce social change are generated*". I am most interested in two things here – how these different sets of networks can produce interactions between local communities of place, forming extended communities; and how these networks act to reproduce and alter social structures, constraining or affording specific actions. Networks of communities provide for interactions across local-scale communities, and also draw these local communities together into regional and macro-regional communities. This is perhaps the best place to introduce the concept of interdependency, a theoretical construct that helps

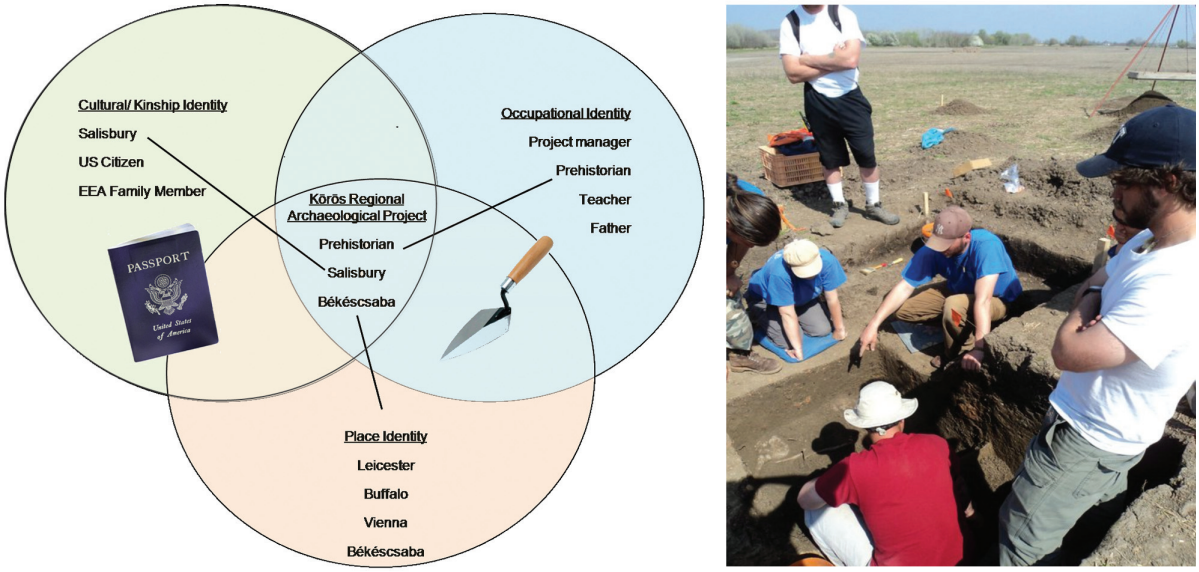

Fig. 2. Communities of identity can form through kinship, ideology, common occupations and experiences or common community of place, among others. The Hungarian-American Körös Regional Archaeological Project is a community of identity produced through common experiences and interactions.

to describe the relationships among people, communities, settlements and sediments.

Neustupný (*1998a*) describes communities as being bound by intra-group social and emotional ties as well as relations of interdependency. Elias (*1974*) argued that dependency on other people limits the range of actions and options available to any individual or group. This not only includes necessities such as mating, communal labour and exchange, but also involves aspects of inclusion/exclusion and restriction of access. Through the concept of affordances (*Ingold 2000*), this dependency can be expanded to include other groups, animals, plants, soils, rocks, and indeed any feature of the natural or cultural environment. It is also important to stress, as Elias does, that interdependencies are completely neutral. This includes the interdependencies between people that Elias spoke of, as well as to interdependencies between people and animals, people and space, people and the physical environment, people and affordances. All of these are neutral in that they do not cause conflict or cooperation, although they may well afford the opportunity for either. In small-scale agro-pastoralist societies, such as those of the Neolithic and Early Copper Age on the Great Hungarian Plain, the networks of interdependencies tend to be all-encompassing; that is, people are dependent upon the members of their community for nearly all aspects of their life.

For the second part, communities are, at every level, essentially a set of networks and relationships (Fig. 3), and it is within these networks that social reproduction occurs. Bruno Latour (*2005*) argues that society does not exist as an independent and tangible entity in the world, but rather is nothing more (and nothing less) than the endless array of interconnections between people and things. Latour's general approach is to include people, social groups and material objects in an examination of the contexts of interactions. Michael Kolb and James Snead (*1997.611*) also look to interactions, stating that:

"*The role of the local community as a particular node of social interaction appears universal, forming a principal arena in which sociopolitical relationships are negotiated or played out. This suggests that a community possesses a minimum demographic component comprised of a core of individuals who interact regularly and whose repeated interactions socially reproduce that group.*"

Within the process of social reproduction, community networks also afford and constrain their members. These networks are dense enough, and the resultant 'chains of interdependencies' (*Elias 1974*) among community members are strong enough to "*discourage individual action which goes against local traditions*" (*Crow, Allan 1994.11*). This quote follows from several examples that Crow and Allan cite where the disposition of the local community serves to restrict deviation from social norms. This is not to say that action is closed off, or that changes do not occur, but it does point out the strong regulating effects of community views of accepted prac-

tice and tradition. Thus, if we see that Late Neolithic communities appear to have a way of organising their space in a distinct and consistent manner, with little or no variation over a relatively long time, we can consider this a tradition, or set of traditions, the perpetuation of which has value to the society. If we then observe a distinct change at the beginning of the Early Copper Age, then we can assume that the other changes we see in settlement organisation are part of a set of interconnected changes that occurred at the very foundation of society. However, if we see that the organisation of space within small settlements during the Late Neolithic and Early Copper Age is largely the same, then we will need to consider other interpretations of the changes occurring at this time.

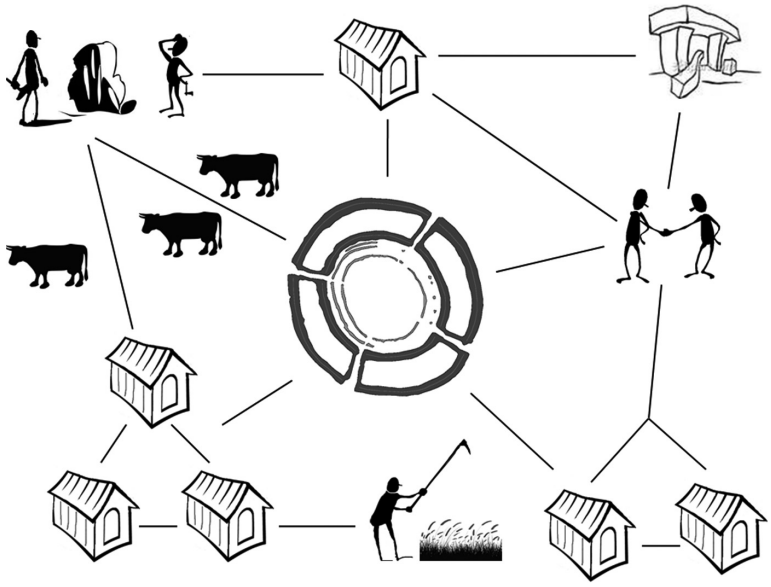

Fig. 3. Communities are networks: interactions forming a 'sense of community' by linking identity and place at multiple spatial and temporal scales.

Using anthropological data, Kolb and Snead (*1997*) formulated a definition of community for the archaeology of small-scale societies based on three essential and irreducible factors: social reproduction, subsistence production, and self-identification. These factors crosscut the themes presented here, rather than mapping to themes in any one-to-one relationship. A concrete example providing several keys to what a community is and what it does is provided by Bill Williamson (*1982*) in his discussion of the village of Throckley in Northumberland. Williamson (*1982.6*) expands on the concept he calls 'constructed community'. This community was understood and experienced by its members as more than a collective of institutions such as churches, schools, shops and assorted social organisations, since "*these institutions were woven into the daily patterns of everyday life*" (*Williamson 1982.77*). The extent of these institutions were taken to mark "*the symbolic boundaries of Throckley as a community*", boundaries which were defined not geographically, but "*by the shared system of meaning and values which people from Throckley could draw upon to give a coherent account of their social life*" (*Williamson 1982.77*). People's daily routines reproduced Throckley as a community, making it always a developing rather than static entity. Essentially, the community is formed through the daily practices of construction and reproduction of local social networks and identities, but again here we can see the multi-scalar nature of the concept.

As we can see, community is not a simple and straightforward descriptive word. Community is a multilayered concept having many contrasting meanings and contrasting roles, among which are face-to-face interactions and a 'sense of community'. Roles include social reproduction, negotiation of tradition and the construction of identity and boundaries. Yet we must be cautious when applying the term uncritically. All too often, we use what Gerald Suttles (*1972*) has called the idea of 'natural community'; that is, that community appears without direction or intention, as the products of human nature rather than as the product of human action. Community, however, is formed through human interaction, practice and interpretation, just as local social networks and identities are produce and reproduced (*Knapp 2003*). We also must be careful not to engage in new binary oppositions of 'natural' *vs.* 'imaginary'. An advantage of allowing ambiguity is that we can talk about multiple kinds of community taking place in multiple contexts and at multiple scales, without setting community in opposition to some other concept. Furthermore, community is a construct, not an entity, and is a construct that perseveres through time. We cannot measure community in the way we can measure a settlement.

Finding and interpreting communities

Not only are we unable to measure community, some of these themes are difficult to explore for Neolithic and pre-Neolithic societies. One place to search for evidence of these themes is in the built environment.

The built environment is an essential part of the quest to interpret community structures in past societies. This is because architecture fills a number of social requirements, ranging from the mundane, such as shelter, to regulating social interaction within a community and facilitating ritual practices. In addition, architecture serves to control contact between individuals, households and communities, especially through the creation of public and private space (*Byrd 1994; Kent 1990; Lawrence, Low 1990*). By built environment, I mean not only those things deliberately and intentionally built, like houses, fortifications, burial mounds and ovens, but also the unintended construction of things like erosional surfaces and cultural soilscapes. Through the unintentional, habituated practices of everyday life, people change their landscapes in identifiable ways. Through tilling and trampling, fertilisation and agriculture, in clearing fields, digging pits, preparing food, building fires, middens, levees, terraces and many other activities, people change the physical and chemical properties of the soil. These are things we can see archaeologically if we treat soil as material culture; the following case studies present examples of using soil as an artefact.

Neolithic soilscapes, Körös Area

My first case study comes from the Neolithic and early Copper Age in the Körös River Basin of eastern Hungary. I have discussed the methods in detail (*Salisbury 2010; 2012a*), so a brief summary should suffice. I hand-cored small farmsteads, described the stratigraphy seen in the cores, and collected samples for pH, available phosphates, multi-element chemistry and magnetic susceptibility. Taken together, these data suggest that cultural soilscapes replaced natural soilscapes at settlements. Cultural soilscapes form part of the household cluster, improving our interpretations of human activities. Human inputs of ash, shell and bone, in conjunction with extensive burning on and in the ground, significantly increased alkalinity over time. Phosphate levels in and around sites are much higher than normal, resulting from anthropogenic inputs of organic matter. Tilling, trampling and adding clay to different areas within the house lots, in conjunction with the addition of organic matter, cause changes in soil texture. All of these combine to create a cultural soilscape and specific activity zones within this soilscape that people could identify through sight, smell and touch. Through this, a community of place developed, connecting people to specific places in the landscape, which would be recognised in similar places during visits to other settlements.

Daniel Miller (*1987*) argues that objects can be important not because they are obviously there or obviously constraining/enabling, but because in many cases they are not obviously there. That is, objects are most powerful when they are acting through our subconscious, as part of an exterior environment that both habituates us and incites us to act. This kind of approach helps us understand how people react to soilscapes. Evans wants us to reflect on the phenomenological aspects of "*the closest, most intimate, scale with the land surface that can be experienced under everyday practices of living*", the "*experience of textures*" beneath our feet and in our hands (*Evans 2003.45*). These qualities become part of how people identify their locality, and how they fit into the world. The creation of place through the construction of soilscapes (Fig. 4) occurs in a manner analogous to that of landscape construction, and has quite similar results. Each community's sense of place is linked in a reciprocal relationship with the land, a relationship that helps to structure their use of space and feeling of belonging. This relationship is reciprocal, because as people interact with the natural processes of soil formation, erosion and re-deposition, the changes they sense inform their conceptualisation of community, place and time. The soilscapes then become key elements of the cultural landscape and an important component of identity.

People live in a complex set of relationships, including relations with the environment, architecture, the organisation of space and other people. These relationships influence remembering and identity. Regularities in the architecture of settlement space suggest a widely held set of cultural traditions that acted both as constraint and affordance. This is seen in the use of mud for house construction, and in the geochemical evidence for the organisation of activity zones around the household-cluster (*Salisbury 2010; 2012a*). Adhering to cultural conventions does not mean blindly following social rules, or fixity due to social structure. Nor does wide variability, for example in the size, distribution and structure of Tiszapolgár settlements (*Parkinson 2002; Parkinson* et al. *2010*), indicate a complete breakdown of traditions. Rather, these traits indicate that settlement space was developed through everyday practice and used as an avenue for negotiation and change following the aggregation and boundedness of the Classic Tisza period. As with diversity within the very structured set of rules followed by LBK people in the construction of their houses (*Modderman 1988*), the structured use of space within Late Ne-

lithic and Early Copper Age farmsteads and the creation of cultural soilscapes around them serves to affirm identity while allowing for divergence from cultural norms. The materialisation of everyday practice in the texture, colour, consistency and fertility of soils in and around the house or hamlet would have made physical the social reality of the community, even as house size changed and populations dispersed. Soil becomes a medium of expression (*Salisbury 2012b*), relaying strong symbols about the world and about the place of and membership in a community. Thus, the soilscape provides an alternative source of collective standardisation to offset some variability.

Neolithic enclosures

Again, architectural organisation has important implications for the construction of memories and identity. This is evident in the formation of tells, burial mounds or henges, and this realisation has resulted in theories about remembering and landscape (*Chapman 1997; Whittle 2005*). Regularities in the architecture of settlement space also suggest a widely held set of cultural traditions. I argue that the structured use of space within Late Neolithic and Early Copper Age farmsteads and the creation of cultural soilscapes around them serves to affirm identity while allowing for variations in other cultural traditions. The materialisation of everyday practice in the texture, colour, consistency and fertility of soils in and around the house or hamlet would have made physical the social reality of the community, even as house size changed and populations dispersed.

Similarly, the construction of social space through the building of rondels in the Lengyel culture contributed to identity and maintained social networks. Ditched enclosures are known throughout Central Europe from the LBK through the Lengyel and Tiszapolgár (*Parkinson, Duffy 2007*). During the early fifth millennium BC, enclosures became formalised in design and no longer necessarily enclosed settlements. These earthworks comprise very formal, circular arrangements of banks, ditches, and timber palisades, albeit with local variations. In the classic form, there are four narrow entrances that tend to be opposite each other, as seen here at Hornsburg 2 in Lower Austria (Fig. 5). Roundels are mostly known from aerial reconnaissance and geophysical prospection, and many have been subject to severe erosion, so relatively little is known about them except for their distribution and general physical form, but their construction represents a lot of work.

The very formal circular layout, although differing in detail from site to site, seems to adhere to a preconceived overall plan. This particular feature distinguishes the roundels from other Neolithic enclosures. The ditches were roughly V-shaped in section, up to 5m deep and 8m wide. Sometimes they were re-cut: segments of ditches near the western entrance at Hornsburg 2 in Lower Austria showed signs of multiple episodes of cutting and infilling. John Chapman (*1988*) has described enclosures as having an

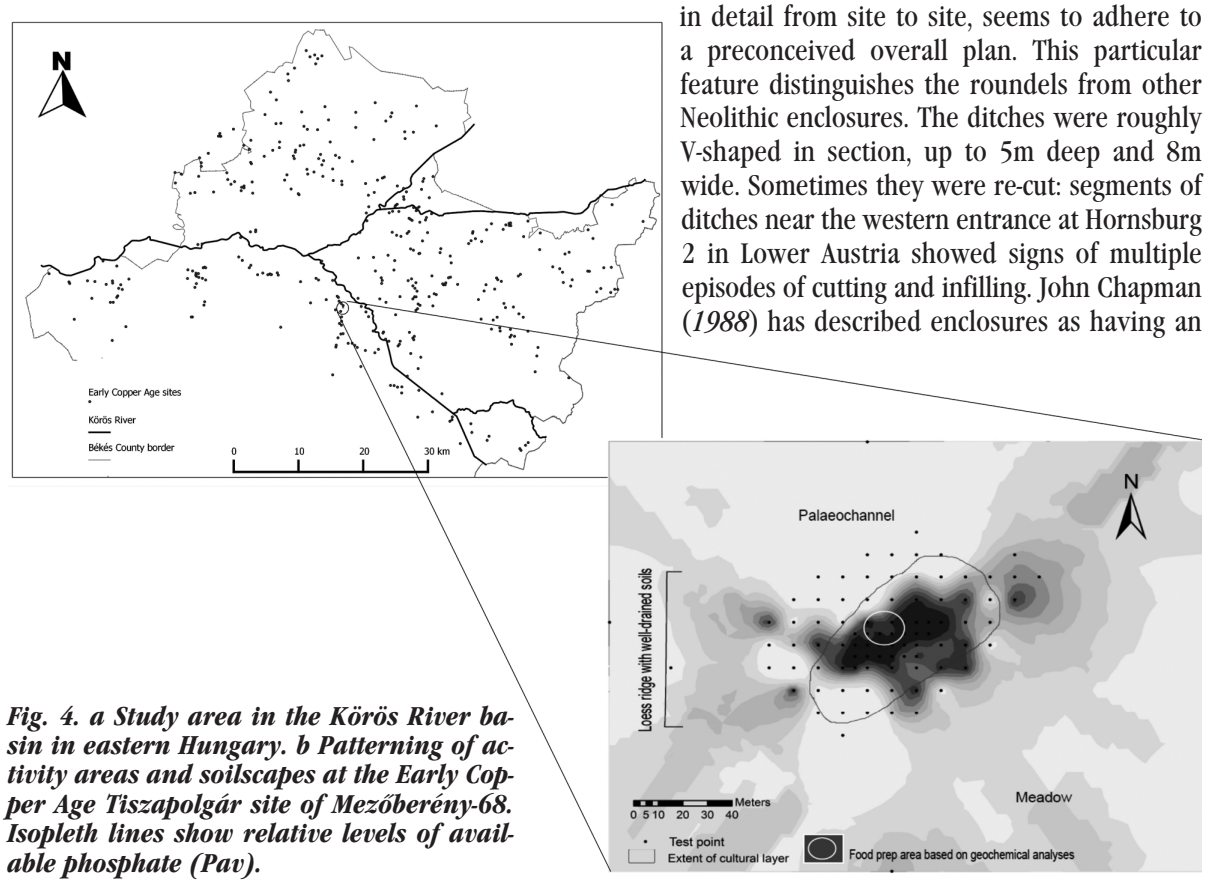

Fig. 4. a Study area in the Körös River basin in eastern Hungary. b Patterning of activity areas and soilscapes at the Early Copper Age Tiszapolgár site of Mezőberény-68. Isopleth lines show relative levels of available phosphate (Pav).

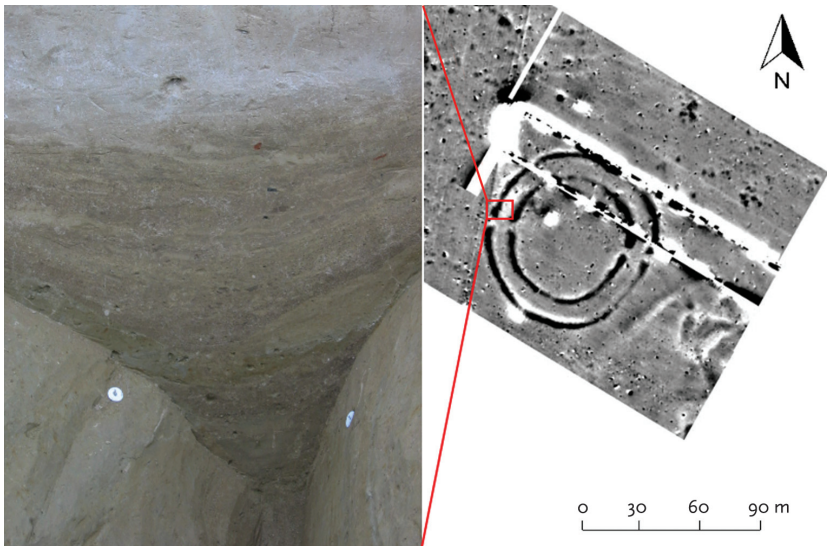

Fig. 5. The Neolithic enclosure of Hornsburg 2 in the Kreuttal, Lower Austria. The enclosure ditches show evidence of multiple episodes of re-digging or cleaning.

essential role in translating space to place. Whittle (*2003*) views the planned and repetitive digging and re-digging of ditches as essential to the maintenance and guidance of collective memory. In other words, the construction of enclosures and other earthworks was important in the formation of common identities and the observance of a shared sense of community. Although more work is needed to learn what went on inside these enclosures, they appear to be a general cultural phenomenon that was established early and remained in cultural memory, but changed and became more highly structured as cultural traditions diverged. With this comes the sedimentation of certain practices within the habitus of a community.

Conclusion

Community typically includes an idea of locality as well as identity, and it is in this very respect that it is most evidently multi-scalar. Each of the levels of Neolithic settlement clustering is related to a form of community, and is part of a dynamic network. At large Late Neolithic sites in the Carpathian Basin, house clusters delimited by small fences of stakes (*e.g.*, *Horváth 1987; Raczky 1987*), may be one community, whilst several house clusters form another, larger community. At the regional scale, we see clustering of small sites around the large settlements (*Parkinson 2002*), suggestive of micro-regional communities (*Salisbury 2010*). The relative uniformity of ceramic decoration that makes the Tisza culture, for example, distinct from Lengyel or Vinča, suggests a regional Tisza community, a community that archaeologists refer to as a cultural group. Likewise, the distribution of Lengyel roundels and settlements suggest several layers of Lengyel community.

At the level of the farmstead, the community appears to be one or two households, but these farmsteads are linked to one another through networks of interaction, evident in cultural traditions of spatial organisation, ceramic decorations, communal construction projects, mortuary customs and exchange. A sense of community can be extrapolated from the ways that task areas are placed, concentric ditches are dug, or sediments are altered. I have shown how the manipulation of soil played a significant role in the process of the construction of community, through the formation of soilscape, through sensual experience and social memory. Changes in the texture, colour and thickness of soils also delimit space in very tangible ways.

In conclusion, while a structural definition of community might seem useful, developing one single definition is not only exceptionally difficult, but also would necessarily be limiting. The multi-layered and multi-scalar nature of the term make it a useful tool for both particularistic studies and cross-cultural diachronic comparison, allowing us to extend our interpretations in directions of both the intersubjective phenomenology of sediments and space and the role that these play across networks of people, communities and materials. Communities are collective actors, transforming their world and their society. Communities are social constructs, which may or may not be related to a shared space, but also to a shared worldview, group affiliation or occupation. Communities are relational entities, composed of networks of people and environment functioning at multiple spatial and temporal scales. The problem is to identify measurable material remains that reflect both the cultural system and the relations between its parts. Soils have these measureable material remains. Documenting multiple themes of community, communities existing at regional and landscape scales, demonstrates some of the very real complexity of life, and archaeology, for Neolithic communities.

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The white beauty – Starčevo culture jewellery

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ABSTRACT – *Personal ornaments are often used to display information about the person wearing them – identity, group or individual, status, current role. In this paper, I analyse ornaments from osseous raw materials from Early and Middle Neolithic sites in Serbia. The exotic origin and labour and skill invested in their production may have conferred value on them or added to it and their animal origin was considered of special significance. Specific forms conveyed information on status and/or social identity (membership of kin or social group,* etc.*) and their white colour probably had more than mere aesthetic significance.*

IZVLEČEK – *Nakit pogosto služi kot podajalec informacij o osebi, ki ga nosi – kaže na identiteto, skupinsko ali posamezno, status in trenutno vlogo osebe. V članku analiziramo koščeni nakit iz zgodnje- in srednje-neolitskih najdišč v Srbiji. Eksotično poreklo ter delo in spretnosti, ki so bile vložene v njihovo izdelavo, so morda tem predmetom dali posebno vrednost, ali pa so k temu vsaj prispevali. Poseben pomen je gotovo imel njihov živalski izvor. Oblike predmetov so posredovale informacije o statusu in/ali družbeni identiteti (pripadnost sorodstveni ali družbeni skupini itd.), njihova bela barva pa je imela verjetno več kot le estetski pomen.*

KEY WORDS – *personal ornaments; osseous raw materials; technological choices; aesthetic choices; Starčevo-Körös-Criş culture*

Introduction

The appearance of the human body has always been used as a vehicle for display and for presentation. The entire body and its decoration can be, was and is, extensively used to show and negotiate different identities, from assertive (individual) to emblematic (group), from permanent or of long duration (such as belonging to a class or kin group) to temporary (*e.g.*, the role of shaman, participant in a ritual, *etc.*). Through the decoration, clothes, jewellery, make-up, but different messages can be transmitted also through entire body posture and gesture, and the endless number of combinations were used throughout prehistory up to modern times (*e.g.*, *Wright, Garrard 2002; d'Errico, Vanhaeren 2002; Taborin 2004; Yatsenko 2004; Thomas 2011 with references*). Hair, for example, was used to express individual status (single, married, young mother, widow, *etc.*), to signify strength and power, to denote ethnic identity, even as a visible sign of punishment (*Firth 1973*). Clothes are today used to display not only social status or wealth, but also the current role of the individual (*e.g.*, uniforms for some occupations). Jewellery and other personal ornaments as well as various types of body decoration (from tattoos to war paint – *cf. Norman 2011.140–143*) can also be combined in an endless number of ways.

The first appearance of decorative beads is usually perceived as a mark of modern human behaviour, and although these items range widely in appearance, they are very important in human societies and their use is deeply embedded in human behaviour (*cf. Henshilwood* et al. *2004; d'Errico 2007; d'Errico* et al. *2005; Álvarez Fernández, Jöris 2008; Rigaud* et al. *2009*).

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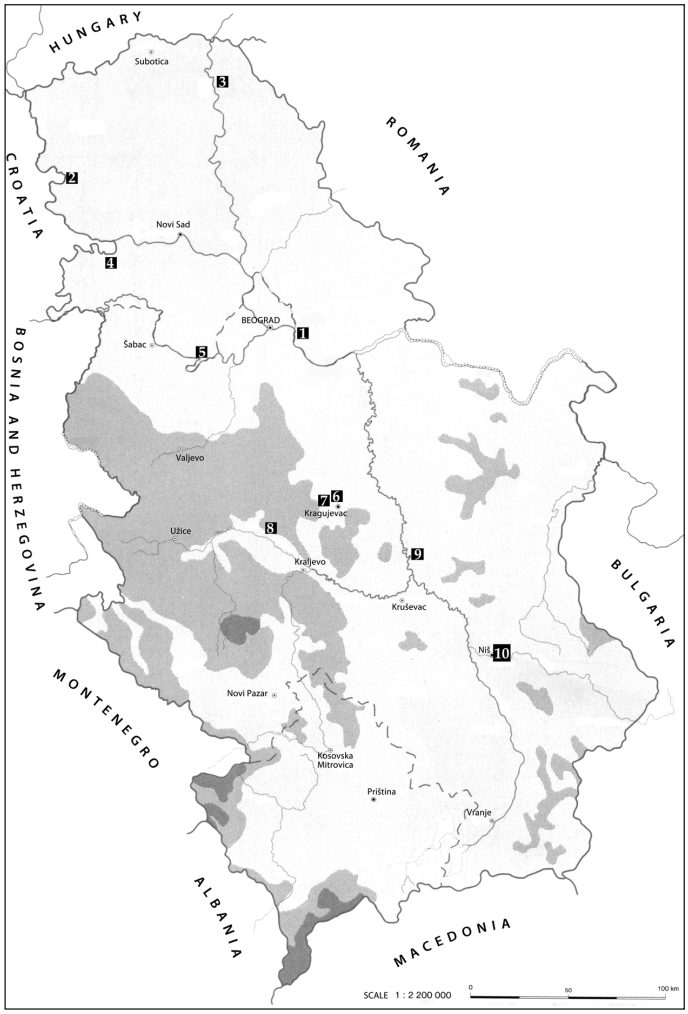
A complete 'set' of decorations may, therefore, be perceived as a text and thus 'read' by decoding the messages embedded in them. In the archaeological record, when only the remains of decoration are available for study, this is of course a challenge and it is even questionable whether any answers may be obtained. As the theoretical framework for the comprehension of the role and significance of personal ornaments I would suggest a contextual and structuralist approach (*sensu Hodder, Hutson 2003.156–205*), *i.e.*, the analysis of the mode of use within a given society and the analysis of position within the social structure and relations with other activities (see also *Braithwaite 1982*), analogous to the analysis of language (*cf. Lévi-Strauss 1958*).



Map 1. Starčevo culture sites mentioned in the text: 1 Starčevo. 2 Donja Branjevina. 3 Čoka-Kremenjak. 4 Golokut-Vizić. 5 Baštine-Obrež. 6 Divostin. 7 Grivac. 8 Anište-Bresnica. 9 Drenovac. 10 Bubanj.

Archaeological setting

Starčevo culture, part of the large Starčevo-Körös-Criş culture complex, represents the Early and Middle Neolithic in the central and western Balkans and south Pannonian plain. The study of Starčevo culture began almost one hundred years ago, when the eponymous site at Starčevo-Grad near Pančevo, near Belgrade, was excavated. The first relative chronology was proposed after the pottery was found in enclosed units at the site (*Aranđelović-Garašanin 1954*; for recent work on relative chronology, *cf. Tasić 1997*). The ^{14}C dates obtained by the AMS method place it in the period from *c*. 6400 and 6200 calBC (the earliest dates are for Blagotin site: 7480±55 BP (OxA–8608) and 7230±50 (OxA–8760)). The dates for the Starčevo sites range from 6975± 60 BP (OxA–8561) to 6480±55 BP (OxA–8560) (*Whittle* et al. *2002.107–117*).

Today approximately 100 sites are known almost all of which are settlements, since grave finds are extremely rare (*cf. Tasić 1997* with references). Finds relating to the bone industry from approximately 20 excavated sites have been collected and preserved; approximately 12 of these also contained decorative items (Map 1) – Donja Branjevina, Golokut, Starčevo, Baštine, Čoka-Kremenjak in Vojvodina, Divostin, Grivac, Međureč, Drenovac in central Serbia, Bubanj in eastern Serbia and Anište-Bresnica in western (*Vitezović 2009; 2011a; 2011c*). As these are all finds from settlements the number of artefacts is not high; they were usually not *in situ*, but were found in secondary positions and they were probably discarded.

Methods of analysis

Ornamental pieces fashioned from osseous raw materials were included among assemblages of objects made from osseous materials (*i.e.*, from animal hard tissue – bone, antler, teeth and mollusc shell), which encompasses the entire range of artefacts from manufacture debris and minimally worked pieces to various tools with elaborated forms (*Averbouh 2000.187*).

The objects were analysed in terms of technology (*cf. Vitezović 2011b*). This also entails the study of material culture in its social and economic context and the concept of technological choices – how and

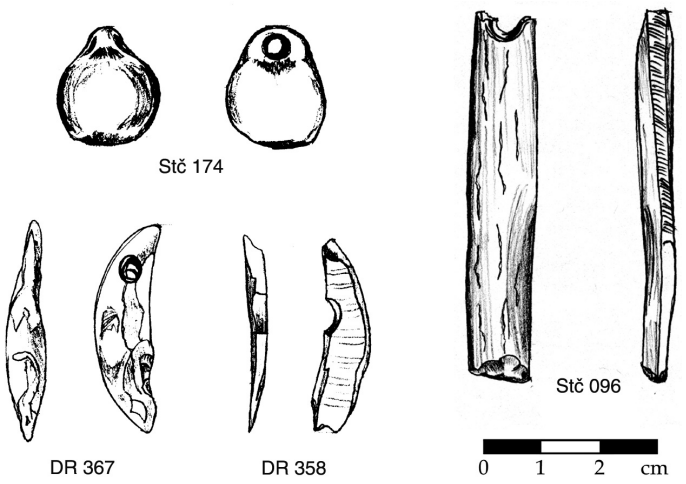


Fig. 1. Pendants: globular pendant from Starčevo; perforated* Canidae canine *from Drenovac; fragmented pendant from boar tusk from Drenovac; fragmented elongated antler pendant from Starčevo.

why one society uses one and not some other technology and how technology is related to other social phenomena (see also *Lemonnier 1992; 1993*).

An important element of this analysis is the reconstruction of the *chaîne opératoire* (operational chain), an analytical method proposed by André Leroi-Gourhan (*1964; 1965; 1971*) which requires the examination of how an artefact is made, used and discarded, from raw material acquisition through manufacturing techniques, final shaping, mode of use (which also includes possible caching of the object, breakages, repairs, *etc.*) to final its disposal. A structure inheres in the making of things which is not only syntactic, but also paradigmatic, since it also involves decision making. The concept of *chaîne opératoire*, therefore, is not only a matter of reconstructing an algorithmic sequence for the life of an object, but is instead a complex analysis of production processes within a single society, which includes the question of choices that are made. The focus is not only on material culture and technological know-how, but also on individual and social behaviour (*cf. Leroi-Gourhan 1964; 1965; 1971; Vitezović 2011b*).

The *chaîne opératoire* approach is a "*theoretically informed commitment to understanding the nature and role of technical activities in past human societies*" (*Schlanger 2005.19*). This method can contribute to the study of material culture by helping to bridge the gap between the symbolic and the quotidian, between production and consumption. It can lead from the static remains recovered in the present to dynamic processes in the past, and thus raise a range of archaeological and anthropological questions (*Schlanger 2005.18–21*).

Another analytical tool designed for the analysis of bone industry, which may also be applied to other raw materials, is 'the manufacturing continuum or the continuum of quality' (*Choyke 1997; 2001; Choyke, Schibler 2007*), which examines worked osseous materials in terms of the effort required for the manufacture of individual objects. The manufacturing continuum reflects cultural attitudes to the objects themselves and attitudes to the tasks in which they were used. Objects are aligned on an imaginary axis from minimally worked, ad hoc, to elaborated pieces following these criteria: (i) the regularity of choice of species and skeletal element used in their manufacture; (ii) the number of stages used in their manufacture; (iii) whether they have been worked; and (iv) their exploitation index, which measures the degree of working (the proportion of surface covered by manufacturing marks) relative to the degree of use (the proportion of surface covered by use wear, handling wear and degree of curation) (*Choyke 2001.63*).

Techniques may be classified as practical and prestigious (*cf. Hayden 1998* with references; see also *Vitezović 2011b*). Practical technology corresponds to the general way that the term 'technology' is used in archaeology and anthropology – it is meant to solve practical problems of survival and basic com-

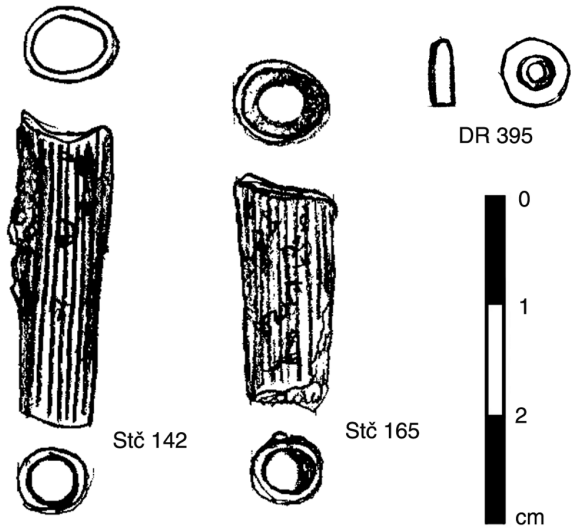


Fig. 2. Beads:* Dentalium *beads from Starčevo and flat shell bead from Drenovac.

fort. One of the underlying principles in practical technology is to perform tasks satisfactorily in an efficient and effective way. For a given problem, the criteria used in choosing between alternative technological solutions are how effective and how costly each solution is (*Hayden 1998.2*).

The purpose of creating prestige artefacts, on the other hand, is not to perform a practical task, but to solve a social problem. They display wealth, success, and power and are used for social tasks such as attracting mates, labour, and allies, or bonding members of social groups together via displays of success. Therefore, the logic and strategy governing the creation of prestige artefacts are fundamentally different from the logic and strategy governing the creation of practical artefacts. Hayden (*1998.11*) also suggested that the main goal of prestige technologies is to employ as much surplus labour as possible to create objects that will appeal to others and attract people to the possessor of those objects out of admiration for his or her economic, aesthetic, technical, or other skills (*Hayden 1998*).

Raw materials and manufacture

Although the first image that jewellery often evokes is of precious stones and metals, the most common raw materials used throughout prehistory as well as in many historical societies were organic. Osseous raw materials are almost the only organic raw materials that survived from the Neolithic and one must assume that the personal ornaments encompassed the full range of other artefacts made from leather, hide, textile, wood, feathers, *etc.* (see also *Pedersen 2004*).

All available osseous raw materials were used for producing personal ornaments – bone, antler, teeth and mollusc shells. Bones and antler were also used for other artefacts such as everyday tools and there is no significant difference in the raw material choice, although bones from large ungulates (such as *Bos*) were somewhat preferred to those from smaller ungulates. *Bos* bones, especially metapodials, were the preferred choice for some artefact classes including highly valued spoon-spatulas and some sub-types of projectile point (the first were made in uniform ways with large investments in skill and labour and were in long-term use, often repaired – *cf. Vitezović 2011a*).

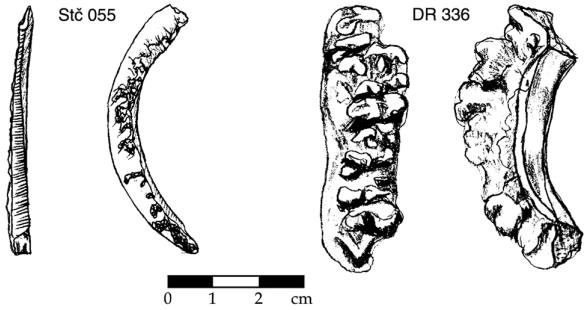


Fig. 3. Bracelets:* Spondylus *bracelet from Starčevo and antler bracelet from Drenovac.

Teeth and mollusc shells, on the other hand, were generally not used for any other artefact types (only boar tusks were sometimes used for making scrapers). It is also important to note that bones for artefact production were generally obtained from domestic animals, while teeth were often taken from wild species (such as various carnivores and red deer canines).

Mollusc shells included *Spondylus* and *Dentalium* (Fig. 9); for some shell beads, however, it was not possible to determine the species. *Spondylus* was an exotic raw material obtained through trade or exchange and was widespread in prehistoric Europe (*cf. Willms 1985; Borrello 2004; Borrello, Micheli 2004; Séfériadès 2010; Ifantidis 2011*). *Dentalium* might have been obtained locally, although this has not been confirmed (*cf. Dimitrijević* et al. *2010*).

Although the choice of raw materials for decorative items does not differ dramatically from the choice for everyday tools, the materials are more desirable and more valued osseous items (shells are of exotic origin, teeth from game animals, and neither were available every day and/or locally).

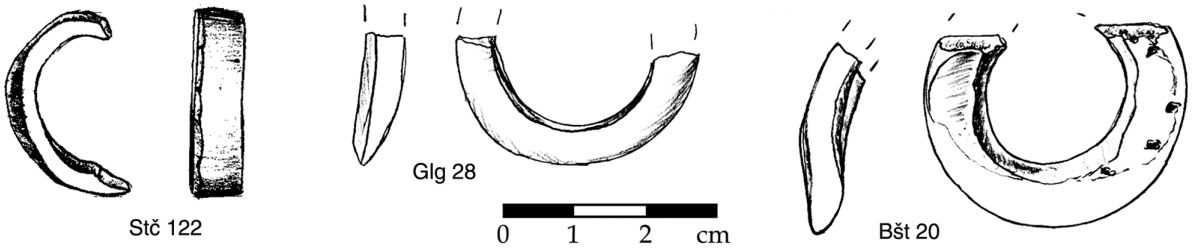


Fig. 4. Rings and discs from long bone segments, from Starčevo, Golokut and Baštine.

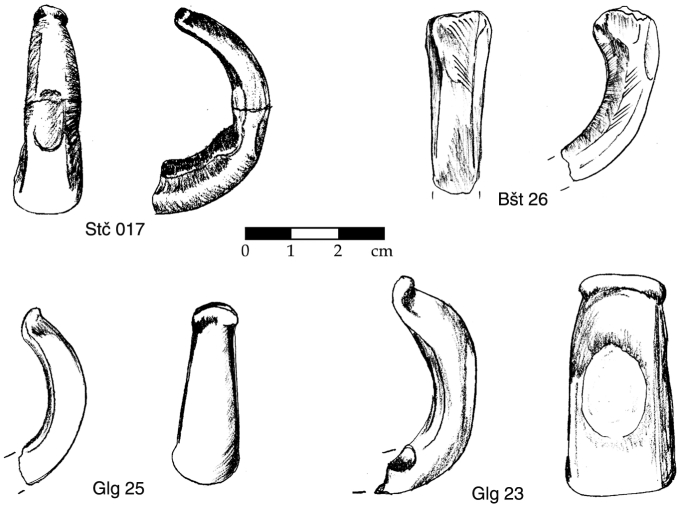


Fig. 5. Buckles in the form of an open bracelet, from Starčevo, Baštine and Golokut.

Bones and antler were transformed into decorative items by using the same techniques as for producing tools – first, a blank was created by breaking, cutting or chopping with stone and flint tools and further shaped by cutting and scraping with retouched and unretouched flint scrapers and burins (*cf. Vitezović 2011a*). However, the entire *chaîne opératoire* included additional stages, especially those of finishing – burnishing and polishing with sandstone or other abrasive stone, fabric with sand added, *etc*. In short, raw materials commonly used for tools were transformed into decorative items by means of much more demanding techniques and with the investment of more labour. This also confers or raises their value as the skills required to make them may have been of intrinsic value (*cf. Sinclair 1995; 1998*), which is a general characteristic of skills associated with prestigious technologies (*cf. Hayden 1998*).

In most cases, teeth were transformed into pendants by the simple addition of perforations made with a flint. The most difficult method to reconstruct is for making shell items as they were highly polished, leaving almost no trace of manufacture. Except for *Dentalium* beads, which were obtained by simple cutting, other artefacts were produced through a long sequence of cutting, scraping and polishing. The method for producing simple flat rounded beads may be reconstructed on the basis of methods from other cultures – a perforation was drilled through irregular pieces of shell obtained by cutting and breaking, and then several beads were string and burnished together with some abrasive stone (*cf. Francis 1982; Miller 1996; Ricou, Esnard 2000*). The absence of raw materials or manufacture debris suggest that marine shells were mainly imported as finished objects, although traces of repair (performed locally) may occasionally be observed.

Typology and site distribution

The items were classified into types according to their general form. However, they may have been used in different ways and one type probably could have been worn in multiple ways: pendants and beads could have been parts of necklaces or bracelets, but also sewn or attached to clothing, a head- dress, *etc*. A further five types may be noted, divided into sub-types and variants: (1) pendants, (2) beads, (3) bracelets, (4) rings and discs, and (5) buckles (*Vitezović 2011a*).

❶ Pendants (Fig. 1) were made from teeth, antler and bones. Several sub-types existed.

- *Globular pendants* (Figs. 7–8) were made from segments of large bones, probably large ungulate long bones. They had globular bodies and perforations on the upper part made by drilling; both were polished from use. One was found on Starčevo and another on Divostin, no other examples from the Starčevo-Körös-Criş culture are known.

- *Tooth pendants* (Fig. 6, left). Various teeth, usually carnivore or red deer canines, were transformed into pendants by the simple addition of a perforation. One red deer canine was discovered at Divostin, and at Starčevo one tooth with an unfinished perforation was found. Fragmented pen-

Fig. 6. Pendants from Divostin, one from red deer canine and an imitation in bone.

dants made from boar tusks are known from Drenovac, as well as a single perforated *Canidae* tooth. This sub-type occurs in the Palaeolithic and they have had a wide geographical and chronological distribution (*cf. Barge-Mahieu, Taborin 1991a; 1991b; d'Errico, Vanhaeren 2002; Taborin 2004*).

- *Bone imitations of teeth pendants* (Fig. 6, right). Bone segments were sometimes cut to resemble the shapes of teeth, most often imitating the drop-like form of red deer canines. They also have a perforation in the upper part and the surface is well polished. At Divostin, one such copy was discovered along with a real red deer tooth pendant.

- Other pendants include various geometrical shapes cut from a long bone or antler cortex segments, burnished and polished, and then perforated.

❷ Beads (Fig. 2) were usually made from shells, although bone may also have been used. Several subtypes may also be noted.

- *Elongated* Dentalium *beads* (Fig. 9, right). *Dentalium* shells were used unmodified or with the ends simply cut. So far, they are known only from Starčevo, where three rather large pieces were discovered (*Vitezović 2011c*).

- *B Flat rounded beads*. Flat beads were made from shell pieces, rarely bone. A hole was drilled and the shell then ground into a sphere. Although they must have been worn in bunches, settlement finds are usually restricted to single pieces that had probably been lost. They are known from Međureč and Drenovac. These beads had a wide chronological and geographical distribution (*e.g.*, *Comşa 1973*), and were also produced from other raw materials, most often white stones (marble, limestone), which imitates the lustre and colour of shell beads (several such beads were discovered at Divostin – *McPherron et al. 1988*).

❸ Bracelets (Fig. 3). Large circular artefacts are classified into bracelets. Judging from their size they were fit to be worn as bracelets on the wrist or arm, although they could also have been worn in other ways. They were made from two raw materials, *Spondylus* shells and antler.

- *Spondylus bracelets* (Fig. 9, left). Three such bracelets were discovered at Starčevo, another three

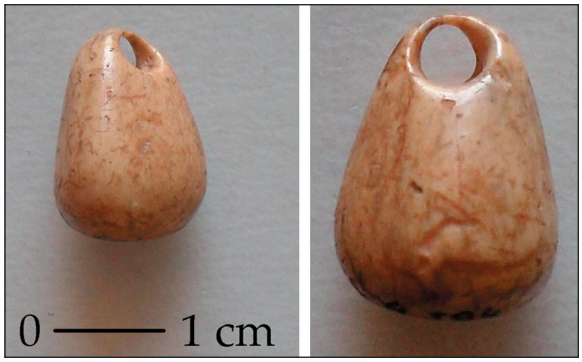


Fig. 7. Globular pendant from Divostin.

at Drenovac and several fragmented finds were excavated at Divostin (*Vitezović 2007; 2011c; McPherron* et al. *1988*). None is completely preserved, although their original shape may be reconstructed after finds from other areas. Traces of manufacture are poorly visible; only polishing may be observed on small portions of their surfaces. One broken bracelet from Drenovac had a perforation, which perhaps suggests that it was repaired and modified after breakage.

- *Antler bracelets* (Fig. 3). One such bracelet was discovered at Drenovac, made from the pearly segment of the base of a shed antler. Fine lines from cutting with retouched flint tool are visible in the inner part, and the polish on the outer surface may be both natural and from use. Only one fragment is preserved, therefore its original form is not clear. Similar bracelets, a total of eight, including one with an animal head at one end, were found in Romania (*Beldiman 2000*).

❹ Rings and discs (Figs. 4, 10, 11). Miscellaneous circular bone pieces are usually simply classified as 'rings'; however, only a few of them could have actually been worn on the finger as the bone is often too thick. Therefore, this type comprises various oval, circular or ellipsoid pieces having a large hole in the centre; most of them probably served as applications attached to clothing. Their shapes vary ac-

Fig. 8. Globular pendant from Starčevo.

cording to the raw material (larger or smaller long bone) and the manufacturing technique – the diaphysis of a long bone could have been transversally cut into segments of different thicknesses, or a segment from the diaphysal wall cut into a certain shape (oval, circular, roughly rectangular); a hole was added in the centre. All of them were also carefully burnished and polished.

Fig. 9. Shell ornaments from Starčevo: bracelet from* Spondylus *and* Dentalium *bead.

Such pieces were found at several sites – Starčevo, Golokut, Baštine, Grivac, Donja Branjevina, Bubanj – all were made from bones, except for one specimen from Starčevo made from *Spondylus* shell (*Vitezović 2011a*). These items are the most common decorative pieces; also, debris related to their manufacture was discovered at several sites. Objects made in the same fashion have been found at sites of the Körös and Criş cultures (*Makkay 1990.45; Beldiman 2007. 138*) and similar artefacts have been encountered at other Neolithic sites in Europe (*e.g.*, *Pascual Benito 1998.152–6; Stratouli 1998.Taf. 27/9, Taf. 32/4,5*). However, the second method of making these artefacts (with a large hole from which specific debris in the form of a chip or token is left) is exclusive to the Starčevo-Körös-Criş culture (Figs. 15–16).

Fig. 10. Discs from Grivac.

❺ Buckles (Fig. 5). Artefacts of various shapes and sizes – presumably used as clasps of some kind, belt buckles, or fasteners for clothes – are classified into this type. Two sub-types can be identified.

- *Buckles in the form of an open bracelet* (Figs. 5, 12). Most of the finds are from sites in Vojvodina: 5 pieces were discovered at Starčevo and additional specimens were found at Donja Branjevina, Golokut, Baštine, and are also known from Grivac. They were all made from long bones of considerable size of large ungulates, probably *Bos*. The bones were cut transversally in the same manner as for ring production by making a groove with abrasive fibre and then by cutting the bone with a flint tool; the segment of the bone was part of the diaphysis closest to the epiphysis (judging from its interior tissue), where the bone has the largest diameter. All these objects have carefully shaped heads made by cutting and whittling with a flint tool, and all the surfaces were carefully polished with fine-grained stone.

- The diameter of these objects varies from between 3 to 5cm; however, as they are all broken in the middle, their original shape is unknown, whether they were in a shape of a semi-circle or almost full circle. This breakage is probably due to use; these particular artefacts may have been used as belt buckles of some kind or clasps for clothing (*e.g.*, for cloaks).

- Although sometimes identified as fish hooks, the thickness of the broken part does not support such an interpretation, *i.e.*, the broken part is too thick to terminate in a sharp point and the preserved part differs from unbroken fish hooks. The decorative purpose is also suggested by careful burnishing and even polish from use. Similar artefacts, sometimes highly decorated, are known from Near Eastern Neolithic sites (Çatal Hüyük, *Mellart 1963.Pl. XXVII; 1964.102*), Greece (*Stratouli 1998*) and Hungary (*Makkay 1990.40*).

Fig. 11. Discs from Golokut and Bubanj.

- *Buckles in the form of buttons with rounded head* (Fig. 13). Only two pieces were found, one at Starčevo and the other at Golokut. The object from Starčevo was in the form of a thin rod with a rounded head. It was made from a piece cut from a long bone, and has traces of grinding and polishing. Intense polish from use is visible on all surfaces, suggesting that piece was in contact with soft materials such as textile or leather for a considerable time. It may have been used as some sort of button or decorative needle. This polish is evenly distributed on all surfaces, so the head could not have been the working end of a tool, because the quality and degree of polish does not stand out from the rest of the object. Also the head is convex and therefore could not have been used as a tool (it would have become flat from use). The specimen from Golokut is similar, although of smaller dimensions and with less pronounced polish from use. Items of this type also exist in Romania, at Carcea-Viaduct (*Beldiman 2007.Pl. 197*).

Fig. 12. Buckles in the form of an open bracelet, from Baštine, Grivac and Donja Branjevina.

Fig. 13. Buckle in the form of a button with rounded head, from Starčevo.

In addition, some other, unique pieces probably served as buckles, clasps or appliqués. An elongated piece, greatly worn from use, with a rounded head and two 'legs' originates from Drenovac, while at Anište a single object in the form of a figure of '8' (Fig. 14) was discovered (*Vitezović 2011a*). At Čoka, manufacture debris probably related to the shaping of these '8' artefacts was found (*cf. Banner 1960*).

Production, use and discard

The actual places, working areas or workshops where decorative items were produced have not been identified at any sites. However, the presence of manufacture debris suggests that they were made at several sites: Čoka, Starčevo, Drenovac, Golokut (Figs. 15–16). The use of the same manufacturing techniques as for the other items in the bone inventory suggest they were produced in the same place, and therefore made locally, except for the *Spondylus* pieces (although repair was done locally).

The use of all these objects was partly or entirely decorative; they were worn as jewellery or as clothing pieces. All of them had use and display polish and worn surfaces from use (*cf. d'Errico 1993; Bonnardin 2008*), even breakage due to use. Prolonged use and the small number of specimens suggest that these were valuable objects and most of them were discarded only when they were beyond repair.

Discussion

In the choice of raw materials, cultural and aesthetic preferences may be observed. Osseous materials, especially bones and teeth, derive symbolic value from their animal origin (*cf. also McGhee 1977; Bernabò Brea* et al. *2010*). The preference for wild and carnivore teeth is especially conspicuous, as well as the choice of Bos bones, which had symbolic significance in the Early and Middle Neolithic (*cf. Vitezović 2010*).

Shells often had great symbolic value and were considered as prestigious, luxurious raw materials (*Siklósi 2004*). Since the Palaeolithic, marine shells have served as prestige goods for adornment and display, money and wealth, status markers and ritual

Fig. 14. Ornament in the form of a figure 8 from Anište.

Fig. 15. Manufacture debris from Starčevo.

use, due to their shapes, colours, and the lustre of their natural forms in almost every part of the world (*cf. Taborin 1993*). They are often symbolically linked with water and the sea and their value increases with distance from the coast (*Trubitt 2003*). Meanings probably changed significantly through time and space; it is even not certain that all populations that used marine shells were aware of their origins or cared (*Séfériadès 2010*). However, their importance was constant; in this regard, the Early and Middle Neolithic finds of (unworked) shells in graves should be mentioned (Velesnica, see *Vasić 2008*).

The raw materials have two important common traits – first, their origin was often from outside the settlement (shed antlers, wild animals, imported or collected shells); second, they are smooth, bright and white. Smoothness and brightness was even increased by manufacture through burnishing and polishing. The importance of colour in the choice of raw material for decorative items has already been observed elsewhere (*e. g., Wright, Garrard 2002; Thomas 2011*), and the significance of white is underlined by copies in white stone (see above). White is a fascinating, bright and shiny colour, and has a wide range of symbolic meaning in different cultures, ranging from symbols for death to symbols of the divine (*Vollmar 2009*).

The techniques used to produce them places all these items at the peak of the manufacturing continuum and also reveal that skill was valued. All their technological features make these items products of prestigious technologies – the choice of rare, more valuable and even exotic raw materials, the use of demanding manufacturing techniques and long use, sometimes even repair.

Typologically, Starčevo culture decorative items may be divided into two main groups. One comprises pie-

Fig. 16. Manufacture debris from Čoka Kremenjak.

ces with a large geographical and chronological distribution – perforated teeth, simple shell beads, *Spondylus* bracelets. The other group consists of types and sub-types whose distribution was restricted to the area of the Starčevo-Körös-Criş culture – rings and discs (made with a specific manufacturing technique), buckles in the form of an open bracelet, antler bracelets, and spherical beads. In some, Near Eastern influences are observable, but some are specific to Starčevo-Körös-Criş culture. Several unique finds, such as the buckle with rounded head and two 'legs' from Drenovac, may be representative of regional characteristics. The earliest examples probably demonstrated wealth and prestige, while the culture-specific items may be considered as items displaying cultural and social identities. Traces of personal identities, however, were not discerned in this limited collection.

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BACK TO CONTENTS

Personal ornaments, Neolithic groups and social identities: some insights into Northern Italy

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ABSTRACT – *The Neolithic is an interesting phase for observing the changes which affected the material culture and the ideology of the prehistoric groups in Europe. The production of personal ornaments improved and new types appeared. A new kind of adornment object was often linked to a new costume expressing a particular social identity, and therefore to new social messages. This paper focuses on the personal ornaments of the Early and Middle Neolithic groups of northern Italy dated between 5600 and 4300 calBC taking into consideration their geographical distribution, the raw materials employed, the exchange networks, the interrelation between different groups and the funerary practices. The analysis of the changes in raw materials, colours and shapes of adornment objects can also give an insight into Neolithic social identities.*

IZVLEČEK – *Neolitik je zanimivo obdobje za opazovanje sprememb, ki so vplivale na materialno kulturo in ideologijo prazgodovinskih skupnosti v Evropi. Proizvodnja osebnih okrasnih predmetov se je izboljšala in pojavili so se novi tipi nakita. Novo vrsto okrasnih predmetov so pogosto povezovali z novimi vrstami noše, ki naj bi odražale določene družbene identitete in posledično tudi nove družbene informacije. V članku se osredotočam na nakit zgodnje- in srednje-neolitskih skupnosti severne Italije v obdobju med 5600 in 4300 calBC, pri čemer upoštevam geografsko distribucijo, uporabljene surovine, omrežje izmenjav, povezanost različnih skupnosti in pogrebnih praks. Analiza sprememb v uporabi surovin, barv in oblik nakita nam prav tako omogoča vpogled v družbene identitete neolitskega obdobja.*

KEY WORDS – *personal ornaments; regional groups; Early and Middle Neolithic; Impressed/Cardial Ware culture; Po Plain Neolithic groups; Square Mouthed Pottery culture*

Introduction

Practices of body ornamentation are very important in all traditional societies from prehistory to modern times. In fact, human beings have always considered their bodies as a natural support for decoration and transformation, as a medium to convey symbolic meanings (*Cordwell 1979*). Personal ornaments, as a component of body adornment, are often significant material elements in defining the identity of social groups and their members: they are conceived and universally employed in order to distinguish individuals and groups from each other and to convey information to others about age, gender, social status and membership. Thus, such objects can serve as means of constructing and displaying social identity. However, adornment items also constitute a field of material culture with psychological and religious implications, since they are often considered powerful objects connected to magic and the supernatural (*Roach, Eicher 1979*).

The increase and spread of body ornamentation in the Neolithic was certainly due to innovations in the social organisation of Neolithic communities wrought by the development of farming, animal husbandry and settled villages. It was also a consequence of changes in craft production, exchange networks and raw material procurement which took place during the Neolithic and which strongly

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influenced material culture and subsistence. Unfortunately, many forms of body adornment do not survive in archaeological deposits, limiting our knowledge about past identities. Instead, personal ornaments, which are mostly made of non-perishable material, are often recovered during excavations and can be extremely useful for the study of some aspects of costume. During the first phases of the Neolithic period, the production of personal ornaments increased and new types appeared. These are two significant clues indicating an increase in the complexity of Neolithic ways of appearance. In fact, in traditional societies, a new kind of personal adornment object is often linked to a new form of costume, new messages to convey and new cultural and social identities. These can also be expressed through the choice and manipulation of particular raw materials and/or the characteristic shapes and colours of personal ornaments, as well as by their arrangement on the body or clothing.

The data available for the Italian Neolithic are not yet comparable to those of other European Neolithic groups, although they have been increasing in the last years, thanks to some fortunate discoveries (Fig. 1). The paper explores some of the above issues, focusing on the personal ornaments of Early and Middle Neolithic groups in northern Italy dated between 5600 and 4300 calBC, concentrating on the period during which prehistoric groups moved from the first stages of Neolithisation in the 6th millennium calBC to a well-established, well-organised and fully Neolithic society in the 5th millennium calBC. The study investigates how personal ornaments may disclose social or cultural identities taking into consideration the raw materials employed, the existence of patterns in the material culture and the geographical distribution. Lastly, it considers the relevance of objects of adornment in funerary contexts.

The Early and Middle Neolithic of northern Italy: a brief outline

The Neolithisation of northern Italy took place during the first half of the 6th millennium calBC with the colonisation by Impressed Ware groups of the coastal territories of the Tyrrhenian and Ligurian seas along maritime routes following the main marine streams. A second case of colonisation of Impressed Ware groups is attested along the Adriatic coast of the Peninsula, when such groups spread

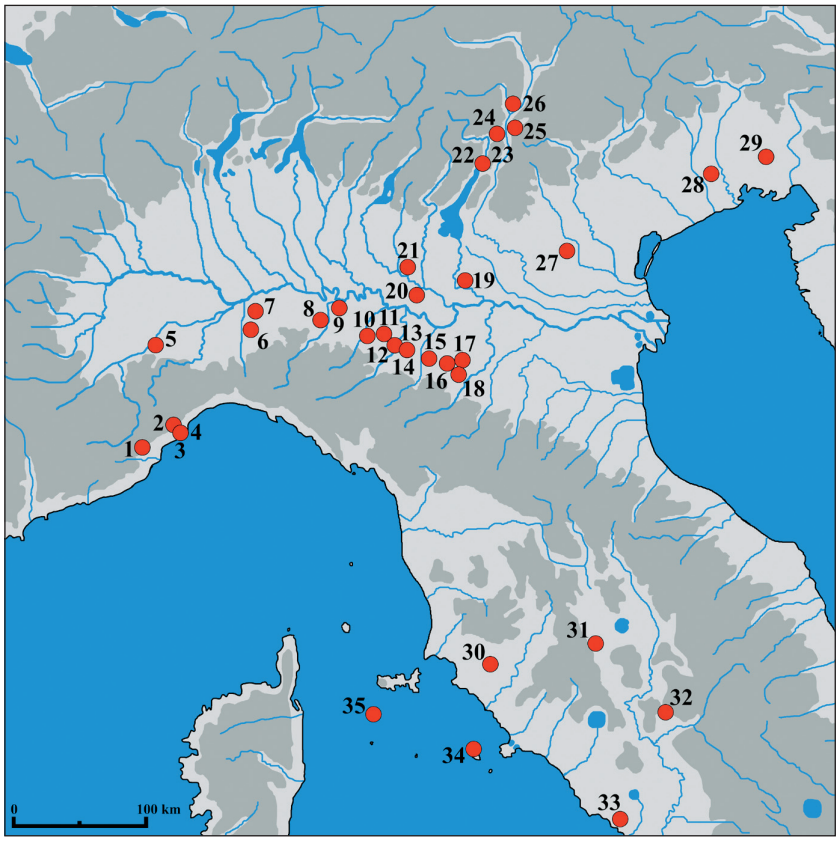

Fig. 1. Neolithic sites mentioned in the text and figures: 1 Arma di Nasino. 2 Pipistrelli or Borzini cave and Arma dell'Aquila. 3 Arene Candide cave. 4 La Pollera cave. 5 Alba. 6 Brignano Frascata. 7 Godiasco – Monte Alfeo. 8 Travo – Case Marchi. 9 Le Mose. 10 Ponte Ghiara. 11 Pontetaro. 12 Collecchio. 13 Parma (Benefizio and via Guidorossi). 14 Gaione (Cascina Catena and Cinghio) and San Ruffino (Cascina Marana and Villa Greci). 15 Bazzarola. 16 Rivaltella – Ca' Romensini and Chiozza di Scandiano. 17 Formigine – Cantiere di Magreta. 18 Fiorano Modenese. 19 San Giorgio – via Raffaello. 20 Vhò di Piadena. 21 Ostiano – Dugali Alti. 22 Riva del Garda – via Brione. 23 Moletta Patone rock-shelter. 24 La Vela. 25 Gaban rock-shelter. 26 Mezzocorona Borgonuovo. 27 Fimon – Molino Casarotto. 28 Fagnigola. 29 Sammardenchia. 30 Fontino cave. 31 Orso cave. 32 Bella cave. 33 Patrizi cave. 34 Giglio island – Le Secche. 35 Pianosa island – Cala Giovanna and La Scola.

from the central Italian regions, reaching Romagna in the second half of the 6th millennium calBC (*Bagolini 1992.280–284; Pessina 1998; Malone 2003; Pessina, Tiné 2008*). Until the first centuries of the 6th millennium calBC, almost all northern Italian territories were occupied by late Mesolithic hunter-gatherers of the Castelnovian tradition (*Binder 2000; Biagi 2003; Franco 2011*) which in some cases may have had a role in the process of Neolithisation; however, such groups are not attested in Liguria, where Neolithic groups settled in the western territory in the first centuries of the 6th millennium calBC in an apparently 'empty space'. A recent study of the literature (*Binder, Maggi 2001*) recognises two main phases in Liguria and Provence: an ancient horizon, characterised by Impressed decoration and dated between 5800 and 5400 calBC, testifies to the first episodes of colonisation, while a more recent horizon with the characteristic Cardial decoration is dated between 5400 and 5000 calBC and is contemporary to the French-Iberian Cardial Ware horizon (*Binder 2000; Manen, Sabbatier 2003; Skeates 2003; van Willinger 2004; Guilaine, Manen 2007*). In the Po Plain, however, Neolithisation happened around the middle of the 6th millennium calBC, when the Padan Neolithic groups occupied the extensively forested area along the main river courses (*Bagolini 1992.284–293; Pessina 1998; Malone 2003; Pessina, Tiné 2008*). While the former was a clear colonisation event from the southern regions along maritime routes, the latter was a more circumscribed and complex phenomenon that included various processes and influences not yet completely understood. The two chronologically contemporaneous cultural spheres in the second half of the 6th millennium calBC (Fig. 2) remained substantially independent of each other, preserving their specific material culture despite the fact that some contacts existed between them.

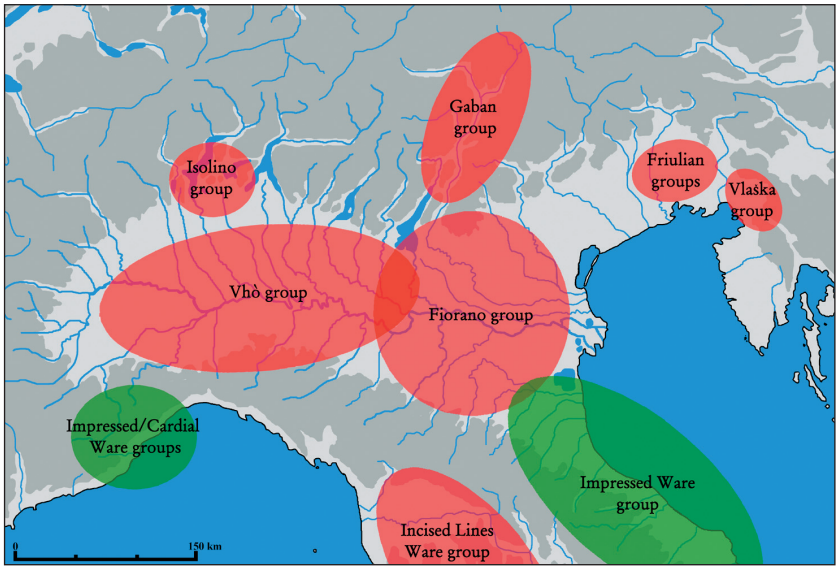

Fig. 2. Early Neolithic groups of northern Italy.

The first process of Neolithisation in northern Italy and the subsequent phase during which the Po Plain Neolithic groups put down roots were followed, between the end of the 6th and the first century of the 5th millennium calBC, by a phase during which Neolithic societies consolidated. In a short span of time, Early Neolithic groups had been replaced and absorbed by the Square-Mouthed Pottery (*Vasi a Bocca Quadrata*, SMP) culture, which displayed a strong ability to expand and adapt to the many different environments of northern Italy. SMP culture developed during the 5th millennium calBC in three main phases which were marked by variations in pottery decoration and which affected a vast geographical area from Piedmont and Liguria in the west, to western Friuli in the east.[1] Its main core area was localised in the central Po Plain between western Emilia, southern Lombardy and western Veneto *(Bagolini 1992.293–300, Figs. 4–5; Pessina, Tiné 2008.96–99, Fig. 13*). The development of SMP culture has long been the subject of discussion, but today its local origins are widely recognised, although various cultural influences from other regions may have helped shape it. Thus, local roots and external cultural inputs contributed to the rise of a distinctive culture with a strong identity and a high degree of uniformity, despite some regional divisions. The discoveries made in recent years have greatly increased our knowledge of the SMP culture, revea-

1 The first phase (SMP 1 – geometric-linear style) is characterised by the presence of fine-ware pottery decorated with geometrical scratched patterns and can be dated between 5000/4900 and 4500 calBC (*Bernabò Brea* et al. *2010a.Fig. 1*). The second phase (SMP 2 – meander-spiral style) presents incised spiral pattern decorated pottery and appears between 4500 and 4300 calBC (*Bernabò Brea* et al. *2010a.Fig. 2*). The third phase (SMP 3 – incised and impressed style) is characterised by the presence of impressed and incised decoration and continues until around 4000 calBC. The appearance of the first Chassey groups around 4300 calBC marks the end of the development of SMP culture in north-western Italy, whereas it continues in the north-eastern regions with clear northern transalpine influences (*Mottes* et al. *2010*).

ling its complexity and raising new questions about its origin and evolution (*Ferrari* et al. *2006; Bernabò Brea* et al. *2010a; 2010b; Dal Santo, Mazzieri 2010; Mottes* et al. *2010*).

Social identity and appearance: some considerations

The Neolithic is an interesting phase for observing the changes which affected the material culture and ideology of prehistoric European groups. "*It is widely accepted, in fact, that the emergence of farming was a fundamental social change in Europe*" and elsewhere. "*The emergence of new kinds of social practices arising simultaneously with their definition was therefore of major importance in these times of widespread change. New individual persons would have been created within expanded forms of relational personhood through the impact of new kinds of social groupings, new embodied skills and new raw materials. It is clear that early farming groups depended on a far wider range of skills and competences than in the previous period. The construction of such new types of skill created a concomitant rise in the diversity of personal identities*" (*Chapman, Gaydarska 2011.28, 37*). Such diversity was highlighted in many ways by body ornamentation and its multiform expressions. Bodily appearance is, in fact, a powerful and meaningful tool for expressing social categories and identities. It is commonly used to signal how individuals are placed within society and to mark changes in their status. Moreover, it can be deliberately employed to affirm the identity of both individuals and groups. Part of its significance lies in its readability and, indeed, body adornment contains codes that can be investigated (*Sørensen 1997. 93*). By means of dress, personal ornaments, hairstyle, tattooing, body painting and modifications, as well as posture and gesture, an individual can communicate many messages, allowing self-identification as a member of larger or different social groups. Nevertheless, appearance is not fixed nor static, but changes in time and in relation to the lifecycle of individuals (birth, puberty, sexual maturity, death, *etc*.) and to their status, since the individual moves the same body through many identities, often simultaneously changing the elements that express them (*Fisher, Loren 2003*): past and present identities are, in fact, fairly complex issues, and the human body acts as a basic point of reference. However, the body may attain multiple social identities. Many scholars have stressed the multiplicity of human identities. Some types of identity groups may have little stability and duration, but other identity groups are fairly stable and change slowly (*Cornell 2004.77–78*).

Terence Turner (*1969; 1995*) stresses the relevance of body adornment as a special form of symbolic communication the purpose of which is to classify individuals during transitions in their life; changes, in fact, are marked by a transformation in body ornamentation. "*The body and direct modifications of its form tend to play a role more fundamental in simple societies than in ones with differentiated systems of exchange. In such simple societies, the circulation of tokens of social identity and value may not be mediated by the exchange of objects (valuables, gifts, or commodities). Societies in which social identity is not constituted primarily through the exchange of goods nevertheless depend on the public circulation of symbolic tokens of valued aspects of personal identity, such as marks of status, appropriate role performance, and the values associated with them. In the absence of concrete objects that might serve as embodiments of such values or tokens of status, a society may make use of other modes of circulation that do not rely on the exchange of objects. One such mode is specialized verbal performance. Another mode of circulation without exchange is through visual display that involves specialized forms of bodily appearance. Where these forms of bodily appearance carry the main load of communicating the nature and value of personal identity, they frequently involve the direct modification of the body itself and/or the elaboration of complex semiotic codes of bodily adornment fraught with social messages about the content and value of personal identity and status*" (*Turner 1995.147*). Thus, body adornment connects the social and biological aspects of individuals with the values of the society in which they live and move.

Representation and materiality: the role of personal ornaments

The personal ornaments of Italian Neolithic groups comprise largely ring bracelets and beads, while decorative applications do not appear to be very common. Firstly, however, it is important to stress the material distinction between unelaborated and elaborated ornaments: the former include objects with natural, unmodified shapes, such as simply perforated shells, teeth and bones; the latter, however, refer to artefacts such as beads or ring bracelets produced through a complex manufacturing

process involving a complete change from the original morphology of the raw materials and blanks employed. As is well known, unelaborated ornaments were largely employed from the early phase of the Upper Palaeolithic (*White 1992; 2007; Vanhaeren, d'Errico 2006; Kuhn, Stiner 2007*), perhaps even earlier (*Zilhão 2007.24–27*), and continued to be used during the Neolithic and later, decreasing progressively in number and importance. The spread of elaborated ornaments is a characteristic phenomenon of the Neolithisation process (*Wright, Garrard 2003; Bar-Yosef Mayer, Porat 2008; Rigaud 2011*) and of subsequent periods, even though such artefacts are attested also in hunter-gatherer body decoration of previous phases (*White 1992.550–553; Rigaud 2011*).

Unelaborated personal ornaments may link individuals to the natural world through a metonymy (*White 1992.542*), associating the wearer of a simply perforated animal tooth to the whole animal body and its imagery. Furthermore, such association can have powerful and diversified symbolic meanings. In fact, in traditional societies, parts of animals or plants are often used metonymically as elements of personal adornment in order to associate the wearer with the qualities of the animal. The process of decoration in the Papua New Guinea Highlands, for example, is not representational but metonymical: when Hageners wish to associate themselves with powerful, magical things such as birds, they do not depict birds on masks, carvings, or paintings. Instead, they take the birds' feathers and wear them as decorations (*Strathern, Strathern 1971. 176*).

Elaborated ornaments introduced changes in body adornment and appearance in the form of new geometric shapes previously not widely attested, causing a progressive shift from items strictly linked to natural forms to more abstract objects having no obvious connection with the physical and mineral world. The reasons for such a shift are several: one is related to developments in society and the increasing need for objects of adornment displaying the various identities of Neolithic people in a new and more complex social world; another is related to improved polishing techniques, increasing the ways of shaping materials. Elaborated ornaments require a more complex manufacturing process which, as Randall White (*1992.541*) noted, involves three stages:

❶ the selection and procurement of raw materials;
❷ the transformation of these into conventional forms via a set of techniques and production relations;
❸ exchange/display/use of the finished objects.

Each of these operational stages is, of course, carried out in a particular social and cultural physical environment. Such an operational chain leaves significant traces in the archaeological record and raises the clear possibility of studying the construction of meaning and its socio-spatial distribution in archaeological contexts. Nevertheless, the organised production of artefacts in traditional societies was not simply linear, because operational phases and sub-phases are characterised by conditions of temporal and spatial discontinuity, phenomena of intersections of different cycles of manufacture, and, in some rare cases, events of ramification of some operational stages (*Vidale 1992.111*).

Material systems of personal adornment enable the construction of a diversity of social and personal identities linked to individual and group histories, values and beliefs through deep metaphorical relations between the raw materials employed and the created forms of the objects (*White 2007.287*). As already noted, personal ornaments are among the various components of body adornment which can survive in archaeological deposits, giving some interesting clues about the multiform representation of identity. In particular, burials are the best field in which prehistoric identities are revealed, because much of the evidence of costumes found in such contexts, including personal ornaments, was presumably related to the appearance of the dead person when he/she was alive, even if they were transformed culturally and conceptually in the grave into the clothes of the dead (*Sørensen 1997.102*). Moreover, differences in the arrangement of graves and the treatment of corpses, the presence of offerings in graves, the richness and variability of grave-goods and, lastly, the presence of body adornment relate to the funerary ideology of each human group and the ways it imagines the otherworld. Nevertheless, in traditional living societies, such variability also depends on other factors linked to the personality and social identity of the dead, such as age group, gender and social membership and/or acquired prestige during life as a consequence of oratory ability, experience and interpersonal relationships. "*Different societies have in fact different concepts of the person, different understandings of the boundaries of and interpenetrations between people and things, one person and another, and groups. Some artefacts might be features of*

a person, or persons in their own right" (*Fowler 2004.4*). According to this view, variability in personal ornamentation can be one of the multiform expressions of such differences and can be detected in funerary contexts.

The spread of some specific personal ornaments among many individuals of one or more groups can display and stress their membership of a particular community. In fact, "*the ethnographic evidence indicates that the range of animal and plant species selected for the decorative value of their parts is usually quite constant within the same groups and among closely related communities. This homogeneity is probably due to the fact that their value as personal ornaments derives from a deeply imbedded and widely shared cosmological structure with respect to particular species. In other words, animals of great cosmological value or power are often used in the construction and communication of social identities*" (*White 1992.543*). This can also be true of raw materials from mineral sources, such as steatite, variscite or softer green stone, employed to create body adornments not only for their evident technological and aesthetic qualities, but also, perhaps, for their intrinsically powerful, symbolic values. However, an analysis of sources of supply, of circulation networks of objects and the possible existence of zones where some items do not appear at all, can reveal the scale of territorial organisation and population dynamics on the basis of local, regional or long-distance item distribution, which can identify cultural, ethnic or linguistic entities as shown by the personal ornaments of the Early Upper Palaeolithic by Vanhaeren et d'Errico (*2006*), of the Mesolithic by Newell *et al.* (*1990*), and, recently, of the final Mesolithic and Early Neolithic by Rigaud (*2011*). Nevertheless, temporal and spatial variation in patterns of material culture could be related to changes in the degree of conflict and competition for resources, as some ethnographic evidence suggests; in fact, material culture can be used to express and reinforce aspects of social relationships that are related to economic and political strategies. This is true, in fact, between sex, age, and political groups within societies as much as it is true between societies as a whole. Forms of body adornment can be use in some instances also "*as key symbols in the structuring and unfolding of political life*". Thus, "*like a map with marks of social and political terrain, body decoration gives a chart of the cultural anatomy which structures relations of status, hierarchy, and power*" (*Steiner 1990.443*). Besides, "*bodily adornment may show the position of a person in a hierarchical system of authority*" (*Roach, Eicher 1979.15*). In the Lake Baringo district in Kenya, for example, there was a very clear difference between the clothes and personal ornaments worn by young unmarried men and those worn by older age-sets who are able to marry; such a distinction clearly depends on the considerable amount of tension between the younger and older men over access to women as wives acting as a key factor in their social structure (*Hodder 1979. 447–448; 1982*).

Personal ornaments and Early Neolithic groups: the case of northern Italy

Neolithic personal ornaments in northern Italy comprise mainly ring bracelets of stone and shell and necklaces formed by various unelaborated or elaborated elements of stone, shell and tooth joined together with a string and arranged as a sequence of one type only or as a mixed composition of various materials. Two large independent cultural spheres existed during the Early Neolithic as a consequence of the processes involved in Neolithisation (Fig. 2). Some characteristics of such cultural distinction are also reflected in personal ornaments and, consequently, in body adornment and appearance. It is possible, in fact, to distinguish two main traditions in Neolithic costume: on the one hand, the employment of simply perforated shells as beads, pendants or decorative applications characterised the Impressed and Cardial groups; on the other hand, stone ring bracelets were peculiar to the Po Plain Neolithic groups. However, a more flexible picture probably existed, with local and regional variations in bodily decoration also within the same cultural sphere, but the available data do not allow a more precise analysis.

Personal ornaments are generally not numerous, since very rich collections from the Early Neolithic in the Thyrrenian and Ligurian areas are very few. Arene Candide cave in Liguria (*Bernabò Brea 1946; 1956; Taborin 1974.309–310; Traversone 1999; Borrello 2003*) and Cala Giovanna Piano and La Scola on Pianosa Island in Tuscany (*Bonato* et al. *2000; Ducci* et al. *2000; Bisconti, Zamagni 2007*) yielded the largest collections of personal ornaments, along with a few other localities in southern France and Corsica (*Taborin 1974; Courtin, Gutherz 1976; Barge 1987; Courtin 2000*). The Arene Candide cave is undoubtedly the most interesting site due to its huge archaeological deposit and well-preserved stratigraphy, documenting the whole chrono-

logical development of the Neolithic in Italy (*Maggi 1997*); but it is also an important reference site for the entire north-western Mediterranean. Also, the cave presents a large and diversified assemblage of Neolithic personal ornaments.

Impressed/Cardial Ware[2] people made personal ornaments mainly from shells; other raw materials are generally less represented. This may have been influenced by the location of many Neolithic sites immediately along the coast or nearby (Fig. 1): marine resources, in fact, were intensely exploited both for human nutrition and the manufacturing of daily tools, as well as for producing personal ornaments. Many shell species were employed, but *Columbella rustica* (Fig. 3) was surely predominant at many sites of the Tyrrhenian coast, Liguria and southern France. As noted elsewhere in the western Mediterranean (*Barge 1987; Courtin 2000.87; Guilaine, Manen 2007.28–29*), its frequent occurrence as an ornamental shell might be related to the previous adornment tradition of the last hunter-gatherers groups, since simply perforated *Columbella rustica* shells and red deer canines are ubiquitous ornaments of Mesolithic groups in northern Italy and the surrounding regions (*Alvarez Fernandez 2003; Borrello, Dalmeri 2005. 43–45; Franco 2011.79–89; Rigaud 2011.399, Fig. 148*). Unfortunately, in Liguria there is no evidence of any direct relationship between the last Mesolithic and the early Impressed Ware groups, since there are no Mesolithic sites along the coasts dating back to the first half of the 6th millennium calBC. Therefore, Mesolithic component in Neolithic body adornment precedes the arrival of Impressed Ware people in Liguria and probably originated from some other southern Italian region.

The frequency of elaborated personal ornaments is generally low. There are some fragmented ring bracelets obtained from *Glycymeris* and *Spondylus* shells and some characteristic pendants made of *Charonia*, *Glycymeris* or *Spondylus* shells (Fig. 4). Among beads, there are some discoidal specimens obtained from *Cardium* shell (*Micheli 2005.Fig. 8*). Evidence of personal ornament manufacturing is sporadic in the Impressed Ware zone, except for a few findings of the Arene Candide cave attesting the beginning of ring bracelet production from *Spondylus gaederopus* shells (*Borrello, Micheli 2011.Fig. 4*). Evidence of shell bead manufacture is occasional in Italy, since there are no data as interesting as those from southern France, where some specialised workshops at Chateauneuf-les-Martigues, Riaux 1 and Fontbrégoua operated (*Taborin 1974.311–312; Barge 1987; Courtin 2000.93–94, Figs. 42–43*).

Some stone discoidal or cylindrical beads complete the series of elaborated ornaments. Some steatite specimens were found on Pianosa, but no evidence of local manufacture *(Bisconti, Zamagni 2007.142*), which is documented in the case of discoidal schist beads on Giglio island, where some rough outs were discovered (*Brandaglia 2000.126, Fig. 2.23–26*).

Fig. 3. Perforated* Columbella rustica *shell from the Arene Candide cave (photo R. Micheli, courtesy of Museo Civico di Archeologia Ligure – Genova-Pegli).

Fig. 4. Crescent-shaped* Spondylus gaederopus *shell pendant from the Arene Candide cave (photo F. Labica and S. Paba, courtesy of Museo Civico di Archeologia Ligure – Genova-Pegli).

2 I use the generic name of Impressed/Cardial Ware where it is not possible to be more detailed because the data on personal ornaments are scarce, or they are statistically significant in only one of the two phases.

Some other stone beads are attested at the Arene Candide cave, where a possible steatite blank for cylindrical or discoidal beads was also found (*Starnini, Voytek 1997.429, Fig. I.1*). More evidence of steatite beads is attested in central Italy in some Impressed Ware sites (*Micheli 2003.286*). However, the use of stone beads or pendants is sporadic. Steatite is a soft variety of talc that can be found in the northern Apennine range, in the central hilly zone of Tuscany, but also in central Liguria. It is a very important raw material, largely exploited for making personal ornaments later, during the 5th millennium calBC, among the SMP people of Emilia (*Micheli* et al. *in press; Micheli, Mazzieri 2012*). It is difficult to say if the beginning of steatite exploitation is related to the penetration of Impressed/Cardial Ware groups into inland areas or, instead, if it was a result of the spread along the Tyrrhenian coasts of steatite personal ornaments manufactured by Neolithic groups inhabiting inland areas; on the other hand, steatite ornaments are rare among the Po Plain and central Italian Neolithic groups.

In northern Italy, ring bracelets are characteristic and seemingly exclusive to all groups of the Early Neolithic (Fig. 5). They are very common in the Fiorano, Vhò and Friulian groups (Sammardenchia and Fagnigola), but are attested in small numbers also in the Isolino and Gaban groups and in central Italy, in the area affected by Incised Lines Ware (*Ceramica a Linee Incise*) groups. As we have seen, these objects are unknown in the Impressed/Cardial Ware costume and appear only in Liguria during a transitional phase between the final Cardial horizon and the SMP 1 phase (*Tanda 1977; Pessina 1998; Micheli 2012*). The distribution of such objects is very wide, indicating that the use of this particular body adornment was trans-cultural and had a long-lasting tradition as an important component of costume. Unfortunately, complete bracelets are few (Fig. 6) and it is plausible that they come from disturbed graves, but there are no data to prove this. However, their use as arm-rings is likely, as evidence shows in France (*Joffroy 1972; Constantin, Vachard 2004*) and central Europe (*Zápotocká 1984; Nieszery, Brienl 1993; Jeunesse 1995; 1997*).

The most common bracelets have a triangular or drop section (*Tanda 1977.112*). Various types of rock were used, but softer green stones are certainly the most preferred for their technical qualities, easy workability and aesthetic qualtities. Ring bracelets can also be made from bone and shell; the former, however, are very rare, while the latter are more numerous, although less common than stone specimens. Shell items are made of *Spondylus gaederopus*, *Glycymeris sp.*, and *Charonia lampas* (*Micheli 2006a; Borrello, Micheli 2011*). The geographical distribution of stone and shell ring bracelets often coincides, although the latter are less common and probably more precious.

The remains of stone ring bracelet production are attested at some sites in the Piedmont region, in the area with deposits of secondary Oligocene conglomerates. The remains are documented in the same sites (for example Alba and Brignano Frascata), where the production of stone axes and hatchets is also attested (*Negrino* et al. *2004; Starnini* et al. *2004*). Such evidence testifies to a form of specialised craft based on the transformation of raw materials that needed particular skill and knowledge. Raw materials were brought to those settlements located in the same region where the ornaments were worked, refined, employed locally or distributed to the central and eastern Padan Neolithic groups. Green stone ring rough-outs are attested also from a few central Po Plain sites, proving that the final manufacture of stone bracelets also took place in settlements very far from the main supplying areas. The incidence of the raw materials emplo-

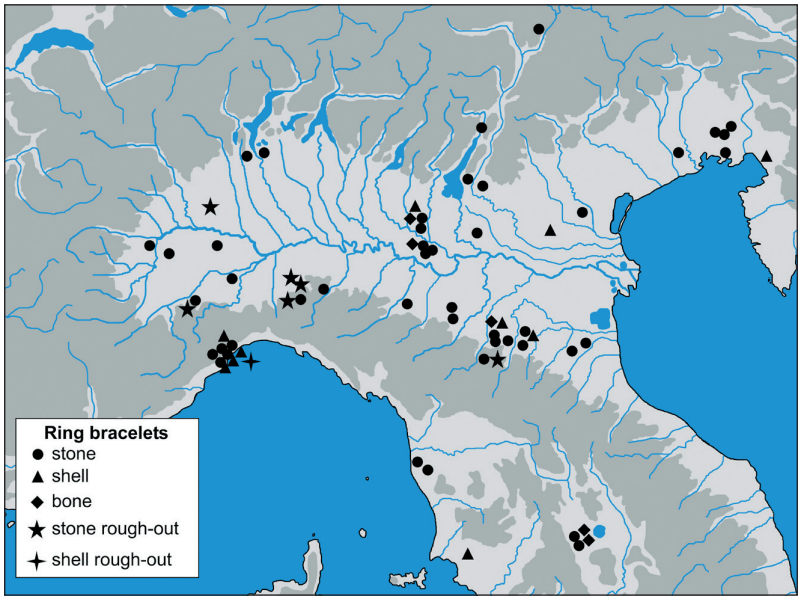

Fig. 5. Distribution of ring bracelets in northern Italy.

Fig. 6. Paragonite mica-schist ring bracelet from Sammardenchia settlement (after* Pessina 1998*).

yed for stone ring bracelets varies among the different Neolithic groups (*Micheli 2012*) depending on various factors, such as:

- the distance of the raw material procurement area from settlements;
- the availability of good quality stones in territories controlled by various groups;
- the presence of other less valuable stones locally;
- the preference for green stone objects rather than other rocks;
- the existence of exchange networks allowing the spreading of valuable raw materials and goods.

In the Po Plain area, other personal ornaments are occasional. Elaborated ornaments such as discoidal beads are also exceptional and found at only three sites: in Lumbardy at Ostiano – Dugali Alti with one *Spondylus* specimen (*Biagi* et al. *1993.Fig. 10.2*) and at Godiasco – Monte Alfeo with a steatite specimen (*Simone Zopfi 2004.92, Fig. 86.1–3*), and in Trentino at Riparo Gaban with a few limestone samples. Perforated *Cyclope neritea* and *Columbella rustica* shells are known only from the Riparo Gaban (*Borrello, Dalmeri 2005.45*), where such items seem to continue a previous tradition attested during the Late Mesolithic. The Gaban group is, in fact, a well known case of an acculturated Mesolithic local community *(Bagolini 1992.290–292*). Such a context also yielded perforated red deer canines, being another characteristic Mesolithic item of adornment. A few fossil *Dentalium* shells came from two sites at Vhò and one at Fiorano (*Micheli 2005.58*).

Unfortunately, Early Neolithic burials are little known in northern Italy (*Bagolini, Grifoni Cremonesi 1994*). This is a problem for anyone attempting to reconstruct Early Neolithic social identities, since it does not allow us to define the forms of body adornment, nor does it allow any observations regarding the relationship between the body and personal ornamentation: in fact, in the few identified burials, no personal ornaments have been found. However, Impressed/Cardial burials have not yielded any personal ornaments or grave-goods, even in the remainder of the Italian Peninsula (*Grifoni Cremonesi 2003; Malone 2003*). In central Italy, in Tuscan and Latium regions, some burials of the Incised Lines Ware group occur with grave-goods and personal ornaments in Fontino, Orso, Bella and Patrizi caves (Fig. 1). Nevertheless, such burials are of no help in providing information about the identities of the dead, since they were disturbed or completely damaged by later cave occupations. However, adornment items are various and include unelaborated ornaments (perforated shells, fossil *Dentalium* shells, small bones tubes and perforated red deer canines) and elaborated objects (stone and bone ring bracelets, perforated bone plaques and occasional pendants imitating red deer canines) (*Grifoni Cremonesi 1992. 319–320; Bagolini, Grifoni Cremonesi 1994. 150–151*). Objects of adornment, including some shell discoidal beads and pendants and a few stone and shell ring bracelets are occasionally attested also in burials in southern France attributed to the Cardial horizon (*Beyneix 1997*). Since Impressed/Cardial Ware burials have not usually yielded any grave-goods or personal ornaments, such evidence provides interesting clues as to the spread of body adornment components characteristic of other neighbouring Neolithic communities in the funerary context of a French Cardial Ware group.

Different ways of adorning the body: the Italian Middle Neolithic example

The Middle Neolithic period shows a more complex picture. Particularly in the first and second phases, SMP culture presents a certain degree of complexity in the costume domain, as indicated by the variability of forms and raw materials employed for personal ornamentation. Information is very scanty, however, in the last phase, as is the case for many other groups attributed to the Late Neolithic. During the SMP 1 and 2 phases, considerable differences in body adornment are documented particularly in Liguria, the central Po Plain, and the Trentino area, where personal ornaments are generally well attested.

The importance of shells and teeth in Liguria

In Liguria, body adornment items comprise simply perforated shells, bones and teeth, while elaborated

ornaments are few. Such objects are particularly common during the SMP 1 phase, decreasing significantly later. The occurrence of simply perforated shells is high and seems to depend on an older tradition typical of the Ligurian Early Neolithic; the incidence of the *Columbella rustica* continues to be high also during the SMP phase in Liguria, but other species such as *Cardium* and *Glycymeris* are also used. A similar high incidence of perforated shells is attested nowhere else in northern Italy, except at Ponte Ghiara in Emilia, where there is a formative phase of the SMP culture. In this site, adornment objects comprise mainly perforated *Cardium* shells (Fig. 7) procured from a nearby fossil deposit and attesting a Neolithic costume not yet characterised by other SMP personal ornaments, such as steatite or *Spondylus* beads (*Micheli 2006b*).

The occurrence of perforated bones and teeth is an interesting phenomenon, because it marks an innovation with respect to the previous Early Neolithic, revealing a prevalence of wild over domesticated animals. Among animal teeth, dog, fox and wolf canines are most common, while sporadic feline, mustelid and bear canines are also employed. Red deer canines, however, are almost totally absent. Simply perforated or transformed pendants made of wild boar tusks also feature. Perforated bones comprise lynx, marten, fox and wild cat mandibles, bear phalanxes and hare and wild cat metatarsus. There is a clear preference for personal ornaments obtained from predators, highlighting the value and skill of those individuals, usually male figures, involved in hunting (*Bernabò Brea* et al. *2010a*).

In Liguria, many SMP burials have been excavated in the caves of the Ponente since the 19th century; in fact, more than a hundred inhumations can be ascribed to the Middle Neolithic phase from excavations at the Arma di Nasino, Pipistrelli, Arma dell'Aquila, Arene Candide and La Pollera caves, as well as a few other sites (*Issel 1908; Bernabò Brea 1946; 1956; Delfino 1981; Del Lucchese 1997*). The dead were frequently enclosed in stone cists, while infants' graves were unprotected. The bodies were in flexed positions, with most of the heads oriented N or N-E. Some skeletons were covered with ochre, which in many instances was contained in a vessel. Grave-goods are attested in some burials, but they are not very common (*Bernabò Brea* et al. *2010a; 2010b*). In some cases, the anthropological data are absent or need to be revised after a new analysis. Some 20% of burials had personal ornaments consisting mainly of unelaborated ornaments. Among such items, perforated shells are the most significant, with a preference for *Columbella rustica* and *Glycymeris* sp., although other species are also present, such as *Cerithium* sp., *Conus mediterraneus*, *Purpura haemastoma* and *Cypraea lurida*. Other items include perforated teeth and tusks. Perforated shells and teeth are associated with adults and children's graves of both sexes.

Some burials are worth mentioning because of the personal ornaments associated with the dead. One adult female burial in La Pollera cave (grave I) presents an interesting necklace formed by six perforated canid canine teeth associated with a lynx mandible placed along the right femur (Fig. 8). The use of such composed necklaces is confirmed by two other discoveries at the Arene Candide cave and Parma-via Guidorossi, grave 27 (*Bernabò Brea* et al. *2010a.Figs. 17–18*). In the La Pollera cave (grave X) a child burial disclosed *Dentalium* shells probably used as necklace, as in some children's burials at Emilia. Fragment of two stone rings and one shell ring were discovered in association with skeletal remains at Pipistrelli cave (grave IV), Arma di Nasino and La Pollera cave (grave III), respectively (*Delfino 1981*); nevertheless, because of their fragmented

Fig. 7. Perforated Cerastoderma (*Cardium*) shells from Ponte Ghiara settlement (photo R. Micheli, courtesy of Museo Archeologico Nazionale di Parma).

state, these objects seem to be offerings deposited in the grave rather than real personal ornaments of the dead. In fact, ring bracelets have not been found in any other SMP burials of northern Italy, indicating that they are not characteristic of SMP groups. Their occasional occurrence and use in some SMP contexts should be interpreted as a practice resulting from an external influence from other coeval Neolithic groups.

Some final comments worth making about the Ligurian case are as follows:

❶ Personal ornaments are not attested in all graves, just as in other regions under SMP influence; such evidence suggests that they are not always important in displaying the identities of all individuals in the otherworld.

❷ The incidence of elaborated ornaments is low, given the prevalence of simply perforated shells and teeth referring respectively to the marine world and some of its products and to the animal domain.

❸ The number of personal ornaments in each burial is generally low, showing that body adornment was poor and not particularly complex.

❹ Perishable items may also have been employed to highlight individual identities.

❺ Adornment items when attested in burials are related both to genders and age groups, making it difficult to identify clearly the correlation between personal ornaments and the different stages of life of the individuals.

The relevance of steatite in the central Po Plain

The personal ornaments of western Emilia and the Mantua territory share many common elements, although in the Mantua area the finds are numerically less significant. In Emilia, adornment objects comprise fossil shells such as *Dentalium* and micro-*Dentalium*, some perforated shells (mostly *Cardium* and rarely *Conus*), and fossil calcareous tubes of marine worms. Perforated canine teeth are also present, including dog, fox and bear teeth (*Micheli 2006b; Bernabò Brea* et al. *2010a*). The incidence of teeth of the various species used for ornamentation reproduces substantially the same ratio documented in Liguria between domesticated and wild animals.

Elaborated ornaments, apart from steatite artefacts, are rare. *Spondylus* artefacts are sporadic, except for a hemispheric button from Le Mose, a cylindrical bead from Formigine (*Mazzier, Micheli in press*) and some beads from a grave at San Giorgio-via Raffaello near Mantua (*Castagna* et al. *in press*). Such evidence attests the first occurrence of *Spondylus* ornaments in the SMP sphere in the central Po Plain. In fact, *Spondylus* ornaments did not seem to be characteristic of this area during the 5th millennium calBC, when they do feature, however, in Liguria and Trentino. The new data show that such artefacts, even if uncommon, were also appreciated by the SMP groups of the Po Plain (*Borrello, Micheli 2011*). The shapes of *Spondylus* ornaments from Liguria, the central Po Plain and Trentino differed: in Liguria, ring bracelets and some unusual pendants are attested; in the central Po Plain, a hemispherical button and some irregular beads have been found, while from Trentino, many types of bead are known, among which the large cylindrical type is perhaps the most characteristic.

The production of decorative steatite objects during the Middle Neolithic is an important phenomenon that distinguishes the Emilian SMP communities from other coeval groups. The sites with steatite objects are in fact numerous, while the use of other rocks occasionally persists. Steatite, also known as soapstone, is a soft rock with a very low hardness rating on the Mohs scale (equal to 1), appropriate for manufacturing personal ornaments. It is a metamorphic rock found in ophiolitic masses which are very common in Liguria in the Voltri Group between Genoa and Savona and in the eastern part of the region, as well as in the Tuscan-Emilian Apennines. In the latter

Fig. 8. Lynx mandible and perforated canid canines from La Pollera cave (grave I) (photo R. Micheli, courtesy of Museo Civico di Archeologia Ligure – Genova-Pegli).

area, steatite is often present in discontinuous, strongly lenticular outcrops, usually not very thick and mostly concentrated in rather small areas. No deposits have been found outside the context of the primary formation of steatite, such as river beds far from the point of origin, as the low degree of hardness of the material does not allow storage; thus, the supply must have been available in the primary outcropping areas in the Apennines or nearby zones (*Micheli* et al. *in press; Micheli, Mazzieri 2012*).

The available data indicate the existence of a few centres specialising in the manufacture of personal ornaments (Benefizio, Gaione – Cascina Catena and San Ruffino – Villa Greci) where production was very intense, with abundant production waste; meanwhile, finished artefacts prevail at other sites. The discovery of materials showing the entire production sequence is particularly important in the case of Benefizio (Fig. 9), where numerous remains of the manufacture of microbeads and larger discoidal beads were found in features 11 and 79 (*Mazzieri, Micheli 2008*).

The shapes of beads and pendants from Emilia vary widely (Figs. 10–11). It is possible to distinguish three categories of personal steatite ornament:

❶ Objects that cannot be classified and are often represented by a single specimen, such as extremely fine pendants.

❷ Types which are fairly standardised in shape and size, but cannot be clearly associated with a manufacturing process.

❸ Extremely standardised artefacts obtained through a more complex manufacturing cycle (*e.g.*, discoidal or short cylindrical beads with a diameter of 5–8mm, and microbeads with a diameter of 2– 3mm) (Fig. 12).

Steatite ornaments are certainly to be considered a product of high technological investment, probably created by experts and involving specialised craftsmanship. The spread of microbeads, all of the same size and shape, throughout many sites may imply mass production, a control of their manufacturing processes, and probably the existence of artisans with specific skills (Fig. 13). This hypothesis is also supported by the occurrence at several sites of biconical pendant (Figs. 11.1–3 and 14), whose particular features suggest that there was control of the shape and dimensions of the artefacts, demonstrating the existence of well-organised production, as well as specific patterns for the production of ornaments (*Micheli, Mazzieri 2012*).

The abundance of steatite remains at some sites and their distribution indicates that manufacturing transcended the mere domestic sphere. However, the occurrence of such remains is variable; there are, in fact, differences between sites where the artefacts are very numerous and diverse, and other sites where production seems to have been more limited. What is certain is that the manufacture of steatite ornaments was so important for Emilian SMP groups that it undoubtedly had considerable economic and social implications, at least for some communities or villages. Moreover, it is likely that such objects were used to emphasise the status of certain individuals or, perhaps, of particular social groups, since they are not evenly distributed among the SMP burials identified so far in Emilia, despite being fairly common in many settlements. It is also possible that steatite artefacts were worn by those who were somehow involved in the supply of raw material and the manufacture of ornaments (*Micheli* et al. *in press*).

The production of these steatite objects, already well attested for the SMP 1 phase, increased during the second phase. In fact, during SMP 2, such growth is simultaneous with the manufacture of various types of artefact made from exotic rocks as a result of the intensification of wide-ranging cultural relations between SMP groups and other contemporary cultures such as Serra d'Alto. Nevertheless, steatite items do not seem to circulate widely outside the central Po Plain, and when they occasionally leave such an area, they remain in the SMP world, as shown by the recent finds in Trentino. Such evidence suggests a close connection between steatite artefacts and SMP

Fig. 9. Remains of steatite microbead production from Benefizio settlement (photo R. Micheli, courtesy of Museo Archeologico Nazionale di Parma).

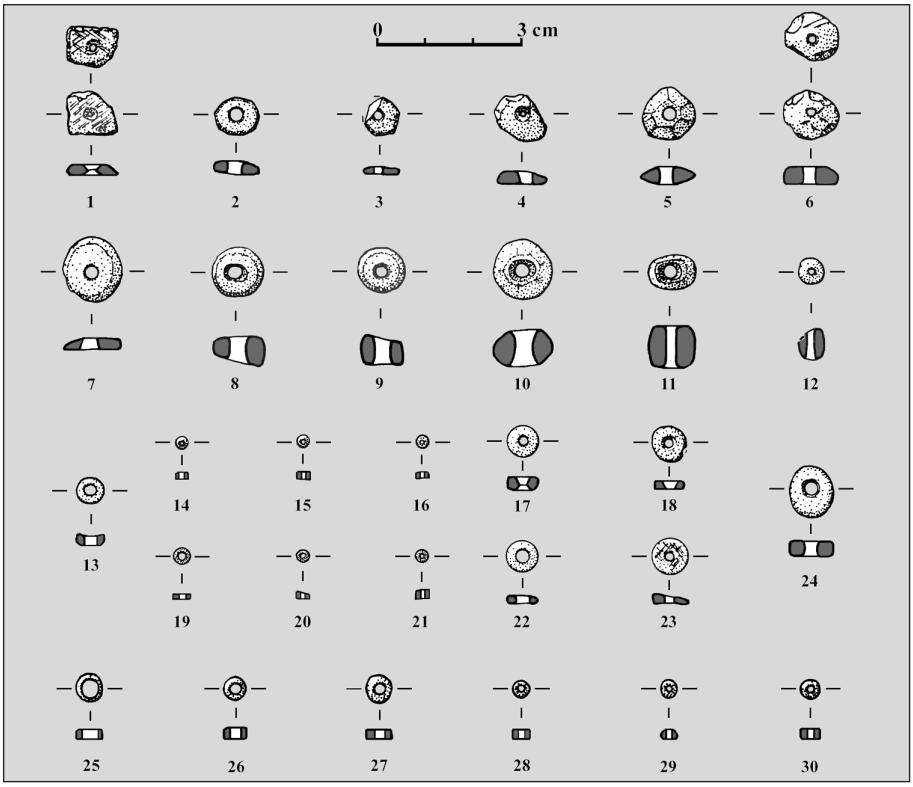

Fig. 10. Steatite beads from SMP sites in western Emilia. 1 Ponte Ghiara; 2–5, 7, 11, 16–18, 21–24 Gaione – Cascina Catena; 6 Travo – Case Marchi; 8 San Ruffino – Cascina Marana; 12 San Ruffino – Villa Greci; 9, 13 Bazzarola; 10, 14, 15, 19, 20 Chiozza di Scandiano (grave I); 25–30 Rivaltella – Ca' Romensini (drawings by R. Micheli, courtesy of Museo Archeologico Nazionale di Parma and Musei Civici di Reggio Emilia).

people, and how the former were used as material elements of body adornment to mark the identity of Emilian groups (*Micheli, Mazzieri 2012*).

The discoveries found in recent years in Emilia have increased the data available so far concerning SMP funeral practices, highlighting their complexity: it is possible, in fact, to establish a framework of elaborate rituals, modes of treating bodies, choice of grave-goods and objects adorning the dead. The graves identified so far between Piacenza and Reggio Emilia number over 230, which is a good sample for the study of Neolithic burial practices and their variability. Pots and some bone tools are generally associated with female burials, while green stone axes and flint arrow-heads are male burial objects (*Bernabò Brea* et al. *2010a; 2010b*). Thus, gender distinction of the dead is evident, although burial objects are not evenly distributed. It is possible to distinguish burials without grave-goods or ornaments, with only grave-goods, with ornaments only, and finally with grave-goods and ornaments. Such distinctions are clues to differences in the personal and social identities of the dead which, however, are not always clearly understandable. The occurrence of adornment objects is generally low, about 10% of the total: these objects appear frequently in the burials of female adults or children, and only in rare cases in male graves. What is remarkable in the expression of the SMP costume is the eclecticism in the choice of personal ornament and the variability of body adornment between individuals due to the dynamic SMP society. Therefore, the domain of SMP personal ornamentation appears to be multiform and much more elaborated than what had been thought until recently (*Mazzieri, Micheli 2012*).

Personal ornaments appear in the central Po Plain in twenty-two graves in Emilia and four burials in the Mantua territory. Steatite adornment objects are attested in only eight burials: their distribution cannot be related clearly to a single gender or specific age group, even if these items seem more characteristic of adult individuals. The use of perforated shells, fossil calcareous tubes of marine worms and *Dentalium* shells, while rare, is documented in both adult and children female burials. The recent discoveries of two female children's burials at Gaione-Parco del Cinghio (grave 10) and Parma-via Guidorossi (grave 58) are therefore very interesting, since they confirm the practice of adorning the bust of female children with fossil micro-*Dentalium*, perhaps with the purpose of marking their status as children. Perforated animal teeth were already known in Emilia from some discoveries at the Ponte Ghiara, Collecchio and Rivaltella–Ca' Romensini settlements, but the finds from the Parma-via Guidorossi burials provide new evidence about the employment of such adornment items (*Mazzieri, Micheli 2012*). Perforated teeth of dog or fox are associated with adult fe-

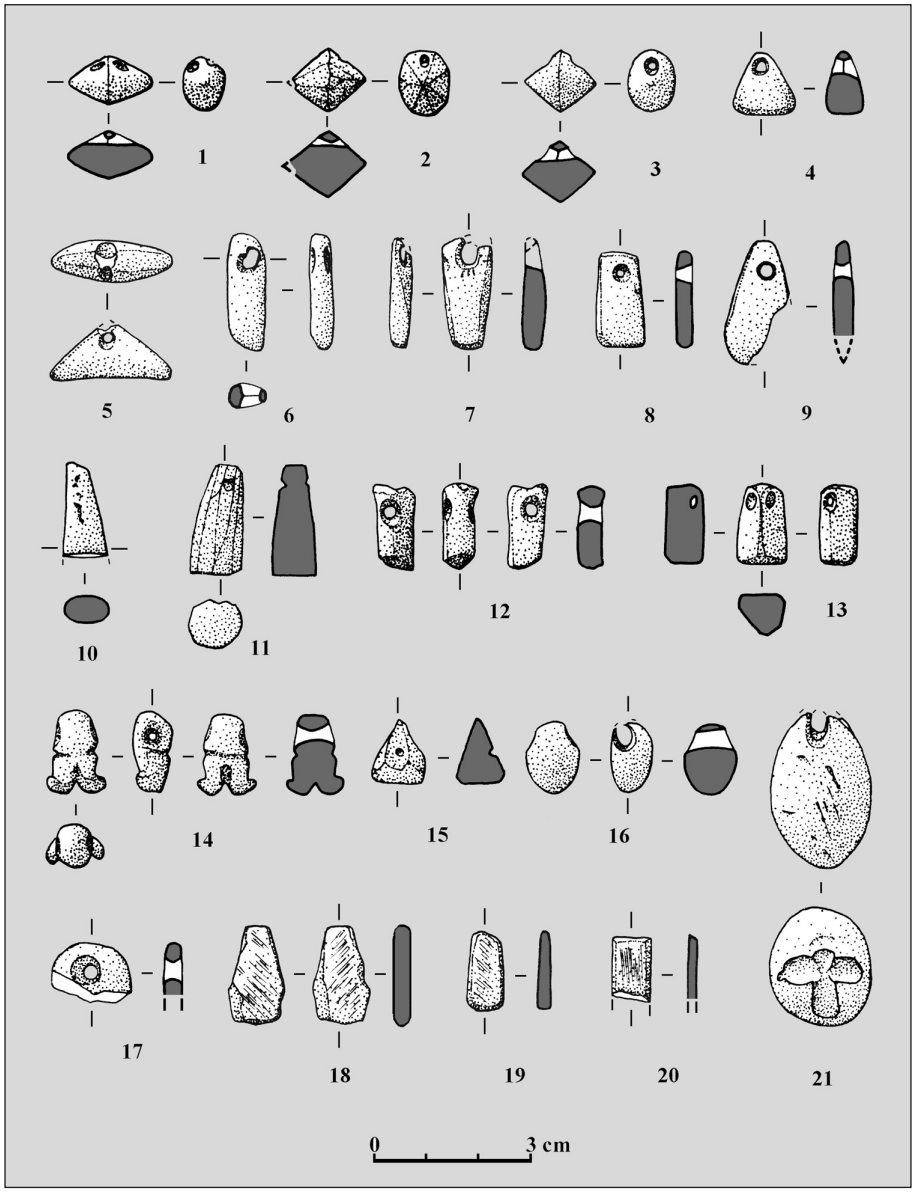

Fig. 11. Steatite pendants from SMP sites in western Emilia. 1, 2, 8–12, 14–17, 21 Gaione – Cascina Catena; 3–5 Reggio Emilia territory (Chierici collection); 6 Travo – Case Marchi; 7, 19, 20 San Ruffino – Villa Greci; 13 Bazzarola; 18 Pontetaro (drawings by R. Micheli, courtesy of Museo Archeologico Nazionale di Parma and Musei Civici di Reggio Emilia).

male burials. Perforated red deer canines appear not have been used by SMP people; nevertheless, imitations are attested, such as the steatite pendants at Pontetaro and Gaione (*Micheli* et al. *in press*) or a bone specimen in a female grave at Parma-via Guidorossi (*Bernabò Brea* et al. *2010a.Fig. 21*). There is, however, unusual evidence attested at Parma-via Guidorossi (grave 6): an adult female wearing a perforated human canine tooth (*Bernabò Brea* et al. *2010a.Fig. 20*). Such evidence is interesting, but probably not exceptional in the SMP world, because some perforated human incisors were found at the settlement of Fimon-Molino Casarotto in Veneto (*Broglio* et al. *2004.59, Fig. 5*). The practice of transforming human teeth, or other human parts, into objects of adornment is well-known ethnographically, but extremely rare in the archaeological record. A recent review of all available published data in Europe since the Upper Palaeolithic to the Copper Age reveals seventy specimens of perforated human teeth transformed into personal ornaments. The Neolithic evidence is limited to the early phase and restricted to three LBK sites in central Europe (Herxheim and Zeuzleben in Germany, Nitra in Slovakia) and the Dispilio settlement in Greece (*Ifantidis 2010*). Thus, the SMP case is very significant. Such scarcity cannot be due to the lack of raw material, but rather to a choice having various meanings (aesthetic, emotional, magical or religious).

The significance of Spondylus *shells in Trentino*

The personal ornaments most preferred by the SMP groups of Trentino are *Spondylus* shell beads, some perforated *Columbella rustica* shells and, a recent addition to the list, steatite beads. Objects of local

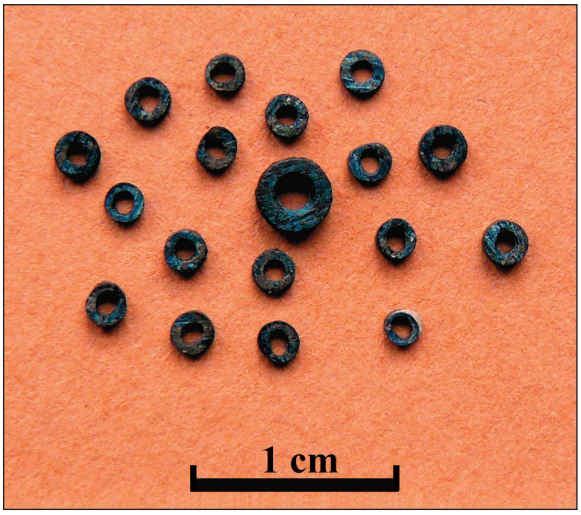

Fig. 12. Steatite microbeads from a burned female burial from Gaione–Cascina Catena (grave 35) (photo R. Micheli, courtesy of Museo Archeologico Nazionale di Parma).

origin also appear occasionally, such as pendants obtained from wild boar tusk, perforated red deer canines and perforated pebbles.

Spondylus beads are attested in four graves at La Vela (*Bagolini 1990*) and in settlement deposits at the Moletta Patone rock-shelter (*Bagolini* et al. *1984*) and Riva del Garda–via Brione. The latter evidence is a recent discovery, confirming their variability in shape and the predilection reserved for such objects by SMP people. In fact, the types found so far are numerous: large cylindrical beads (Fig. 15), short cylindrical specimens and discoidal elements (Fig. 16). A twofold origin is plausible for such artefacts: *Spondylus* ornaments came via the central Po Plain and Lake Garda from SMP groups settled along the coasts of Liguria, or they spread through the Alpine mountain range from other coeval central European Neolithic groups, where such objects are common.

In Trentino, there are some about thirty SMP burials, but their number is probably higher. The funerary practices include inhumation burials, with interred individuals crouched on the left side and deposited in stone cists or in pits within stone circles, sometimes strewn with red ochre (*Bernabò Brea* et al. *2010a*). Such funerary evidence is ascribed mainly to the SMP 2 phase. Burials include grave-goods, counting stone axes, hatches and chisels, ceramic pots and flint arrow-heads and blades, but graves without grave-goods or adornment objects are also known (*Pedrotti 1996; Mottes 1996*). Personal ornaments are few and concentrated in three burials of females of different ages and one burial of a child of undetermined sex at the important graveyard of La Vela (*Bagolini 1990*). However, the La Vela evidence is interesting because it highlights the personhood of some individuals of the community through body adornment, and in particular, that of a 4–5 year-old child richly adorned with a long necklace and a bracelet formed from around 150 *Spondylus* beads (Fig. 17).

The differences in frequency and richness of grave-goods and the presence of some prestigious or exotic personal ornaments in SMP burials clues to the existence of some kind of hierarchy in SMP society, the features of which are not clear. Some children's burials with rich grave-goods are also known in the central Po Plain, thus it is probable that the identity of such children and their belonging to a certain social group were represented in the grave by these objects. It was, in fact, very unlikely that *Spondylus* beads of exotic origin from remote territories were passed from hand to hand until they reached a 4–5 year-old child. The LBK evidence shows that such prestigious and valuable objects may have been handed down from generation to generation by some relatives as symbols of their status and power (*Jeunesse 1997.116–117*).

Steatite beads from Riva del Garda-via Brione (Fig. 18) and La Vela are very similar in typology and dimensions to those of Emilia. From the former site come some microbeads and one small pyramidal pendant, and from the latter, some short cylindrical specimens. Since steatite is not common in the Alps, it is likely that these beads came from western Emilia.

In the SMP domain, perforated *Columbella rustica* shells feature among personal ornaments only in Liguria. Therefore, the specimens from Riva del Garda-via Brione (Fig. 19) and Mezzocorona Borgonuovo (*Bazzanella* et al. *2002*) are particularly interesting because of their peculiarity. In fact, such shells are different from other Neolithic *Columbella rustica* specimens from northern Italy: the hole is obtained by abrasion in correspondence with the natural opening. Such perforation suggests a specific way of fixing shells and their probable use as decorative applications instead of the beads of a necklace.

The discoveries made at Riva del Garda-via Brione provide new data about SMP personal ornaments in Trentino and confirm the existence of exchange networks between the central Po Plain groups and those of the central Alpine region via Lake Garda. It seems

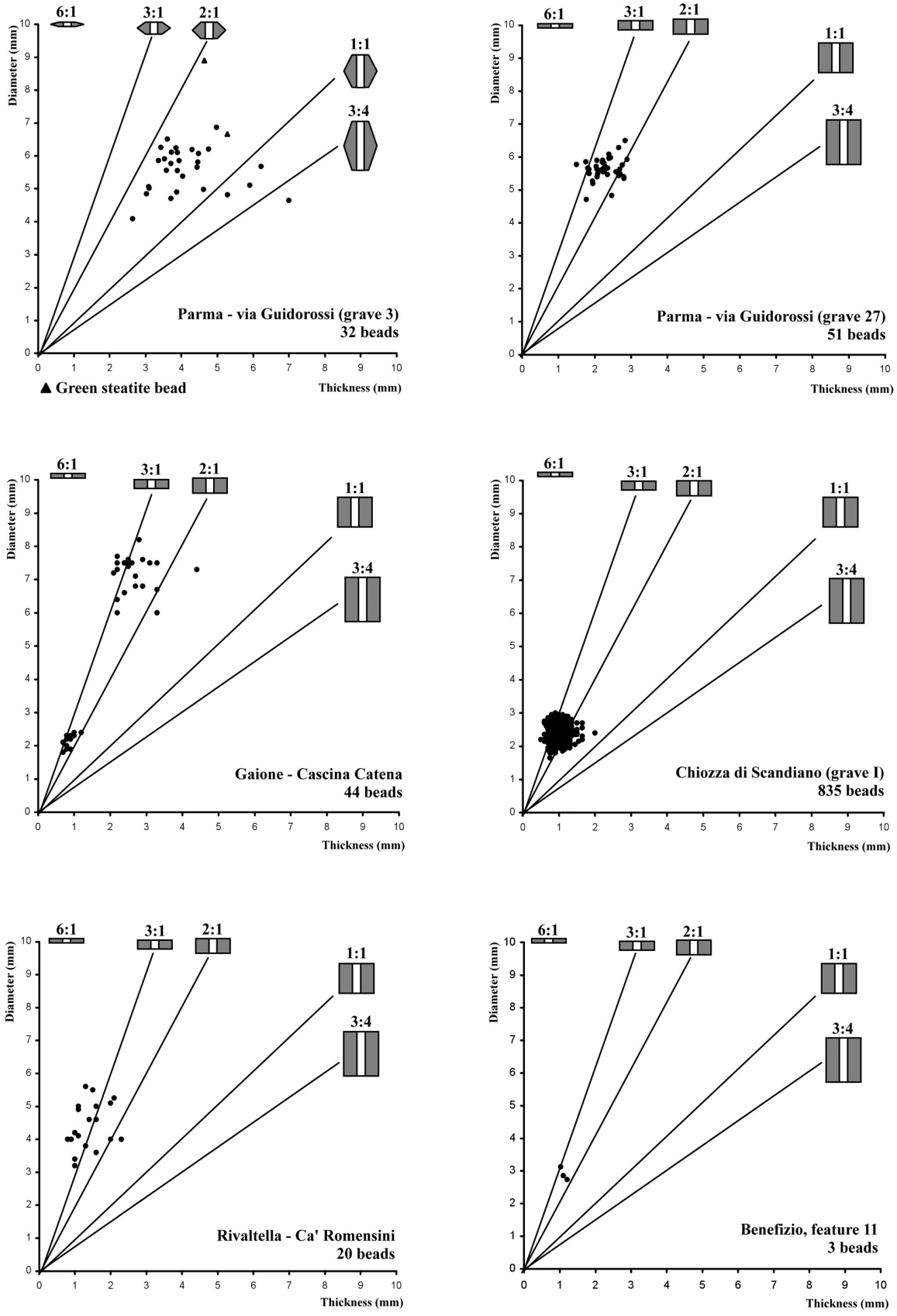

Fig. 13. Dimensional ratios and lengthening indexes of steatite beads from some SMP sites in western Emilia.

Fig. 14. Biconical pendants from Pontetaro settlement (photos R. Micheli, courtesy of Museo Archeologico Nazionale di Parma).

that the SMP groups of Trentino preferred personal ornaments of exotic origin that linked them ideally to the place where such objects were procured or manufactured and, perhaps, the territories where SMP culture had its original core, or to other territories and people in central Europe, as the case of the large cylindrical *Spondylus* beads suggest. It is not possible to outline clearly the social identities of SMP groups of the central Alpine region, except in a few instances; however, the data suggest a prevalence of male burials with grave-goods, but without personal ornaments. As documented in other SMP burial contexts, stone axes and arrow-heads are very significant objects, highlighting male identity (*Bernabò Brea* et al. *2010a*).

Fig. 15. Cylindrical* Spondylus *shell bead from Riva del Garda – via Brione settlement (photo R. Micheli, courtesy of Soprintendenza per i Beni Librari, Archivistici e Archeologici della Provincia di Trento).

Material culture, Neolithic groups and ethnicity: some notes on personal ornaments

"*There is usually very little ambiguity or blurring about the tribal group to which a person belongs. Each tribe is characterised by a distinctive style of dress. The people themselves know very clearly whether at any one moment they are identifying with the Pokot, Njemps or Tugen, and this identification is shown overtly in items of dress*" (*Hodder 1982.18*). This is true not only of the Baringo district in Kenya, but for any human groups, because body adornment communicates and strengthens social identities and the sense of belonging through appearance codes which are meaningful in people's lives. Thus, the combination and arrangement of ornamental objects worn or attached to the body distinguish individuals visually, linking them to categories and groups. The distribution and clustering of some of such elements could therefore be useful to distinguish prehistoric groups and bound their cultural borders. In fact, "*personal ornaments, perhaps more than any other aspect of the archaeological record, are a point of access for archaeologists into the social world of the past*" (*White 1992.539*), because they share a system of meaning intelligible within a community and aimed at communicating not only intra-group differences, but also regional affiliations and group membership.

In traditional archaeology, there was a tendency to interpret all differences in the material cultures of different groups as permanent ethnic markers, but recent studies point to the inadequacy of these postulates (*Cornell 2004.69*). Ethnicity, and the relationship between cultures and ethnic/tribal groups, remains a problematic aspect of archaeological analysis, because the connection between variations in material culture and the expression of ethnic/tribal distinction is complex (*Ucko 1969; Hodder 1982; Jones 1997*). The difficulty lies in identifying which material characteristics are socially meaningful in a particular social context, and which are irrelevant. A further problem for archaeologists is to consider which non-material elements might have been important to group identity, and how they would appear in archaeological remains. Recent studies on group identity suggest that differences in almost any cultural features can distinguish one group from another. The

distribution of a pottery style, for example, may not indicate the existence of an ethnic group, but may mark political boundaries or simply the spatial limits of a particular system of distribution (*Emberling 1997.300–311*).

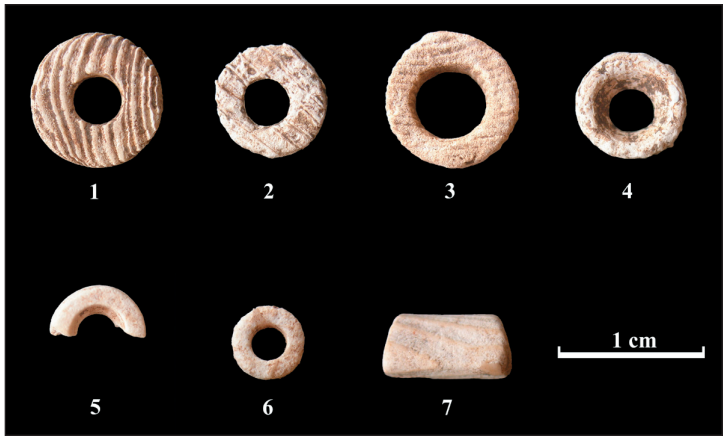

Fig. 16. **Spondylus** ***shell beads from Riva del Garda–via Brione settlement (photo R. Micheli, courtesy of Soprintendenza per i Beni Librari, Archivistici e Archeologici della Provincia di Trento).***

The boundaries of ethnic/tribal groups and the identification of individuals are not stable, because they may change through time and from place to place, often as a result of the manipulation of identity. "*In archaeological literature, it has also been suggested that ethnicity is a dynamic and instrumental phenomenon and that material culture is actively used in the justification and manipulation of inter-group relations' and this can take place by means of stylistic variation. Thus, 'style can be one of the many channels through which identity can be projected to others, and consequently it will be affected by processes of social comparison and determined by the outcome of that comparison in terms of the expression of similarity and difference. Moreover, with reference to social identity and group membership, style may be actively used in the disruption, alteration and creation of social relationship*" (*Jones 1997.110–111, 113*). Nevertheless, items of material culture involved in ethnic symbolism can vary between different groups and the ways through which ethnic boundaries are expressed may involve few aspects of material culture, while other material components spread across such boundaries. The analysis of the personal ornaments of the Tugen, Njemps and Pokot tribal groups reveals, in fact, the importance of some adornment objects as symbolic elements identifying women belonging to specific social groups. Thus, women's earrings and decoration patterns clearly display the affiliation of a female to one tribal group or another. However, there is a difference between the traits associated with male and female, in that items related to men tended to move farther and more easily across borders than female objects. Although many socio-economic interactions exist between the above-mentioned tribes, tribal borders are perfectly preserved in many aspects of material culture, some of which also persist in costumes, particularly of women (*Hodder 1977.253–258; 1982.75–86*). The reverse case is documented in Sierra Leone: the Limba, Yalunka and Kuranko groups share several common cultural traits, but material culture provides only a limited indication of divisions. Material expressions of group cohesion, social identity and ethnicity are primarily visible in ritual, and the most important indicators of ethnicity are material aspects of ritual behaviour, such as shrines, rock paintings and burial practices. It is notable that various types of aesthetic expression, a field which is often regarded as an indicator of ethnicity or social identity, are very limited throughout northern Sierra Leone (*DeCorse 1999*). Such interesting observations clearly show that material culture, group membership, social identity and ethnicity often do not correspond or are not usually directly correlated. Moreover, it is difficult to identify such traits in archaeological contexts, because data for the past are often incomplete and poorer than those available for living groups.

During the Early Neolithic, two large cultural spheres existed in northern Italy with specific material cultures and ideologies and probably with their own languages and ethnicities; the distribution of sites and exchange networks of goods and raw materials confirm such distinction.

The Impressed/Cardial Ware culture affected a wide territory, but appears to have been uniform, since its material culture shows little evidence of marked regionalisation. Instead, the Po Plain Neolithic groups show a common cultural identity, but with many regional entities related to each other through intra-groups interactions and the circulation of the same commodities (Lessini Mounts flint, green stone artefacts, Fiorano cup, *etc.*). Also, personal ornaments, despite the inadequate data and lack of burials, indicate a twofold body adornment domain. In particular, the wide distribution of green stone ring bracelets highlights the existence of a common aesthe-

Fig. 17. Grave-good from a 4–5 year-old child interment at La Vela (grave III) (after* Mottes 2007*).

tic of body adornment and the employment of the same permanent ornaments on the body among various Neolithic groups. Thus, ring bracelets can be considered socially meaningful in the context of the Po Plain Neolithic and a trans-cultural component of body ornamentation for such groups.

Perforated *Columbella rustica* shells might have been similarly important in the Impressed/Cardial world. Nevertheless, the real use of such shells is not yet clear, because they could be variously employed as single pendants, as beads of a necklace or a bracelet, and/or for decorative application on clothes or textile. Therefore, the social significance of wearing *Columbella* shells is not immediately evident, depending on contexts of employment unfortunately unknown to us. The use of cowrie shells (*Cypraea*) among the Naga people of northeastern India might clarify this point. Such people employ many kinds of body adornment items (*Jacobs 1990.103–115; Saul 2005.31–70*), among which cowrie shells are largely appreciated for their aesthetic qualities and brilliance, and as objects conveying information about the status of individuals. This shell is socially very meaningful in the Naga's language of body adornment: nevertheless, its significance is not inherent in the shells or their exotic origin, but on the context in which they are employed as ornament and on their arrangement on clothes forming particular motifs. For the Naga, body adornment is more than a matter of aesthetics: it helps make statements about, and define the identity of individuals and groups. The personal ornaments and clothes of the Naga highlight the group membership of individuals (class age, clan or village), while the colours and motifs of decorative applications on clothes signal achieved status and how it has been attained. Thus, cowrie shells, as decorative applications of clothes, are components of a common language that changes on the basis of the circumstance of use from one Naga tribal group to another within the same culture. Although there are some Naga personal ornaments that can be worn by anyone, how and when they wish, most adornment items are meaningful, because they are powerful objects that must be handled with care. Indeed, all elements of body adornment are so important in Naga society for displaying personal and social identities that they are conceived as part of the definition of being truly human. Therefore, they have to be removed from the body at death, since they cannot follow the corpse of the wearer in the grave. I am aware that it is not appropriate to apply ethnographic models to a prehistoric context, but some of the previous observations might be enlightening for explaining some unclear aspects of Italian Neolithic body ornamentation.

The personal ornaments of SMP groups are numerous and their variety allows us to draw a regional pattern of variability depending on the local availability of raw materials, exchange networks of exotic objects and also on the aesthetic or cultural preferences of the different groups. Such regional variability, however, is also due to different chronology, as confirmed by the three SMP pottery styles. During the SMP 1 phase in western Liguria and at the Ponte Ghiara site, in fact, it is possible to recognise the

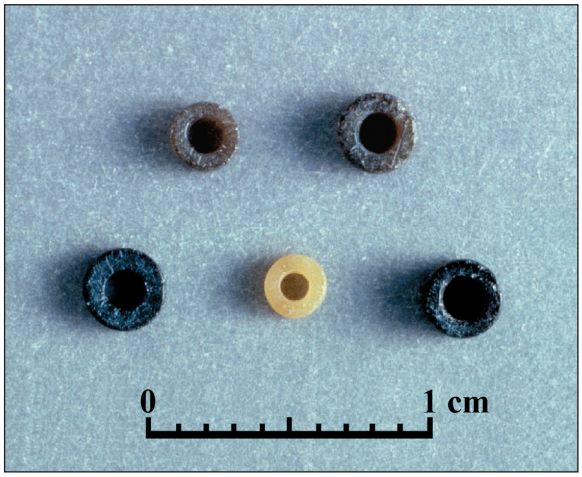

Fig. 18. Steatite microbeads from Riva del Garda – via Brione settlement (photo R. Micheli, courtesy of Soprintendenza per i Beni Librari, Archivistici e Archeologici della Provincia di Trento).

importance of perforated shells and teeth and *Dentalium* shells, although at other Emilia sites of the same phase, steatite beads start to come appear. In the subsequent phase, the evidence in Liguria is scanty, while it is very significant in western Emilia, where many types of steatite bead and pendant spread, along with some perforated shells and teeth, *Dentalium* shells and *Spondylus* beads. The evidence in the Mantua area is not yet very rich, but it is similar to that of Emilia. In the same phase in the Adige valley and the upper Lake Garda areas, *Spondylus* beads are characteristic together with some perforated shells and steatite beads. Finally, during the SMP 3 phase, personal ornaments disappear almost completely.

SMP culture presents a body adornment domain which is more complex and very different from that of other coeval Neolithic groups on the Peninsula. The Ripoli and Serra d'Alto cultures do not have, in fact, a similarly developed range of personal ornamentation, nor do they present the same regional variability, although the contacts and relationships, especially between SMP and Serra d'Alto groups, are well documented during the half of the 5th millennium calBC. Instead, the SMP and Chassey cultures do not seem partly permeable to each other because both entities have two well-established cultural identities, with their individual ideologies and material cultures. Chassey groups spread in Italy from the west during a late phase of the SMP culture, presenting few and not very characteristic decorative objects, although such items are well known in the same cultural sphere in southern France (*Courtin, Gutherz 1976; Barge 1982; 1988*). Chassey groups did not receive any components of SMP personal ornament traditions during their tenure in northern Italy. A different case is attested in Switzerland with reference to the Chamblandes group of stone cist burials dated to the Middle-Late Neolithic. Such groups and SMP culture are partially coeval and share many traits in their funerary practices: personal ornaments are generally associated with female individuals or the young and children and vary from region to region. As in the SMP world, differences are evident between the burials of Italian Valle d'Aosta and Swiss Vallais and those of the Leman basin; the former have revealed only ring bracelets made of *Glycymeris* and *Charonia* shells, while the latter present mainly wild boar tusk plaques, *Charonia* shell pendants and Glis type buttons. Thus, the ways in which the dead were adorned in the Chamblandes group might be a manifestation, visible in the funerary domain, of ethnic/tribal differences

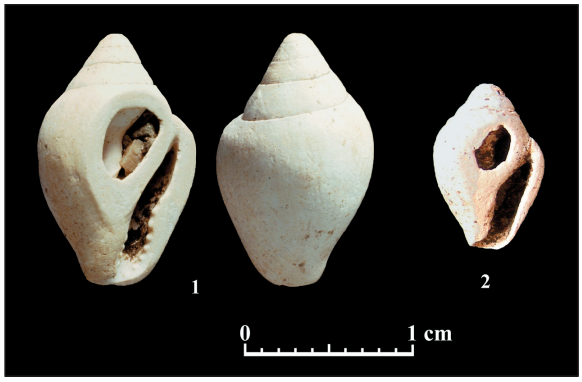

Fig. 19. Perforated* Columbella rustica *shells from Riva del Garda – via Brione settlement (photo R. Micheli, courtesy of Soprintendenza per i Beni Librari, Archivistici e Archeologici della Provincia di Trento).

within the same cultural sphere (*Moinat* et al. *2007. 305*), as in the SMP world. Moreover, it can be argued that such SMP regional variability may be partly rooted in the previous differentiation of early Neolithic groups and in some of their traits transmitted to the SMP culture: Cardial Ware in Liguria, the Vhò group in the central Po Plain and Gaban group in the Adige Valley. Therefore, some of these regional differences might denote the persistence of different ethnic/tribal groups within the SMP world, but this can not be confirmed by other data.

Removable *vs.* permanent personal ornaments: the relationship with the body

The relationship between the body and ornamental objects worn or attached to it is always transient. In fact, such items associated with appearance are threefold:

- elements permanently attached to the body;
- permanent items fixed to clothes and textiles;
- removable objects.

Permanent objects had a lasting relationship with individuals and must have provided a permanent statement on personhood, because they created fixed identities. In some traditional groups, the relationship of personal ornaments with the body emphasises differences of gender among individuals: for example, male wear only removable items, while females are associated with permanent objects, sometimes not easy to wear, producing some sort of obstacle to movement or even bodily deformation (*Sørensen 1997.101–102*).

The use of ring bracelets as permanent markers of individuals is observed from the Early Neolithic on-

wards among many Europeans groups (*Zápotocká 1984; Jeunesse 1997*). Therefore, the northern Italian case is perfectly in accord with the rest of Europe. Nevertheless, the significance of such objects among Italian Neolithic groups is not yet clear: we still do not know whether they characterised gender, age class, kinship, social group membership (clan, lineage, village, *etc*.) or other social features of individuals. Ring bracelets were generally worn on upper arms from a very early age by Neolithic people and worn for many years until they were damaged or until the death of the owner. However, broken bracelets could be reassembled, as in the case of the composed specimens fixed together by means of strings. Composed bracelets do not seem to be only the result of repair, as shown by the burial of Jablines–Longues Raies in France *(Bulard* et al. *1993*), but rather they might be considered as a particular type of bracelet that could be worn and removed easily, especially when made of precious or rare raw materials.

It is clear that the majority of Impressed/Cardial Ware and SMP personal ornaments were employed as removable items on the body (necklaces, bracelets, pendants, *etc*.) or as decorative applications on clothes. Through the choice of permanent or removable ornaments, a group decided between different looks and chose how to appear before others: permanent objects gave individuals a more static appearance, while removable items created a more original and diversified look. However, such observations leave out the importance of perishable ornaments, of which there are no traces in the Neolithic costume in Italy so far.

There are no clues to the exact use of personal ornaments in the Impressed/Cardial Ware culture and their relationship with the body; nevertheless, we know that removable ornaments could have been employed in many ways. Ring bracelets could have been used as permanent ornaments on arms, usually above the elbow, and, less frequently, on wrists or ankles. The predilection of Po Plain Neolithic groups for objects marking the limb articulations of the body is evident. Personal ornaments of SMP groups are all removable. On the basis of the funerary data, they were employed in various ways: as single pendants or beads of necklaces adorning neck and chest; as beads of bracelets around the wrist; as decoration on a sash or waistband; as ornaments adorning the head, worn directly on the hair or indirectly on perishable diadems and hats. Numerous areas of the body could be adorned, even if the bust seems to have been preferred, because it emphasises the face of the individual and their personality.

Green, white and black: some observations on the Neolithic aesthetic of colours

Colour is everywhere. It is a significant component of the natural environment, but the perception of it through our senses and the perception of its attributes (texture, brightness, *etc*.) are socially and culturally constructed. Thus, all variations in the perception of colours in one or another human group have their origins in language and not in human physiology. In fact, the use of colours permeating all aspects of the material culture of a human group depends largely on cultural preferences and aesthetic appreciation, but may also be related to wider aspects of ideology and cosmology. It is the result of a continue interaction between people, things and substances of the natural (*e.g.*, mineral) world. For such reasons, the cultural significance of colours has been emphasised in several anthropological and archaeological studies (*e.g.*, *Turner 1967; 1969; 1995; Jones, MacGregor 2002; MacLaury* et al. *2007*).

Since several cultural meanings can be attributed to them, colours play an important role as elements displaying differences in appearance. This is clearly observable since the Neolithic, but probably also earlier. In particular, despite the availability of many types of rock, PPNA and later groups of the Levant have a particular appreciation for green personal ornaments obtained from various stones that are widely reported and sometimes dominate bead assemblages, followed by red specimens forming a structural and probably meaningful opposition with the former (*Wright, Garrard 2002.277–278; Bar-Yosef Mayer, Porat 2008*). An analogous case, but more articulate, is documented in the Balkans between the Neolithic and the Copper Age, when colour and brilliance become significant features in preferences for objects of the greatest visual significance in social practices, among which personal ornaments are relevant (*Chapman 2007; Gaydarska, Chapman 2008*).

The cultural or aesthetic preference for some colours for body adornment is also well documented in the Neolithic of northern Italy. The incidence of green ring bracelets is very high in the Early Neolithic series of Vhò and Friulian groups, while it is less relevant in the Fiorano group because fewer precious and locally available stones of other colours were employed. Artefacts made from softer green metaophiolitic stone have two aesthetic qualities

ideal for visual display which made them highly appreciated: a pleasing colour varying from light to dark green and a glossy surface which becomes very smooth with polishing (*Micheli 2012*). As suggested for the Levant, the preference for green specimens during the Early Neolithic might imply certain meanings related to the colour, such as fertility, vegetation, the regeneration or life, but such a hypothesis cannot be corroborated. Nevertheless, a few white shell ring bracelets are also known aside green-coloured specimens attesting a possible chromatic contrast in the employment of such ornaments.

It is also possible to observe a further distinction in the spread of Neolithic ring bracelets between northern Italy and southern France on the basis of raw materials availability, aesthetics preferences and the extension of exchange networks. In the latter areas, in fact, ring bracelets of marble or limestone ranging in colour from white to light grey are very common and reached Liguria without extending to the rest of northern Italy (*Courtin, Gutherz 1976*). Moreover, there is a strict relationship between the section morphology of the ring and the geological characteristics of the stone employed, since specimens with thin and large triangular sections obtained from green stones appear in Italy without spreading widely in France, where other types of marble or limestone bracelet with a narrow and high oval section are well known.

Regarding shell items, three observations are possible about aesthetics and brilliance. Firstly, some fresh shells were collected solely for their beautiful shapes, colours and shine, having no use as food or tools. In such cases, the possibilities of choice are as many as the qualities of the shells available in the sea or along the coasts. Secondly, the process of production of elaborated personal ornaments usually removes most of the colour and brilliance, as well as the characteristic morphology of the original external surface of shells. This means that elaborated ornaments are generally white, although some *Spondylus* ring bracelets retain reddish traces of the original colour. Thirdly, fossil shells do not usually preserve their original colour and shine, but are white or light grey and opaque. All three cases have been documented in various forms for the Early and Middle Neolithic in northern Italy.

Colour contrast and opposition in SMP body adornment can be identified, thanks to some evidence. At Parma–via Guidorossi (grave 58), the burial of a 2–5 year-old child included a fossil micro-*Dentalium* necklace with some shells with traces of red ochre inside, suggesting a thread soaked in red pigment (Fig. 20). Thus, the necklace presents a red-white opposition. The use of red mineral pigments on the body of the SMP dead is documented in Liguria and some graves of Trentino. In particular, the analysis of the red pigment in grave III at La Vela indicates the use of cinnabar, a mineral mainly characteristic of the Amiata Mount formations in Tuscany (*Dal Rì* et al. *2001*). Such pigment was used to cover the upper part of the corpse, but it was also employed to colour the *Spondylus* beads with a thin film of pigment mixed with clay. While in the case of Parma-via Guidorossi the purpose was to create a chromatic opposition between the thread and the shells, in the latter case it was clearly the intention to change the white colour of the worked *Spondylus* artefacts to red, like the original *Spondylus* shell.

Further evidence for the preference for some particular colour is the high incidence of black or dark grey steatite personal ornaments. In the northern Apennines, green is the prevailing steatite colour in the outcrops, although other colours are present (beige, brown, dark red, black and grey). The use of green or other colours is, however, very limited and occasional, while the occurrence of dark colour ornaments is around 95% or more of the total known. Since black steatite is not common in the deposits, its large procurement cannot have been casual, as it involved a specific and thorough survey by SMP prospectors of the localities where it was available. Such choice depends on an aesthetic preference for using black or dark grey steatite as beads for totally dark necklaces, or to match other light-

Fig. 20. Micro*-Dentalium *with red pigment traces inside, from a necklace of a 2–5 year-old child interment at Parma – via Guidorossi (grave 58) (photo R. Micheli, courtesy of Museo Archeologico Nazionale di Parma).

coloured ornaments, such as white perforated shells or beige teeth to form composite necklaces. Nevertheless, a chromatic opposition could be also obtained by mixing differently coloured steatite beads, as in the case of the outstanding necklace worn by an adult male in a grave at Parma-via Guidorossi (Fig. 21). Pyro-technological treatments of steatite artefacts intended to change their natural colours by means of thermal alteration have not yet been documented for SMP culture. The preference for certain colours and for chromatic contrasts in SMP personal ornaments was probably essential for reproducing views about the world and for constructing differences and oppositions between individuals through body adornment.

Concluding remarks

Through body adornment, individuals can communicate many messages and information about their biological status and gender, their social and economic position, their kingship and/or membership of a larger social group. This happens by means of a variety of perishable and inorganic materials and of various shapes and colours. Thus, body ornamentation is a powerful and meaningful mediation of social categories and identities, containing many codes that can be read and immediately understood without ambiguity about their meaning, as the ethnographic evidence suggests. As I have shown throughout this paper, personal ornaments, just as other components of body adornment, highlight similarities, differences or oppositions between individuals which can be used to affirm the identity of both individuals and groups.

Although in traditional societies body adornment is more uniform and standardised within the same social group, making its codes more legible than those of our complex western society, the reconstruction of identities in prehistoric contexts is not an easy task. The archaeological data are often incomplete and not homogeneously available for sites and territories, limiting our knowledge of the past, as in the case of the very low occurrence of Early Neolithic graves in northern Italy. Moreover, personal ornaments do not feature in all burials, but only in some, as in SMP and Chamblandes funerary practises. This implies that the identities of the dead were not only highlighted by personal ornamentation, but also by other symbolic elements that were not necessarily imperishable like those of grave-goods. Objects of adornment seem, instead, not very relevant in the Neolithic funerary practises of the Impressed/Cardial Ware, Ripoli, Serra d'Alto and Chassey cultures for highlighting the personal and social identities of the dead. Moreover, we should not neglect the importance of perishable items in Neolithic body adornment, items which appear in many traditional living societies.

From what I have described above, the importance of personal ornaments and raw materials in highlighting some Neolithic groups and their identities, as well as the identities of some individuals within such groups, is clear. The same cannot yet be said of the Impressed/Cardial Ware culture, while it is evident in the case of Po Plain Neolithic groups, among which ring bracelets are a characteristic type of body adornment identifying groups with their own traditions and identities, but within a larger and common cultural sphere. The importance of personal ornaments is very clear within the body adornment tradition of SMP culture, given the differences in the ways each group adorned its individuals, thus displaying cultural particularities' denoting different ethnic/tribal groups within the SMP world, although such statement cannot be corroborated by other data. However, the Baringo district and the Naga examples concerning the meaning and context of personal ornamentation and the group membership of individuals can be helpful in understanding some points of the SMP case.

As I have stressed many times in this paper, the SMP ornamentation system is more complex and multi-

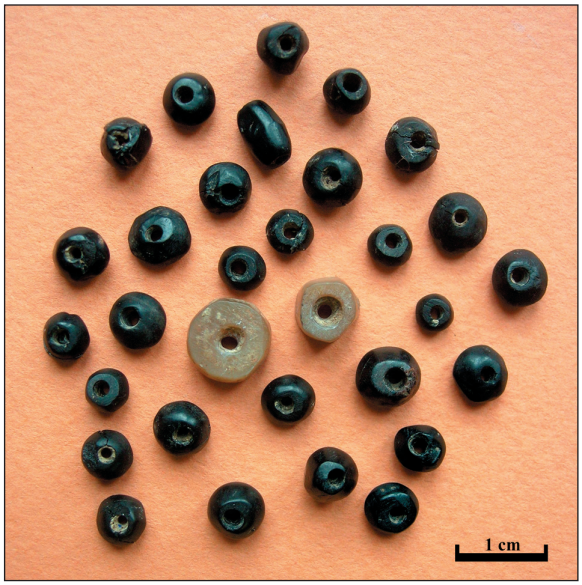

Fig. 21. Chromatic contrast in a steatite bead necklace from an adult male interment at Parma–via Guidorossi (grave 3) (photo R. Micheli, courtesy of Museo Archeologico Nazionale di Parma).

form than that of previous Early Neolithic groups; many identities probably appeared in SMP culture as a consequence of new personhoods created by new kinds of social groupings, new embodied skills and new raw materials during the Middle Neolithic. The data for the earlier Neolithic phase are, however, still too scarce. Except for a few standardised objects that provide some clues about past identities, SMP personal ornaments appear too various and elaborate: individuals adorned themselves in many different ways in order to stand out, and this is true not only of different SMP regional groups, but also within individual SMP social groups. Although the SMP personal ornaments are generally numerous, it is difficult to decipher their codes fully and understand their meanings.

This paper has presented a picture of personal ornaments used between 5600 and 4300 calBC, showing how in some case body adornment had long-lasting traditions and in other cases was temporally limited, and how some of its components spread over very large areas, while others were restricted to only one region. It has also shown the variation in raw materials, shapes and colours and how such elements were often meaningful in constructing past identities. Certainly, many aspects of the personal and social identities of the Neolithic groups of northern Italy remain unknown. This will be possible only through new discoveries of Neolithic burials preserving rich grave-goods and personal ornaments, which might significantly increase the available data and offer new detailed information about the past identities of Neolithic people and their multiform complexity.

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'Austronesian' and 'Jōmon' identities in the Neolithic of the Ryukyu Islands

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ABSTRACT – *This paper examines Neolithic cultural identities in the Ryukyu Islands of southwest Japan. It is argued that there were two different identities in this archipelago: a 'Jōmon' identity in the northern and central Ryukyus and an 'Austronesian' identity in the southern Ryukyus. These identities were constructed despite broad similarities in subsistence adaptation in both cultural zones.*

IZVLEČEK – *V članku analiziramo neolitske kulturne identitete na otočju Ryukyu, jugovzhodna Japonska. Ugotavljamo, da sta bili na arhipelagu dve različni identiteti: 'Jōmon' v severnem in osrednjem delu in 'Avstronezijska' ma jugu. Idntiteti sta se izoblikovali kljub podobnim subsistenčnim prilagoditvam v obeh kulturnih conah.*

KEY WORDS – *identity; island archaeology; coral reefs; Ryukyu Islands; Austronesian expansions*

Introduction

This paper compares two different cultural identities in the prehistory of the Ryukyu Islands. The Ryukyus stretch for over 1000km between Kyushu in Japan and Taiwan. The islands are now divided between the Kagoshima and Okinawa Prefectures of Japan. Archaeologically, we can distinguish two major cultural zones in the Ryukyu archipelago: (1) the southern Sakishima islands and (2) the central Okinawa and northern Amami islands (*Kokubu 1972*) (Fig. 1). This paper focuses on the Holocene prehistory of the Ryukyus through to about the 12th century AD. This period will be referred to as 'Neolithic' for reasons explained in the next section. The main argument of the paper is that there were two contrasting Neolithic identities in the Ryukyus: 'Austronesian' in the southern and 'Jōmon' in the central/northern Ryukyus. These two identities were, however, constructed despite significant similarities in subsistence.

The 'Neolithic' in the Ryukyus

The Neolithic period had begun in Taiwan by at least 3500 BC. After a pause of around a thousand years – perhaps the time during which a maritime technology was developed – Neolithic populations began to expand south from Taiwan into Southeast Asia from around 2200 BC (*Bellwood 2005; 2011*). The southern Ryukyu Islands were re-settled (Pleistocene humans having apparently become extinct) by around 2300 BC. Although there is currently little archaeological evidence that this Sakishima colonisation derived directly from Taiwan, it seems appropriate to see it as part of the same Neolithic Austronesian expansion for reasons discussed in more detail below.

In Japan, the term 'Neolithic' is not commonly used for the cultures of the Jōmon period. However, the widespread use of pottery was a notable feature of the Jōmon. Similar cultures with pottery but without agriculture in the Far East regions of Russia are regularly termed 'Neolithic'. In the central Ryukyu Islands, an early chronology proposed by Hiroe Takamiya (*1978*) used 'Neolithic'. Several archaeologists, including Asato (*1991*), have also used 'Neolithic' for the prehistoric cultures of the southern Ryukyus. For these reasons, the two cultures considered in this paper can be placed under the broad rubric

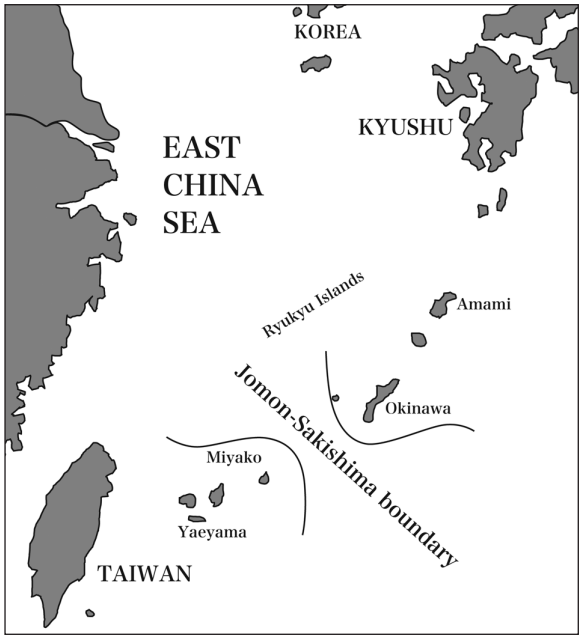

Fig. 1. Map of the Ryukyu Islands.

of 'Neolithic'. However, the real question that concerns us here is, What sort of Neolithic cultures and identities existed in the Ryukyu Islands?

Jōmon expansion to the central Ryukyus

The Jōmon expansion from Kyushu to the central Ryukyus represents a major long-distance migration by hunter-gatherers (*Hudson in press*). Jōmon groups also visited offshore islands such as Rebun and Rishiri off Hokkaido and the Izu Islands south of Tokyo, but the islands of Okinawa were much farther in total distance.[1] Furthermore, the settlement of the Ryukyus required substantial changes in Jōmon subsistence-settlement systems. The Jōmon developed as a series of broad adaptations to the post-glacial environments of the main islands of Japan, where seasonality was high and winters were cold even in the southernmost island of Kyushu. The Jōmon settlement of the Ryukyus, however, required a new adaptation to a completely different environment – that of sub-tropical coral reefs (*Takamiya 2004; 2006*).

The Jōmon occupation of the Okinawa islands required an ideology, not just of regular exploration, but of actual settlement expansion. Despite the length of the Jōmon period, such an ideology was no means common and examples of long-term settlement expansions are limited. At the northern end of the Japanese archipelago, for example, some Jōmon groups visited Sakhalin, but there was no long-term expansion to that island. What push/pull factors were at work in Jōmon migrations to the Ryukyus is unclear. As seen from ceramics, Ryukyu Jōmon culture was characterised by the maintenance of remarkably constant links between Okinawa and Kyushu (*Itō 2000*). One reason for the maintenance of these links may have been the need to find marriage partners in an island system with low population densities. Marital and other social networks can also be assumed to have promoted the resilience of social-ecological systems in the prehistoric Ryukyus (*Hudson* et al. *in press*).

Austronesians in the southern Ryukyus

Jōmon people do not appear to have crossed the 250km gap between Okinawa and Miyako Islands. The Sakishima islands of the southern Ryukyus were settled around 4300 years ago by a quite different group of people(s) who seem to have come not from Japan, but from somewhere in Taiwan and/or Southeast Asia. Two Neolithic cultures are known from the southern Ryukyus (*Asato 1991; Shimabukuro 2011; Pearson in press*). The Early Neolithic dates to around 4300–3500 years ago and is characterised by sites with pottery that is completely unlike anything known from the Jōmon. Between about 3500 and 2700 years ago, there is an apparent hiatus in the region with no evidence of human settlement. The next, Late Neolithic phase dates to around 2700–900 years ago and is characterised by shell adzes and by the absence of pottery. Again there are no artefacts that suggest a relationship with the Jōmon or later cultures of Okinawa and, based on the presence of shell adzes, the Philippines is thought to be a possible source for this Late Neolithic culture (*Asato 1991*). While agriculture was, of course, being practiced in the Philippines and elsewhere in Southeast Asia at this time, the Late Neolithic of the southern Ryukyus appears to have been based on hunter-gathering.

Subsistence

Settlement of the Ryukyu Islands by hunter-gatherer groups was made possible by the heavy exploitation

1 The islands of the northern and central Ryukyus are largely inter-visible and require maximum ocean crossings of about 60km when calculated as direct distance. Other islands visited by Jōmon populations were closer to the mainland, with the exception of Hachijō Island in the Izu archipelago, which is about 80km from the nearest island, Mikurajima. Despite this exception, the Jōmon settlement of the Ryukyus required much more frequent and sustained voyages over longer total distances to reach islands that were actually settled on a permanent basis.

of coral reef resources (*Takamiya 2004; 2006*). Similar species of reef fish and shellfish were exploited in the Ryukyus over very long periods. Commonly exploited shellfish were giant clams (*Tridacna sp*. and *Hippopus hippopus*), *Turbo argyrostomus*, *Tectus niloticus*, *Conidae*, *Strombus luhuanus*, and *Atactodea striata* (*Kurozumi 2011*). Three types of reef fish (parrot fish, wrasses and emperor fish) dominate almost all assemblages (*Toizumi 2011*). In addition to fish and shellfish, wild pigs were also hunted on the (mostly larger) islands where they were available. Though less common, dugong was hunted at sites in all parts of the archipelago.

These similarities in subsistence adaptation reflect the availability of similar resources along the Ryukyu archipelago. In the southern Ryukyus, Kurozumi (*2011.95*) notes that similar shellfish species were exploited over the 1000 years of the Early Neolithic and then again in the Late Neolithic, which began after a hiatus of around 800 years. Although ceramics were presumably used for cooking in the Early Neolithic, pottery disappeared in the Late Neolithic and stone roasting pits seem to have been widely used in this period. According to Kurozumi (*2011*), however, the presence and absence of ceramics in the Early and Late Neolithic periods, respectively, does not seem to have affected shellfish prey choice in the southern Ryukyus.

Cultural identities

Despite these similarities in subsistence, prehistoric cultural identities in the Ryukyu Islands were very different. As noted, the cultures of the northern and central Ryukyus originated primarily in the Jōmon tradition of Kyushu, but they soon evolved into a distinctive type that is sometimes known as the 'Ryukyu Jōmon'. Some of the main characteristics of the Ryukyu Jōmon were an adaptation to a new environment, which included a growing dependence on coral reef resources, the modification of aspects of Kyushu Jōmon culture to the new island environment (pottery, for example, became smaller in size) and the development of new technologies for new lifestyles in the Ryukyus. The Ryukyu Jōmon continued the mainland Jōmon tradition of pit dwellings, but in Okinawa these used coral limestone slabs for wall supports, "*a usage completely absent from the mainland Jomon*" (*Itō 2003.63*). Ryukyu Jōmon culture could easily have become very isolated, but frequent voyaging between the islands and even back to Kyushu maintained a certain commonality of culture over a wide area. Such broad, regional commonalities of culture were one characteristic of the mainland Jōmon (*e.g., Kobayashi 1992*), but in the Ryukyus, this frequent exchange of culture required a technology and ideology of marine voyaging that was perhaps rather different from anything known in the mainland Jōmon.

One of the most distinctive aspects of the mainland Jōmon was a rich material culture related to ritual practices. Artefacts such as clay figurines, masks, and phallic rods were widely used. Features associated with ritual and feasting include earthen mounds and wooden henges (*Kawashima 2005; 2008; 2010; Naumann 2000*). The Ryukyu Jōmon lacks almost all of these rich ritual artefacts and features of the mainland Jōmon. Of course, the lack of such remains in the archaeological record does not mean that the Ryukyu Jōmon people lacked an elaborate ritual or spiritual life. It does seem safe to propose, however, that the beliefs and rituals found in the Ryukyus at this time were different from those on the mainland.

As noted above, the archaeological record offers no evidence for the movement of people or artefacts across the gap between Okinawa and Miyako Islands, and it is widely assumed that this marks the boundary between two different cultural zones (*Kokubu 1972*). At present, the precise origin of the prehistoric cultures of the southern Ryukyus is unknown and we cannot completely rule out the possibility that they derived from a stray voyage by people of the Ryukyu Jōmon culture. Given the geographical proximity of the southern Ryukyus to Taiwan and Southeast Asia, however, an origin in the latter regions is much more probable. The fact that the Early Neolithic of the southern Ryukyus began at around the same time as Neolithic populations started to expand from Taiwan also supports this interpretation.

Fig. 2. Late Neolithic dog mandible from the Nagabaka site, Miyako Island. Photograph by R. Takahashi.

For these reasons, I believe the Neolithic of the southern Ryukyu Islands was part of Austronesian culture (see also *Summerhayes and Anderson 2009*).

Bellwood (*2011*) suggests four phases of the Neolithic in Taiwan and the northern Philippines (Tab. 1). Bellwood's phases 2 and 3 are distinguished by the presence of expansions from Taiwan to the south in phase 3. As noted by Bellwood himself, Summerhayes and Anderson (*2009*) suggest that movement from Taiwan *north* to the southern Ryukyus may have occurred a little earlier than his phase 2, perhaps around 2500 BC. This date is a few centuries earlier than that proposed for the start of the southern Ryukyu Neolithic by most Japanese archaeologists, *i.e.*, around 2300 BC, although it should be noted that both estimates predate the 2200 BC proposed by Bellwood for the beginning of the Austronesian expansion to the south. This seemingly minor problem in chronology is actually quite important, and two possibilities present themselves: (1) the three estimates (2500, 2300 & 2220 BC) in fact reflect the same historical event, and further work on chronometric hygiene would remove the apparent differences between the dates; or (2) the expansion to the Ryukyus was in fact earlier than that to the Philippines and reflects a (slightly) different cultural process. Whichever interpretation is correct, it can be said that the historical *results* were very different: the Austronesian expansion south from Taiwan led to a dramatic series of migrations as far as Polynesia, whereas the movement north to the Ryukyus ended there.

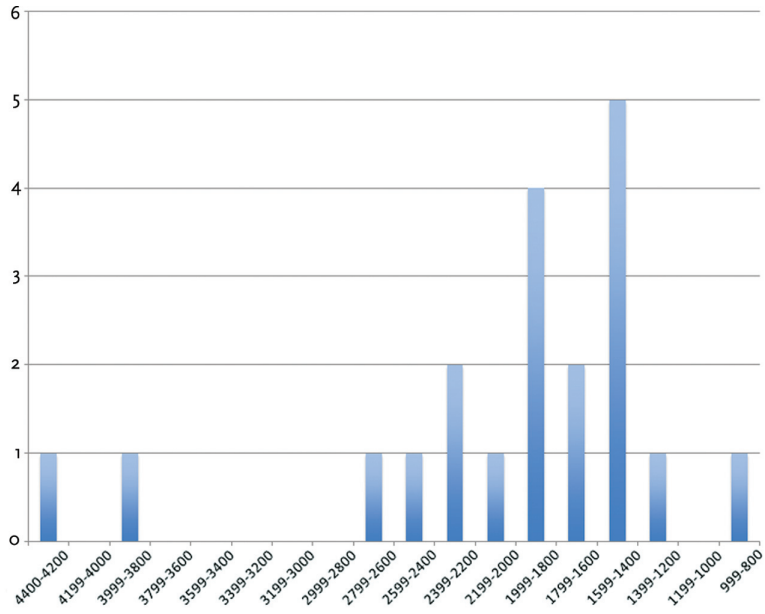

Fig. 3. Frequency of radiocarbon dates from the Neolithic of the southern Ryukyus. Dates are calBP taken from Najima* et al. *(2008).

An Austronesian origin for the Neolithic of the southern Ryukyus is by far the most parsimonious hypothesis at present, but in the context of the present paper, it has to be emphasised that the Neolithic cultures of the southern Ryukyus were, in many ways, not typically Austronesian. Most Austronesians possessed farming and, as a result, "*cultivated territory was always the fundamental basis of [their] social life*" (*Kirch 2000.304*). In the southern Ryukyus, however, there is no evidence for plant cultivation or domesticated animals (except for the dog, *cf.* Fig. 2). Despite the use of pottery, the southern Ryukyu Neolithic seems to have been a hunter-gatherer society from its beginnings.

Long-distance oceanic voyaging was another characteristic of Austronesian society (*Horridge 1995*). The apparent total absence of such voyaging in the Neolithic of the southern Ryukyus presents us with a paradox. If, as suggested by some Japanese scholars (*e.g., Asato 1991*), the southern Ryukyu Neolithic originated in the Philippines or Micronesia, then sophisticated ocean-going technology must have exi-

Phase	Description
1 (before 3500 BC)	Flaked lithics and shell tools. No evidence for Neolithic technology such as pottery.
2 (3500–2200 BC)	Appearance of Neolithic technology. Cord-marked pottery develops into red-slipped plain ware. Use of nephrite and slate. Rice and foxtail millet cultivation. No known expansion south of Taiwan at this time.
3 (2200–1000 BC)	Neolithic expansion to Batanes and Luzon from southern Taiwan about 2200 BC. Followed by increasing flow of material culture, including red-slipped and stamped pottery.
4 (first millennium BC)	Frequent contacts between Taiwan, Batanes and Philippines in both directions, particularly involving Taiwan nephrite.

Tab. 1. The Neolithic in Taiwan and the northern Philippines from before 3500 BC to 500 BC. Adapted from Bellwood (2011).

sted at the time of settlement, only to be lost over time. Alternatively, the origins of this culture may have been in neighboring Taiwan and a complex voyaging technology and ideology may have been absent from the outset. Whatever the case, the southern Ryukyus developed a Neolithic that was culturally isolated, even though those islands cannot be counted as geographically isolated when compared to many other islands in the Pacific.

Another distinctive aspect of the southern Ryukyu Neolithic was the apparently slow rate of population growth. Particularly in the malaria-free islands of Remote Oceania, Austronesian societies often developed high population densities based on intensive cultivation and land-use (*Kirch 2000*). If we plot the number of radiocarbon dates from the Neolithic of the southern Ryukyus, we do see a pattern of increase that may be related to growing population levels over time, especially in the Late Neolithic (Fig. 3). Sample sizes in this graph are, however, very small and the general impression obtained from the Neolithic archaeology of the southern Ryukyus is not one of extensive population growth and expansion.

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Conclusions

There are many ethnographic and historical examples of different cultures exploiting the same environment (*e.g., Bennett 1969*). Classic studies of ethnicity such as Barth (*1969*) have argued that contact between different groups of peoples leads to the formalisation of ethnic identities. In the case study examined in this paper, two archaeological cultures exploited the same chain of islands in remarkably similar ways, both basing their subsistence on foraging of coral reef resources. Yet, as far as can be determined from the archaeological record, there was no contact between the two cultural zones of the southern and the central/northern Ryukyus in prehistory. Both cultures developed very different patterns of material and social life that cannot be explained simply by their separate origins.

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Emerging craft production and local identity: a case of the Late Jōmon Period

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ABSTRACT – *After the Late Jōmon period, several changes have been identified, such as a reduction in the number of settlements, new types of settlement, an increase in the number of ritual objects, and emerging local craft production. Of these changes, the appearance of new types of settlement implies a change in the settlement system, which leads to a more sedentary system. This can be connected with the emergence of local crafts and social identity. In the Kantō Plain of the Late Jōmon clay earrings, shell bracelets, stone rods, and salt were produced. In this paper, I focus on salt production in the Late Jōmon, and examine the meaning of emerging craft production in this period.*

IZVLEČEK – *Po obdobju mlajše/pozne kulture Jōmon so bile prepoznane številne spremembe, kot so zmanjšanje števila naselbin, novi tipi naselbin, povečanje števila ritualnih predmetov in uveljavljanje lokalne obrtniške proizvodnje. Med temi spremembami pa pojav novih tipov naselbin kaže na spremembo sistema poselitve, ki vodi v bolj sedentarni sistem poselitve. To lahko povežemo s pojavom lokalnih obrti in družbene identitete. Na ravnini Kantō so v poznem obdobju kulture Jōmon proizvajali glinene uhane, zapestnice iz školjk, kamnite palice in sol. V članku se osredotočam na proizvodnjo soli v poznem obdobju kulture Jōmon in preučujem pomen obrtniške proizvodnje, ki se je uveljavila v tem obdobju.*

KEY WORDS – *salt; craft production; identity; Jōmon; Japan*

Background to salt production in the Late Jōmon

After the Late Jōmon period, several changes are recognized, such as fewer of settlements, new types of settlement, an increase in the numbers of ritual objects, local craft production and so on. Of these changes, the appearance of new types of settlement implies a change in the settlement system, which led to a more sedentary system (*Kawashima 2010b*). At the end of the Middle Jōmon, there are many large archaeological sites, which consist of many pit houses. These large sites suddenly disappear at the end of the Middle Jōmon. Sites become smaller and are usually founded in a short time. Compared to the Middle Jōmon sites, those that appeared in the middle of the Late Jōmon were occupied until the middle of the Final Jōmon. As the new settlement system was adopted, regional craft production, shell bracelets, clay figurines, clay earrings, stone rods, and salt production, occurred in some parts of the Kantō Plain in this period. Although an increase in craft production is a general trend in the Late Jōmon (*Imamura 1996.116–120*), salt production – which first appears in the Kantō Plain – is a unique characteristic of this region. Numerous sites are close to the source of salt making, the sea; salt was produced only at specific places. This would be the key point for specifying the identity of prehistoric salt-makers.

An approach to studying craft production has been discussed (*Costin 1991; 1998; 2001*). For instance, Costin proposes analysing the specialisation of craft production. While most studies focus mainly on technical and socio-political aspects (*Costin 1998.4*), various studies suggest that craft production has a role in the formation of identity (*Dickie 2003; Schort-*

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man, Urban 2004). First, in order to examine the meaning of emerging craft production in terms of identity formation, I will describe salt making in the Jōmon and compare it with ethnographic examples of salt production in New Guinea.

Salt production in the Jōmon

As I have noted the outline of salt production (*Kawashima 2008b; 2010a; 2012*), I will explain it briefly. The main source of salt production from the Jōmon period to Modern period has been seawater. There is no archaeological evidence to show intensive salt production from salt springs in Japan. Since Jōmon salt-making pottery was discovered in the Kantō Plain (*Kondo 1962*), some places along the Pacific Ocean are reported as salt production areas (*Iwase 1994; Kitabayashi 1994; Kimishima 1999; Koikawa and Katō 1994; Tsuji 1994; Tsunematsu 1994*) (Fig. 1).[1] While the technological relationship between Kantō and Tōhoku is still not clear (*Takahashi 2008. 1085*), salt-making pottery appears at the end of the Late Jōmon in both regions around Lake Kasumigaura and Sendai Bay.

Salt-making pottery has similar characteristics, such as a reddish colour caused by secondary firing, scale (light grey material which is possibly formed from boiling seawater), exfoliation of the exterior surfaces, a thin wall, coarse finishing of exterior surfaces and rim, and small (including pointed) bottoms. On the other hand, the regional diversity of the shape and finish of salt-making pottery is known (*Kawashima 2008b; Takahashi 2008*) (Fig. 2). The salt-making pottery around Lake Kasumigaura has an exterior wall scraped with a sharp tool, probably a spatula. This finish is rough, compared to the 'normal' pottery in the same period, which was usually finished by rubbing or burnishing. The fact that the inside of salt-making pottery is well rubbed implies its function. Rubbing the inside wall prevents the liquid content from leaking or soaking into the wall, which is thought to cause a break because of crystallization. While the finish of the inside wall is fine, like those in the Kantō region, the exterior wall of salt-making pottery in the Tōhoku region usually leaves traces of ring building. With regard to the rough finish, salt-making pottery from both regions has similar characteristics. Rough finishing can be also seen on the rim. In the Tōhoku region, rims are not finished, but pinched with fingers so the profile is triangular, or rubbed roughly. While these kinds of finish are also found on rims in the Kantō region, the characteristic finish of rims in this region is an incision with a sharp tool (Fig 2.16). Salt-making pottery in the Jōmon period, including those in the Tōkai region, has basically similar characteristics such as rough finishing. This tendency can be applied to the bases, which are categorised into three shapes: small flat base, rounded base, and pointed base. In the first half of the Final Jōmon of the Tōhoku region, flat base pottery which measures approximately 5cm is dominant, but in the second half of the Final Jōmon, the diame-

Fig. 1. Distribution of salt-making pottery. 1. Mutsu Bay, 2. Northern Sanriku Coast, 3. Sendai Bay, 4. Kasumigaura (★: Hirohata Shell Mound), 5. Tōkai region (after* Kawashima 2010.Fig. 1*).

1 Some archaeologists doubt that salt production is carried out in the Tōkai region of the Jōmon (*Nie 2009*).

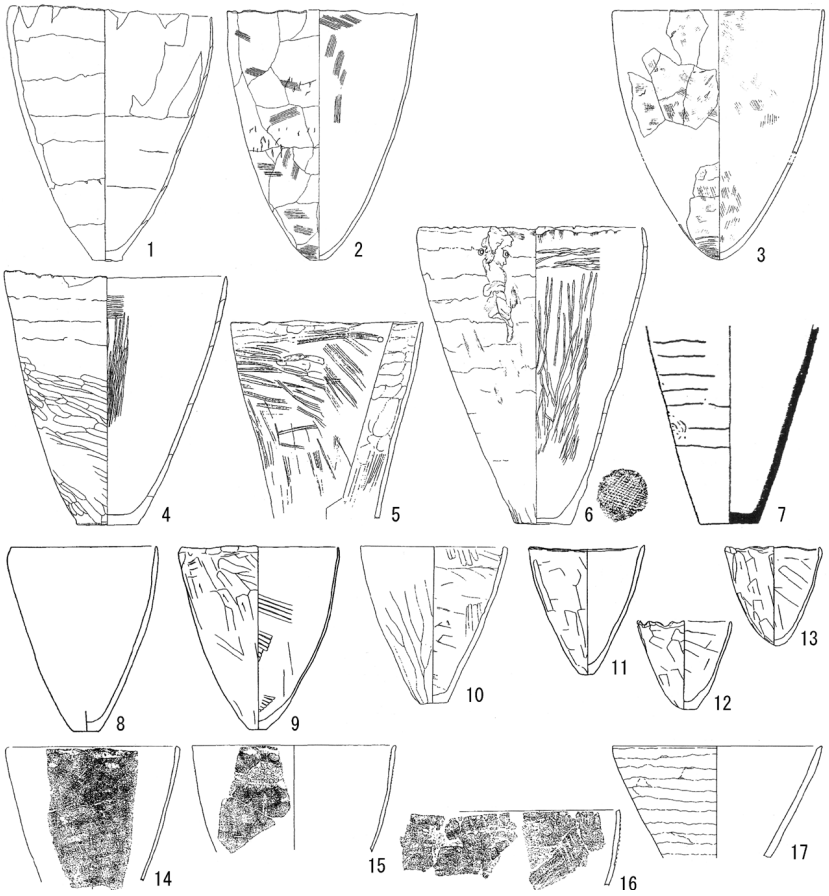

Fig. 2. Salt-making pottery: 1.Takihata (Aomori Pref.), 2–3. Ōashi I (Iwate Pref.), 4, 6–7. Satohama (Miyagi Pref.), 5. Minamizakai (Miyagi Pref.), 8. Kainohana (Chiba Pref), 9, 11–13. Kamitakatsu (Ibaraki Pref.), 10. Wakaumi (Ibaraki Pref.), 14–16. Hirohata (Ibaraki Pref.), 17. Ōnishi (Aichi Pref.) (after* Takahashi 2008.Fig. 1.2*).

ter of bases tends to be smaller, whereupon rounded and pointed bases become predominant.

As salt-making pottery is usually found in small sherds from which it is difficult to reconstruct a complete form, the study of salt-making pottery focuses on the shape and finish of rim and base sherds. Although typological studies suggest that the cut rim dates to the Final Jōmon, the rim sherds of salt-making pottery in previous studies were not stratigraphically uncovered. However, based on the re-examination of the sherds reported by Kaneko (*1979*), rim sherds at Hirohata show that type A becomes prevalent in layer 3, which is where most of the Final Jōmon sherds have been found. On the other hand, type D has features similar to normal pottery, such as a rim thicker than the body wall. In this case, the chronological transition in pottery forms is clear (Fig. 3).

That the diameter of salt-making pottery bases decreases in the Final Jōmon can be confirmed by comparing base sherds from Hirohata (Fig. 4) to those from Hōdō (Fig. 5), since the Hōdō site dates to the Final Jōmon (*Tozawa and Handa 1966*). While the Hirohata data reported by Kaneko contains remains from the Late Jōmon, in another excavation yielded a high percentage (35%) of rounded and pointed bases in a total of 81 sherds (*Takahashi, Nakamura 2000*). As this excavation area produced mostly the Final Jōmon pottery, a decrease in the diameter of the base, which probably leds to the appearance of rounded and pointed bases, occurred at production sites.

In the process of salt production, the standardisation of the finish for rims and bases accelerates in the Final Jōmon. As I have assumed that Jōmon salt production was performed part-time and was kin-based (*Kawashima 2008b; 2010a*), we should explore whether part-time salt makers in simple societies could establish their identity as salt makers.

Salt production in Highland New Guinea: salt production and identity

In Highland New Guinea, some examples of simple salt production have been reported (*Godelier 1976; Heider 1970; Honda 1967; Ishige 1976; McArthur 1972; Meggitt 1958; Parsons 2001*). In most of these examples, salt springs are the main source for salt production, while a special grass, which contains salt, is also used. As I have mentioned (*Kawashima 2010a; 2012*), at least the Moni, Enga, and Baruya tribal groups produce salt without pottery in Highland New Guinea. The scale of production is small, and the organisation is based on households or kin-based. The case of the Moni group, which is reported by Ishige (*1976*), probably is most useful for understanding how identity is formed in a prehistoric society.

Kumupa, which measures seven meters in diameter and 0.2–0.5m deep, is the most famous salt spring

in the Western Highlands of New Guinea (*Ishige 1976.361*). There is no owner of the salt spring. In the case of the Moni tribal group (*Ishige 1976.363–368*), women usually produce salt. They soak wood in the salt spring, where they then burn the wood on the following day. They collected the crystallised salt from the ash, and compress it in order to make salt cakes. Finally, salt cakes are wrapped with Zalu leaves and banana tree bark, which weighed approximately 1.5kg. Although Ishige does not mention the season for salt production, the Moni group could probably produce salt throughout the year, since Ishige stayed there from January to February, which is during the rainy season.

It is noteworthy that the salt at Kumupa is famous in the Western Highlands and distributed widely, while some other salt springs are also known in this area. In fact, while staying in a village, Ugimba, which is located on an exchange route, Ishige observed four parties going to Kumupa or returning with salt (*Ishige 1976.371–372*). Two had parties crossed the Nassau Mountains, which consists of 4000m high mountain chain. Each of the parties needed two or five days to reach Ugimba, from where it took five days to Kumupa. Therefore, the salt of Kumupa was a valuable item, while salt from other salt springs was used for local consumption.

This wide exchange network implies that the salt makers, the villages, or the salt springs were widely known in other villages. The partners to the exchange may have been related, as in Kula exchange (*Kawashima 2008a*). The fact that New Guinean salt was not often consumed in daily life, but mostly used for exchange and ritual, is supporting evidence for ritual exchange. The residents of such a salt making village could share the identity of salt makers. In the example of Baruya (*Godelier 1976*), only 2–5 salt makers existed in a village. However, the village members who did not produce salt also could identify themselves as members of a salt making village. The village must include members who are kin to the salt makers, and in fact some Baruya people are involved in harvesting salt grass as part of the salt producing process. The specific method of producing precious salt must have been inherited by a kin group or even more restricted. This would lead to the formation of social identity.

Emerging local identities in the Late Jōmon

In prehistoric Japan, salt was made from the seawater available anywhere along the coast. Nevertheless, salt was produced only in certain areas, such as the southern coast of Lake Kasumigaura, which are located near the mouth of a river in what had been a deep bay where the seawater is less saline. In this sense, the location of the salt producing sites in the Kantō region seems unsuitable for salt production. As salt was produced from the Late to Final

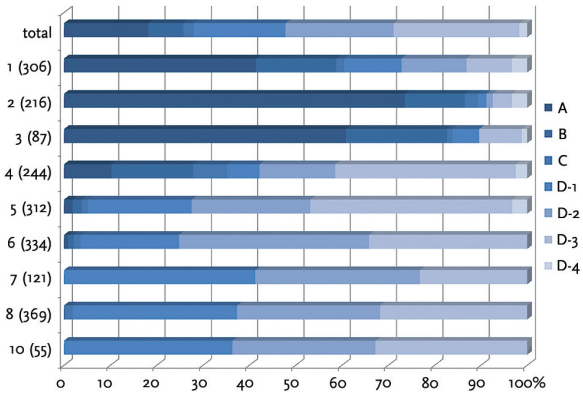

Fig. 3. Types of salt-making pottery at Hirohata (after* Kawashima 2008b.Fig. 2*).

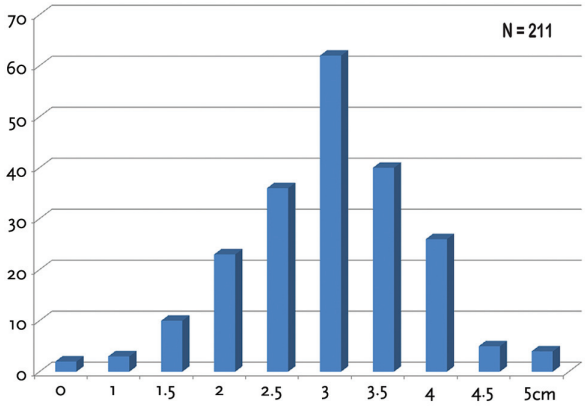

Fig. 4. Diameter of salt-making pottery base at Hirohata (0: rouded or pointed base).

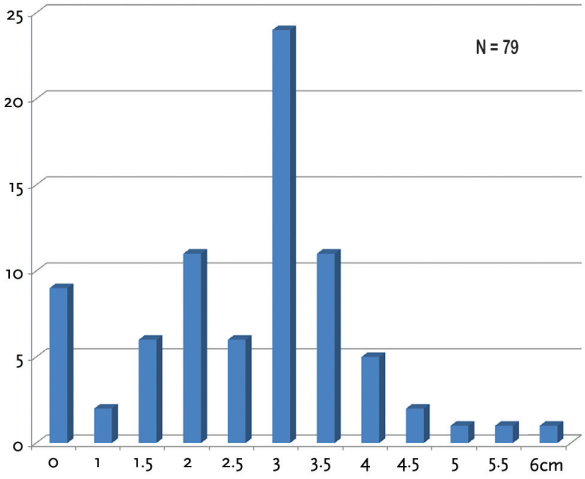

Fig. 5. Diameter of salt-making pottery base at Hōdō (0: rouded or pointed base).

Jōmon, the salt producing technique and knowledge must have been handed down there. This is probably because pottery-based salt production is derived from non-pottery production in this area in a previous period (*Kanō 2000*).

While these tribal groups in New Guinea subsist primarily on sweet potato cultivation by slash-and-burn agriculture, the organisations observed in these examples of salt production give an insight into Jōmon salt production. In the Jōmon, salt-making pottery was invented and made in an efficient way, solely for salt production. There are traces of intensive salt production, such as hearths and the accumulation of ash, as well as the standardisation of salt-making pottery. Even if though there are no other historical or ethnographical examples of pottery-based salt production by hunter-gatherers, the production of salt in the Jōmon must have been based on kinship, as in the New Guinean examples. In New Guinea, salt is produced seasonally or periodically performed by part-time specialists. As I assume that the Jōmon salt production was also a seasonal activity of part-time specialists (*Kawashima 2010a*), Jōmon salt makers could have developed an identity as salt makers or as members of a salt-making group. Therefore, craft production in the Jōmon period played an important role in the formation of local identity.

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Man, animal or both? Problems in the interpretation of early symbolic behaviour

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ABSTRACT – *The interpretation of the first symbolic behaviour is difficult, because our Western mind restricts us. It is hard, if not impossible, to understand the way ancient people perceived the world. The Palaeolithic was the period when the modern human mind had just emerged, and people understood time and the surrounding environment differently. With the appearance of the modern mind and the evolution of new perceptions of time, rituals and funerals emerged. Early therianthropes might be a reflection of this evolution of the human mind.*

IZVLEČEK – *Razlage prvega simboličnega vedenja so težavne, ker nas pri tem omejuje naš zahodni um. Težko, oziroma skoraj nemogoče je razumeti, kako so zgodnji ljudje dojemali svet. Paleolitik je obdobje, v katerem se je moderno človeško razmišljanje šele pojavilo in ljudje so takrat dojemali čas in okolje, ki jih je obdajalo, drugače kot ga mi. Z vzpostavitvijo modernega razmišljanja in razvojem novega pogleda na čas so se pojavili rituali in pokopi. Zgodnja sestavljena bitja (žival/človek) so morda odraz te evolucije človekovega uma.*

KEY WORDS – *self-awareness; identity; perception of time; therianthropes; Palaeolithic*

Depictions and figurines of therianthropes or composite beings emerged at the beginning of the Upper Palaeolithic. Interpretations of these hybrid beings vary. Some believe that they represent hunters in animal disguise (*Demouche* et al. *1996; Guthrie 2005.279; Hodgson, Helvenston 2006.6*), others that they are shamans (*Lewis-Williams, Dowson 1988.212; Clottes, Lewis-Williams 1998; Lewis-Williams 2002.205, 206*) or some type of spiritual being (*Clottes, Lewis-Williams 1998; Morris 2000.22*).

In contemporary western society, people and animals are two different and totally separate entities. But was it always so? Was the boundary between humans and animals less well-defined, as it still is today in some of indigenous societies? And do composite beings in the early 'art' reflect this lack of distinction?

Humans and animals have close relationships. Animals are frequently the object of dreams in children and adults, regardless of culture (*Mundkur 1994. 160–162*). Even in modern societies, estranged from nature and wild animals, contact with animal life is maintained through pets, which are abundant in the homes of Europeans and Americans. The degree of contact with pets in modern society is so great that in the United States more than 75% of pet owners consider their pets akin to children (*American Animal Hospital Association 1996; Serpell 2005*).

But for contemporary Western people, people are people and animals are animals. The idea that a human being can metamorphose into various animals is simply inconceivable within canonical Western thought (*Willerslev 2007.79, 80*). Two species are completely separated. But for some indigenous people, this is not the case. For the U'wa people, no rigid distinction is made between people and animals, because they are all products of the same creative process, contain the same properties and consume similar food. The U'wa shaman sees himself as a ja-

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guar, bear or bird in the lower or upper world, and animals in turn see themselves as people in they own area – in the lower world, the bear becomes human (*Osborn 1994.150, 151*). According to the Inuit, at the beginning of time, animals and human beings lived together in total promiscuity. It was easy to change from one kind to another. The polar bear was the closest to man of all the animals: when it metamorphosed, it was recognizable by the size of its canines and its pronounced liking for fat (*D'Anglure 1994.178–180, 184*). Animals are also thought to act like people in their spirit animal world. The Hopi believe that animals can even doff their fur or feathers (*Bahti 1994.135*). For Siberian Yukaghirs, animals are also a type of people who live analogous lives to those of humans. They live in households with fireplaces whose smoke 'humanises' them. But even in the transformed state, animals retain some characteristics – for example, 'reindeer' people grunt instead of speak (*Willerslev 2007. 1274*). So therianthropes might also be animals or animal spirits who are partially transformed into human beings, not only vice versa.

In the early phases of human evolution, the perception of the self might have been different than today, when we are convinced of our uniqueness and superiority to animals. People were much more connected with the world around them and at certain opportunities, when altered states of consciousness were attained in different ways, people and animals could merge into beings which were neither one nor the other.

Humans evolved from animals, and the first depictions of therianthropes might be representations of the mixed identity. They could be a reflection of human individualism emerging from collective consciousness. The emergence of a new perspective of the universe could be depicted in Les Trois Frères, the cave in France where therianthropes (Fig. 1), small human faces (Fig. 2a) and figures (Fig. 2b) appear surrounded by animals.

Human faces and figures appear as if they do not know what to do with their new place in the world. Most of the surrounding animals are perfectly elaborated, while the human faces are clumsy and schematic – it seems that they lack identity. Bégouën and Breuil (*1958.87*) interpret the faces as animal souls, Eskimo Inuas or elementary spirits, but they seem more like something new that is starting to appear from the surrounding chaos.

When the new consciousness was formed, the collective one moved to the realm of the spiritual, where animals and people became spiritual beings which could on this level metamorphose into each other and easily communicate. People's sense of power over animals started to develop and they began to raise themselves above them. This is reflected in the image of the 'Sorcerer' from Les Trois Frères, in his elevated position above the animals (Fig. 3). It seems as if the images in this cave were executed when people were still searching for their identity and had just started to establish their position in the world. The images might be a record of the evolution of human identity from the first timid attempts to a fully developed symbolic mind.

Despite their new identity, it is very likely that early people perceived themselves as descendants of certain animals. Even today, in some cultures it is believed that people have mythological animal ancestors. In many cultures, moral lessons are taught via myths about animals, as in Aesop's fables, Sanskrit literature or in many other folklore tales in which animals represent human types: the lion is king, monkeys

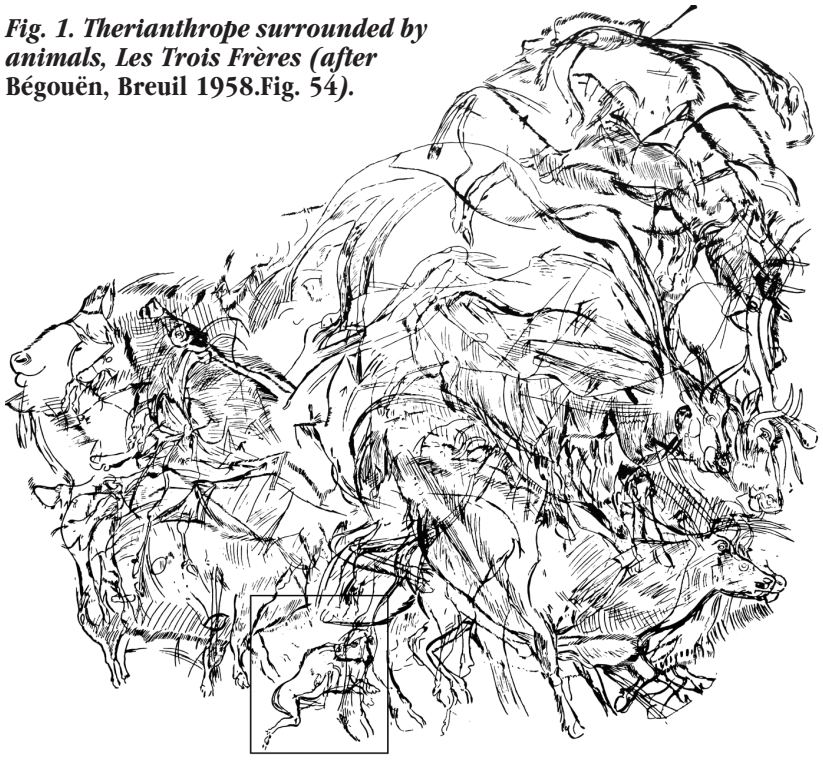

Fig. 1. Therianthrope surrounded by animals, Les Trois Frères (after* Bégouën, Breuil 1958.Fig. 54*).

are clever, donkeys are fools, *etc.* (*Daston, Mitman 2005; Doniger 2005*). Yukaghir hunters also see certain animals as very similar to themselves in terms of their moral values and rules of conduct (*Willerslev 2007. 1136*). It is possible that in the past people attributed human qualities to animals and conversely attributed qualities perceived in animals to people.

For the modern rational mind, it is hard to imagine that some so-called 'primitive people' believe that they have animal ancestors, but we are perfectly prepared to accept Darwin's evolutional theory, which in our western scientific way also connects us with animals at a very basic level. For the modern scientist, it is the normal understanding that people and apes have common ancestors, but to perceive the bear as a parent, as some Inuit tribes do, is incomprehensible.

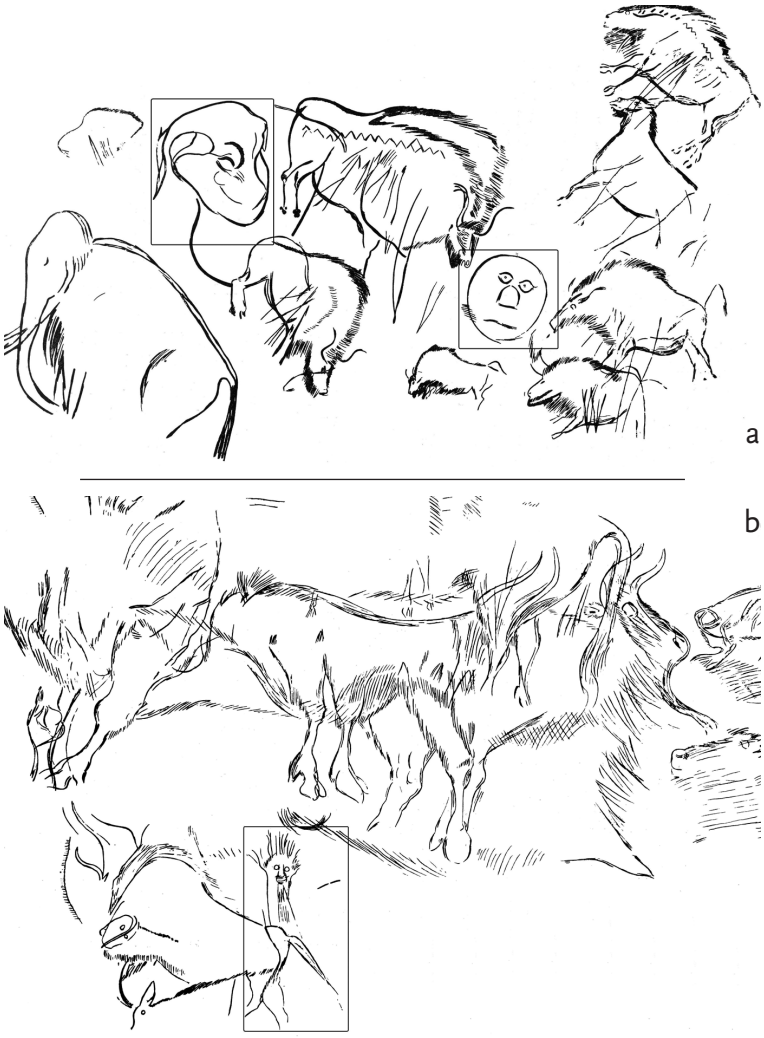

Fig. 2a. Small human faces among animals, Les Trois Frères (after* Bégouën, Breuil 1958.Fig. 39*); 2b. strange human figure surrounded by animals, Les Trois Frères (after* Bégouën, Breuil 1958.Fig. 75–77*).

People have conflicting relationships with animals: while they enjoy a certain respect, familiarity and sometimes even veneration, they also constitute a valuable source of food. In modern society, we have largely lost the deep empathy which is so important to hunters and gatherers, whose survival depends on understanding animals and their behaviour. We can not understand the magical relation between hunter and prey in early societies, because the world is perceived dualistically – humans stand opposed to nature and environment. This dualism is most powerfully expressed in Cartesian thought. Descartes perceived human beings as comprised of two opposites: the body, which is a mortal machine and indivisible, immortal spirit. Animals lack spirit; they are merely machines, and therefore are inferior and not comparable to human beings. This is similar to the view of Judaism, Christianity and Islam, in which humans are masters of animals. Animals are inferior beings; some tolerance is acceptable just for those species which are edible or assist people in various tasks. In contrast, the border between humans and animals in Buddhism and Hinduism is much less well defined; humans can be reincarnated as animals, while animals often have human attributes.

Before the domestication of animals, the primary connection between animals and people was through the hunter-prey relationship. Even today, the ability of expert indigenous hunters to predict animal behaviour is sometimes astonishing; it is as if the hunter became the hunted animal and the two merged into some liminal being. All the senses of the hunter are alert and often interact to acquire more perfect information about the prey (*Willerslev 2007.1218–1221*). Relic of this ability to mix senses – to see music, for example – is still present in some people today and is called synaesthesia.

In addition to sharp senses, hunters often use some sort of disguise to improve their odds. Probably, some of the earliest disguises included mimicking animal calls, disguising scent and wearing animal hides and antlers. These strategies probably played a vital role in attempts to fool prey in order to ap-

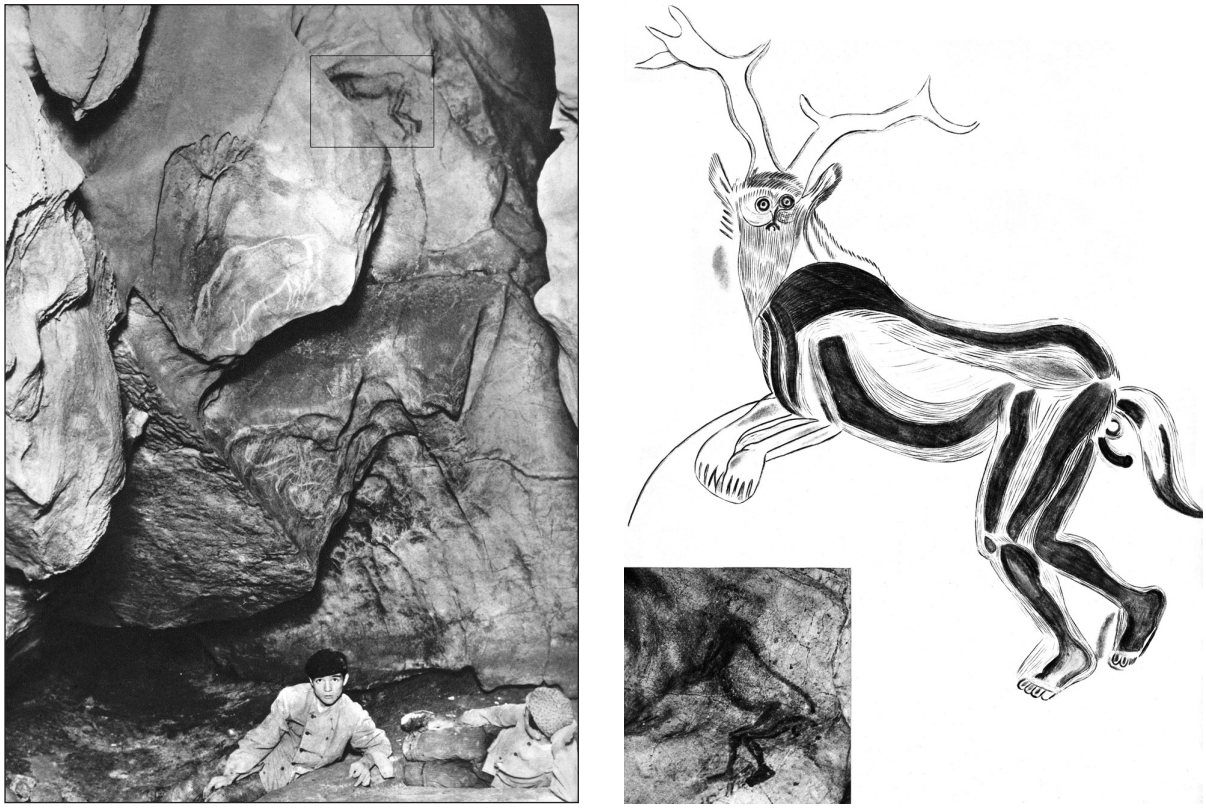

Fig. 3. The Sorcerer, Les Trois Frères (after* Breuil 1952.Fig. 116, Fig. 130*).

proach closer for a kill. Numerous examples of hunting disguises were used by Native Americans, *i.e.*, wearing buffalo skins and scenting with dung (*Hodgson, Helvenston 2006.6*). The idea of a hunting disguise similar to the one used by the North American Lakota people was suggested for the one of the therianthropic figures at Les Trois Frères (*Demouche* et al. *1996*). The 'Petit Sorcier a l'Arc Musical' is described by Bégouën and Breuil as a male person with a bison head and human legs playing a flute or musical bow (*Bégouën, Breuil 1958.58*). The name itself suggests that the figure had some special status and commanded the animals surrounding it. On the other hand, Frédéric Demouche *et al.* (*1996*) interpret the figure from a utilitarian perspective and compare it with disguised American Lakota hunters approaching their prey. They suggest that the figure should be rotated through 90° to obtain the stalking pose. The feature in its mouth is a weapon, not an instrument (Fig. 4).

Some authors, such as Niko Kuret (*1984.10, 11*), adopted Breuil's idea (*Bégouën, Breuil 1958.54*) that the hunting disguise was a sort of first mask and that masking evolved from such disguises. In Kuret's opinion, the therianthropes in Les Trois Frères are masked human beings. Morris (*2000.22*) broadens this concept and perceives the sorcerer in this cave (Fig. 3) on a higher level – as a masked, dancing medium, who embodies spiritual beings in the form of the animal. On the other hand, Henry Pernet (*2006.28, 42*), disagrees with the idea of composite figures as ritually masked humans and believes it is doubtful that masks were used in rituals in the Palaeolithic.

Rane Willerslev describes a hunting event in which an old Yukaghir hunter partially disguised as an elk successfully killed a female elk with her calf. The disguised man was perceived as being simultaneously like the man and the elk. He had a liminal quality and occupied a strange place between human and non-human identities. The disguise and the act of hiding the human scent leads to some type of 'dehumanistion' (*Willerslev 2007.79, 80, 126*). Man must transform into an animal not only physically, but also psychologically. But this deception must not overwhelm them; they must be aware of their identity and that they differ from the animal they represent; otherwise, they would not be able to exercise power over the animal. In disguised Yukaghir hunters, the imitation is not perfect, and the differences between elk and man disguised as elk are obvious. It is in this difference and partial disguise that a man can have power over an animal. Without the difference, the imitator and the imitated would col-

lapse one into the other, they would become one, making any exercise of power impossible (*Willerslev 2007. 79, 214, 215*).

Fig. 4. 'Petit Sorcier a l'Arc Musical', Les Trois Frères. The figure is rotated to resemble more closely a man in disguise stalking prey (after* Bégouën, Breuil 1958.Fig. 63*).

Hunters disguised in the parts of a dead animal and acting like that animal were seen by other people as being like the animal come back to life. They acquired power over death and also over the animals deceived by their disguise. When men or women put on animal hides or antlers and started to tell stories about the characteristics of the animals and the best ways of hunting them, they revived them. Because of this magical ability, they might have experienced a feeling of power and started to see themselves as superior beings. With the mimetic performance and the aide of speech, people were able to conquer death for a few moments. In the dramatic environment created by a skilled story teller, children were probably the most affected, so this was the best way to teach them about animals and hunting techniques. With impressive presentations of animals and their behaviour, especially gifted persons gained the power to influence the minds and emotions of listeners. The spectators might have seen them as half-human, half-animal, whereby they transcended the reality of the ordinary human. To be genuine, the actor probably entered a sort of trance or altered states of consciousness and 'became' the animal he or she represented. In this way, they also acquired power over animals – as in African healing dances, where the individuals involved actually 'become' a lion, perhaps as a compensatory strategy to gain some 'control' over their most feared predator by means of ritual dancing and singing that deliberately induces a trance (*Hodgson, Helvenston 2006.8*).

Because of their ability to seemingly merge with the animal into a new being, performers gained special status and became privileged. From this sensation of union with other beings, religious feelings might emerge. Such people were thought to have power over animals and their spirits, which was the beginning of beliefs similar to shamanism. The Inuit tell an interesting story about the origins of shamanism. An Inuit wishing to help people during a severe famine sought a way to intervene with the spirits that ordered the world and animals. He invented shamanism and discovered techniques for exploring space and time (*D'Anglure 1994.182*). In this Inuit myth, it was for a very practical reason, famine, that shamanism appeared. All the beliefs that include altered states of consciousness might reflect a connection with a primordial universe from which humans emerged with a new identity – and lost the paradise as it is described in the Bible.

Early 'art' used to be interpreted as depiction of sympathetic magic. This idea is no longer popular, although hunting rituals and drawings of hunted animals might help hunters to prepare efficiently for a hunt. Rituals might have been a type of hunt rehearsal in which the participants symbolically killed the depiction of the animal and tried to influence the real animal; at the same time, they also learned the best hunting techniques from each other, corrected eventual errors and planned hunting strategy (Fig. 5).

Human self-awareness and perception of identity was probably different in the distant past than it is today. The capacity to become the object of one's own attention and focusing on internal milieu rather than the external environment, as Morin (*2006. 2*) defines self-awareness, might have increased during human evolution. The perception of time was also different (*Suddendorf, Corballis 1997*). Mental time travel is probably a uniquely human ability which evolved rather recently (*Suddendorf, Busby 2003*). Even today in some indigenous cultures, time is not viewed in the same way as in Western society. The most extreme case (if the reports are true) is the Pirahã tribe of the Amazon rainforest, whose language has no past tense, because everything exists in the present for them – when things can no longer be perceived, they cease to exist. Because of their culture's ingrained emphasis on referring only to immediate experience, the Pirahã have no words for

abstract concepts, from colour to memory and even numbers (*Davies 2006*).

Fig. 5. Australian tribe performing a ritual which includes an imaginary attack on an animal (after* Buschan 1922.Vol. 1, Fig. 200*).

Human perception of time, which is divided into past, present and future, was one of the conditions that enabled the formation of external memory storage in the form of rock art. For beings that have no knowledge of mental time travel and no concept of past and future, creating something that endures is beyond their understanding. For the creation of rock painting, there must be past experience and a self-conscious desire to repeat this experience if it is pleasant or avoid it if it is terrifying – in this case, the painting might also have been a warning to others. If there is just the experience of the present time, there is very little need for symbolic thought. Symbols represent something else; the most powerful are those connected with past experiences that provoked strong feelings.

The perception of the future and evolution of understanding of the connection between cause and effect were the basis for the emergence of rituals. Yukaghir people believe that the devil has no sense of past or future and lives only in the present; therefore, he is careless and incapable of taking responsibility for his actions (*Willerslev 2007.1370–1374*). In devil's existence, there is no need for ritual behaviour, but for humans, with a different perception of time, rituals are almost a necessity. Properly executed rituals in the present assure an abundance of prey and healthy descendants in the future. They ameliorate the future and drive away dangers. With a dance (Fig. 6) or by telling stories, people were able to share past events with others. They could mediate their experiences and feelings with the whole community and teach future generations.

The human ability to mentally perceive the passage of time was also foundation of funeral rites and the concept of ancestors – beings who lived in the past and who should be praised in the present, to be satisfied and cause no trouble in the future (Fig. 7).

For beings living in the present, such concepts are unthinkable. The complexity of burials increases in the late Palaeolithic, which might be a reflection of a greater awareness of the past and the future. Burials became richer for other reasons, but without the concept of the past, they would not exist at all. If an extinct human species experienced only the present, they had no need to bury their deceased, except perhaps for hygienic reasons. Paul Pettitt (*2010*) describes the evolution of funerary practices, which seem to evolve from very simple to more complex. It is possible that the mental concept of the passage of time was not omnipresent in the Palaeolithic and the memory of the dead was very short in earlier stages of human evolution. The first burials might also be a reflection of increasing human individuality. They emerged when people started to believe that their identity would be preserved after death. Before human beings established themselves as individual entities who have special role in nature and who are in some way able to be transformed and live on after death, they saw no need to preserve bodies.

Fig. 6. Mountain spirit dancers, Mescalero Apache. They dance to drive away evil spirits. (Photography: San Carlos Agency, New Mexico 1899).

Pleistocene 'art' might also have evolved from the practical development of the abilities needed for survival. Research in neurology indicates that mental reviewing of events activates the same parts of the human brain as the real situation. This is important, because we can mentally review dangerous events which happened to us and exercise our reactions without being injured in real situations (*Franklin, Zyphur 2005. 64, 65*). It is possible that the evolution of 'art' was a result of similar processes of mental imagery of the animals, which were transmitted to a material medium such as a cave wall.

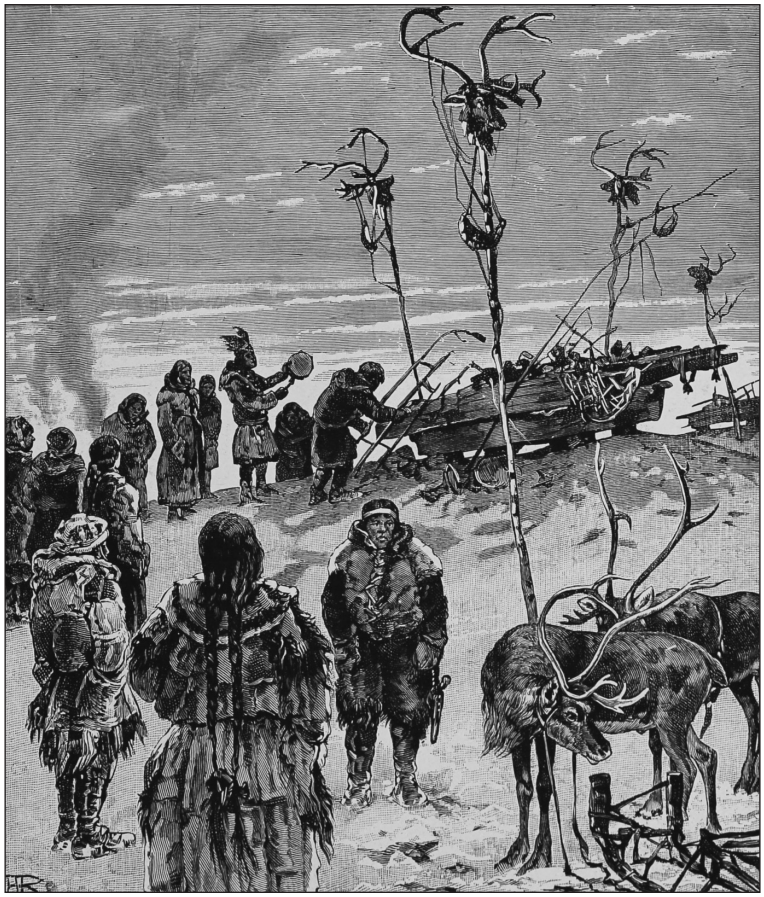

Fig. 7. Funeral rites in Siberia (after* Buschan 1922.Vol. 2, Fig. 316*).

During the Pleistocene, human evolution was a gradual process, in which human identity, consciousness and individuality developed. The process of separation from other beings and environment started. Today, we are estranged from natural environment and from beings that are part of it. That is why it is so difficult for our modern mind to perceive the reasoning behind the first symbolic behaviour and to explain its meaning. As for the first art itself, it is best described by Tim Ingold's statement (*2002.131*): "*Hunters and gatherers of the past were painting and carving, but they were not 'producing art'. The existence of 'capacity for art' is a figment of the Western imagination*".

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Did shamans always play the drum? Tracking down prehistoric shamanism in Central Asia

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ABSTRACT – *This paper considers the question of antiquity of shamanism in Central Asia and outlines several lines of enquiry into the issue. It analyses both linguistic and archaeological data with particular emphasis on ancient rock art. In the sphere of rock art studies it focuses on methodological questions connected with identifying shamanism in visual arts. It concludes that most convincing traits of shamanic symbolism, which characterizes Central Asian tradition, can be deciphered in the art dated to four thousand years.*

IZVLEČEK – *V članku se ukvarjamo s starostjo šamanstva v Centralni Aziji. Analiziramo lingvistične in arheološke podatke. Posebno pozornost namenjamo skalni umetnosti in metodološkim vprašanjem, povezanim z identifikacijo šamanstva v vizualnih umetnostih. Ugotavljamo, da je centralno azijska šamanska simbolika stara štiri tisoč let.*

KEY WORDS – *Central Asia; shamanism; prehistory of shamanism; rock art*

Introduction

Historical records from different times and parts of Asia clearly show that shamanism is an archaic belief system of Asian peoples. Although shamanic beliefs and practices have been documented in different parts of Asia, many studies still consider Siberia to be the land of their most classic forms[1]. Regardless of the discussion about whether the term 'most classic' is appropriate to characterise Siberian shamanism (*e.g.*, *Rozwadowski 2008a*), there is no question that shamanism in Siberia is an ancient tradition. To pinpoint its 'birth' or identify the people in whose culture it originated is, surely, a highly problematic question, and one can even doubt that it is resolvable at all. However, if we consider Siberian/Central Asian shamanism as a cultural tradition, I believe that the answer to the question of its antiquity should not be reduced to 'very ancient', but should actually be investigated. In this paper, I attempt to show that such an investigation is possible and I outline several lines of enquiry into the issue of the existence of shamanism in the past. To do so, I refer to the border area of southern Siberia and Central Asia, where I carried out research on this issue for several years. However, the region to which I refer should not be considered diagnostic for the question, as its choice resulted from various coincidences. Other areas surely may appear to be equally significant for the problem, but until we have access to data from adjacent regions this case study may serve as an introduction to the issue.

Central Asia and Siberia – different histories, different dynamics

The development of research on shamanism in Siberia and Central Asia is uneven. In Siberia, as is commonly known, it is a very well recognised phenomenon which has been extensively studied since the

1 This essay is confined to Central Asia and Siberia, and considers shamanism as a traditional local belief system. For a phenomenological perspective on shamanism, see for example *Eliade 1964; Ripinsky-Naxon 1993*.

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turn of the 19th century. Rich descriptions and thorough analyses of Siberian shamanism were possible because shamanism was still practised when pioneer ethnographers entered this mysterious and forgotten land. Historically, shamanism in Siberia enjoyed a rather vigorous tradition, which was also little influenced by other cultures and religions (like by Buddhism, Lamaism, in southern parts of the region). Until the Russian conquest in the 17th century the majority of Siberia more or less remained 'untouched'. Central Asia evidently has a more complex history. The inclusion of the southern parts of the region into the Persian Empire already in the middle of the first millennium BC introduced Zarathustrian ideas. At the turn of the Christian era, Buddhism and Christianity appeared here. By the 1st centuries of this era, Manichaeism had developed and, since the 7th century, Islam has spread into Central Asia, dominating the history of these lands ever since. Although this does not concern the whole area of Central Asia (the steppe remained an area of local traditions), it is clear that if shamanism existed here in ancient times it must have undergone more significant transformations than in Siberia. In fact, it has long been recognised that shamanism function here in the guise of Islam (especially Sufism) and other eastern religions. However, its antiquity remains unknown. Was it just with the influx of Turkish tribes from the north that shamanic ideas also came to Central Asia and were incorporated into the local religions? In this essay, I introduce new archaeological data, particularly on rock art, which in combination with linguistic sources suggest a significant antiquity of shamanism, or aspects of shamanic culture, in Central Asia, which predate the appearance of the Turks in the region.

Shaman, *kam* and *baksy*: antiquity through language

There is no single word for shaman across Siberia and Central Asia. Almost every culture has its own name for this spiritual practitioner, and even in a single language group the names for shaman differ regionally. This is also the case among the Turkic peoples (*Alekseyev 1984*), who constitute a crucial ethnic stratum of Central Asia. The most eastern branch of the Siberian Turks, the Yakuts or Sakha, call shamans *oyun*.[2] In southern Siberia, mainly in the Altai and Sayan region, therefore in the close proximity to Central Asia, the most common term is *kam* (*kham/qam*), from which the term for the shamanic ritual known as *kamlanie* is derived.[3] In written form, the word *kam* first appeared in the Uygur *Kudatku Bilik* written in 1069 (*Chadwick, Zhirmunsky 1969.235*). Then, it is also noted in the *Codex cumanicus* of 1303 and in the writings of the Persian historian Rashid ad-Din Fadlallah Hamadani in 1302, with reference to the shamans of the Mongols (*Laufer 1917.369*). In fact, Potapov writes (*1978.7*) that the term *kam* as the term for shaman among the Yenisey Kirghiz is recorded earlier in Chinese chronicles from the Tang dynasty (618–906). Towards the close of the first millennium BC, the Chinese chronicles mention also *wu*, often interpreted as shamans (*Boileau 2002*), amongst a group of the Huns, a people closely related to the Turkish tradition (*Potapov 1978.9*). However, in Central Asia (Kazakhstan, Kyrgyzstan, Uzbekistan, Turkmenistan, Tajikistan), a shaman is known as *baksy* or *bakshy/bakhsy* (amongst the Kazakhs, Kirghiz, Uygurs, Uzbeks, but also among Tajiks in Afghanistan – *Centlivres* et al. *1971*)[4]. Various etymologies of *baksy* have been proposed. These are usually derived from the old Turkish *bak* (*bakmak*) 'to look carefully', 'to watch', or from the Chinese word *boshi* (*bag-ši*) meaning 'teacher', which could have come into the Turkish languages via Mongolian. It is worth mentioning, however, that an Indian genesis cannot be excluded, from the Sanskrit term *bhikshu* for a Buddhist monk (*Żerańska-Kominek, Lebeuf 1997.39*).

From a functional perspective, *baksy* and *kam* are analogous personages. The main function of a *baksy* is healing based upon negotiations in the spirit world, although he/she may have other abilities, such as changing the weather, prophecy and finding lost objects. Since illness is caused by a bad spirit which seizes the soul of the sick person, the core of the *baksy*'s ritual activity concerns negotiations with the spirits. Sometimes it is not merely

2 This Yakut term also appears amongst the Kirghiz, the Uygurs and in Khoresm in Central Asia, but not as a word denoting a shaman but the shamanic healing ritual (*Baylieva 1972.147*).

3 The Turkish *kam* is possibly a phonetic variant of the Tungus sam (the root of the word *shaman*). Furthermore, the Yakut epithet for shaman *khamna*(*xamna*), *khamsa*(*xamsa*) meaning 'to move' (quickly in ecstasy) is also believed to stem from the same root (*Laufer 1917.366–370*).

4 In Uzbekistan and Tajikistan (also among Turkmens and the Karakalpaks) shamans or specialists in spirit mediation are also called *porhans*, from the Iranian *pori khon* 'to cast spells on spirits' (*Snesarev 1969.44*) of *folbin* 'fortune teller'. *Baksy* is also a common term for an epic or folk singer who does not practice shamanic rituals.

negotiation, but a struggle. *Baksys* use helping spirits to perform these ceremonies. Just as in *kam*'s ceremonies, the *baksy*'s healing power reaches its climax in a trance state. The following Kazakh *baksy* healing ceremony was recorded in the 19th century (*Levshin 1832.62–63*):

"*The* baksy *takes the* kobyz *and begins to sing to its accompaniment. When his voice becomes louder, the movements of his body became all the more violent. He tries harder and harder; the sweat flows down his face and foam appears on his lips. He throws down his* kobyz*, and suddenly stands up, jumps up, shaking his head and start shouting in an affected voice, calling on the spirits, waving his hands (in this way, he calls some of the spirits to himself, and chases others away). In the end, having lost his strength, pale faced, with bloodshot eyes, he falls upon the rug, giving off wild cries, falling silent, as though dead.*"

This account corresponds closely to the *kamlanie* of Siberian shamans. As in the Siberian tradition, a *baksy* is called by spirits to fulfil the shaman's role and the shamanic gift is usually transferred within families. From an ideological point of view, *baksys* also share the pan-shamanic belief in the threefold vertical structure of the world. In Kazakh shamanism, a threefold horizontal perception of the world is also discernible: this is a characteristic feature of northern shamanic ideologies, in which the river is the most typical element of 'passing over' (*Kośko 2002.20*).

The similarities I have pointed out may actually suggest that shamanism was brought to Central Asia by Turkish peoples spreading out from their Altaic cradle in the middle of the first millennium AD. However, taking into account that the expansion of Turks into Central Asia coincided with the expansion of Islam, and the fact that analyses of the culture of Central Asian peoples suggest that shamanism in Central Asia can be viewed as a pre-Islamic cultural feature (*Basilov 1976.149–157; 1992; Baylieva 1972; Jettmar 1986.289–295; Snesarev 1973.37–46; Snesarev, Basilov 1975; Sukhareva 1960.41–58*), these all point to a possible conclusion about its ancient existence. Perhaps we may assume earlier than the arrival of historical Turks.

As is commonly known, the word *shaman* (*saman*) comes from the Tungus language.[5] However, its position in this Siberian tongue is not very clear. As long ago as the 18th century (*Shirokogoroff 1935.270*), the suggestion of its Indian inspiration appeared, based on the Sanskrit word *śramana*. This parallel was found attractive, and it was argued that this term had passed to eastern Asia from India through Central Asia and China (the Chinese *sha men* is a transcription of the Pali *samana*) with the spread of Buddhism (*Shirokogoroff 1935.276–287*). Although this theory was criticised already in the mid-19th century (*Laufer 1917*), recent studies have tried to verify this 'Indian path' and extend the date of possible borrowing back almost to the previous two millennia. An analysis undertaken by Sidorov (*1997*) allows him to suppose that it occurred at the time of the eastward movement of the early Indo-Europeans, whose main migratory waves reached India and Iran in the mid second millennium BC. Thus the sphere of Indian influence should be understood as having been far wider than previously believed – in Indo-European, or at least Indo-Iranian, terms. In fact, studies of the Indo-Iranian tradition demonstrate that it possessed practices for altering consciousness, although there is no agreement as to whether the term shamanism is appropriate to Indo-Iranian culture (and I will refer to this issue later in the text).

The antiquity of the shaman's function should not thus provoke reservations. Historical sources related to Central Asia allow us to claim that the history of shamanism in this region stretches back two thousand years, and the 'Indian path' adds another two millennia to its antiquity. However, even if the term 'shaman' appeared in Siberia 4000 years ago, it does not necessarily mean that the introduction of this term was accompanied by a prepackaged ideological and ritual context. In the following part of this essay, I try to show that archaeological sources, particularly rock art, permit us to suggest that aspects of shamanic culture could have already existed in Central Asia 4000 years ago.

Prehistory, ethnography and visions: antiquity through rock art

Identification of the shamanistic context of rock art requires not only a thorough acquaintance with the material, but also a theoretical perspective (*Hoppál 1992; Rozwadowski 2009; in press*). This is especially important with regard to prehistoric art, for which we have no direct indications to identify

5 The word was recorded in the seventeenth century by Russian Cossacks; in the Tungus language, it was pronounced 'saman' (*Potapov 1978.7*).

which images were connected with shamanistic practices or beliefs. For many years, the primary approach to reconstructing ancient beliefs was to think through ethnographic analogies. This reasoning has been a subject to strong criticism, particularly since the middle of the 20th century, when structuralism questioned the usefulness of ethnographic parallels for elucidating ancient meanings. But it should be remembered that such criticism was a natural reaction to the decontextualised applications of such parallels to very ancient cultures, between which the distances of time and space were particularly large, as in the case of the Palaeolithic cave art which was viewed through the prism of Aboriginal Australians. New studies of the last three decades show, however, that ethnographic contexts can be of profound significance for elucidating the meaning and function of rock art (which often appears not to be of such great antiquity as parietal paintings in Western Europe). Studies in Africa (*e.g.*, *Lewis-Williams 2002*), America (*e.g.*, *Whitley 2000*) or Australia (*Layton 1992*) demonstrate that a fresh look at local ethnographies can open new interpretative insights into local rock art. A similar situation can be postulated in Central Asia, where rock art imagery belongs to both prehistoric and historical periods, including the quite recent past. It is significant to note that shamanic themes can easily be found, particularly in this recent rock art (of the last few centuries) in Southern Siberia (*Kubarev 2002*). This proves that the tradition of making images on rocks, at least to some extent and in given contexts, was somehow related to shamanism. The question, then, is if such a relation can also be identified in much older art?

The oldest expressions of the rock art in Central Asia (the rock paintings discovered in southern Uzbekistan and Tajikistan) may date to the Mesolithic, although their precise age is not clear (*Rozwadowski, Huzanazrov 1999*). We find no explicit shamanistic indications in these paintings. Possible shamanistic motifs appear only in the rock art of the Bronze Age (2nd millennia BC). At this time, human figures appear more often in rock art imagery, suggesting that a group of people or individuals were perceived as holding special positions in local social contexts. Some of these images, discovered in the Altai Mountains of southern Siberia, and south-east Kazakhstan, Uzbekistan, and Kyrgyzstan, are distinguished by attributes for which a shamanistic context seems to be likely. The painted and engraved images of the 'ox-headed', 'bird-headed' or wolf-headed (Fig. 1) zoo-anthropomorphic figures discovered in stone burial chambers on the bank of the Karakol River in the Russian Altai (*Kubarev 1988; 2002*) and other parts of southern Siberia (*Esin 2009*) are the most spectacular. Archaeologically dated to the early 2nd millennium BC, they may be the oldest well-dated images of shamans in this part of Asia. These humans are associated with birds (a common metaphor for shamanic flight) or are simply transformed into birds of prey. Their bodies are covered by something that resembles well-known historical shamanic ritual costume (Fig. 2). Equally intriguing are the petroglyphs in the Chu-Ili and Karatau Mountains in Kazakhstan. Here we find human figures dressed in costumes, some of which seem to imitate the hide of a horse-like animal.[6] Their heads are decorated (in some cases there can be masks) and they hold staffs, which could be hardly explained in purely utilitarian terms (Fig. 3). The staffs are often crosier-shaped. All of these attributes – headdress, dress, and staff – are characteristic attributes of historical shamans. If we refer to ethnography, however, it can easily be noted that this set of attributes is lacking the most characteristic object of Siberian shamanism – the drum.

Fig. 1. Wolf-headed anthropomorphic figure; note also bird aspects in the form of feathers covering the head. Painted in red on the grave stone slab, Karakol, Altai in southern Siberia; height approximately 40cm (photo A. Rozwadowski).

6 Shamans in modern Kazakhstan and adjacent areas do not wear special ritual costumes. Some people, however, still remember old-time *baksys* who wore special headgear, such as feathers, wolf heads, fox skins, or metal helmets (*Arik 1999.14*).

In fact, the drum is commonly seen as most essential object of Siberian shamanic culture. However, it is surprising to realise that rock images of drums in Siberia are relatively rare and mostly associated with recent historic periods. When we consider strictly prehistoric art, the situation becomes complicated. To some extent, of course, it results from the problem of dating rock images. However, more then one century of rock art research in this part of Asia (*Rozwadowski, Lymer 2012*) gives us tools to differentiate at least between recent images and those connected with Iron Age nomads (which are characterised by unique formal features known as 'animal style') and the earlier imagery of the Bronze Age or Neolithic (*Rozwadowski 2004*). On the basis of this research we can conclude that there is evident lack of images of drums in the Bronze Age and possibly also in the Iron Age rock art (see also *Rozwadowski 2012b*). However, even if the drum is a recent object in the tradition of Siberian shamanism, it is still important for our discussion, particularly from the perspective of its symbolism, which could be more archaic, being inherited from a 'pre-drumming' tradition.

Fig. 2. Human figure with animalistic features. Note bird-like claws instead of feet, protrusions from the body which strongly resemble historical shamans' coats, and the bird flying under the left arm of the human. Engraving on a grave slab at Karakol, Altai; height approximately 50cm (after* Kubarev 1988.Fig. 33*).

First of all, the drum in Siberian shamanism is perceived as an animated object, precisely as an animal. The shaman's act of drumming is thus equated to riding the drum-animal. During the ritual, the drum is transformed into a horse, deer, or camel (in Altaic steppe cultures). Analogous symbolism refers to the shamanic staff. It is also symbolically perceived as an animal, being a beast on which the shaman journeys to the other world. The same can be said of shamanic costume – it imitates an animal, because the shaman is entering the world of animals. This shared symbolic code, common to different material attributes, suggests it can be considered as a core symbolic code of more ancient shamanic culture. The question of the antiquity of shamanism should then be discussed more in terms of identifying the symbolic code of shamanism, than merely seeking ancient images of contemporary shamanism (*Rozwadowski 2009.243–281; 2012a*). Therefore, although drums are absent from prehistoric rock art, the essential idea of the human-animal/object-animal metamorphosis, as encoded in the drum, can still be recognised in prehistoric art (*Rozwadowski 2009.249–275*).

However, tracing shamanic themes in rock art through ethnographic analogy (which is understood here more in terms of identifying symbolic code than material objects alone) does not exhaust all the possibilities of identifying shamanism in prehistoric rock art. As is commonly accepted, trance is crucial to shamanic practice, a psycho-mental state in which the shaman is able to fulfil his or her ritual functions, be it curing or changing the weather. As has extensively been demonstrated (*Siegel, West 1975*), the experience of trance is very complex, but some reactions to altered states of consciousness appear to be shared cross-culturally. This does not mean that each person while in a trance will have exactly the same experiences, but that these experiences will fall within a predictable range of possibilities. From the perspective of art, the important issue in this regard involves visual and somatic hallucinations and their influence on visual depictions.[7]

Among visual hallucinations, two groups of images may be distinguished: those based on an individual's memory, derived from any number of phenomena tied to that individual's life; and images generated by the central nervous system. This second

7 The influence of visions on art has been demonstrated in a number of cultural contexts, among the Tukano Indians of Columbia or the Huichol of Mexico, for example. In rock art research, the most fruitful studies on this topic are of South African Bushmen art (*e.g.*, *Lewis-Williams 2002*) and the prehistoric art of California (*e.g.*, *Whitley 2000*).

kind of imagery is universal and can be perceived regardless of cultural context. 'Entoptic images', as these are most frequently labelled, are light patterns in geometric shapes in the forms of ovals, crosses, chains or zigzags. They appear as either individual images or may be superimposed on hallucinations evoked from personal memory (in deeper states of trance). A hallucinating person commonly attempts to interpret these geometric images, trying to make sense of them in terms of imagery in his or her memory (*e.g.*, *Lewis-Williams, Dowson 1988*).

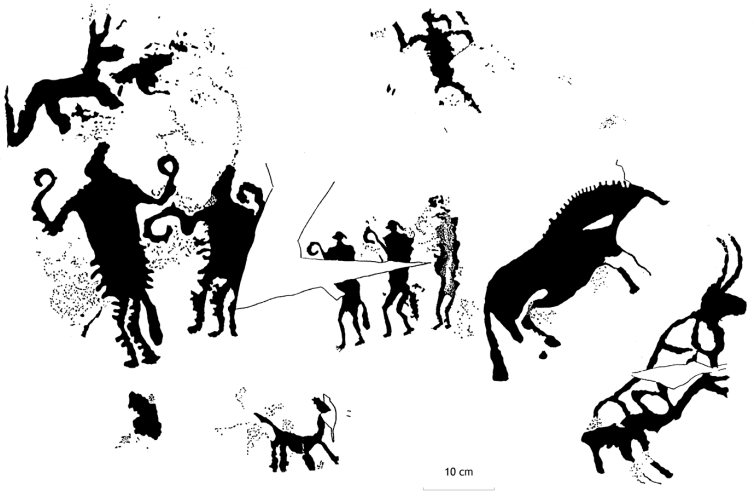

Fig. 3. Petroglyphs, Tamgaly Valley, south-east Kazakhstan (copy by author).

These universal hallucinatory phenomena are particularly important for our discussion. In Central Asia, there is a unique class of rock images in the form of anthropomorphic figures, presumably dated to the Bronze Age. These most spectacular and, at the same time, most enigmatic rock images in this region are characterized by rather schematic bodies, but their most exceptional feature is the elaborate forms of their heads, most often in the form of one or more concentric circles, either filled or surrounded by point-dots and short lines radiating outwards. These features, which at first glance resemble a schematic image of a radiating sun, informed the name 'sun-headed' or 'sun gods' which was attached to these petroglyphs found at different sites in Central Asia (*Kadyrbayev, Mariyashev 1977; Maksimova* et al. *1958; Kuzmina 1986; Martynov 1988; Martynov* et al. *1992; Davis-Kimball, Martynov 1993*). However, as I have demonstrated elsewhere (*Rozwadowski 2001; 2003; 2008b*), their interpretation as images of solar gods raises questions. First, it is difficult to accept the argument that a solar cult was the predominant aspect of Bronze Age culture in Central Asia (as has commonly been argued by proponents of this interpretation, mostly be reference to Indo-Iranian mythology). Second, circular shapes do not necessarily denote the sun (and not all of the strange heads are actually sun-like forms). Instead, the circular forms of the 'heads' and the concentrations of dots packed around and inside surprisingly correspond to universally visualised oval and radial entoptic images, which have been observed during experimental studies (Fig. 4).

Interpretation of these petroglyphs in terms of graphic expressions of trance visions raises new question. Even if one agrees on this interpretation, the problem remains: should it be accepted as evidence of shamanism? The answer is not straightforward. Trance is rightly considered crucial to shamanic practice, but should trance always point to shamanism? Should, for example, Islamic Sufi trance experiences be interpreted in terms of shamanism? These questions are pertinent to our problem. The trance-inspired rock images most probably belong to the Bronze Age, the period during which the main migrations of Indo-European peoples took place on the steppes of Eurasia; in Central Asia, these were Indo-Iranians. These peoples were characterised by a distinct class of priests, and the Vedic and Avestan texts offer rich data on their ritual life. The Vedas are dated linguistically to the turn of the 2nd and 1st millennia BC, but whether the picture of the culture described in these texts is also of such antiquity is not clear. We know that they appeared in written form only in the 6th century BC (*Mallory 1991.37*). We cannot be precisely sure how ritual life looked in the Bronze Age and earlier periods. One fact, however, is important in this context. It concerns the sacred ambrosia *soma*, a core ritual drink known both in the Vedas (*soma*) and Avesta (*haoma*), hence assumed to have a crucial role in Indo-Iranian cultures. Drinking *soma* enabled the priests to enter the world of the gods, become 'immortal' for a short time, and lose all the limitations associated with human nature. *Soma* gave them insight into a sphere of reality that was inaccessible to normal human senses. As a source of sacred knowledge, it enabled priests to ensure social, moral and cosmic order (defined in the Vedic writings as *rta*). There is no doubt that *soma* was a real concoction.

Descriptions of reactions induced by *soma/haoma* show clearly that it was an intoxicating potion with

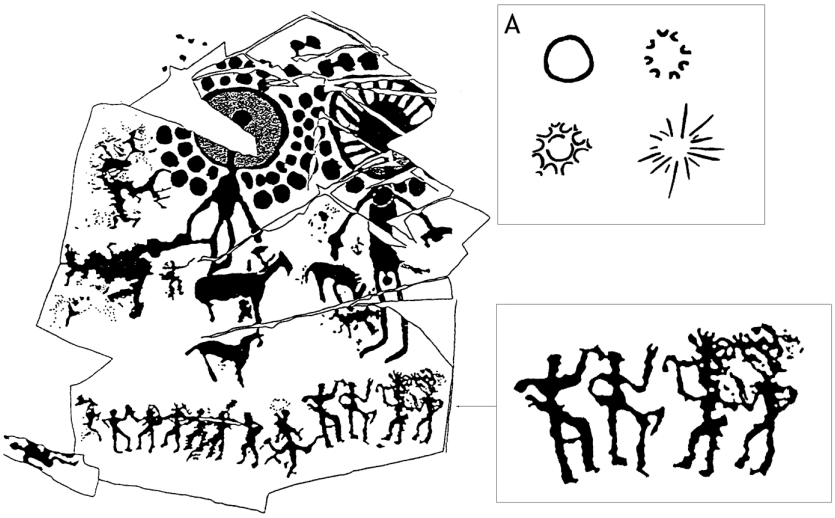

Fig. 4. Fragment of a large panel with petroglyphs in Tamgaly. The shapes of the heads of these anthropomorphic figures (height approximately 2 metres) resemble visionary patterns seen in trance states – A (after* Horowitz 1975.Fig. 2*). Copy by author.

hallucinogenic properties (*e.g.*, *Keith 1922.104; Renou 1971.96; Wasson 1972; Stutley 1980.74; Elizarenkova 1989.445; Flattery, Schwartz 1989; Brockington 1990.14; cf. O'Flaherty 1981.119, 137*)[8]. Its ingestion led to trance states, as demonstrated by the descriptions of these experiences: *soma* caused visual sensations of macroscopy and microscopy; it produced the impression of flight; and quite frequently a person identified himself/herself with a bird, feeling an unusual lightness and lack of any physical limits (*Jurewicz 1995*). *Soma* was conceptualised as a drink of immortality and to achieve this 'immortality' effect *soma* was intentionally drunk in ritual contexts. The prayers for immortality addressed to the god *Soma* by priests did not concern the wish to achieve such a state after death. *Soma* was drunk in order to "*experience here and now, during one's lifetime, during the offering, a happiness similar to a post-mortal one*" (*Jurewicz 1995.98*).

Thus it is reasonable to claim that *soma* as a hallucinogen played a central role in priestly rituals in Indo-Iranian cultures (*i.e.*, the Bronze Age). The fact that in the ceremonial life of the Indo-Iranians one can also find other elements which echo shamanistic practices (*Rozwadowski 2002*) suggests three possibilities: we are dealing either with strong influences from archaic shamanistic Asian cultures, or the priestly function emerged from the shamanistic function of an institutionalised specialist in the field of communicating with the supernatural world, or that ceremonial life was a completely independent ritual context focused on visionary experiences. Given the current stage of knowledge, it would be risky to suggest that any of these solutions is correct. This ambiguity, however, has implications for our discussion. Assuming that 'sun-headed' petroglyphs are graphic expressions of visionary experiences, it is still difficult to say that all of them, and in every case, point to shamanism (entoptic visions could be stimulated by *soma* drinking – see *Nicholson 2002*). In some cases, however, this ambiguity may be moderated. An analysis of the 'sun-headed' images in the Tamgaly Valley in Kazakhstan can serve as an example. A thorough iconographic study of these petroglyphs shows that these images may represent shamans while in trance (*Rozwadowski 2001; 2008b*). Several features support such an interpretation. First, in the row of small (dancing?) humans visible in the lower part of the composition with sun-headed figures are two men holding short crooks (Fig. 4). Analogous staffs one can be seen in the hands of other human images, which are dressed in horse-like garb and associated with horses (see Fig. 3). Furthermore, some of these petroglyphs are evidently integrated with natural cracks in rocks (Fig. 3). If this integration was not accidental, at least in some examples, it had to be meaningful. I believe that popular beliefs in cracks as entrances to the spirit world, as noted in the tradition of local shamanism (*Sagalayev 1992.55–56, 60–78; Tátar 1996; Rozwadowski 2012b.461–465*), provide a reasonable explanation for this iconographic motif. It could then be seen as an additional argument in favor of shamanic overtones of the 'sun-headed' petroglyphs in Tamgaly.

Some sun-headed petroglyphs can thus be explained through shamanism. Whether the same could be said about other similar petroglyphs at other sites in Central Asia is a question to be investigated. Simila-

8 The active ingredient of *soma* is still unknown; it must have been found in a plant. The most well-known hypothesis was proposed by Gordon Wasson (*1972*), who was convinced that it was the fly-agaric fungus (*Amanita muscaria*). More recent research by Flattery and Schwartz (*1989*) identifies *soma* with a desert plant known as harmel or wild rue (*Peganum harmala*). It is possible, however, that there were several kinds of *soma* prepared from various plants.

rity in form should not automatically point to semantic homogeneity; although it cannot be excluded, it needs to be demonstrated.

Making final conclusion concerning the issue of antiquity of shamanism in Central Asian/south Siberian border zone through the prism of rock art, we can note that both classes of images (those identified with shamanism through ethnographic parallels and those identified with visionary experiences) probably date to the Bronze Age. It is thus reasonable to believe that forms of shamanic symbolic code as well as practices which focused on visionary experiences already existed four thousand years ago in Central Asia and southern Siberia. This does not, of course, necessarily mean that shamanism originated at this time. We merely note that, at this juncture, reliable sources support the existence of shamans or aspects of visionary practice about four thousand years ago.

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'Skeuomorphs': on the rhetoric of material in the Gumelniţa tradition

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ABSTRACT – *The social changes, which characterise the Chalcolithic in southeastern Europe, which coincide with the emergence of metals, imposed a new material and led to the emergence of skeuomorphs (*i.e. *copies of objects made from a material different from that of the originals). Some gold objects from the Gumelniţa tradition were objects of value, such as the valves of exotic shells, which therefore become visible in the form of paraphernalia. The present paper discusses the rhetoric of material visible in the shape and proximity of originals and skeuomorphs.*

IZVLEČEK – *Družbene spremembe, značilne za obdobje eneolitika v jugovzhodni Evropi, so s pojavom kovin uveljavile nov material in vodile k pojavu skeuomorfizma (kopija predmeta, izdelana iz drugačne snovi kot original). Nekateri zlati predmeti v kulturi Gumelniţa, kot so upodobitve lupin eksotičnih školjk, so bili dragoceni predmeti in so tako postali vidni del osebne lastnine. V članku obravnavamo retoriko snovi, razvidno iz oblike, in podobnosti med originali in skeuomorfi.*

KEY WORDS – *materiality; skeuomorph; Spondylus shell; gold; Gumelniţa tradition*

Introduction

The last few decades illustrate how anthropological and archaeological studies of material (*Renfrew, Scarre 1998; Schiffer, Miller 1999; Miller 2005; Hurcombe 2007; DeMarrais* et al. *2004; Jones, MacGregor 2002; Tilley 2004; Meskell 2005; Jones 2007; Gheorghiu, Children 2011*) have become more common in the field of prehistoric studies.

Materiality is extremely important, since it offers a special perspective on the relationship between material and social (*Hurcombe 2007.105*). Because of the large variety of materials in the Balkan and Lower Danube Chalcolithic traditions, an approach from the perspective of materiality could offer new data on the cultural problems of the emerging stratified societies of the 5th millennium BC.

During the Chalcolithic, the raw materials used in the prehistoric world underwent a series of modifications due to the social-economic transformations that characterise the 5th millennium in South Eastern Europe (see *Bailey 2000; Müller 2012*). This is the moment when a new material, *i.e.* metal, appeared/came into use. Metal soon became the most important material (see *Pernicka, Anthony 2010*), dominating the materiality of other local or exotic objects of value.

Although not openly manifest (see *Slavcev 2010*), emergent social stratification (*Gheorghiu 2001.375; Müller 2012*) can be inferred from the spatial organisation of settlements, whose early levels are relatively standardised and ordered by geometry (see *Todorova 1982*; see also *Chapman 2010.80*), in the fortification of settlements (*Popovici 2010.103*), or in the removal of objects of value from the daily economy (see *Ivanov, Avramova 2000*) to funerary deposits, as well as the non-uniform distribution of value in funerary contexts (see *Slavchev 2010.200; Lazăr* et al. *2009; Comşa 1995*). The relative homo-

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geneity of local and exotic objects of value could be explained by the existence of several regional settlement networks (*Higham* et al. *2007*).

Probably the most evident exotic objects during the Neolithic (*Berciu 1966; Chapman 2007*) and Chalcolithic (*Haimovici 2007*) were exotic bivalves and scaphopods (*Pope, Goto 1993*), such as *Spondylus gaederopus L.*, *Glycimeris* or *Dentalium* (*Comşa 1973*) imported through long-distance trade (see *Séfériadès 2011*). The rarity of *Spondylus* shells – which appear as early as the Middle Neolithic – led to the emergence of copies made of marble (see *Berciu 1966*), an exotic material in the north of the Balkans, or to the use of fossil shells (*Dimitrijević, Tripković 2006.246*).

One can imagine the great importance of exotic materials in prehistoric societies (see *Chapman 2003; Chapman 2007; Vianello 2010*; for the Bronze Age, see *Knapp 1998*) due to their symbolic value (see *Claassen 1998*) or, in other words, to their special materiality (*Chapman 2007.212; Gheorghiu 2010.15*).

Skeuomorphs

The rarity of exotic materials and the beginnings of metal working (copper and gold) were mutually influential. To meet the need for prestige objects in an emergent stratified society, one solution would have been the exploitation of copies of prestige objects made of an accessible local material, which would then lead to the proliferation of skeuomorphs, which would have replaced the scarce originals (see *Gheorghiu 2010*). In reality, in spite of the emergence of skeuomorphs, they did not completely replace the originals, continuing to exist alongside them.

A skeuomorph is a special case of the substitution of material, being a copy of one object in a different, usually more common, material. The reverse occurs when a common material is used to copy one of higher value, such as the gold astragal from grave 36 in the Varna cemetery.

The present paper discusses some examples of skeuomorphism from the Gumelniţa tradition, when gold replaced graphite and exotic shells.

The first example is represented by the ceramics painted with flakes of alluvial gold (*Eluère, Raub 1991*) from Grave 4 of the Varna cemetery (*Ivanov 1988*), a large plate and a small bowl with lid. In this instance, gold replaces the graphite, which would normally decorate the fine pottery. Skeuomorphs of these two ceramic pieces were discovered north of the Danube, at the Sultana tell-settlement, in the form of a large dish and a lid (Giurgiu Museum). Both objects (Figs. 1 and 2) are decorated with a graphite pattern (similar to that of the large Varna dish painted with gold), drawn on a yellow-reddish ground. Experiments with up-draught kilns demonstrate that such a technical achievement was possible using a three-stage firing process, *i.e.* re-oxidizing the objects fired in a reduced atmosphere, a process possible after three openings and closures of the kiln's apertures (*Gheorghiu 2006.31*); this technique would later be rediscovered in Ancient

Fig. 1. Large plate decorated with graphite, Sultana settlement (Giurgiu Museum).

Fig. 2. Large lid decorated with graphite, Sultana settlement (Giurgiu Museum).

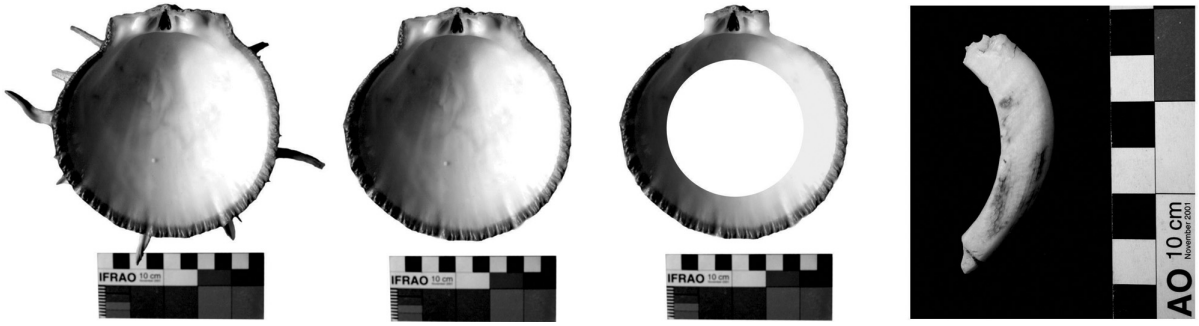

Fig. 3. Four phases in the processing of a* Spondylus *shell, from the valve with spikes to a fragmented ring.

Greece to produce black and red figure pottery (*Noble 1988*).

A second example illustrates the use of gold to produce skeuomorphs of exotic shells like *Spondylus* and *Dentalium*. If the shell of the scaphopod *Dentalium* was used in its natural shape to form necklaces, the valves of the *Spondylus* shell underwent a series of operations (see *Tsuneki 1989; Gaydarska* et al. *2004; Kiparisi-Apostolika 2011.162*), from the cutting of the spikes, to the perforation of the middle of the valve, until the final transformation into a ring/anulet, or bracelet (Fig. 3).

In the Gumelniţa tradition (at Varna, Sultana or Hotnitsa, see *Fol, Lichardus 1988.121, Fig. 69*) all the stages of the *chaîne-opératoire* of the transformation of the *Spondylus* valves were copied in gold (*Gheorghiu 2006.30; Gheorghiu, Children 2011. 19*), from the moment the spikes were removed to the perforation of the middle of the valve (Fig. 4), and up to the making of rings and cylindrical beads. There is a manifest analogy between the general proportions of the shell, the shape of the *umbus* or ears of the valve, the shape and position of the tubercles on the interior of the left valve, and the general proportions and contours, as well as the position of the perforations of the gold pendants. For example, the central upper perforation on the gold pendant from the Durankulak necropolis (Fig. 5) could represent the *monomyarian* (*i.e.* the visible notch of the central ligament of the valve) and the two other small perforations, the prominent round teeth specific to the left valve. As for the large central perforation present on some gold pendants, it could represent a major stage in the manufacturing process of the shell to become a bracelet (*Gheorghiu 2010.18, Fig. 2.9*).

In the gold inventory of the Varna cemetery, one can identify all the manufacturing stages of the left valve of the *Spondylus* shell (*Gheorghiu 2010*) as described by Tsuneki (*1989.9, Fig. 6*) (see the gold pendants from Grave 36, in *Anthony, Chi 2010. 236, Fig. 141*).

An additional skeuomorph common in the Varna and Sultana hoards (*Hălcescu 1995*) is the *Dentalium* tubular shell used for necklaces, which was also copied in gold. In order to suggest the segmented shape of the necklaces made of this scaphopod, narrow pieces of gold sheet were given a spiral shape (Fig. 6).

Assuming that gold was mainly used as skeuomorphic material, one can also consider the large gold bracelets and gold rings from the Varna cemetery and the Sultana hoard (Fig. 7) to have been skeuomorphs of *Spondylus* bracelets and rings. In support of this statement, I mention Grave 43 (see *Fol, Lichardus 1988.9, Ill.2*), which contains a *Spondylus* bracelet repaired (or enlarged) with gold foil, which implies compatibility between the two materials (see also *Séfériadès 1995*).

A comparison between the gold objects from Varna and the Sultana hoard reveals the existence in the Gumelniţa tradition of a quite uniform set of prestige objects, consisting of skeuomorphs (Tab. 1).

When gold was substituted for the material of an object, this changed the dimensions of the object being copied; for example, the skeuomorphs of whole

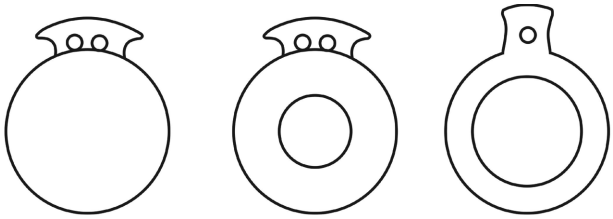

Fig. 4. Three gold pendants from Varna cemetery, showing three stages of the* chaîne opératoire *of shell processing (after* Gheorghiu 2010.Fig. 2.10*).

valves, or valves with central perforation, are smaller than the originals, the resulting bracelets being more massive or miniaturised.

One can infer that this rhetorical process of minimisation and maximisation of skeuomorphs was because they were to be exhibited either on the body or on a costume. Examples can be found in other traditions: skeuomorphs of the exotic shell *Cypraes* are recorded as among brooches of the Picean culture (*Landolfi 2005*). The small perforations in the Gumelniţa gold pieces found on human skeletons could be explained as a method of fastening on a textile surface (*Gheorghiu 2010.22–23*).

Varna cemetery	Sultana settlement
Skeuomorphs of *Spondylus* shells (in different stages of manufacture, from the whole shell with central perforation, to small bracelets/rings and cylindrical beads) (Graves 1, 2, 15, 36, 41)	Skeuomorphs of *Spondylus* shells (whole shells with central perforation and rings)
Skeuomorphs of *Dentalium* shells (as spirals made of narrow sheets of gold) (Graves 1, 41)	Skeuomorphs of *Dentalium* shells (as spirals made of narrow sheets of gold)
Ceramic plate and vase with lid, painted with gold powder on a dark surface (Grave 4)	Ceramic plate and lid, painted with graphite on a yellow-reddish surface

Tab. 1. A comparison between the funerary inventory from different graves at the Varna cemetery and the Sultana hoard and settlement objects (after* Gheorghiu 2006.30*).

Ceramic vases like the large plate from Sultana have perforated protuberances on their backs, a detail indicating the vase could have been fixed to a wall.

A display of skeuomorphs of objects of value on the body or on walls could have been a message referring to the social status of the owner (*Veblen 1994*); for example, at the Varna cemetery the complete or metonymic images of horned animals sewn to the costume could be interpreted as an index of the owner's wealth.

Fig. 5. Gold pendant from Durankulak cemetery (no scale) compared with the left valve of a* Spondylus *shell with central perforation.

A different kind of skeuomorph found at the Varna cemetery is a human figure copied in clay and positioned in cenotaphs to replace the real body. In Grave 2, the traits of the human figure were emphasised by various gold objects: a diadem on the forehead, two round pieces on the eyes, a narrow strip on the mouth, and wire rings piercing the ears (see *Fol, Lichardus 1988.5, Fig.1*). The gold skeuomorphs of *Spondylus* shells were positioned near the chin of the clay mask.

Skeuomorphic materials: shapes, colours and proximity

A skeuomorph is an attempt to copy the shape, colour and texture of the original. For example, the colour palette at the Varna cemetery (see *Chapman 2002.58, Tab. 2.1, 59, Tab. 2.2*) shows the presence of colour analogies, which in most cases probably determined the selection of skeuomorphic materials: the various nuances of red of the contour of the *Spondylus* valves had a visual correspondent in the colour of the polished copper (for copper nuances, see *Keates 2002.111*), which in turn had a correspondent in the flesh-like colour of the carnelian (*Rapp 2009*).

These equivalent colours of copper, carnelian and *Spondylus* valves suggest a rhetoric of material based on analogy. There is general agreement that the study of colour in prehistory is linked in particular with texture (*Lynch 1998; Jones, Bradley 1999; Owoc 2002.133*; for the relation between the colour

and texture of Gumelniţa fine ceramics, see *Gheorghiu 2006*); in this haptic perspective, all the colours mentioned belong to materials with a high polish.

The rhetoric of materiality is observable also in the proxemics of materials with analogous colours or textures, such as the necklaces with gold and carnelian beads (Graves 41 and 97 at Varna), or the necklace with *Spondylus* and copper beads (at Reka Devnja, see *Fol, Lichardus 1988.102, Fig. 55*).

An additional aspect of the visual rhetoric in Gumelniţa is the proximity of originals with skeuomorphs; for example, in Grave 43 at Varna, a flint arrow point and a stone axe were placed near a copper arrow point and a copper axe-hammer.

Original material	Skeuomorph
Spondylus shell	Gold ring bracelets (Grave 43); *Spondylus* bracelet mended with gold (Grave 43)
Perforated *Spondylus* shell	Perforated gold appliqués (Graves 2, 15, 36, 97)
Curved fragment of *Spondylus* bracelet	Gold crescent plate (Graves 1, 143)
Copper beads	Carnelian beads (Graves 41, 43, 97, 143)
Copper	Red ochre (Grave 11)
Copper/gold	Yellow ochre (Grave 111)
Dentalium shell beads	Gold spirals (Grave 41)
Spondylus shell beads	Marble beads (Grave 158)

Tab. 2. Skeuomorphic colours at Varna.

Fig. 6. Virtual reconstruction of a* Dentalium *necklace compared with a gold necklace with spiral strips.

Conclusion

The emergence of skeuomorphs of prestige objects in relation to the new technology of metal manufacturing during the Chalcolithic is part of a wider phenomenon of skeuomorphism created by the process of copying (see *Jovanović 1996.31; Lichardus 1991*) and replacing (see *Siklósi, Csengeri 2011.57*) common and valuable materials with metal. Although the models copied still preserve Neolithic shapes and symbols, a new material began to take over, slowly modifying the old models and suggesting new shapes. For example, at the Varna necropolis, alongside the metallic skeuomorphs of exotic shells, new images (such as animals and various paraphernalia) are now present. Such novel imagery does not exist at the periphery of the tradition, which used only skeuomorphs of Neolithic objects.

In the Cucuteni tradition, skeuomorphism changed more drastically the material of objects. For example, the Brad hoard (see *Ursachi 1991*), discovered in a Cucuteni A3 phase, and of a definite Gumelniţa influence, had an inventory analogous with that of the Varna tombs: a copper axe, two gold discs with two perforations, three copper discs and bracelets. The difference is that the *Dentalium*, or *Spondylus* beads were replaced here with a local product: deer teeth.

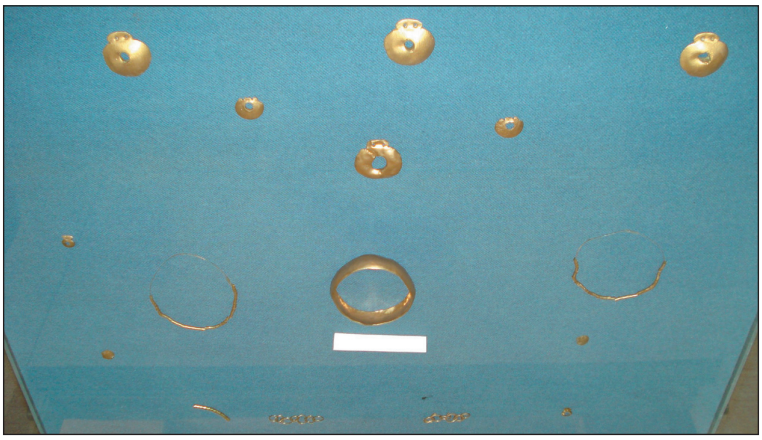

Fig. 7. Copy of the Sultana hoard, Oltenita Museum.

Analysing the Gumelniţa skeuomorphs, one can conclude that their role was to expand the set of objects

of prestige by changing the material of these objects. Thus, the presence of skeuomorphs infers the use of a rhetoric of the copy in relationship to the original. For example, the use of gold is the rhetorical trope of copying an object in a brighter material, without rust and with a relatively effortless technique of acquisition, since alluvial gold (*Koleseri 1789*) was more easily found and processed than copper.

The number, material and position of the skeuomorphic accessories of the costume at Varna suggest a high degree of theatricality and performance (see *Gheorghiu 2010.23*). A valuable vase displayed on the walls of a house would convey a similar message. A new material, more visible in the social spectacle (see *Debord 1992*) than what preceded it, announced the intention of a social transformation and a new manifestation of the concept of value.

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BACK TO CONTENTS

Cattle to settle – bull to rule: on bovine iconography among Late Neolithic Vinča culture communities

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ABSTRACT – *Bovine iconography is one of the most important components for understanding social identities among Neolithic Vinča culture communities. It is believed that both wild and domesticated cattle were introduced into Vinča culture symbolic practice as one of the most powerful and profound metaphors of human perception of the world. I argue that the use of bovine iconography was socially structured, as was the maintenance of animals, and that the vast corpus of bovine iconography should be considered in terms of actual human-animal relationships.*

IZVLEČEK – *Ikonografija goveda je ena izmed najpomembnejših komponent za razumevanje družbene identitete med skupnostmi neolitske kulture Vinča. Na splošno velja prepričanje, da je bilo tako divje kot domače govedo vključeno v simbolično prakso kulture Vinča kot ena najmočnejših in temeljnih metafor človeškega dojemanja sveta. Trdim, da je bila uporaba ikonografije goveda družbeno strukturirana, kar velja tudi za oskrbo živali, in da je potrebno obsežen korpus ikonografije goveda razumeti v kontekstu dejanskih odnosov med ljudmi in živalmi.*

KEY WORDS – *bovine iconography; Vinča culture;* bucrania*; figurines; human-animal relationship; symbols*

Introduction: human and nonhuman animals in Late Neolithic Vinča culture

Tim Ingold (*2000.61–77*) brilliantly described the history of human-animal relationship as a long-term process from trust to domination. Still, the relationship between humans and animals differs significantly from place to place and from time to time, depending on various cultural, environmental and economic issues. Animal imagery in human material culture[1] actually grew out of those relationships, as well as from the numerous ways in which people understand and comprehend nature and their environment. In this paper, I argue that the main impetus for the creation of bovine iconography in Late Neolithic Vinča culture also grew out of the physical-visceral relationships people had with cattle and from the constant reinterpretation of humans' and animals' place in the world.

In the lucid language of Douglas Bailey and others, the term Vinča culture refers to an archaeological overgeneralisation widely used to simplify the complexities of people, behaviour and material culture focusing on Serbia, western Bulgaria and southwestern Romania (*Bailey* et al. *2010.161*). Indeed, this statement is true; humans are expert classifiers and categorisers (as cited in *Parker-Pearson, Richard 1997.9; Humphrey 1984.143–145*); prehistoric archaeologists succeeded in their classifying quest, and as a result different communities that share similar material culture were labelled with the term Vinča culture and were neatly catalogued in the Late Neolithic folder (Fig. 1). In reality, the similarities in the physical manifestation of the material culture are merely imaginative, while their social, cultural and

1 It is now indisputable that certain animal species also create material culture (*Ingold 1983; 2000.363–364*).

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ideological (sensual also) attributes differ greatly from site to site, and from period to period.[2] There are some general patterns in settlement, economy and material culture, but still there are considerable divergences which do not allow for broad generalisations. Some Vinča culture communities lived on river banks or hilltops, others at tell sites, even in caves. Some built elaborate two-story houses, others dwelt in pit-houses; some were skilled flint knappers, other specialised in copper metallurgy. Some made shiny black vessels, some matte red. At the risk of making just another redundant statement, I will again underline that the structuring and shaping of material culture occurred via a myriad of various social agents and cultural constructs.

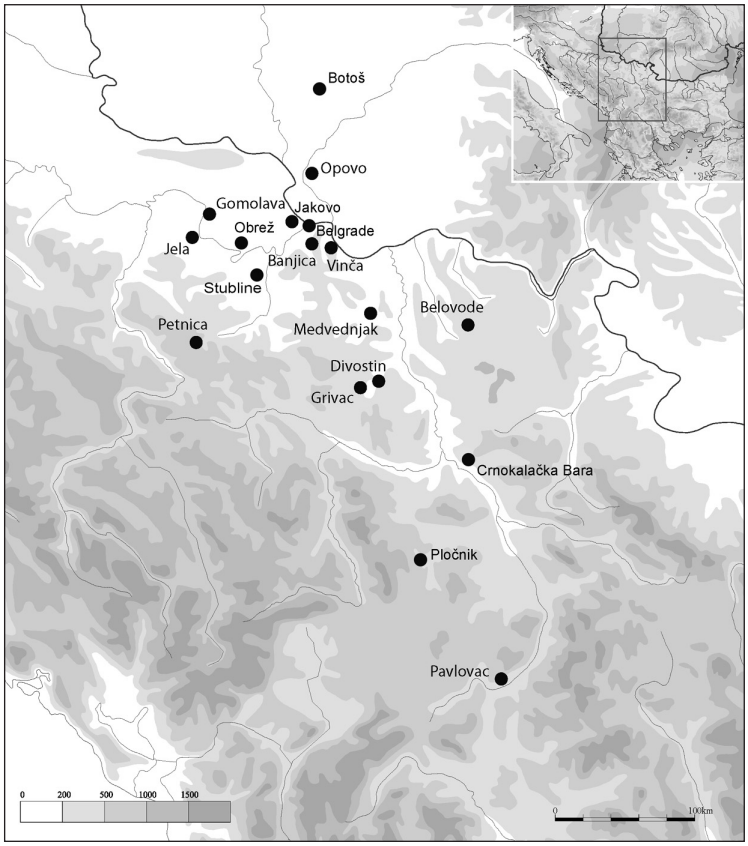

Fig. 1. Late Neolithic Vinča culture sites mentioned in the text.

Likewise, human-animal relationships, as well as the use of animals in the economy and in symbolic activities differed significantly. We know that the everyday lives of Vinča communities were marked by numerous encounters with animals, both physically and symbolically. Domesticates were carefully nurtured, wild species were hunted, and both were the subject of vivid symbolic structuring. The list of wild and domestic animal species in Late Neolithic Vinča culture is long, and their role in the economy of different communities has been thoroughly elaborated (*cf. Greenfield 1986; Bökönyi 1988; Clason 1979; Dimitrijević 2006; Orton 2008*). If heuristic theses that place animal representations in the sphere of cult and religion are not to be taken seriously (*cf. Gimbutas 1982*) being merely anecdotal (*sensu Bailey 2005. 12–15*), the social and symbolic aspects of human-animal relationship were of far less interest (*cf. Russell 1998; 1999; 2012.80; Orton 2008.292–318*). Although the lives of Vinča communities were probably profoundly influenced by complicated systems of beliefs and religion, considering the current state of evidence, I see no reasonable line of inquiry which could be followed in order to comprehend animal's place in supposed Vinča culture cosmology. Certainly, some animal species (cattle, birds, deer, dogs, *etc.*) were introduced into the belief systems, but we are so far away from delineating some sort of animal Pantheon, that it is better not to discuss it. Instead, a whole range of studies dealing with other aspects of animal symbolism in the Neolithic have proved to be very fruitful (*cf. Perić 1996; Russell 1998; Whittle 2003.79–106; Borić 2005; Marangou, Grammenos 2005; Mlekuž 2007; Nanoglou 2008a; 2009; Twiss, Russell 2009*).

Animal iconography

Animal representations in the Late Neolithic Vinča culture have been a subject of archaeological inquiry for more than a century. The history of the theoretical frameworks employed followed the progression of interpretations of anthropomorphic imagery, at least in the case of clay figurines. Thus, interpretations focused mainly on various questions of function and use, with these objects being seen primarily as cult instruments. This approach has not changed: Balkan archaeologists have not posed new questions concerning animal representations in Vinča culture. We just became more careful in our analysis, and as a result there is a strong decline from posing any interpretative questions concerning either human or animal imagery. There are some advan-

2 Late Neolithic Vinča culture is dated to the period 5300–4600 BC (*Borić 2009*).

ces, in that more attention is paid to contextual data; but since this has not offered any progress in functional interpretation, the finds continue to be published with no inquiry that addresses some other aspects of human and animal representations.[3] We will see that in order to move away from heuristic and anecdotal explanations, we need to cast off the functional burden and change the direction of our analysis in order to respod to answerable questions.

When dealing with animal iconography in Vinča culture, the first obstacle is the identification and recognition of the species represented. Taken as whole, the interpretation of both human and animal Vinča iconography is in the deep shadow of ambiguity and vagueness. Sometimes it is even hard to determine whether it is an animal or human that is represented. We know that there are many examples of hybridism and absurdness in depicting humans and animals in Vinča culture, such that any effort to identify the exact species, gender or age is doomed to failure. It is almost as we are dealing with some sort of cultural bestiary, with representations of liminoid half-human-bird-like creatures, human-bear hybrids, cat-awls, centauries, sphinxes, *etc.* Therefore, although the topic of hybridism and ambiguity in Vinča iconography is very challenging, for the purposes of the present paper, I deal only with securely defined bovine representations. Even in this category, we will see that what we see is not what we think we see, and that what they thought is not what we see.

Bovine imagery in Vinča culture

It has always been assumed that the relationship between Neolithic communities and cattle was somehow significant. Both the hunted wild *beasts* and the well cared for and tame domesticates were indeed very important. Besides their nutritional value, cattle had potent symbolic importance for almost all Neolithic communities in the Central Balkans.[4] Bovine iconography in late Neolithic Vinča culture is also very diverse. Cattle *bucrania* were placed on the interior and exterior walls of houses, vessels were decorated with cattle *protomes*, cattle astragals were used as loom weights, and clay bull figurines were modelled for various purposes (deities, toys, ceremonial and religious items *etc.*). I argue that the employment of bovine iconography was socially structured, as was the maintenance of animals themselves. It is generally believed that bull symbolism in the Neolithic had strong male associations (power, strength, fertility, prestige *etc.*). A comparable setting was observed among contemporary indigenous societies (*Evans-Pritchard 1940.16–51*) and the same stands for Neolithic Vinča culture also. However, new evidence suggests that bull iconography was clearly associated with both female and male activities. Finally, cattle iconography appears to be equally of private and public concern, and it was probably related to both genders and all ages. I argue that the vast corpus of *Bos* iconography should be considered in terms of actual human-animal relationships, and it is only in this way that all structural oppositions (male/female, wild/domestic, private/communal, inside/outside) that have been observed can be understood.

Iconographic representation of cattle in Vinča culture can be divided approximately into four arbitrary categories: (i) *bucrania*; (ii) clay figurines; (iii) ceramic vessels; (iv) miscellaneous – this category includes loom weights, so-called Y amulets *etc*. As a clarification, it is notable that among the many types of animal representation, only cattle imagery has some naturalistic and realistic attributes of the species. All four categories of bovine representations could be further divided into sub-categories, but the main characteristic of all of them is the material of which they were made: clay. Almost the whole inventory of animal imagery in Vinča culture is made of clay. Stone is used very rarely and intriguingly only for the modelling of specific forms of so-called equine-like and canine-like figurines (*Garašanin 1951; Antonović 2003*).[5]

Bucrania

Bucrania appear over a vast geographical area, from Central Asia and the Near East to Central Europe,

3 Needles to say, the significance of contextual data is enormous, but again it turned out that as if we were expecting to find speaking *bucrania*, or a burial with male shaman holding bull figurine and his female apprentice holding a vessel with bull *protomes*. Again, in order to understand the function and use of animal representations. A truth case of *Pompeii premise* (*sensu Binfrod 1981*).

4 Even since the Middle Neolithic Starčevo culture bovine representations had constituted an important part of animal iconography in the Central Balkans, with small clay and stone amulets and bull figurines as the most frequent animal representations (*cf. Stanković 1989–1990; Budja 2003; Vuković 2005*).

5 Anthropomorphic figurines in Vinča culture are also rarely made of stone. In contrast, stone figurines are quite common in the Late Neolithic of northern Greece (*Nanoglou 2008b*).

and are mainly associated with Neolithic and Chalcholithic agro-pastoral communities. As defined in the literature, a *bucranium* is a cattle skull plastered with clay. It is most frequently part of the house inventory, placed inside the house or hung on the outer wall.[6] *Bucrania* are highly visible items and are among the most permanent features of a house. They constitute an enduring structure, which was kept and displayed in the same part of the house for a very long time. There are numerous examples of re-plastering, re-modelling and modification of *bucrania* in Neolithic houses. Even when houses undergo significant reorganisation, *bucrania* are kept and repeatedly displayed in the same place or near to where they were originally intended to be positioned. Only in later Vinča culture we have possible evidence of portable *bucrania*, which could be the case with an entirely clay *bucranium* from house 1/2008 at Stubline. According to the current evidence, at least 30 *bucrania* have been retrieved from Vinča culture settlements in Serbia.

On morphological and purely arbitrary bases, *bucrania* could be divided into four main categories:

❶ *Bucrania* with plastered skull and horns. This is the most typical, but not the most common type of *bucrania*. After removal from the body, the head was plastered with clay and ornamented in various ways. The horns were left unplastered, protruding from the clay covered skull.

❷ The second type includes clay modelled *bucrania* with horns. In this type, the head is modelled entirely from clay, except the horns; real horns were set in the wet mass of clay immediately after the head was modelled.

❸ *Bucrania* made entirely of clay are usually very small, sometimes no larger than a human fist. Usually, only the head is represented, without the horns.

❹ Horns alone and/or skull frontlets are the rarest type of *bucrania* that appear in Vinča culture houses. Until now only three such specimens have been reported from the house 2/1979 at site of Banjica, as well as almost complete aurochs and domesticated cattle skulls with horns from a burnt Late Vinča culture house at Jela near the town of Šabac and from the pit at Gomolava.

The appearance of some of these *bucrania* types seems to diverge chronologically, and there are probably some differences in their meanings. According to evidence from the sites at Vinča and Jela near the town of Šabac, the *bucrania* with plastered skull and horns and real cattle *bucrania* with horns are the oldest examples, being produced at least since the Vinča C period. Clay *bucrania* are specific to a younger phase, as attested at the sites at Stubline, Jakovo and Gomolava. The main iconographic characteristics of all the *bucrania* types with clay plastering are a very pronounced muzzle, eyes, and horns. Other anatomical details are rarely rendered. All the *bucrania* from the Serbian sites were published with insufficient or no data on the context of the find or actual archaeo-zoological analysis. In the following, I present the data on *bucrania* which were available to me.

Banjica

Banjica is a multi-layered settlement with horizons which correspond to the middle and late phase of Late Neolithic Vinča culture. It is situated on a gen-

Fig. 2. Late Neolithic Vinča culture house 2/79 at Banjica.

6 There are numerous examples of *bucrania* being placed in other contexts also, such as burials, house foundation deposits, pits *etc.* (*cf. Russell 2012.99, 106*). The evidence for this practice among Vinča communities is scarce. One or two cattle *bucrania* are reported from dug-out pits at Gomolava. The placement of the heads of other species is reported from dug-out pits in Vinča culture settlements also: deer head with horns is found at Gomolava (*Orton 2008.302*), dog skulls were found at Petnica, Gomolava, Opovo (*Orton 2008.168, 273, 305*) and Belgrade fortress; several sheep heads with completely preserved horns were found during rescue excavations at Pavlovac-Čukar.

tle slope in the vicinity of the Serbian capital, Belgrade (*Todorović, Cermanović 1961; Todorović 1981; Tripković 2007*). Based on material culture, the Neolithic settlements at Banjica could be dated roughly to the period 4900–4600 BC. Three sets of entirely preserved cattle horns (two also had preserved head frontlets) were found in the southern room of house 2/79 (Fig. 2). The house is rectangular, with three rooms. One pair of horns was found in a small south-western compartment in the southern room, which probably served as storage. In addition to cattle horns, several *pithoi* were also found here. Two pairs of horns with head frontlets were found in the central area of the southern room. Both were oriented with horn tips pointing north. The southern room contained a small oven and numerous ceramic vessels for storing, preparing and consuming food. All three sets of horns were possibly left in the house upon abandonment. None are preserved today.

Gomolava

Gomolava is a tell site on the bank of the Sava River, near the village of Hrtkovci. It has cultural horizons which correspond to the Vinča B–D development phases (*Brukner 1980; Jovanović 2011*). The site was occupied almost without a significant hiatus from the Late Neolithic until the Roman period. According to AMS dating, the Late Neolithic sequence at Gomolava is dated to 4950–4650 calBC (*Borić 2009.221–227*). Judging from the few reports, eight *bucrania* were recovered from the 1955–1980 excavations (*cf. Jovanović 2011.34–35*).

Two entirely clay modelled *bucrania* were found in house 6/1956. The first *bucranium*, with a pronounced muzzle and eyes represented by circular lines (Fig. 3) was found inside the house, at the entrance to room 3 (*Jovanović 2011.34*). This *bucranium* resembles some hybrid human/animal representations. The second *bucranium* was probably hung at the entrance to the house.

Two entirely clay modelled *bucrania* were recovered from house 4/1975 (Fig. 4). The house is rectangular, with three rooms, and dated to late Vinča culture (*Petrović 1992*). Both *bucrania* are very small (no larger than a fist) and similar in shape, with muzzle, eyes and small horns/ears being represented. The

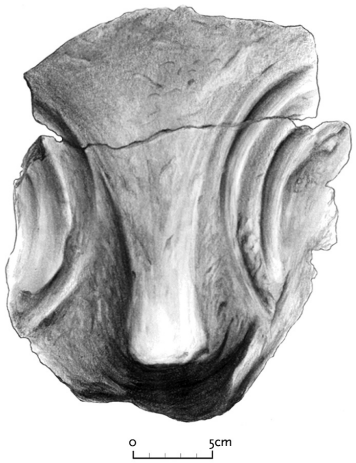

Fig. 3. **Bucranium** ***from house 6/1956 at Gomolava.***

first was found near the oven in the central room and was probably hung on a wooden post (Fig. 4.2). The second was recovered from the mass of the collapsed wall, one metre from the northern room; it is suspected that it was hung on the outer wall of the house (Fig. 4.1).[7]

Two more *bucrania* were found in rectangular, above ground building marked as 6/1980 (*Brukner 1988.Abb.2, T.3.7–8; Jovanović 2011.31, Fig. 10*). The smaller, entirely clay modelled *bucranium* was found in room 1 in the vicinity of the partition wall shared with room 4 (Fig. 5.2). The second *bucranium* – a skull plastered with clay, no longer preserved protruding horns (Fig. 5.1) – was found in room 3 in the same line as the first one, that is near the partition wall with room 4 (*Jovanović 2011.31*). Both *bucrania* have representations of the eyes, snout and nostrils.

Jakovo

Jakovo-Kormadin is a single-layered Late Vinča culture site near the Serbian capital, Belgrade (*Jovano-*

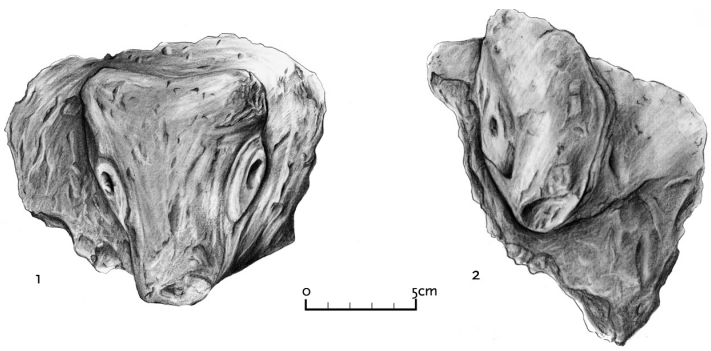

Fig. 4. **Bucrania** ***from house 4/1975 at Gomolava.***

7 The second *bucranium* could also belong to a different, partially excavated house situated near house 4/1975 (based on information from Marija Jovanović, curator of the Gomolava collection in the Museum of Vojvodina in Novi Sad).

vić, Glišić 1960). Two houses, several pits and a segment of a defensive ditch were discovered in the course of the 1956–1960 excavations. Based on material culture and relative chronology, the settlement could be dated roughly to the period between 4750 and 4600 BC. Three *bucrania* were recovered from the site.

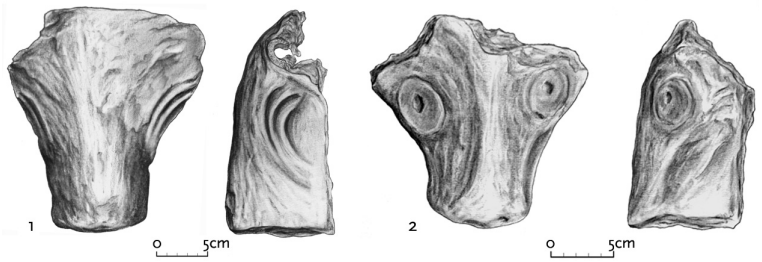

Fig. 5. Bucrania from house 6/1980 at Gomolava.

Two *bucrania* were found in house 1/1957. The house was rectangular, and probably had two rooms with decorated walls, one oven, and one large rectangular clay structure with horn-like endings which was interpreted as an altar (*Jovanović, Glišić 1960. 132, Fig.33, 35*). The house was burnt and probably cleaned before demolition, so only several whole vessels, as well as one anthropomorphic clay figurine and one clay object in the form of a so-called Y amulet were found on the house floor (*Jovanović, Glišić 1960.125, Fig.18*). The first *bucranium* was found in the southwestern part of the house (Fig. 6.1) – a cattle head frontlet plastered with clay; no horns were preserved, and considering the pentagonal shape of the *bucranium*, which resembles some hybrid human/ animal representations, it probably never had horns. The eyes are represented by small circular imprints, above and beneath which are slightly curvilinear lines. During the excavations, facial hairs from the cattle head were still visible protruding from the mass of clay (*Jovanović, Glišić 1960.131*). The reverse side of the *bucranium* bears a trace of a wooden beam, so it was probably hung on a wooden post. Judging from the diameter of the imprint of the wooden beam on the back of the *bucranium*, the excavators suggested that it probably stood in the northern section of the house, where traces of a similar wooden post were observed (*Jovanović, Glišić 1960.131, Fig. 33*). The second *bucranium* was found in the northern room, near fragments of decorated daub wall (Fig. 6.2). It is heavily fragmented, with only the elongated nose with nostrils being preserved. Part of the bone is still visible at the rear.

The third Jakovo *bucranium* was found in house 2/1958 (*Jovanović, Glišić 1960.129*). The house is rectangular, and is a typical Vinča culture above-ground building with three rooms. It belongs to the first type of *bucranium* with clay plastered cattle skull. It originally had both horns, which were in a very bad state of preservation even during the excavations. The *bucranium* was found facing upwards, in the central room, associated with the oven. Judging from the imprint of the wooden plank and ropes on the reverse side of the *bucranium*, a skull with horns was first tied to a low daub construction near the oven, and then plastered with clay. Only the eyes are represented by spiral circular lines (Fig. 7). Both horns and *bucranium* are now missing.

Jela-Benska bara

The site of Benska bara near the town of Šabac is situated on a small river terrace, once surrounded by swamps on three sides (*Trbuhović, Vasiljević 1983. 26; Stojić, Cerović 2011.149–173*). The site is dated to the Late Neolithic Vinča culture, as well as the Late Eneolithic Baden culture. Numerous ceramic vessels decorated in the manner of Tisza culture have also been detected in three superimposed Vinča culture settlement layers. Two *bucrania* were recovered from the site. The first is an almost complete aurochs skull with horns found on the floor of one of the above-ground Vinča houses (Fig. 8). The second, badly preserved, is completely made of clay; it was also found on the house floor (Fig. 9).

Stubline

Based on current information, Stubline is a multi-layered Late Vinča site on an elevated slope (*Todorović 1967*). New excavations, as well as a geo-physical survey revealed that the settlement is exceptionally well-preserved, with more then 200 above-ground houses and circular ditches surrounding it (*Crnobrnja* et al. *2009*). Four *bucrania* were found

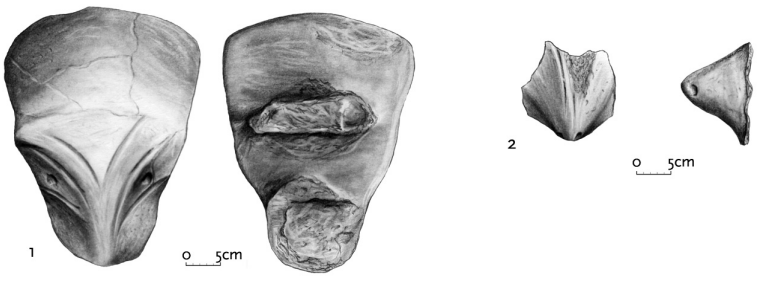

Fig. 6. Bucraniua from house 1/1957 at Jakovo.

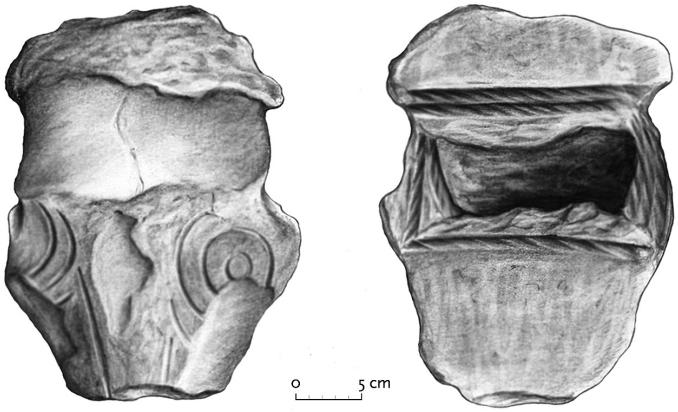

Fig. 7. **Bucranium** ***from house 2/1958 at Jakovo.***

in two houses excavated in the course of the 2008 and 2010 excavations.

One *bucrania* made entirely of clay was found in house 1/2008. The house is rectangular, with no apparent subdivision of rooms. The house inventory was remarkably well-preserved, with two ovens, a quern, a clay structure for cereal storage (interpreted as an altar in the initial publication), dozens of ceramic vessels, 43 figurines and 11 miniature tool models. The *bucranium* was found in the central part of the house, and is quite unique. Careful examinations during the reconstruction showed that the stylised horns and snout were modelled on a flat clay board (Fig. 10). There are no structural elements suggesting that the *bucranium* was hung on a post or some other structure; therefore it was probably portable.

Three more *bucrania* were found in house 2/2010. The house is also rectangular, with no detected subdivision of the interior. The house has a massive clay floor and numerous well-preserved structures and finds (two ovens, one clay structure for cereal storage, a clay table, one quern, a large number of storage vessels, *etc.*). Two *bucrania* found facing the floor were associated with a large oven in the northeastern part of the house. The first was 30cm from the mouth of the oven (Fig. 11.2). The snout is clearly defined, while the eyes are represented with low linear finger impressions. It has an elongated and pronounced forehead, thus resembling the *bucranium* from Jakovo, as well as heads of some small hybrid human/animal and anthropomorphic representations. Small fragments of the skull can be seen protruding from the clay. The imprint of a wooden post and rope are visible on the reverse side of the *bucranium*. Post holes were not detected in the vicinity of the place of find. The second *bucrania* is entirely made of clay. The head is wider, and the snout is even clearly defined (Fig. 11.1). It was found 70cm west from the mouth of the oven, in the vicinity of a triangular post hole and ceramic quern. The third *bucranium* is entirely made of clay, and was found in a mass of collapsed wall fragments in the southern part of the house, which is heavily damaged. It has a marked snout, and eyes represented by concentric circular lines (Fig. 11.3). It also resembles the heads of some small hybrid human/animal and anthropomorphic representations.

Figurines

Zoomorphic figurines are the most common media of animal imagery in the Late Neolithic Vinča culture. The main attributes of animal figurines include: use of clay as raw material; miniature dimensions (often no larger than 5–8cm); schematisation and abstraction in the representation of animal species and gender. As noted above, clay is the most frequently used raw material for the production of both human and animal figurines in Vinča culture. Further studies of zoomorphic imagery should address the question of why only one type of extremely schematised zoomorphic figurine was modelled in stone. This type of figurine appears throughout the Vinča culture territory, from the sites in southern Serbia (Pavlovac, Crnokalačka Bara, Pločnik) to the Pannonian plain in the north (Vinča, Botoš).

Fig. 8. **Bucranium** ***from Jela-Benska bara.***

Although animal figurines are usually quite small, some examples are significantly larger.[8] Unlike in the case of raw material selection, the

8 New rescues excavations carried out at the site at Pavlovac-Čukar in southern Serbia revealed several bull figurines with the heads alone measuring more than 10cm long.

variability in dimensions of both anthropomorphic and zoomorphic figurines differs – in terms of regional settings, with southern Serbia (Morava valley and Kosovo and Metohija mainly) being the area where larger figurines were most often produced. Perception and observation of scale is something that is exhibited in various ways in material culture (*Bailey 2005.26–34*). Thus, the size of figurines is certainly somehow related to the various ways of emphasising and negotiating social identities specific to regions and settlements. The question of abstraction and schematisation in anthropomorphic and zoomorphic figurines has already been briefly addressed. The representation of bovine figurines in the Late Neolithic Vinča culture is usually realistic, at least when the whole figurine survives. Thus the schematisation of zoomorphic imagery applies mainly to other species. It should also be stressed that detailed representations of any anatomical characteristics such as eyes, mouth, teeth, fur, skin, or claws[9] are absent in the whole corpus of animal figurines in Vinča culture. Intriguingly, detailed depictions of anatomical parts of the body, clothing and jewellery are commonly present on anthropomorphic figurines. This could lead to the assumption that anthropomorphic figurines were projected to accumulate things that are essential for visual communication, while animal figurines (including bovine examples) were intended for more tactile interaction (*cf. Nakamura, Meskell 2006.182*).

Cattle figurines are quite often found in Vinča settlements. Unlike any other cattle representation, figurines are modelled very realistically, with horns, four legs and a typically male body. Gender characteristics (mainly male genitals) are also often modelled. Bull figurines are small (up to 5cm high and 10cm long), although there is evidence for larger specimens. Like human figurines, they are found in various contexts. Perhaps of the greatest importance in understanding the meaning of bull figurines is their occurrence in contexts with thermal structures in a house, as presented by finds at the Belovode settlement (*Šljivar, Jacanović 2005*), which could have been inhabited from 5350 to 4650 BC (*Borić 2009.209*). Four out of seven bovine figurines were found in a clear context, near the southern wall of oven 1, in one above-ground house, while the other three specimens were recovered from a deeper layer of the same trench (*Šljivar, Jacanović 2005.71–73*).

Fig. 9. **Bucranium** ***from Jela-Benska bara.***

The group of four figurines found near the oven is said to represent two bulls, a cow and a calf (*Šljivar, Jacanović 2005.72*). It is also said that among the 7 figurines, two species of ancient domesticated cattle could be identified: *Bos primigenius* and *Bos brachyceros* (*Šljivar, Jacanović 2005.75*). Regarding the group of four figurines associated with the oven: two have male genitalia, one of which has a perforation on the snout; three are similar in size, one considerably smaller (Figs. 12, 13); of the finds from the cultural layer, two out of three figurines have male genitalia, one of which has a perforated snout. All 7 figurines are realistically modelled and all have broken horn tips.

An interesting issue concerning bull figurines is the question of their fragmentation. Almost all the figurines I have had the chance to see have broken horn tips, which in many cases certainly was not the result of clumsiness and/or careless handling by Vinča people and such fragmentation is not the result of post-depositional effects. Therefore, as in the case of

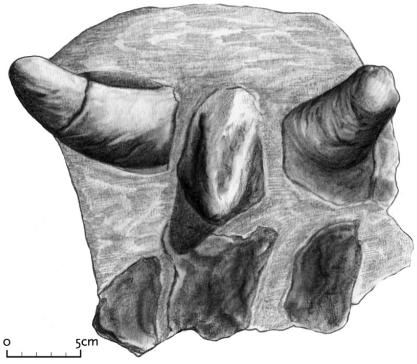

Fig. 10. **Bucranium** ***from house 1/2008 at Stubline.***

9 Some quadruped figurines from the site at Pavlovac-Čukar have incisions on the body which probably represent textile draped over the body of animal rather than depicting animal fur or skin pattern. It could also depict ceremonial painting on the animal's body.

anthropomorphic figurines (*cf. Talalay 1987; Chapman 2000.55–79; Chapman, Gaydarska 2007.113–143*), the practice of breaking the horns of bull figurines is undoubtedly closely connected with social practice, ideology and various other social agents in Vinča culture. Thus the fragments could have operated as a part of a broader idea or concept of humanity/animality. Fragmented bovine figurines could also have imbedded properties as a whole, but lose some of their original meaning in the course of symbolic breakage.

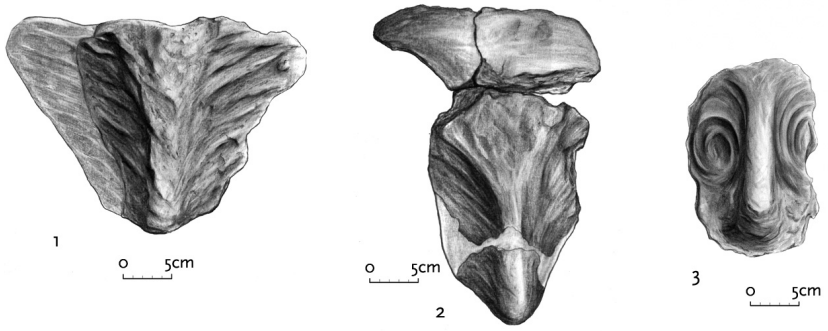

Fig. 11. **Bucrania** ***from house 2/2010 at Stubline.***

Ceramic vessels

The third category of bovine representations consists of various motifs associated with ceramic vessels. The most common are stylised bull *protomes* on the handles of smaller vessels probably used for liquid consumption. These are usually very schematic representations of bull's head and horns (Fig. 14). It is worth noting that those finds very often have long biographies. If the vessels breaks, the handle with *protome* continues to be used as a polisher for a long time afterwards.[10] Bull heads modelled on the exterior of vessel walls are rarely found (Fig. 15). The only reported example comes from the late Vinča house at Obrež-Beletinci (*Jovanović 2011.35, Fig.12*). The third category includes incised abstract bull representation on the exterior walls of vessels. One example is a schematised linear bull representation on the exterior wall of a ceramic bowl from the site at Banjica (Fig. 16). These incised abstract scenes have been interpreted as a sign of property. More absurdly, these representations have also been interpreted as proof of the beginning of literacy in Vinča culture. My current analysis shows that many of these images are mainly associated with animal symbolism, which certainly has nothing to do with literacy.

Fig. 12. Clay bull figurines found in the oven at Belovode.

Fig. 13. Clay bull figurine from Belovode.

Vessels in the form of animal bodies are extremely rare in Vinča culture; so far only few such finds were reported, with birds being the most frequently depicted species (*cf. Nikolić, Vuković 2008a.175–179; 2008b*). Only one possibly bull-shaped ceramic vessel is known from the site at Vinča (*Ignjatović 2008. 257, kat. 162*). The vessel is shaped

10 This practice of secondary usage is also observed among other types of handles on ceramic vessels, so it need not be associated with symbolic activity.

Fig 14. Bowl with schematised representation of a bull's head on the handle from Belgrade fortress.

in the form of a quadruped with two horns on the head; the opening of the vessel is on the back of the animal's body. Plastically applied clay straps are modelled on the neck and sides of the body. Thus the applied straps associated with the vessels mouth on the back appear to be representing some sort of fastenings for carriage put on the animal's back.

So-called altars or cult tables also fall into the group of ceramic vessels with animal representations. Animal *protomes* are most frequently placed in the corner of rectangular shallow recipients. The depiction usually includes only the head, which is so ambiguously represented that it is impossible to say with certainty whether some anatomical details represent ears or horns, snout or beak. Thus many interpretations of the precise animal species on the so-called altars are fruitless. Even in cases when there is some kind of broad scientific agreement – such as that the animal represented on the so-called Gradac type altars is a red deer/stag (*Jovanović 1982.49; 2006.224–225; Borić 2009.204*) – it could equally be the representation of some other horned mammal, such as bull, ram, goat (*cf. Perić 2006.243, Pl. V/35, 36*).

The whole corpus of bovine representations on ceramic vessels consists mainly of stylised bull representation. Further studies should address the question of the relationship between ceramic vessels and bull representations at more levels. Although the fact that women in prehistory are usually associated with the process of making and decorating ceramic vessels is merely heuristic, if we accept it only as a working thesis, then the process of introducing typically male symbols such as bulls into the sphere of female activity has to be studied in the line of negotiating male/female relations. Thus due to the ambiguity in representations we could also question male/female interactions. Considering the relationship between bovine imagery and ceramic vessels, a reasonable line of inquiry would also be to perceive animal bodies as capable of holding substances, so there could be a connection between certain types of substances and certain animal species depicted on ceramic containers (*sensu Nanoglou 2008a.200, 201*). Still, this is only a good way to think of animal representations, because linking particular animal species with particular substances by means of pottery is rather difficult, given the ambiguity and vagueness of depiction.

Bovines in Vinča culture: good to eat and good to think[11]

The eyes and the heart are sad, but the teeth and the stomach are glad. (*Evans-Pritchard 1940.26*)

The quote from E. Evans-Pritchard's seminal work on the Nuer cattle herders of Central/Eastern Africa (Sudan) properly sets out the agenda for the discussion of human/cattle relationship. Cattle are highly valued among the Nuer both symbolically and nutritionally (*Evans-Pritchard 1940.16–51*). They had enormous economic significance in the Late Neolithic Vinča culture also (*Russell 1998.49*), and there is no doubt that cattle had potent symbolic value. Bovine symbolism was both of public and private concern. Cattle *bucrania* placed inside the house,

Fig 15. Bowl with bull's head on the wall from Obrež-Beletinci.

11 The famous Lévi-Strauss's statement that animals are both good to eat and good to think with (*Lévi-Strauss 1964.89*) influenced broad range of scholars dealing with human/animal relationship. The sentence is often cited in various ways (*cf. Whittle 2003. 78, 94, 95; Russell 2012.340*).

near the oven, certainly had a more private character, and were probably somehow included in symbolic structuring. *Bucrania* were probably thus used as instruments to recount and curate household/ancestral narratives. This claim could be further reinforced in the light of the placement of *bucrania* near the oven, especially taking into the account their association with the main supportive beam as attested in houses 1/1957 at Jakovo, 4/ 1975 at Gomolava and 2/2010 at Stubline. Thus the symbolic potency of *bucrania* can be perceived considering their relation with the main structural element of the house. Such a dichotomy points to the perception of the *bucranium* as the most important symbolic precursor enabling life in the house. Further associations of *bucrania* and supportive beams with hearths and ovens delineate these house areas as focal mnemonic loci commemorating house narratives. In the course of the house histories, these areas were the main arenas for establishing and negotiating social and gender identities.

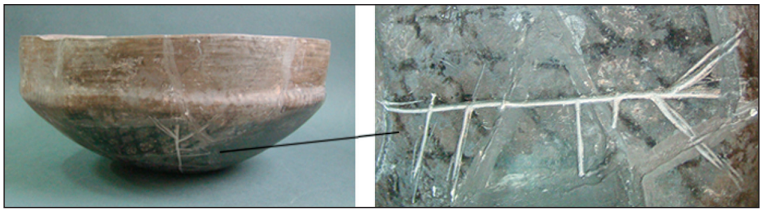

Fig. 16. Bowl with incised schematic representation of bull from Banica.

There is an interesting shift regarding cattle symbolism and *bucrania* in Vinča culture. The number of real clay-plastered cattle skulls with protruding horns decrease in the Late Vinča culture. Instead, entirely clay modelled *bucrania* with less prominent bovine attributes were introduced into household narratives. *Bucrania* became more hybrid, resembling a similar representational shift in anthropomorphic imagery. Except in the case of the *bucranium* from house 1/2008 at Stubline, the change in iconography was not the result of reducing the physical properties of the imagery while retaining its symbolic value. The change was both in physical and symbolic manifestation of representations. Still, the new *bucrania* with ambiguous anthropomorphic, bull-like, deer-like features were employed at the same place and probably in the same way as previous ones. Thus, the change in iconography of the *bucrania* perhaps signals a broader cultural transformation in Vinča culture. Were these perhaps economic or symbolic transformations? However, none of the Late Vinča culture sites has shown a significant decline in domestic cattle numbers, or a shift in orientation towards specific animal species or in the wild/domestic ratio.[12] Thus the change in the representational paradigm of *bucrania* must be explained by addressing other questions besides the change in economy. The question of placing two *bucrania* inside houses at Stubline and Jakovo should also be addressed. This practice is particularly important because two types of *bucrania* are engaged – one with clear bull representations, and the second with the attributes of some hybrid anthropomorphic creatures typical of small clay figurines. Such symbolic structuring of bull and human imagery calls for a reconsideration of symbolic dualism in Vinča culture and both human and non-human *Umwelt* (*sensu Sebeok 1988.66; Willis 1994.10, 11*).

As just sketched above, there are numerous ways to think in terms of bovine/human relationship; as a final excursus, I will briefly aim at two more concepts relating to this issue.

One of the most prominent ways of understanding bovine iconography in Vinča culture is to follow the structuralist approach of Ian Hodder in his seminal books *The Domestication of Europe and Symbols in Action* (*Hodder 1981; 1990*).[13] As in no other Neolithic contexts, we can clearly delineate the concept of opposed structures in Vinča culture: 'inside/outside; domestic/wild; female/male; domus/agrios; human/animal'. To put it simply, if there is symbolic structuring among Vinča culture communities, and there certainly is (at least in the case of material culture), there should be corresponding relations between oppositional structures. Therefore, as inside is opposed to outside, domestic to wild, female to male, domus to agrios, so should notions of inside, domestic, female and domus be somehow connected, as well as outside with wild, male and agrios. There is a strong connection between the house, the domestic sphere and woman, as there is between man, wild and forest in Vinča culture. But in the case of cat-

12 There are some subtle changes, *e.g.*, the number of cattle increases slightly during the 100–200 years of occupation at Opovo (*Russell 1998.50*).

13 Although the domus/agrios thesis has been much debated recently (*cf. Thomas 1991.14; Whittle 2003.93; Russell 2012. 246–247*), despite some shortcomings and limitations, the concept has enormous interpretative potentials and is used here to demonstrate the myriad ways of looking at human-animal relations.

tle in Vinča culture, all supposedly opposed structures are interwoven. Men are in the house, so are the bull *bucrania* and wild bull figurines. On the other hand, cattle *astragali* were used as loom weights (*Blažić, Radmanović 2011*) as well as bull decoration on ceramic vessels as part of the male symbolic repertoire are introduced into the female part of the social arena. Therefore, bovine iconography was probably included in the process of shifting and negotiating social and gender identities among Vinča culture communities. Still, such structuring, especially in terms of spatial house division according to age and gender, has not been observed, at least not in the sense of clearly delineated and restricted house areas (*cf. Borić 2005.62–64, Fig. 20*). Then, as already mentioned, symbolic structuring concerning bovine iconography in Vinča culture is to be sought as a paradigm of both gender and age cohesion, as well as a signal of subtle segregation.

Thinking in terms of actual human/animal relationships offers a far more challenging perspective. I argue that every notion of animal, in our case bovines, whether we are dealing with animals as symbols or animals as food, is deeply embedded in the human perception of the animal world. And, by the animal world, I mean the same world that humans inhabited and shared with other non-humans. Also, I am quite sure that one should not neglect the purely physical, visceral connection and experience that people had with animals, as well as emotions that grew out of that connection. The pain caused by injury during the hunt, the smell of cow dung, the song of the bird, all influenced basic ideas and notions that shaped and transferred animals into powerful symbols in human culture.

At the moment, I can only suggest how cattle became such a strong metaphor in Vinča culture. In case of domesticates, like other tamed animals, they were introduced into the Vinča community, and thus became an inseparable part of Vinča culture. And conversely, in the case of wild cattle, humans commonly enter their world, considerably influencing the life course of wild animals. The importance of cattle in the economy, their value as a food source and bride-wealth linked them with specific gender, age group and temporal events, thus becoming essential in symbolic structuring among Late Neolithic Vinča culture communities.

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BACK TO CONTENTS

Neolithic flat-based pots from the Carnac Mounds in the light of Cycladic 'frying pans'

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ABSTRACT – *A rare type of pottery, found in four single graves under earthen mounds in the Carnac region of Brittany, consists of a circular, flat-based vessel with a near-vertical wall. On the basis of the equipment known from elsewhere in the world, it is possible that the morphology of these dishes is related to processes involved in the production of salt. To help us in exploring their function, we chose to compare these vessels with another enigmatic class of pottery from the Cyclades – the so-called 'frying pans' – which seems to have functioned in a similar way, as an object-sign, and has been found in a maritime milieu and in high-status contexts.*

IZVLEČEK – *V zemljeni gomili v regiji Carnac v Bretaniji smo v štirih posameznih grobovih odkrili nov tip posode, za katero je značilna krožna oblika z ravnim dnom in skoraj navpično steno. Na podlagi predmetov, ki jih poznamo drugje po svetu, sklepamo, da je oblika teh skled povezana s pridobivanjem soli. O njihovi uporabi sklepamo s pomočjo primerjav s t.i. 'ponvami' s Kikladskega otočja, za katere se zdi, da so jih uporabljali v podobne namene, tudi kot predmet-znak in se pojavljajo v obmorskih okoljih ter v kontekstih, povezanih z višjim družbenim slojem.*

KEY WORDS – *frying pan; Castellic; salt*

Observations on an unusual context

We would like to discuss a hypothesis concerning the function of an unusual type of pottery found in the Neolithic of western France: a flat-based circular dish with a near-vertical wall. This pottery type is unknown in the settlements and passage tombs in the region (4200–3500 BC), and is only known from four individual graves under mounds, dating to the preceding period (4600–4200 BC), and also from two contemporary, and regionally-specific 'ceremonial' contexts, associated with standing stones. This cultural context is marked by the development of the Castellic culture. The most famous of these tombs is the Tumulus Saint-Michel at Carnac (Fig. 1), one of the three largest and richest monuments around the northern edge of the Gulf of Morbihan (the others being Mané er Hroëck and Tumiac) which are famous for their polished axe heads of Alpine stone, and for beads and pendants of Iberian variscite. The Tumulus Saint-Michel is also the youngest of these three monuments, being dated fairly precisely to the middle of the 5th millennium BC (*Cassen* et al. *2012*).

A typochronological comparison of the various vessels in question has revealed that there are points of similarity with some other flat-based vessels in

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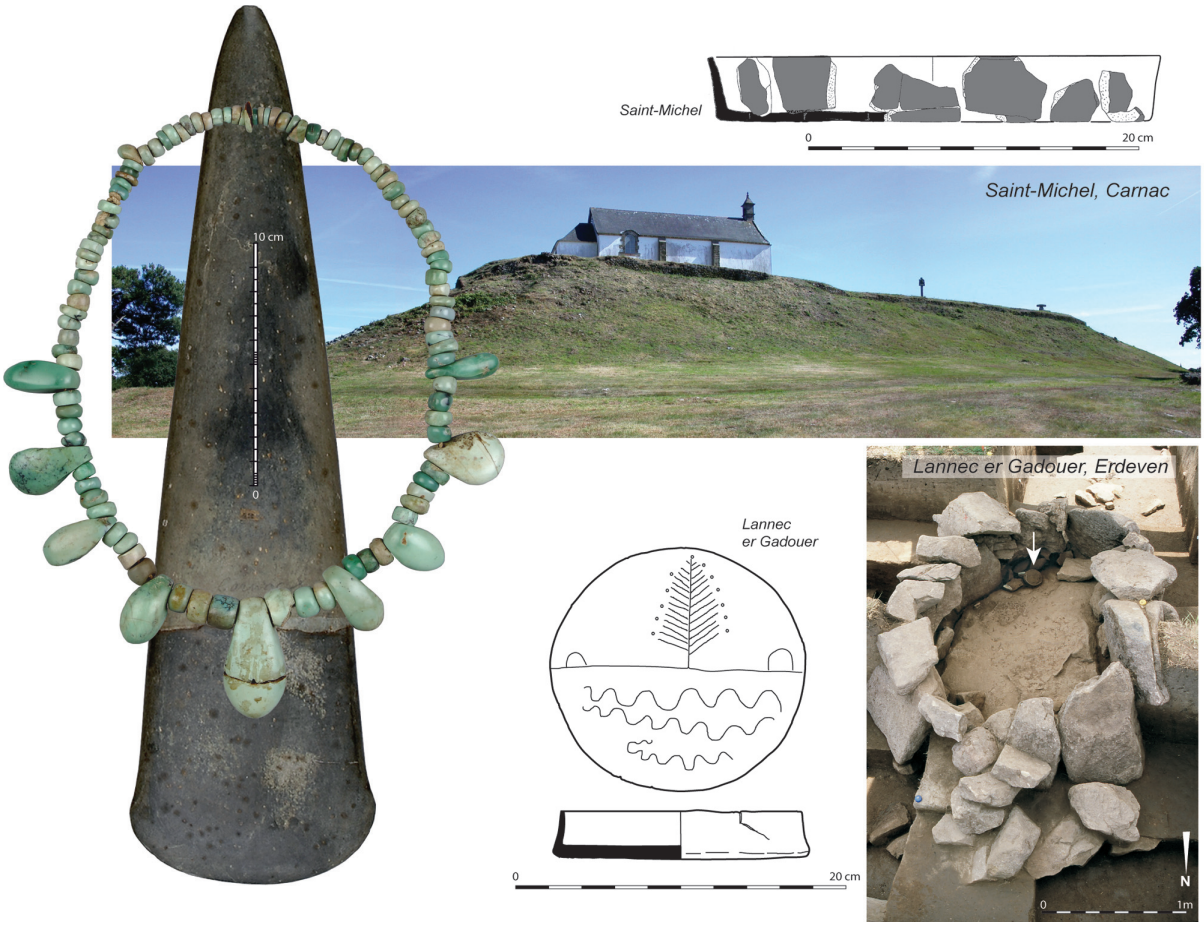

Fig. 1. Two circular Castellic dishes from individual graves under barrows at Saint-Michel (Carnac) and Lannec er Gadouer (Erdeven). The arrow indicates where the dish had been placed, vertically, on the floor slab of the tomb; polished axe head and necklace made from Iberian rock. (Photos: Serge Cassen and Christian Obeltz; drawings: Serge Cassen and Gwenaëlle Hamon.)

western Europe, from Italy to Catalonia, but these have been discussed elsewhere (*Boujot, Cassen 1998*) and we shall not return to them. We are not convinced by the widely-held interpretation of these flat-based vessels as 'lids'; and, bearing in mind the fact that the Carnac mounds contain objects of high social value, we have proposed an alternative function for these vessels. This interprets their particular shape as linked to the production of salt through brine evaporation, since similarly-shaped pots are known to have been used for such a purpose in ancient and modern Mexico, and also in Iron Age contexts in eastern France. Therefore, the hypothesis that the vessels were used in salt production seemed to us to be the most plausible interpretation (for references on this subject, see *Cassen 2000*).

The present article will attempt to clarify the situation by using two different, and geographically discrete, approaches. The first consists of the experimental production of sea salt using two replicas of one of the Carnac dishes, and an investigation of the performance of the dish and the nature of the finished product. The second approach has involved research on similarly-shaped vessels from a context that is comparable both topographically and culturally (*i.e.*, the Early Bronze Age Cyclades); these vessels may have played a role analogous to that of the dishes in the Carnac region. Thus we hope to resolve a contradiction whereby a seemingly utilitarian object was deposited within an exceptional funerary context. Perhaps these pots were associated with a material – salt – whose status was, and remains, ambiguous.

Experimentation

We know that, given the fact that salt occurs naturally in varying concentrations and in various forms (*i.e.*, as brine, salt-rich soils and sands, plants and rocks), people in the past – as today – had recourse to a variety of methods to extract it. We shall not consider the exploitation of rock salt here. Thus,

having gathered, trapped or picked up the raw material, the commonest means of extraction – sometimes after soaking the salt-bearing material in water to dissolve the salt – involves evaporation from a solution, either through natural drying in the sun or through artificial heating, to leave salt crystals. These may then be used in this state, or compacted into hard salt loaves of standard size and weight. In this form it can be stored and transported easily, and exchanged over long distances.

The use of fire to effect evaporation is the commonest method, irrespective of whether marine or territorial brines are involved. Heating concentrates the salt in the brine, and a variety of structures have been used for this purpose, ranging in size from small to large, some being set in the ground and others above ground, and ranging from a simple large hearth to smaller heaters and simple hotplates. Most of the methods involve the use of a container for the brine, of various materials (bark, fired clay, stone, lead, tin), and the use of moveable supports (of fired clay, stone, cast iron *etc.*) to raise these containers above the source of the heat. The shape of the brine containers is virtually universal (Fig. 2): the containers are designed to allow the largest possible surface area to be heated, whether in the form of a horizontal vessel (like a frying pan), or as a vertical truncated cone.

As far as ceramic containers (also known as briquetage) are concerned, a differentiation can be made between those that are used to heat the brine to the point of crystallisation, to produce a moist paste that can be moulded in other containers, and those that are used both to boil the brine and to mould the crystallised salt into a cake of fixed volume that is compact and easy to transport. The latter are usually used only once, since the cake of salt needs to be extracted by breaking open the vessel after the long process of gentle heating. However, examples are known where the salt is transported while still in ceramic containers, as in the Philippines (*Yankowski 2007; 2010*).

In order to test the possibility that the dishes with near-vertical walls from the Carnac chambers could have been used in a similar manner – not only for boiling brine to crystallise salt, but also for creating hard, easily transportable cakes of dry, non-hygroscopic salt – an experiment was carried out in summer 2011 at the museum at Carnac by Cyrille Chaigneau, Pierre Gouletquer, Gwenaëlle Hamon, Chloé Martin and Emmanuelle Vigier. Two facsimile dishes were made by a potter (J. Colivet). The original vessel from the chamber under the Tumulus Saint-Michel is circular in plan, with a diameter of 30.4cm and a wall thickness of 5mm. The diameter of the facsimiles is 31.4cm; their wall, slightly concave and with a squared-off rim, stands 5cm high and is 7–8mm thick, narrowing to 4mm near the rim. As was the case with the original vessels (*Hamon 2000*), the facsimiles were fired in a reducing atmosphere. Brine from the marshes between la Trinité-sur-Mer and Carnac was transported to the museum; this had a relatively low salt content (at a concentration of 10° Baumé rather than 20°, *i.e.*, 106g/l). In order to save time, sea salt was added to this brine to bring it to the desired concentration (around 350g/l, enough for a raw egg to float on the surface of the liquid).

One replica dish was filled with this brine and placed in a heating chamber constructed from earth

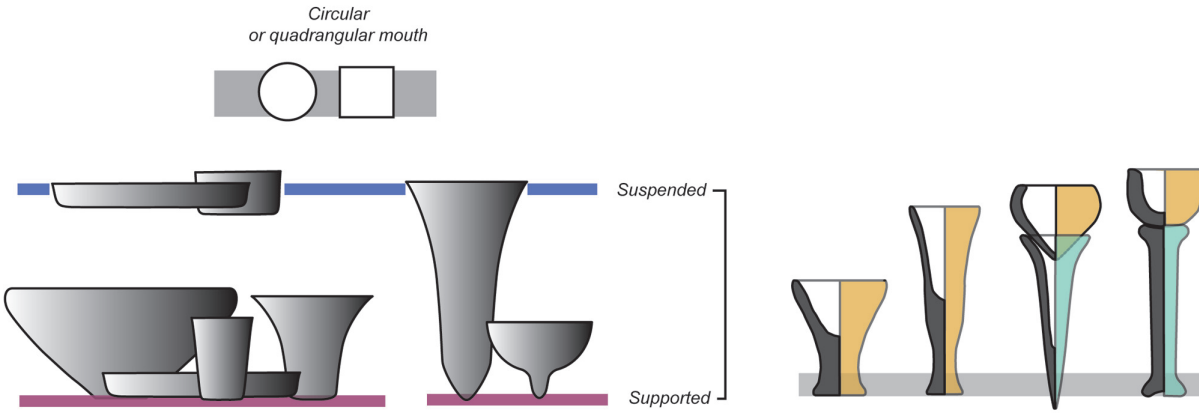

Fig. 2. Vessels used for heating brine and/or crystallising salt, and their position with respect to a source of heat. Left: examples from various late prehistoric contexts in Europe; right: arranged according to the morpho-technical evolution of Iron Age salt-production vessels as proposed by D. Kleinmann in 1975 for the Saale Valley in Germany. (Drawing: Serge Cassen.)

and stones, some 40cm wide, 50cm deep and 30cm high (Fig. 3). The vessel was suspended above the burning embers from a wattle-work structure around 20cm high. It was decided that it would be preferable to heat the brine using the radiant heat from the embers, rather than subjecting the vessel to the direct heat of flames. After 1 hour 25 minutes, a thick whitish crust formed. It should be noted that the time taken for this to occur could have been considerably shortened had the heating taken place in a closed environment. This crust was crumbly, taking the form of a semi-liquid paste when wetted.

A second experiment involved heating the salt paste gathered from the base of the first vessel in which the brine had been boiled. In order to facilitate removal from the mould, the interior of the base and wall was first coated with beeswax. The semi-liquid salt paste was then placed in the vessel and firmly tamped down by hand. The residual water that appeared on the surface was removed. The layer of salt paste attained a thickness of around 2.5cm. In order to accelerate the heating process, the structure used for heating was covered with a slab of local granite. The vessel was propped up on two stones, which raised it several centimetres above the embers. The process of solidification was very rapid, taking only 25 minutes. After removal, a perfectly hard disc of salt (weight 950g), 29cm across and around 2.5cm thick, was obtained (Fig. 3). The vessel had withstood the process well, although small irregular hollows had formed on the surfaces, a phenomenon also noted on pottery dating to the final La Tène period (*Daire 2003*).

The results of these experiments demonstrated that the disc-shaped vessels with near-vertical walls found in the Carnac mound chambers could have been heated and used to boil brine in the same manner as their ethnographic counterparts. This is not surprising, although it does not prove that the pots were actually used for this purpose. However, the rapid formation of a crust of salt from the evaporation process, and its rapid transformation into a solid cake of salt following a second heating, did demonstrate the advantages of having a large surface area exposed to heat. This use of a broad-based vessel contrasts with the use of a vertical vessel, or one with taller walls, for carrying out the evaporation; with such pots, the height of the brine is reduced to one quarter during the process. The solid cake of salt produced using those containers is discussed further below, when considering discs of salt known from Mesoamerica and China.

Fig. 3. 1–2 Experimental heating of marine brine in the replica of the Castellic dish from the Saint-Michel tumulus. (Photos: Serge Cassen and Emmanuel Vigier, Musée de Carnac, 2011.) 3 The solid disc of salt after removal from the dish. 4 The glyph for iztatl, salt in the classic Nahuatl language (Kingsborough I 84 Codex Mendoza) and a Pre-Hispanic pot from Sayula (Mexico) used for heating brine (after* Liot 2000*).

The Carnac vessels in the light of the 'frying pans' of the Aegean

Let us return to the Neolithic vessels. Their rarity, in contrast with the concept of briquetage (which is synonymous with the presence of large amounts of broken pottery), their incongruous presence among exceptional grave goods, and the fact that they are the only kind of ceramic object present in these graves do not a priori militate in favour of the idea that these vessels were the equipment of a specialist salt maker. Indeed, in our past publications concerning these vessels, we argued that, in the absence of obvious traces of salt and bearing in mind the change in sea level (whereby their find spots were further from the shore than they are now), they were unlikely to have been used for salt extraction. Now, however, we wish to pursue a radically different and more positive line of enquiry, by looking far outside the region. There exists a rare type of object in the archaeology of the Cyclades whose find circumstances and enigmatic function offer us an analogy with the Carnac vessels; by studying these, we hope in return to shed new light on the Morbihannais objects.

It was over the course of the Early Cycladic I and II periods (between 2800 and 2300 BC) that an unusual ceramic object appeared in rich graves and also in several settlements (where they are found in fragmentary form), although with the latter, since many were found a long time ago, their find circumstances were not always well recorded. Commonly known as 'frying pans' by the first commentators, it seemed that their function was to be sought by comparing them with baking plates, although archaeologists did not seriously propose that they had been used in such a way. The object consists of a circular, flat-based vessel with low walls, standing 3–5cm tall and with an average diameter ranging between 20 and 28cm. The flat (and occasionally convex) base is decorated on its exterior with incised or impressed designs, infilled with a white substance to make them stand out against the dark background. The presence of a quadrangular or bifid handle has allowed archaeologists to formulate various typological classifications, which also take account of variability in the largely spiral decoration (Fig. 4).

Over a hundred complete examples have been catalogued (*Coleman 1985*), but in comparison with the overall amount of pottery known from this period, this is a small number. The distribution is essentially insular, but fragments of several have been found on the mainland (in Attica, Boeotia *etc.*, and also in western Turkey); these are locally-made versions of Cycladic examples. A few examples were made from marble, and two imitations in bronze have been found at Alaca Hüyük in central Anatolia (*Davis 1992*). Two platters found in Crete are Cycladic imports.

Ever since their initial discovery, archaeologists and historians have been intrigued by the rich decoration and unique morphology of these objects and have sought to understand their function.

Although the normative term 'frying pan' is used without implying that this was the function of these objects, the fact that several (undecorated) fragments have been found in domestic contexts in the Aegean (at Agios Kosmas, Naxos and Manika) has nevertheless encouraged the idea that they could have been used for such a purpose (*Coleman 1985*). The surviving surfaces show no sign of scorching or burning, however. It has been assumed that they were used for the serving or consumption of food, perhaps in liquid form.

However, the practical use of the object seems to have been linked to a material that was sufficiently unusual to warrant its use as an 'object-sign' in individual tombs, and not just any tombs, but only the richest examples (*e.g.* only 32 out of the 600 excavated by C. Tsountas in 1899 on Syros). In these tombs, the objects accompany the famous marble figurines, obsidian blades and jewellery of precious metal (gold and silver). As for the other ceramic grave goods, none resembles the cooking equipment or everyday containers that are found in settlements.

The funerary context has allowed to suggest that these vessels, which are so well made and decorated on their exterior flat surface, could have served as a mirror, analogous to examples known in metal (*Tsountas 1899; Mellink 1956*). They could function as such with the addition of a thin layer of a liquid (water, wine, olive oil) on one side, creating a reflective surface. The facts that the decoration is only on the exterior and that the objects have been found close to the head of the deceased offer support for this suggestion. And if their colour seems to be too light – a characteristic that would hinder the optico-physical phenomenon of reflectance – experiments have shown that the addition of a liquid would have darkened the surface and corrected this 'fault' (*Papathanassoglou, Geogouli 2009*). Prior to the publication of the result of that experiment, Coleman

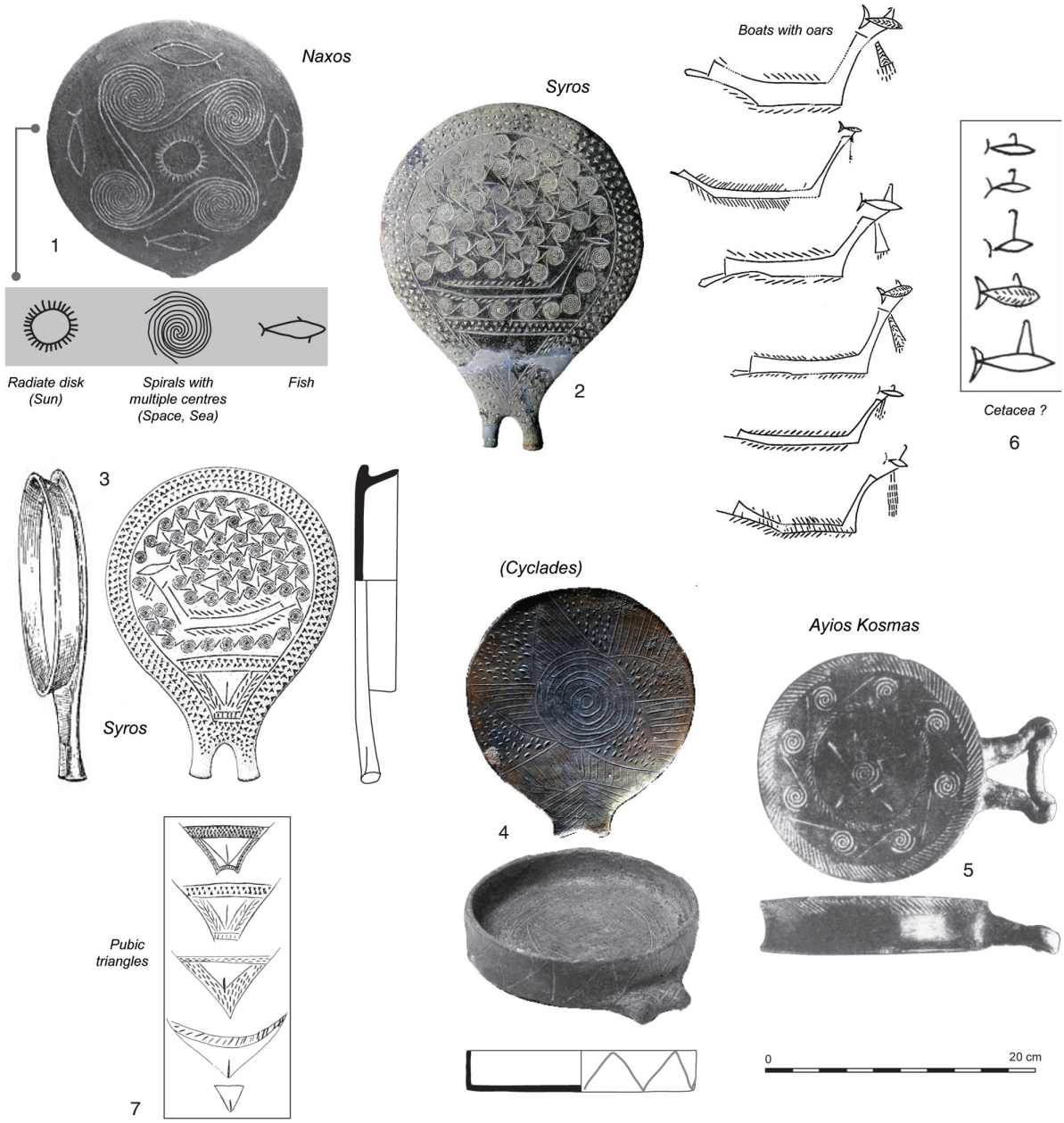

Fig. 4. Cycladic 'frying pans' (with indicative scale). 1 Naxos (after* Coleman 1985.Cat. No. 37*). 2 Syros (after* Coleman 1985.Cat. No. 18*). 3 Syros (after* Tsountas 1899*; section after* Rumpel 2010*). 4 Unknown provenance, Museum of Cycladic Art (Foundation Goulandris, No. 99). 5 Ayios Kosmas (after* Coleman 1985.Cat. No. 79*). Details on the engraved and impressed designs: 3 representation of the sea; 6 representations of high-prowed boats with lateral oars, with (in box) representations of 'fish'; 7 representation of a female pubic triangle at the upper end of various objects (after* Coleman 1985*).

had not been convinced by the 'mirror' hypothesis, regarding the objects as having poor reflecting capability. Consequently, he rejected the whole idea of the use of cosmetics and beauty products as part of mortuary rites. The experimental images obtained by Papathanassoglou and Geogouli do, however, show excellent reflectance under certain conditions. Furthermore, we should bear in mind that the primary purpose of the mirror might not have been to create a faithful image. The reflecting powers of mirrors have been used in numerous kinds of divination, and in effecting a passage to the otherworld. In Ancient Greece, it was deemed to be a premonition of death if one dreamed of seeing one's reflection in water (Artemidore of Ephesus, The Key to Dreams; *Fraser 1911.538*). The fact that the Cycladic examples were imitated in bronze in Anatolia – a region where metal mirrors are also known – does not in fact support the 'Mirror' interpretation. If it were necessary to polish the interior surface of the ceramic

version in order to affect reflectance, then why did these objects have a wall around their edge, which would hinder the process of polishing the surface?

Less plausible interpretations of these objects have been proposed, with some having suggested that these objects were used as instruments of navigation (*i.e.*, as an astrolabe – a poorly-founded hypothesis by *Faucounau 1978*); others have argued that they were tambourines; and Rumpel (*2010*) has proposed that they are representations of a tsunami, an unlikely interpretation, notwithstanding the fact that tsunamis feature in the mythology of the area. The 'lid' interpretation was suggested by Treuil (*1983*), but no connection with any other vessel has been found in any tomb, and besides, the diameters of the 'frying pans' is far greater than that of the vessels in use. Dugas' (*1925*) idea that they were incense/perfume burners is not supported by any traces of heating on the vessels, and their morphology does not resemble that of known incense/perfume burners from archaeological or ethnological contexts. However, the presence of a quadrangular, footed 'grill', found beside an undecorated 'frying pan' and matching it in size (*Sparkes 1962.129, Pl. V*) suggests that some kind of heating was involved in the use of these vessels; but the 'grill' is reminiscent of Iron Age objects from eastern France that were suspended, or set on a flat surface, and were used in producing salt (*Rouzeau 2002*). Similar objects are known from a middle Lengyel context at Barycz in Poland, used in extracting salt (*Jodłowski 1977; Weller 2012*). This analogy could have operated in the sense that the Cycladic objects were representations (perhaps in miniature) of such objects. The fact that the use of a grill indicates that the vessel was not in direct contact with the heat source is pertinent to the idea that these vessels were used to form salt loaves.

It is the final hypothesis – *i.e.* the suggestion that these vessels were used to shape loaves of salt (*Doumas 1993*) – that has encouraged us to seek a similar interpretation for the dishes from the Morbihan, although we ignored it when one of us initially started to think about the Cycladic objects. The visual correspondence between the Cycladic and Breton vessels is matched, to a certain extent, by the decoration used (although the decoration on the Cycladic vessels needs to be more fully described).

Let us remind ourselves of the arguments used by Christos Doumas in 1993. The form of the Cycladic vessels seemed to him to have been determined by the need to contain a liquid. The engraved and inlaid decoration, featuring the sun, the sea and a white substance, could have evoked the evaporation of sea salt using the heat of the sun. The salt would have crystallised in the vessels, and then been turned out by inverting the vessels without breaking them. The standard-sized cake thus produced would have been ideal for transportation, being stackable. The boats shown on the vessels could have been the means of transport and would have indicated trading and the accumulation of wealth consequent on this trade; the salt would have been used in inland locations for salting meat or other produce and adding to cheese. The salt cakes could indeed have been used as a form of currency. Thus, the 'frying pans' found in the tombs could have been a symbolic representation of wealth based on the extraction of sea salt, and not simply utilitarian vessels. Although this hypothesis has not been fully substantiated, the general argument seems to us to make sense; let us examine aspects of the proposition in more detail.

Five decorative motifs have been listed (*Coleman 1985*), four of which are found on the flat surface, while the fifth is always found on the bifid type of handle (Fig. 4). These motifs are as follows:

- A central, 'solar' motif, featuring a disc with projecting rays or triangular, star-like limbs;

- A spiral sign, with either one or multiple centres, which can be repeated over the surface, often articulating with a neighbouring spiral. In the opinion of some researchers (*Broodbank 2000*), this could represent waves of the sea;

- A boat, clearly asymmetrical, with a prow and stern. No sail or crew is shown, but there are lateral oars;

- A 'fish', 'attached' to the prow and shown in a vertical position as if leaping from the water. This fish has short fins, but the first of these is often accompanied by a large loop above the body, either open or closed. In our opinion, this could represent the spume of a cetacean (dolphin *etc.*), rather than an immense dorsal fin;

- An incised triangle, at the distal end of the handle, formed of two short juxtaposed lines. An identical motif has been used to indicate the sex of female stone statuettes and allows us to conclude that the motif on these vessels represents the pubic triangle.

The 'sun' and 'sea' are the most common motifs, while the 'fish' and 'boat' motifs are less common; and of the twenty boat motifs that have been catalogued, ten come from the island of Syros, which appears to have been the epicentre of the use of these 'frying pans'. On this island, many pots bear the 'pubic triangle' motif on their base.

What can we deduce from these various observations?

● The radiating sun motif is always placed in the centre of the dish.

● Waves, albeit shown in stylised form, do seem to be what the spirals denote, and the presence of the 'fish' and 'boat' motifs accord with this interpretation.

● Thus, the unknown product that these 'frying pans' contained ought to be linked directly to the sun and the sea.

At the point where the two handles ('legs') converge (*Coleman 1985.196*), the pubic region thus clearly demarcated provides an orientation for the dish and accords with its circular form. The morphology is not strictly anthropomorphic – a representation of neither arms nor head, only (perhaps) a stomach – but it encapsulates, in this sex-specific figure, the marine world and may represent a fertile 'goddess' (*Zietschmann 1935*).

How are we to unite these sets of facts and images? We shall shortly see how Doumas approached this question; meanwhile, the following convergence can be perceived between the form of the vessels in question and the representations engraved on their outer surface:

● The form of the vessels is known elsewhere in the world among equipment used to heat brine or to mould damp salt into solid forms;

● The presence of a representation of the primordial natural elements of the Mediterranean (*e.g.*, sea and sun) relates to a highly symbolic material that passes from liquid form to solid. (In Greek, the same term, with only minor differences, is used for salt and the sea: *Kopaka, Chaniotakis 2003*);

● The presence of another, explicitly feminine representation which emphasises the pubic region and stomach (or the umbilicus), brings to mind the many ethnographic examples where salt is associated with the female sex. Salt is a Janus-like material which lends itself to the drawing of all the oppositions and mediations that relate to people, animals and things. Salt allows one to imagine ancient disjunctions and order the world according to its properties (*Ivanoff 1993b*). The current portrayal of New Guinea men as virile warriors is expressed by means of a salt-based symbolism (*Coiffier 1993*). Among the Nyakyusa, salt and sperm are conceptually indistinguishable as the crystallised material that is introduced into the vulvas of women to ensure their fertility (*Maertens 1978.60*). In Bolivia, the brine spring of the Chimane is covered in multiple engravings of vulvas, from which the precious amniotic liquid that lies at the origin of salt flows (*Daillant 2008*). And in France, around the Châtillon-sur-Seine region (Burgundy), menstruating women are described as being 'salty' (*Testart 1991.43*). Among the Moken, salty water is believed to effect pregnancy and the birth of a marine mammal, since it brings life and acts as a woman in creating a being that is half-marine, half-terrestrial (*Ivanoff 1993a.317*). In the Manche region of France, when the first contractions of childbirth occur, a woman would traditionally hold grains of salt in her hands, and would have to strew it (*Duclos, Morice 1984.56*). In the Algerian massif of Zakkar, a pinch of salt is placed on the umbilicus of the newly-born (*Servier 1972*). Finally, on the coasts of Thailand, the Brine Woman is a being who gives the sea its saltiness (*Le Roux 1993*).

The representations found on 'frying pans' would therefore seem to be consistent with this coherent suite of imagery, and to accord with the idea that these vessels were directly associated with the production of salt. In this regard, we should recall the discovery of sea salt inside a vessel in the cave called Tis Ouranias to Froudi (Zakros, Crete, 1 kilometre from the sea; *Kopaka, Chaniotakis 2003*). Here, the vessel is represented by a fragment of a flat circular base; its wall had broken off. It belongs to the Minoan Bronze age (1900–1600 BC). Given the absence of its wall, it is difficult to be certain, but this vessel appears to resemble the dishes with near- vertical walls that are the subject of this contribution.

In view of Doumas' (*1993*) interpretation of the use of the Cycladic vessels, where he sees them as containers for brine that would be evaporated by the heat of the sun, there is a striking resemblance to the circular basins that are still used for the same purpose on the shores of the Magne peninsula in the southern Peloponnese (Fig. 5; *Saïtas, Zarkia 2001*).

Elsewhere, the Greek place-name Tigani means 'frying pan'. These basins in the rock held brine that had previously been concentrated in trenches on the rocky shore, and are divided into compartments of varying shallowness in order to control the gradation in salinity from brine to crystallised salt. Furthermore, we should draw attention to what may be a representation of such basins on a unique marble vessel that exactly copies ceramic 'frying pans' in shape (except in lacking a handle) and was contemporary with them. This 'Dove vessel' (Fig. 5), probably from Dhaskalio (Kavos), had been deliberately broken and had a row of doves carved on its base; these doves divided the base in two (*Getz-Gentle 1996*). We should recall the extent to which doves are drawn to salt springs (*Morin 2002.156*); consequently, the association of these seemingly disparate elements (*e.g.*, salt and doves) could have been part of a symbolic system.

Let us return to the pre-Cycladic vessels and to their morphology, focusing now on the other family of 'frying pans', whose handle is quadrilateral rather than bifid. (Incidentally, with both quadrilateral and bifid versions, the 'handle' is more decorative than functional, and is an evocation of the actual handles that would have been present on real versions of the vessels). Regarding these quadrilateral handles – which in reality consist of two short 'legs' linked by a bar, or else are a single 'leg' of the same size – Machteld J. Mellink perceptively remarked that their formal variability suggests that they are copies of a wooden version, most probably a bunch of withies that were wrapped around the disc then twisted and attached at one end, serving both as a wrapping for the disc and as a handle (*Mellink 1956*). It should be added that several of these vessels have concave walls (*Coleman 1985*), unlike those of the vessels with bifid handles; this reproduces exactly the effect of compression under torsion. In short, the form of these vessels is more evocative of a flexible, organic container than of a ceramic vessel. In this regard, we can see the Cycladic vessels in a new light by citing one of several ethnographic instances where bark containers have been used, as among the Mangyan of the Philippines, to heat brine and crystallise salt (*Postma 1977*).

We therefore see that Doumas' hypothesis gaining in plausibility, although we cannot test it against original utensils – of which the ceramic versions are representations – since none of these is known to exist. It would be useful to undertake chemical composition of the ceramic dishes, focusing on the chlorine and bromine concentrations (through X-ray fluorescence analysis, for example); this analysis should be undertaken not only on vessels found in funerary contexts, but also on those found in settlements.[1] If these dishes were indeed used to produce salt, then additional confirmation comes

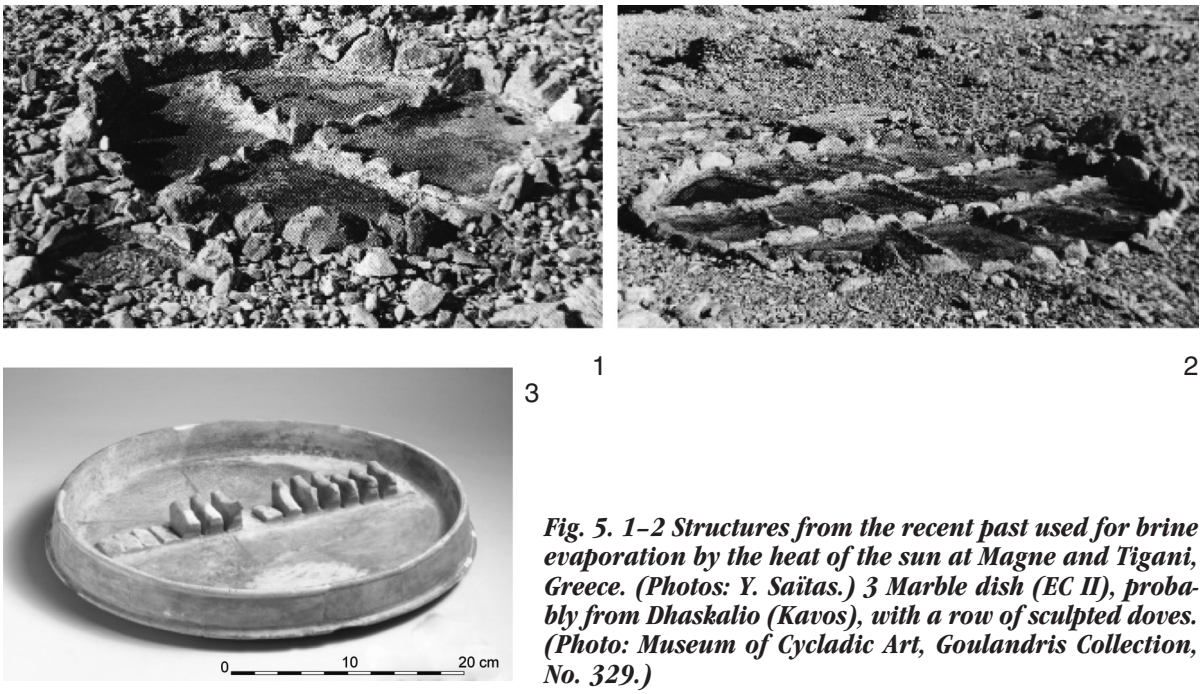

Fig. 5. 1–2 Structures from the recent past used for brine evaporation by the heat of the sun at Magne and Tigani, Greece. (Photos: Y. Saïtas.) 3 Marble dish (EC II), probably from Dhaskalio (Kavos), with a row of sculpted doves. (Photo: Museum of Cycladic Art, Goulandris Collection, No. 329.)

1 An initial analysis would seem to have been carried out on the dishes from the tombs at Manika (Euboea). The results have not been published or commented upon, other than to suggest that they may have been contaminated by marine sand that had been placed on the floor of the tomb, as a layer upon which the deceased rested (*Aloupi* et al. *2001.53*).

from the fact that the Linear B ideogram for salt takes the form of a disc with dots on it (*Kopaka, Chaniotakis 2003.63*). This is strikingly similar to the Mexican nahuatl glyph, which consists of two concentric circles, with the inner circle covered with dots (Kingsborough I 84, Codex Mendoza). Without doubt, this is the glyph for iztatl, salt (*Siméon 1885; Karttunen 1983; Wimmer 2006*). We do not know if these two identical signs relate to similar procedures in the past, but for the moment the fact that they are so similar is of note (Fig. 3).

Having reviewed the evidence for the Early Bronze age 'frying pans' of the Aegean, what may we conclude about the famous dishes found in the four tombs in the Carnac region? Does it help us to determine whether they were used in the production of salt, as we have proposed? Let us return to the inventory of facts and ideas that we have compiled; let us evaluate how our hypothesis might be viewed by archaeologists, in the absence of proof; and let us try to avoid circular argument:

● The Carnac region and the Cyclades are both excellent examples of marine environments. The former lies in a 'Little Sea' (Mor Bihan in Breton) which, since the 6th millennium BC, has provided a remarkable sheltered space. The latter, during the 3rd millennium, is a sea united by an exceptional constellation of islands. In both cases, the conditions existed for maritime communication.

● In these two regions, the vessels in question consist of fired clay dishes with low, near-vertical walls. They are similar in diameter, and in neither case is it easy to find counterparts among the utilitarian pottery that was made. In Greece, the examples of these vessels that have been found in settlements are fragmentary and undecorated, while in the Morbihan they are totally absent from domestic assemblages. In the latter region, fragments have been found in association with the megalithic complexes of symbolic architecture (at the stone alignment of the Grand Menhir and at the enclosures of Er Lannic; *Cassen, François 2009*).

● This uniqueness of the vessels, and their unusual morphology, has hampered attempts to identify their function in both regions.

● A feature common to both regions is the fact that the vessels have been found in tombs, and this sets them apart from everyday pottery. Moreover, the tombs in question contain rare grave goods. With the Aegean examples, archaeologists have suggested that these represent wealth amassed from marine resources or from maritime trading (*Blackman 2002*), while for the Morbihan, the idea of a thalassocracy has been suggested (*Jullian 1908.492*).

● The distinction drawn in the Aegean between straight-walled dishes and concave-walled dishes also applies to the Morbihannais examples, in spite of the small number of vessels involved, with just a single example of a concave-walled dish known from a tomb in the Carnac region (*Closmadeuc 1865.Pl. V*).

● There is also similarity in the positioning of these dishes in the tombs in both areas, with the Aegean 'frying pans' having been deposited upright on their edge, resting against the wall of the tomb (at Manika and Haghios Kosmas; *Sampson 1987.22; Mylonas 1934.273*), while the one complete specimen of the four found in the tombs around Carnac was also found in a vertical position, resting on the side wall of the grave (*Boujot, Cassen 2000*).

● The decoration on the dishes in the two regions, which intimately links the shape of the flat dish to the motifs inscribed on the surface, underlines the symbolic character of these vessels, and qualifies them as 'object-signs'. Viewed in this way, we can return to the interpretation of the wavy lines found on the dish found in the Lannec er Gadouer (Erdeven) barrow. These were initially interpreted as representations of snakes moving around in the Underworld (*Cassen 2000*). However, an alternative reading is now possible, whereby they are seen as waves of the sea. This was considered when the vessel was first published, but we did not accept the idea at the time, since one end of one of the wavy lines rises up vertically, like a snake's head, and because genuine serpent designs have been found engraved on standing stones (at Manio 2 and Gavrinis). If we accept the 'waves' interpretation, however, this would provide a direct link between the dish and the world of the sea, thereby reinforcing the importance of marine imagery in the Morbihan.

Of course, it is a delicate matter to use evidence from Greece – itself not definitive proven to support an archaeological hypothesis about the Morbihan, especially when the two examples date to different periods of prehistory. However, it would be foolish to ignore evidence of certain common traits relating to technical know-how and to the world of symbolic imagery in two societies that were focused on the sea. To complete our study, let us consider and discuss

the two principal objections that could be raised to our hypothesis, in the context of the Morbihan.

If these dishes were equipment used for the evaporation of brine and/or for the shaping of salt loaves during the 5th millennium, then where are the traces (*e.g.*, in the form of sherds, at the very least) of this activity? The example cited above of the use of flat containers of bark for heating sea brine among the Mangyan offers a possible answer to the question of the missing briquetage: there may not have been any in the first place. The same is true for the process of evaporation using the heat of the sun in split and hollowed tree trunks, as attested in Mexico and the Philippines (*Williams 1999; Yano 1994*). Whatever the case, the consistent positioning of the salt processing workshops on the high point of the beach in the Philippines means that, if the activity had been similarly located in the Morbihan, then all traces of it would have been destroyed by the 3–5 metre rise in sea level since the 5th millennium that we know to have occurred in the west of France. Similarly, if people had used the kind of basins and hollows in the rock that we have seen in the Aegean for the evaporation of marine brine through the heat of the sun, then these would be very hard to spot under the sea, being eroded or covered by sand and other material.

If these dishes were used as utilitarian containers for specialist salt extraction, and as such, were disposable vessels with a short use life, then why deposit them in exceptionally rich tombs, alongside axe heads and jewellery of Alpine (Jade) and Iberian (variscite) rock, exotic and rare materials brought from long distances? This enigma is harder to resolve, and applies as much to whatever the dishes may have contained as to the vessels themselves. The fact that one such dish, from the tumulus Saint-Michel at Carnac and black in colour, had been burnished to a brilliant sheen does not bring us closer to proving that it was used for salt extraction: as a rare type of object that demonstrates the skill of the potter and has an intrinsic quality (be it acoustic or visual), it could have been accorded a special value by virtue of these characteristics, indicating that it was distinctive and desirable and hence worthy of inclusion among a rich assemblage of grave goods. This type of argument has been used to account for the exceptional pottery of the Serra d'Alto culture in Italy, which could have occupied an equivalent special position in the politics and religion of its users to that of the large polished axe heads of Alpine jade found to the north and west of the Alps (*Pétrequin* et al. *2011*). In the Morbihan region, we may well be dealing with a case where it is the contents of the vessels, and not necessarily the vessels themselves, which were the marker of high status and the source of the vessels' power. It would be difficult to argue that the dishes contained cheese or honey, given that at least one such dish was deposited in an upright position, and that no other ceramic containers of foodstuffs were included among the grave goods in these tombs. If our preferred interpretation is that these dishes contained salt, it is not because salt would have been an ingredient in cooking, but rather because this material possessed cognitive power which could, under certain circumstances, be revealed. In other words, it was a special substance, bringing to mind Marco Polo's (*1289. Book 2, Ch. 38*) description of the disc-shaped cakes of salt, each around a kilogramme in weight, that were used in 13th century China. These cakes had no value unless marked by the Emperor's seal; thus marked, they became sacred objects, used in commercial transactions and as bridewealth. It would, however, be very difficult to identify these salt cakes in an archaeological context. To argue that this was the case with the dishes found in these Neolithic tombs consequently poses the difficult question of the status of salt, a substance that could have been traded as well as exchanged in ceremonial transactions. Even if we cannot envisage salt as a precious treasure in the same league as the jade axe heads with their complex biographies, we can nevertheless argue that, given its ambivalent qualities, salt could have been a sign of wealth in the Morbihan region, wealth that was controlled both by sea and on the land.

Conclusions

Although salt can be used to preserve food, to improve lactation in domestic animals and as a nutritional supplement for those who rely for their subsistence on cereals, which have low mineral salt content, it is in fact a phenomenon in the full sense of the term, insofar as its production involves a transformation from a liquid to a solid state, and the dissolution of crystals. A mediator par excellence, salt is both a corrupter and preservative, and it lies at the heart of the process of differentiating the undifferentiated, and of the passage between worlds. We can see this in the fact that in many societies around the world, salt plays a unifying role in major life events, just as it is believed to have done at the beginning of time (*Van Gennep 1943*). Its capacity to be divided without losing any of its value, to last over the long term, and to be irreplaceable as a

Fig. 6. The beach at Petit Rohu, at Saint-Pierre-Quiberon (Morbihan). The peat under the sand is scored by criss-cross ard-marks. The four axe heads of Alpine jadeitite were found a few metres away. (Photos and drawing: Serge Cassen and Hervé Neveu-Derotrie.)

substance, has long conferred on salt a special place in various spheres, the domestic, technical, socio-economic and symbolic. A source of wealth, salt (or rather control of its production and circulation) cannot fail to be considered as a factor in the emergence of marked social inequalities among the inhabitants of the southern coast of Brittany from the 5th millennium (*Boujot, Cassen 1992.208; Gouletquer, Weller 2002*). In this regard, we should recall the remarkable and only recently-discovered, evidence for the production of salt loaves at Solnitsata-Provadia (Bulgaria), situated less than 50km from the rich graves at Varna (*Nikolov 2008; Weller 2012*). More specifically, we can imagine that salt had a role to play alongside the rare objects and rare materials which were deposited, accumulated and sacrificed as part of the ceremonies involved in the interment of exceptional individuals.

The form of the ceramic vessels from the tombs under mounds at Carnac, Erdeven and Locmariaquer is a circular dish with low, near-vertical wall; no parallel for such a vessel has yet been found in the contemporary domestic ceramic assemblages of the region. It seems plausible to us – on the basis of numerous societies around the world – that its morphology was dictated by its use in the *chaînes opératoires* involved in the production of salt, even though we cannot say that these dishes were used in the evaporation of brine or in the moulding of salt paste into loaves (or both). Similarly, we cannot be certain that the semiotic function of these dishes was symbolic or evocative of salt production. To help us decide how these dishes were used and what their significance was, we chose to compare them to another enigmatic vessel form – the 'frying pan' of the Early Bronze Age Cyclades, which seems to have functioned in a similar manner as an 'object-sign' in a maritime milieu and in a high-status social context. At either end of these two geographical extremes, the former presence of salt is felt, even if we do not have direct evidence for it in the Morbihan.

It would be difficult to pursue our enquiry any further in the west of France, especially since the Carnac region has seen a rise in sea level such that the tombs in which the dishes have been found would originally have stood some 2km to 3km further inland than they are now. Nevertheless, we now know that we need to look for the following:

● One of the commonest methods used elsewhere in the world consists of raking the topmost layers of sand on the shore, to 'wash' them in filtration trenches, then collect the concentrated liquid and heat it in order to crystallise the salt. The process of raking the sand (or sandy sediment) would have been effected using a rake or, at a more intensive level, using an ard (at present in the Philippines, or during the Middle Ages until the 18th century in Normandy, France). Indeed, criss-cross ard-marks have been revealed under the beach at Petit-Rohu, 5km from Carnac (Fig. 6; *Cassen* et al. *2010*), ard-marks on peat in a marshy location (which would also have been marshy during the 5th millennium). These latter marks are incompatible with cereal agriculture. This beach at Petit-Rohu is where four identical axe heads of Alpine jadeitite were deposited in pairs, identical to those found deposited together, and upright, in the chamber at the tumulus Saint-Michel.

● Trenches are associated with salt production are often found in pairs, with one used for filtration and the other as a reservoir. Their walls were often lined to make them watertight, an important characteristic that facilitates their identification. The enclosure at Sandun, 200m from the shore of the ancient marine inlet at Brière (today, silted up), possesses a set of twinned, parallel trenches set behind ditches and palisades. The paired trenches have vertical walls, made watertight by being lined with clay. These features are excellent candidates for a radical reinterpretation of this complex as a centre of salt production (*Cassen 2000; Cassen* et al. *2008*).

The objective of this archaeology of 5th millennium sea salt production consists of imagining the process, shifting our perspective and perhaps then finding elements that attest to the process of crystallisation: in other words, in revealing specific locations where the process took place, and in bringing to light, and to our memories, the everyday containers used for evaporating brine and moulding salt paste.

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BACK TO CONTENTS

Houses, pots and food: the pottery from Maharski prekop in context

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ABSTRACT – *In this paper, we attempt a multiscalar analysis of the Maharski prekop archaeological site, connecting the landscape context, temporal dynamics, and spatial organisation with the composition of the artefact assemblage, the shapes, sizes and technological composition of the pottery, and traces of activities in the form of food residues on pottery. The pottery assemblage from Maharski prekop is characterised by a wide variation in vessels. This can be explained by the non-specialised use of vessels, where they were deliberately designed to be able to perform a series of different functions, which is supported by the technological analysis of fabrics and the wide range of identified foodstuffs, interesting contexts with an abundance of anthropomorphic figurines are presented and discussed.*

IZVLEČEK – *V članku predstavljamo rezultate večnivojske analize najdišča Maharski prekop na Ljubljanskem barju. Pokrajinske kontekste, časovno dinamiko najdišča in njegovo prostorsko organizacijo smo povezali s podatki o sestavi artefaktnega zbira, oblikami, velikostjo in tehnološkimi značilnostmi keramike ter s podatki o sledovih aktivnosti, dokazane z ohranjenimi sledovi hrane v/na lončenini. Za keramični zbir z Maharskega prekopa je značilna velika variabilnost posod. To si lahko razlagamo kot nespecializirano uporabo lončenine, kjer so bile posode namenoma oblikovane za celo serijo različnih funkcij, kar so podprle tako tehnološke analize lončarskih mas kot širok razpon prepoznanih vrst živil.*

KEY WORDS – *pottery; pile dwellings; Ljubljansko Barje; Eneolithic*

Introduction

The Ižica floodplain is the micro-region on Ljubljansko Barje that has been most intensively investigated in the past 137 years. Three main archaeological research and fieldwork episodes can be recognised during this period. The first relates to Dragotin Dežman's 'pile dwellings' discovery and the excavation of several large areas of approximately 12 000m^2. Unfortunately, only scant fieldwork documentation was provided (*Korošec P., Korošec J. 1969*). The second episode comprises Resnikov prekop (*Korošec 1964; Bregant 1964*), Maharski prekop (*Bregant 1974a; 1974b; 1975*) and Parte (*Harej 1978; 1981; 1987*) excavations. The interdisciplinary approach and sophisticated recording procedures and techniques that were introduced for the Maharski prekop site excavation are worth noting. Systematic palynological (*Šercelj 1975; 1981–1982; Šercelj, Culiberg 1978*) and soil analyses (*Stritar 1975; Stritar, Lobnik 1985*) run parallel. They have all resulted in detailed site archives that include palaeoenvironmental data and conventional radiocarbon dates, along with catalogues of pottery and other artefact assemblages. The third episode comprises intensive fieldwork (*Velušček 2006*) on the landscape and settlement dynamics in the micro-region (*Budja 1994/1995; 1997; Mlekuž, Budja and Ogrinc 2006*). Remote sensing research has enabled new insights into landscape taphonomy and revealed a pattern of palaeochannels that structured the landscape and affected the Maharski prekop site. Radiocarbon dating

was applied to show the correlation between settlement and landscape dynamics (*Budja, Mlekuž 2008; 2010*).

The scale of analysis often determines the range of questions raised about data and the narratives we produce (*Jones 2002*). Microscale studies, studies of pottery technology, its chemical composition and studies of organic traces preserved in pottery are nested in a wider context of human daily practices and activities. Decontextualized analyses are in danger of being abstracted from their archaeological context and cannot contribute to the wider discussion and narratives.

This paper is an attempt at a multiscalar analysis of the Maharski prekop archaeological site, approaching it in terms of landscape context, temporal dynamics, spatial organisation, the composition of its artefact assemblage, the shapes, sizes and technological composition of the pottery to the traces of activities as indicated on pottery in the form of food residues. The purpose is to integrate a wide range of data into a holistic, multiscalar picture of the site. Detailed and more technical aspects of analyses of organic residues on pottery are presented in a complementary paper (*Ogrinc* et al. *this volume*). A more plausible alliance between microscale analytical procedures and interpretative archaeology is possible only by nesting the results of microscale analyses within wider narratives.

Maharski prekop

The excavations of the Maharski prekop site from 1970 to 1977 by Tatjana Bregant are the largest excavation of a settlement in the Ljubljansko Barje area so far, since a large area of around 1220m^2 was excavated (*Bregant 1974a; 1974b; 1975; with unpublished documentation from excavations in 1976 and 1977*). However, test trenches excavated in the vicinity of the site, pile clusters in the Ižica River and in the ditch at Maharski prekop, cores and sediment exposures from the immediate environs of the site suggest that the settlement extended even further across the floodplain.

A lidar image reveals that the Maharski prekop site is set in a landscape criss-crossed by a network of palaeochannels (Fig. 1). The organic infill of the palaeochannel that runs parallel to the site dates the silting up of the channel to 2833–2466 calBC, attesting that the channel was abandoned before that date. Part of this palaeochannel was already excavated during Bregant's campaigns, where a row of piles located at the edge of the channel was interpreted as a revetment that protected the site from bank erosion. Maharski prekop was located next to an active channel. The lidar survey thus revealed a complex microtopography, which makes this area suitable for settlement, and suggests a very dynamic landscape of seasonal floods and shifting palaeochannels (*Mlekuž, Budja and Ogrinc 2006; Budja, Mlekuž 2010*).

Sequence of radiocarbon dates

The Maharski prekop sequence is comprised of 35 radiocarbon dates (Tab. 1; Fig. 2). Besides the series of 6 conventional dates on wooden piles completed in the 1970s and 5 AMS radiocarbon dates obtained from animal bones, an additional 22 AMS radiocarbon dates of carbonised food residues on pottery were obtained recently. The wooden structures of Maharski prekop are dated between 4226 and 2631 calBC, but the dates of bones yielded a much narrower span between 3641 and 3372 calBC, with only one outlier, which was dated to 5615 and 5475 calBC (*Mlekuž, Budja and Ogrinc 2006.Tab. 1*).

A new series of direct dates of pottery significantly contributes to the chronology of the site (Fig. 3). The sum of distribution of AMS radiocarbon dates demonstrates roughly a bimodal distribution of probabilities, with a period of intensive occupation dating between 4400 and 4000 calBC, and a second occupa-

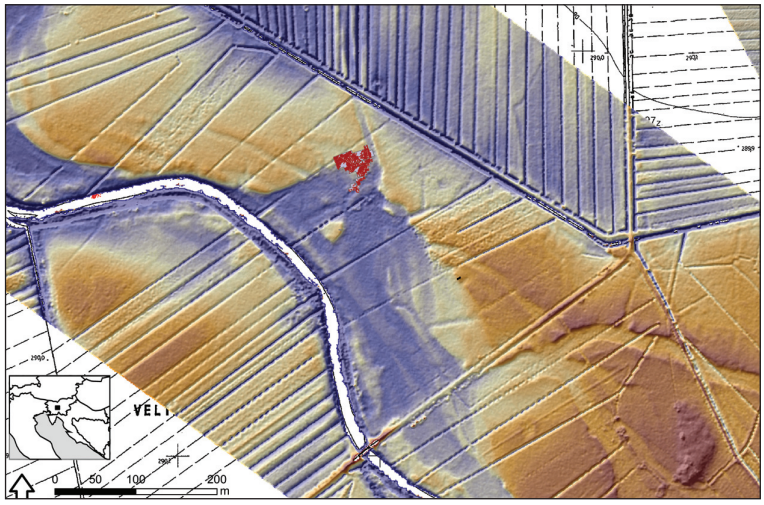

Fig. 1. Maharski prekop in a landscape context.

Sample n.	Consecutive n.	Site	Context	Material	Lab code	Conventional BP	CalBC	Median
15LJ	MP226	Maharski prekop	excavations 1977, grid sq. 60	food residue on potery	Poz–48519	3920 ± 35	2547–2291	2406
		Maharski prekop	excavations 1974, test trench 4	wood	Z–353	4330 ± 120	3354–2631	2991
		Maharski prekop	excavations 1973, grid sq. 15, pile 1	wood (*Fraxinus*)	Z–305	4345 ± 113	3357–2671	3011
		Maharski prekop	excavations 1974, grid sq. 12?, pile 40	wood (*Quercus*?)	Z–278	4633 ± 117	3646–3026	3392
		Maharski prekop	sediment exposure MP1, layer 61–63cm	charcoal	AA–27182	4680 ± 55	3632–3362	3463
14LJ	MP177	Maharski prekop	excavations 1977, grid sq. 62	food residue on potery	Poz–48518	4700 ± 40	3630–3369	3464
		Maharski prekop	excavations 1974, grid sq. 15, pile 4	wood (*Sorbus*)	Z–315	4701 ± 104	3698–3106	3477
		Maharski prekop	grid sq. 42	bone	Beta–219608	4710 ± 40	3633–3372	3495
		Maharski prekop	grid sq. 42	bone (*Ovis*)	Beta–219607	4720 ± 40	3635–3374	3511
		Maharski prekop	grid sq. 42	bone (Ovis)	Beta–219606	4740 ± 40	3638–3377	3543
		Maharski prekop	grid sq. 32	bone	Beta–219611	4740 ± 40	3638–3377	3543
19LJ	MP2	Maharski prekop	excavations 1970, grid sq. 1–8	food residue on potery	Poz–48659	4750 ± 35	3636–3379	3563
		Maharski prekop	grid sq. 34	bone	Beta–219610	4750 ± 50	3641–3376	3547
21LJ	MP223	Maharski prekop	excavations 1974, grid sq. 32	food residue on potery	Poz–48661	4755 ± 35	3637–3379	3566
16LJ	MP227	Maharski prekop	excavations 1977, grid sq. 64	food residue on potery	Poz–48520	4760 ± 40	3638–3378	5363
17LJ	MP123	Maharski prekop	excavations 1970, grid sq. 2	food residue on potery	Poz–48521	4790 ± 35	3648–3385	3568
05LJ	MP171	Maharski prekop	excavations 1977, grid sq. 47	food residue on potery	Poz–48507	4810 ± 35	3654–3519	3570
04LJ	MP158	Maharski prekop	excavations 1977, grid sq. 47	food residue on potery	Poz–48506	4860 ± 40	3710–3527	3653
11LJ	MP17	Maharski prekop	excavations 1972, grid sq. 14	food residue on potery	Poz–48514	4900 ± 40	3768–3635	3682
06LJ	MP172	Maharski prekop	excavations 1977, grid sq. 47	food residue on potery	Poz–4808	4940 ± 40	3794–3644	3715
		Maharski prekop		wood	Z–314	4964 ± 99	3971–3533	3766
20LJ	MP211	Maharski prekop	excavations 1970, grid sq. 1–8	food residue on potery	Poz–48660	4970 ± 40	3928–3652	3746
10LJ	MP46	Maharski prekop	excavations 1973, grid sq. 23	food residue on potery	Poz–48513	4980 ± 40	3936–3654	3756
22LJ	MP151	Maharski prekop	excavations 1976, grid sq. 45	food residue on potery	Poz–48526	5000 ± 40	3942–3693	3782
		Maharski prekop	excavations 1974, grid sq. 42, pile 156	wood (*Sorbus*)	Z–351	5080 ± 110	4226–3646	3872
03LJ	MP144	Maharski prekop	excavations 1976, grid sq. 43	food residue on potery	Poz–48504	5105 ± 35	3970–3798	3868
07LJ	MP224	Maharski prekop	excavations 1976, grid sq. 43	food residue on potery	Poz–48509	5180 ± 40	4219–3811	3990
09LJ	MP45	Maharski prekop	excavations 1973, grid sq. 23	food residue on potery	Poz–48512	5210 ± 40	4224–3952	4016
12LJ	MP96	Maharski prekop	excavations 1974, grid sq. 34	food residue on potery	Poz–48516	5270 ± 40	4230–3984	4109
18LJ	MP1	Maharski prekop	excavations 1970, grid sq. 1–8	food residue on potery	Poz–48522	5280 ± 40	4233–3989	4120
13LJ	MP174	Maharski prekop	excavations 1977, grid sq. 60	food residue on potery	Poz–48517	5310 ± 40	4256–3998	4139
08LJ	MP25	Maharski prekop	excavations 1973, grid sq. 18	food residue on potery	Poz–48510	5340 ± 40	4320–4045	4171
01LJ	MP100	Maharski prekop	excavations 1974, grid sq. 37	food residue on potery	Poz–48502	5470 ± 35	4366–4242	4327
02LJ	MP121	Maharski prekop	excavations 1974, grid sq. 42	food residue on potery	Poz–48503	5760 ± 40	4708–4502	4612
		Maharski prekop	grid sq. 34	bone	Beta–219609	6570 ± 40	5615–5475	5523

Tab. 1. Radiocarbon dates for Maharski prekop.

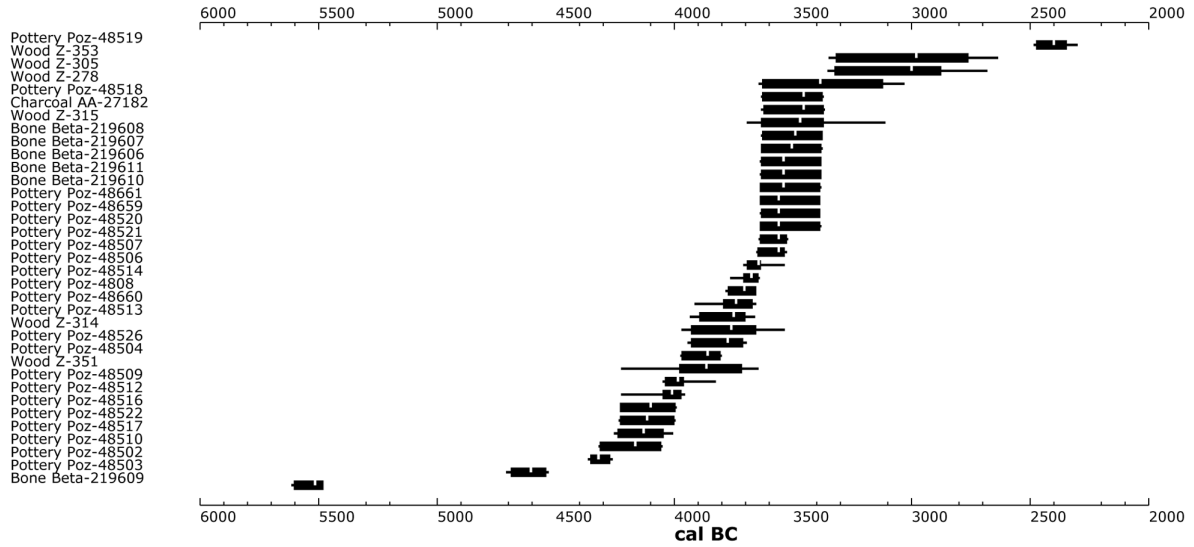

Fig. 2. Radiocarbon dates from Maharski prekop.

tion period between 3800 to 3550 calBC. The final spike after 3500 calBC can be attributed to a wiggle in the calibration curve between 3500 and 3400 calBC. These two concentrations are separated by a gap of around 200 years after 4000 calBC.

The oak chronology of 173 years from Maharski prekop is dated between 3661 and 3489 calBC (*Čufar* et al. *2010*). This corresponds well with the second concentration of radiocarbon dates presented above and indicates a period of intensive building and other activities at the site. However, a number of dates of carbonised food/organic residues are significantly older than suggested by the dendrochronological sequence. Thus at least 14 of the new dates obtained from pottery fall into the period between 4400 and 4000 calBC, suggesting intensive activities at the site at the time. This is further supported by two old dates of wooden piles that fall within this period.

Two intriguing older dates from Maharski prekop testify to sporadic activities at the site before the intensive occupation period between 4400 and 3550 calBC. Thus, one sample of animal bone yielded a date of 5615–5475 calBC, which makes it contemporaneous with the date from a Mesolithic site at Breg pri Škofljici (5843–5307 calBC). Additionally, one date of charred food/organic residues on pottery (4708–4502 calBC) is roughly contemporaneous with the dates from Resnikov prekop (*Mlekuž, Budja and Ogrinc 2006.Tab. 1*).

As already mentioned, the radiocarbon date of the organic infill of the palaeochannel (2833–2466 calBC) indicates the *terminus ante quem* for the palaeochannel located next to the site, suggesting that the palaeochannel silted up before that date. One date of carbonised food/organic residue on pottery from Maharski prekop comes immediately after this event, suggesting sporadic activities continued after the abandonment of the site.

These new dates suggest a much more complex chronological sequence for Maharski prekop than previously supposed. It appears that the site was settled for a much longer period, had distinct phases of occupation, and shows traces of earlier visits or activities. Therefore, new chronological sequence for Maharski prekop also has implications for the chronology of the microregion, as the gaps in the chronology are filled. Consequently, instead of a discrete, short-lived site, we are dealing with a node within a complex 'landscape of inhabitation'.

This exercise also shows the benefits of complementary dating methods and samples for a better under-

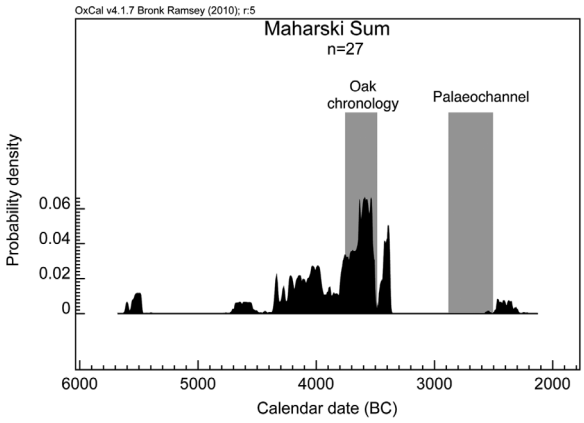

Fig. 3. Summed radiocarbon distribution of radiocarbon dates of food residues on pottery and bones from Maharski prekop.

standing of the chronology of a site. The radiocarbon dates of bones and carbonised food/organic residues on pottery date events relating to the practices of preparation and disposal of food, and thus complement the dates of the wooden structures relating to events of building and construction.

Spatial organisation

Only such large-scale excavations offer an opportunity for a better understanding of the spatial structure of the sites. Thanks to the large area excavated by Tatjana Bregant, it is possible to assess the organisation of space within the Maharski prekop settlement. Bregant interpreted the site as a single-phase 'pile-dwelling' with several raised platforms where small houses were located (*Bregant 1975.17–30*).

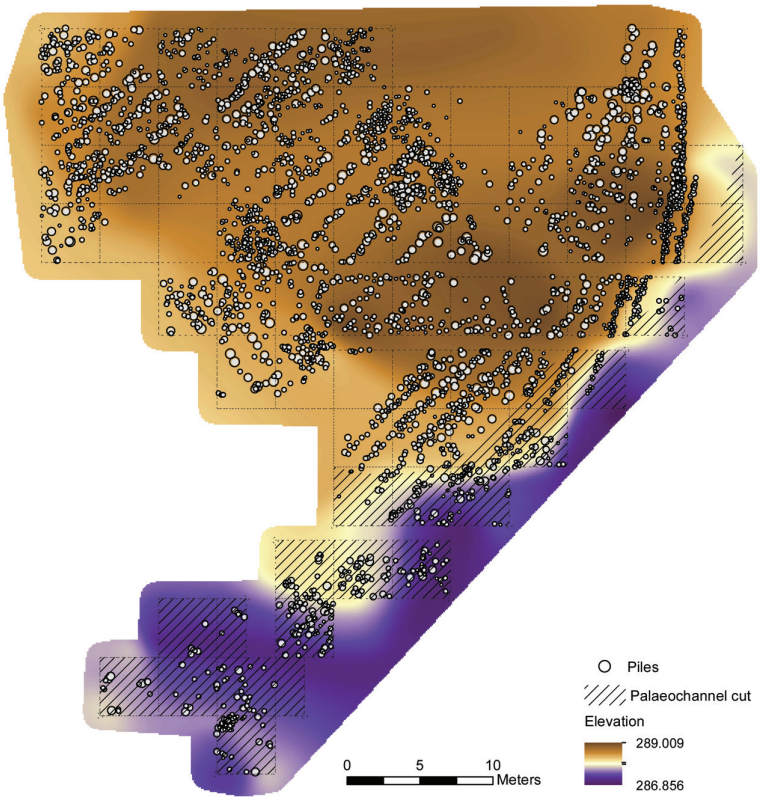

Fig. 4. The elevation of the original surface where piles were located at Maharski prekop. Note the palaeochannel on the eastern edge of the site.

The site was obviously located on a slightly raised area near an active channel which runs to the east of the excavated area. A distinctive cut in the cultural layer is visible in the sections, which is the result of the erosion of the banks of the stream. In the southern part of the excavated area, further destruction can be observed in the lower density of piles and the lack of a cultural layer. This erosion can be identified on the lidar-derived digital elevation model as a low terrace associated with the modern Ižica River. The central, western and northern parts of the site were not damaged by erosion (Fig. 4).

During the excavation, 2432 vertical wooden piles were recorded at the site. The average vertical pile density is almost 2 piles per m^2 and the arrangement of piles displays a regular pattern. Over most of the undisturbed part of the activated area, piles are usually organised in sets of three parallel rows. Most of the rows were oriented parallel to the documented palaeochannel. The mean pile diameter is 5.8cm (standard deviation 3.8cm, N = 1743), although piles with diameters of up to 26cm have been found. Piles with larger diameters were often split, and comprise 28% of all piles. The piles were usually made of three types of wood, oak (*Quercus*), ash (*Fraxinus*), and rowan (*Sorbus*) and comprise more than 90% of the identified taxa (*Šercelj 1973; 1975*). Some of the recovered piles were very long, as they were driven up to 3m into the silt (*Bregant 1974b.43*).

This arrangement of piles can be interpreted as the remains of nine houses with dimensions of around 10 x 3.5–4.5m arranged in parallel. Each house is therefore made of three rows of structural timbers, with a central row of centre-posts supporting a roof ridgepole, while lateral the rows are wall posts. Most of the houses are oriented with the longer side parallel to the channel. Only one of the houses is oriented at right angle to the others (Fig. 5).

Based on the relative height of the piles, we can divide the settlement into two building phases. When the superstructure was destroyed (either by fire, flood or decay), only parts of the posts below the occupational surface survived. Thus the heights of the recovered piles may indicate the levels of occupational floors at the time when the houses were destroyed. Since the original surface of the settlement was irregular, we cannot compare the heights of the remaining piles directly, but we can relate them to the surface of the cultural layer that was interpolated from the published sections. Piles with tops below the surface of the cultural layer were the-

refore part of older structures than the piles extending above the cultural layer. In this way, two phases of the settlement, an older and younger phase, can be identified (Fig. 6). Piles from both phases are not distributed randomly; instead, piles from the same phase tend to be clustered in groups that we have identified as houses. This supports our interpretation of pile-rows as the remains of houses, and enables us to subdivide the houses themselves into chronological phases (*Mlekuž, Budja and Ogrinc 2006*).

However, a number of piles could not be linked to houses at Maharski prekop. Some thin piles located within the settlement area can be associated with less permanent wooden structures such as drying racks or fences. But the most obvious structures were two or three dense rows of piles running along the channel on the eastern side of the excavated area. The piles in these structures were generally of much smaller diameters than those in the central part of the excavated area, and split piles are almost non-existent. The type of wood used for these piles was much more diverse than in the piles of the central area (*Šercelj 1973; 1975*). Some piles from the easternmost row were inclined towards the channel, which obviously eroded the cultural layer. The excavator interpreted these structures as a revetment (*Bregant 1975.17–20, Fig. 1*), which supports the evidence of the active paleochannel associated with the site.

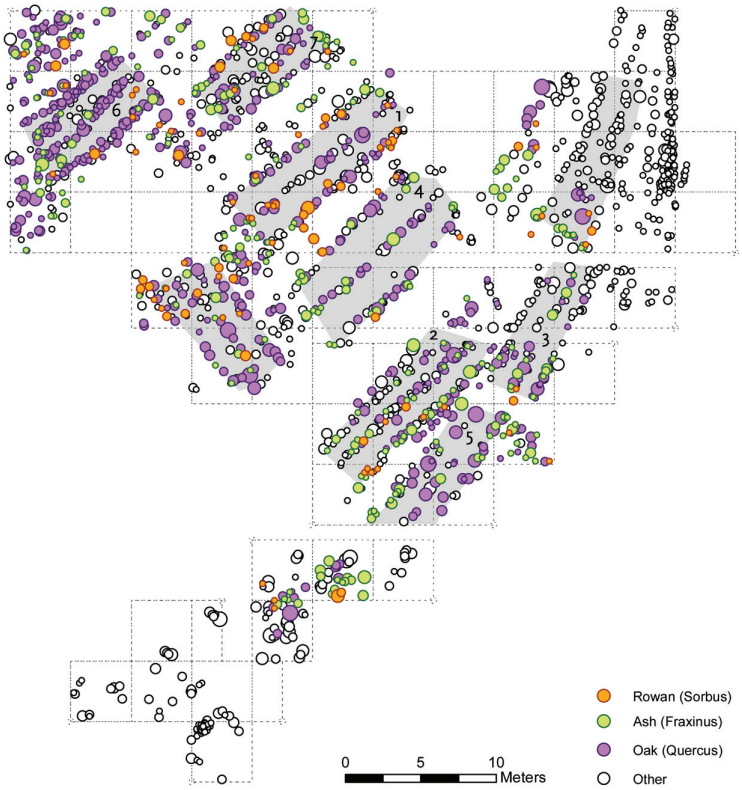

Fig. 5. Distribution of piles, choice of wood and reconstructed house plans at Maharski prekop.

Clay surfaces that were often burned were also recorded within the cultural layer (*Bregant 1974b. 12; 1975.14–15*). They could be up to 20cm thick, and covered large areas between the rows of piles, and in some cases their direct stratigraphic superposition could be observed. For example, in the southern part of the excavated area, there is evidence of the superposition of two clay floors separated by a thin layer of occupational debris, which could indicate the periodic rebuilding of surfaces (Fig. 7). Concentrations of stones are another common feature of the site (*Bregant 1974a.12; 1974b.41; 1975.14–15*). Stones form distinctive clusters or features that were commonly found at the peripheral ends of houses. Stones were sometimes distributed along lateral rows of piles and are often associated with lenses of charcoal, indicating that they could be interpreted as remnants of thermal structures. The concentrations of stones are also often associated with grindstones.

Additionally, around 224kg of pottery were collected at the site, and the position of 131 other types of artefacts (such as axes, spindle whorls, bone tools, loom weights, personal ornaments, cooper metallurgy implements *etc.*) was recorded during the excavation (Fig. 8). Based on the assumption that the 'cultural layer' represented a short-term occupation of the site, the excavator recorded the spatial position of artefacts only within 4 x 4 m grid squares. Therefore, the stratigraphic position of artefacts within the 'cultural layer' is lost, compelling us to treat the artefacts as only a single spatial distribution over the site.

Most of the material enters the archaeological record through depositional practices that have a clear spatial dimension. Artefacts discarded at their locations of use are termed primary refuse; those discarded elsewhere are known as secondary refuse. The primary refuse is rare, since we tend to clean our living and working areas. An unmistakable characteristic of secondary refuse distributions in most settlements is clustering. People tend to dump refuse some

distance from where it was produced, and where others have previously dumped refuse, producing concentrations. The distribution of pottery at Maharski prekop is clustered. We can observe at least three distinct concentrations: one in the palaeochannel in the southern part of the site; in the central part of the site; around old phase house 1 and between new phase houses 2, 4 and 5. The distribution of other material generally follows the distribution of pottery, with some differences. There is a large concentration of bone axes in front of house 1, together with concentrations of stone, pottery and flint tools. Spindle whorls are concentrated in the empty space between houses 4 and 2; here, personal ornaments and finds associated with metallurgical activities were also recovered. On the other hand, bone tools are concentrated in the paleochannel together with pottery (Fig. 8).

At long-term settlements, we cannot assume any direct relation between structural remains and artefact distribution. Michael Schiffer's (*1987; LaMotta, Schiffer 1997*) work on the formation processes of the archaeological record demonstrated that what we see in an archaeological record is the result of the process of building, use, abandonment, and post-abandonment transformations often operating together, making artefact distribution a complex palimpsest of various formation processes.

Pottery at Maharski prekop

Pottery studies have been dominated by detailed analyses of decorative motifs and the construction of elaborate chronological schemes. However, pots are made to be used. In most cases, the primary functions of ceramic vessels are processing, storing, transporting, serving, and consuming foods and liquids (*Rice 1987.207–208*). The potter makes technical choices related to performance in manufacture and use in accordance with the vessel's intended functions, controlling the shape and size of the vessels, paste characteristics, firing conditions, and surface treatments to create vessels for specific purposes (*Skibo 1992.27–56; DeBoer 1984; Tite 2008; van As 1984*). The shape, size and capacity of a vessel are likely to relate very closely to the different potential functions of the pot (*Rice 1987.207*).

Marion Smith (*1988*) found three measures, 'morphological correlates of use', that are particularly relevant when correlating form to function. The first is the relative openness of the vessels, which is the ratio of the circumference of the rim to the total external surface area; the second is the diameter of the vessel rim and the third is capacity of the vessel. Using a cross-cultural approach, he isolated several interesting correlations between these measures and intended functions of the vessel. Thus, rim size is proportional to the extent that the contents of a vessel are changed. The serving of liquids or solids correlates with rim forms that do not curve inward. Rim diameter is inversely proportional to the duration of storage time. Vessels that require access to contents during use will have an opening big enough for hand access. Vessels used to transport liquids have a small opening. On the other hand, Prudence Rice (*1987.224–226*) identified four loosely defined performance characteristics related to vessel shape: capacity, stability, accessibility, and transportability. These attributes are not defined mathematically, but are nevertheless useful in describing the properties of a vessel in relation to intended use. Other

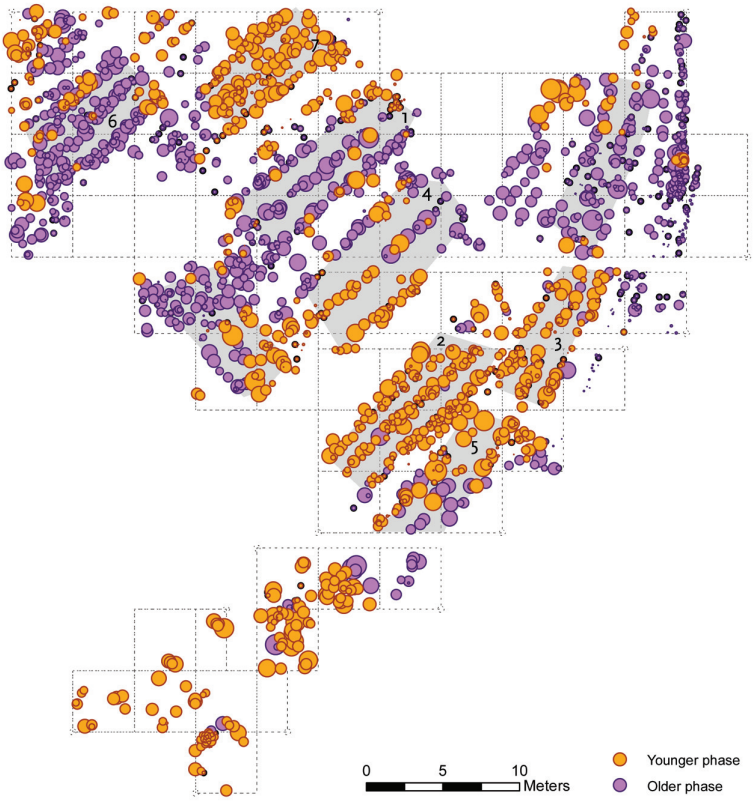

Fig. 6. Division of piles and houses into chronological phases based on the relative heights of the piles at Maharski prekop.

technological choices are also closely related to the intended use of the pot. Thus the choice of a particular temper, paste characteristics and firing conditions might have an impact on how a vessel performs during manufacture and use (*Braun 1983; DeBoer 1984; Skibo 1992.27–56*). Technological properties such as thermal shock resistance, and heating effectiveness might thus be highly related to the intended function.

Pottery typology and use

Our approach to the pottery assemblage from Maharski prekop (*Bregant 1974a; 1974b; 1975; with unpublished material from excavations in 1976 and 1977*) is characterised by a focus on whole pots rather than individual sherds. During the initial analysis of the pottery assemblage, 476 reconstructed or partly reconstructed pots were defined. Vessel form was described with the formal parameters defined by Milena Horvat (*1999*), and the capacity, openness and rim diameter were estimated for 349 vessels. Openness was defined as the ratio between orifice area and external surface area. The vessels were then arranged along three dimensions: capacity, openness and rim diameter. The rim diameter and capacity highly correlate; therefore, the relation between the vessel's openness and capacity was established to be most informative. Based on these criteria, we divided the corpus of vessels into 5 vessel groups. Most of the vessels have low capacity, below 4 litres, with the peak between 1 and 2 litres; however, there are some very large vessels with volumes up to 100 litres (Tab. 2; Fig. 9–10).

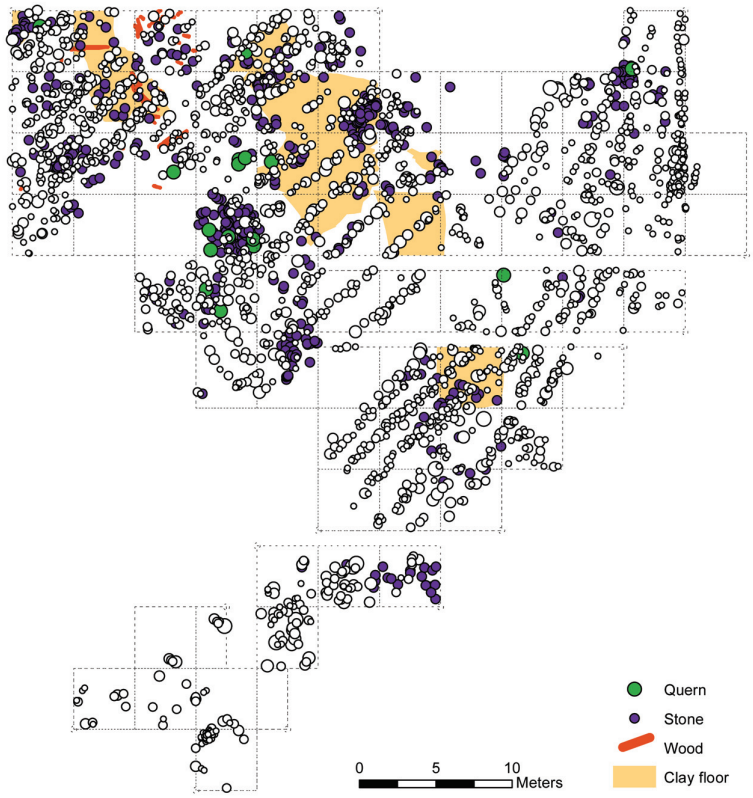

Fig. 7. Distribution of stone features, querns, clay floors and wood fragments at Maharski prekop.

❶ The first vessel group consists of small pots, usually with a capacity less than 0.5 litres. The relative openness ranges from low to moderate, while rim diameters are highly uniform, as they fall between 5 and 10cm. The low capacity, low rim diameter and moderate openness suggest that these vessels might have been used for the individual consumption of liquids.

❷ The second group consists of vessels with very high to extreme openness. The vessel capacity ranges between 0.5 and 20 litres, although most have a capacity below 4 litres. Rim diameters are very large and the vessels are mostly shallow, indicating very high accessibility and stability. These vessels might have been used for the individual consumption of food (in the case of low capacity vessels) and communal serving vessels (in the case of high capacity vessels).

❸ The third group consists of vessels with lower rim diameters and moderate openness. Vessel capacity ranges between 0.5 and 20 litres; most of the vessels have a capacity below 10 litres. These vessels are usually of globular shape, with moderate accessibility. Their intermediate openness and accessibility – between groups 2 and 4 – suggest a variety of functions.

❹ The fourth group consists of vessels with lower rim diameters and low openness. These vessels are usually deep and have low accessibility. Volumes up to 20 litres indicate that they could be used for the preparation of full meals. However, most of the vessels have capacities around 1 litre, indicating that only certain parts of a meal could have been stirred and cooked in such pots.

❺ The fifth group consists of a few vessels with an extreme capacity above 20 litres. The vessels in this group have low openness; they are deep and inac-

cessible. Their large capacity and accessibility suggest that they can be interpreted either as very large food preparation and processing vessels or vessels for temporary storage.

The vessels from Maharski prekop display a broad range of size and/or form classes associated with a variety of inferred functions. The variety of vessel forms and sizes suggests that the site served as a locus of diverse subsistence processing, storage, and consumption activities. There is a general lack of vessels with very low accessibility (low rim diameter and low openness) that could be interpreted as long-term storage vessels. Capacities that peak between 0.5 and 2 litres suggest that most of the assemblage consists of vessels for the individual consumption of food or food preparation for small groups of people. This suggests individual consumption, which can be defined as when not only the eating of food is done from individual vessels, but also the serving (*Bats 1988.23*). However, the presence of some very large vessels that could be used for food preparation or serving suggest that communal food preparation and consumption was at least sporadically practiced.

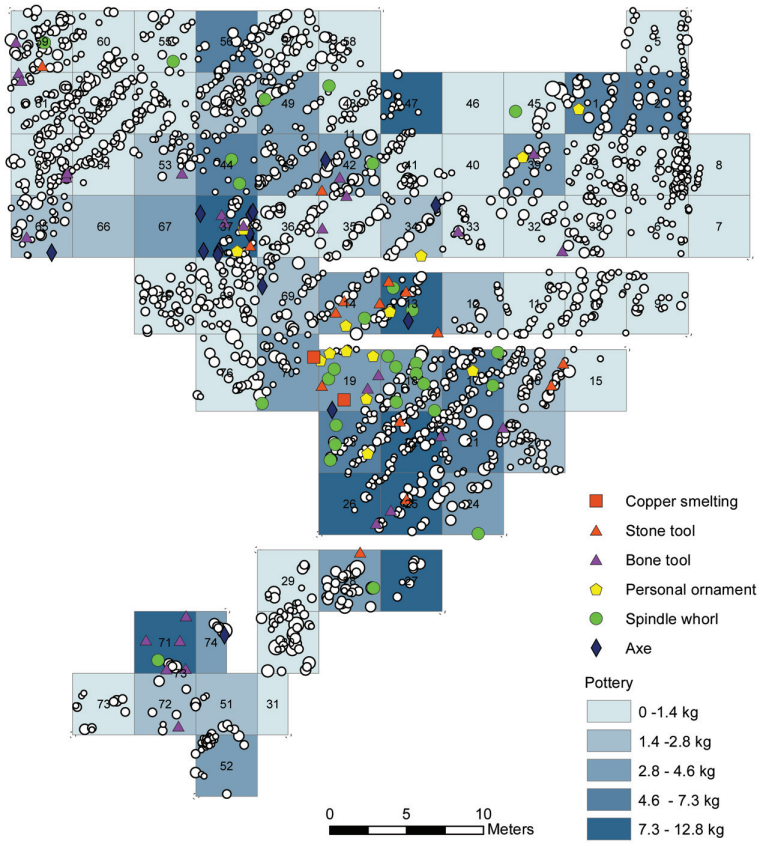

Fig. 8. Distribution of pottery and other material at Maharski prekop.

The direct evidence of vessel use can survive in the form of external soot or as burnt food residues on the surface, and animal fats and plant waxes absorbed by the pottery. In the assemblage from Maharski prekop, 39 vessels with organic residues were identified. If we interpret these residues as traces of burnt food, and therefore an indication of cooking, then they can give further insight into the use of pottery. Organic residue is completely absent in groups 1 and 2, further supporting the hypothesis that these vessels were not used for cooking, but for the consumption of food. Most of the food residue is present in group 3, especially in the vessels with a capacity below 5 litres, which further supports our observation that most of the cooking at Maharski prekop was done on a small scale, either for very small groups of people, or that only elements of a larger meal may have been cooked in individual pots. However, organic residues are present on some very large vessels in group 5 with capacities up to 80 litres, indicating that cooking or processing of large quantities of food was sporadically practiced (Fig. 9).

Pottery samples with charred organic residue on the internal surface of the vessels were AMS radiocarbon

	Definition	Size	Organic residue	Median capacity (in litres)	Median rim diameter (in cm)	Median openess
Group 1	Capacity less than 0.5l	13	0	0,24	7,7	0,31
Group 2	Capacity between 0.5 and 20l, very open	14	0	2,72	22	0,42
Group 3	Capacity between 0.5 and 20l, moderately open	63	5	4,96	21,6	0,31
Group 4	Capacity between 0.5 and 20l; closed	176	16	7,00	20	0,21
Group 5	Capacity more than 20 l	36	4	33,89	35,8	0,21

Tab. 2. Vessel use groups of pottery from Maharski prekop.

dated (see above), but were also analysed for their lipid content with a series of different methods and techniques (as presented by *Ogrinc* et al. *this volume*). Lipids are exceptionally well preserved, since among 20 analysed samples only 5 yielded no lipids, and the remainder include a wide range of identified foodstuffs. Most of the samples provided evidence of animal fats (including cattle adipose fats), and there is also a large number of samples with evidence of mixed animal and plant fats. Two samples also yielded evidence of milk. At present, 13 samples can be linked to individual vessels; their capacity ranges from 1 to 51 litres; vessels were classified into groups 3, 4 and 5 (Tab. 3).

Pottery technology

For the study of pottery technology of the Maharski prekop assemblage, samples from different types of vessels from a series of grid squares were chosen for analysis. The study included a hand specimen description of the pottery where different fabric types were identified (following *Horvat 1999*) and later a petrographic analysis of pottery thin sections (following *Whitbread 1995.365–396; Terry, Chillingar 1955*). The fabric groups were defined according to the origin of the clay and ceramic recipe, which includes the presence of temper in the fabric. Temper is distinguished from naturally occurring inclusions with the aid of various criteria, including grain-size distribution, roundness, angularity, sorting, and mineralogical composition (*Rice 1987.409–411; Whitbread 1995.393*).

At Maharski prekop, we selected 222 pottery samples, of which more than 70% come from typologically defined vessels and from all five of the vessel groups (see above). The hand specimen analysis of Maharski prekop pottery showed great uniformity of fabrics and recipes. We identified 4 different fabric types: fabric 1 with abundant calcite inclusions (in the fine sand to gravel fraction); fabric 2 with inclusions of calcite and grog; fabric 3 with fine-grained quartz inclusions and organic material; and fabric 4 with abundant coarse-grained quartz. The majority of vessels were made with fabric 1, which is characteristic of 95.9% of the pottery analysed. Fabric 2 with inclusions of calcite and grog in the paste, as well as fabric 4 with quartz, were present in less than 1% of the samples, while fabric 3 with quartz and organic matter was present in 3% of the samples. The pottery from Maharski prekop was mostly fired in a reducing or not fully oxidised atmosphere; the most common surface colour is dark grey, and the pottery is mostly soft. These characteristics give the pottery assemblage a very homogenous appearance.

Pottery samples from fabric groups 1, 2 and 3 were also prepared for thin section analysis by polarising microscope. The results of the petrographic analysis show that the mineralogical composition of these samples is mostly comprised of calcite, quartz, chert, muscovite and biotite micas, dolomite, plagioclase feldspars, opaque concentration features and organic material (Tab. 4).[1] The main differences between the fabric groups are mostly based on the various materials added as temper. Fabric 1, the most common fabric group among the Maharski prekop pottery, is identifiable mostly by the presence of added monocrystalline calcite as temper and the presence

Sample no.	Sample description	Vessel group	Rim diameter (in cm)	Capacity (in litres)	Predominant commodity type
MP25	absorbed food residue in pottery	4	17	4.2	mixture
MP45	absorbed food residue in pottery	4	11.4	1	ruminant goat milk
MP96	absorbed food residue in pottery	3	33.9	19	plant
MP100	absorbed food residue in pottery	5	39	52.9	ruminant cattle adipose fat
MP121	absorbed food residue in pottery	3	28	13.1	mixture
MP144	absorbed food residue in pottery	4	17.6	4	n/a
MP158	absorbed food residue in pottery	4	25.6	17.2	ruminant cattle adipose fat
MP158a	charred organic residue on vessel surface	4	25.6	17.2	ruminant adipose fat
MP174	absorbed food residue in pottery	5	31.8	32.6	plant
MP211	absorbed food residue in pottery	5	33.6	33.9	mixture
MP85	charred organic residue on vessel surface	5	39.2	51	plant
MP181	charred organic residue on vessel surface	4	26.2	18	plant

Tab. 3. Vessels with the results of lipid analyses from Maharski prekop (see also* Ogrinc *et al.* this volume*).

1 12 pottery samples from Maharski prekop were already partly analysed in the 1970's using a reflected light microscope, x-ray diffraction and differential thermal analysis (*Osterc 1975*). Most of them had a similar composition to our fabric group 1 with calcite added as temper and one of the samples had added grog characteristic for fabric 2 (*Osterc 1975.124–125*). No samples belonging to fabric groups 3 or 4 were described in Osterc's this study.

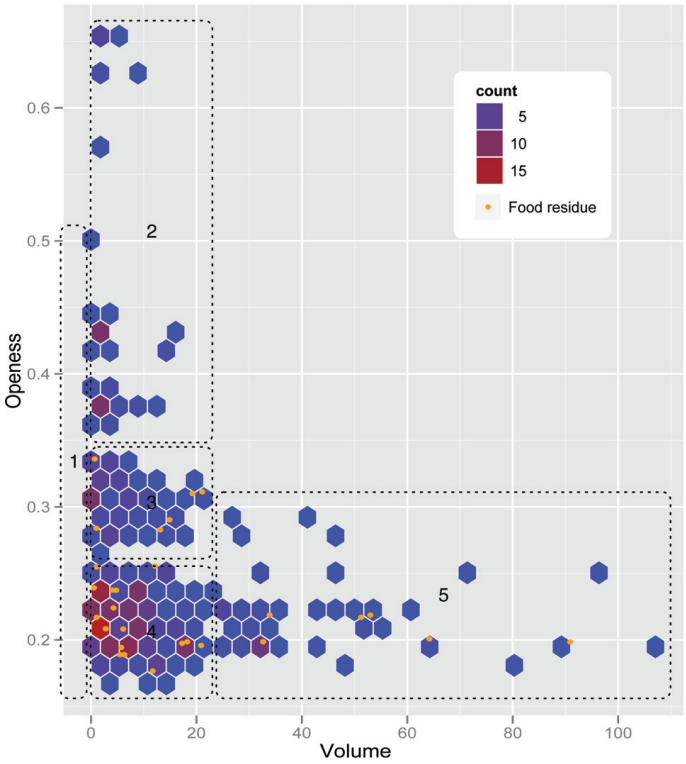

Fig. 9. Vessels from Maharski prekop, arranged according to their capacity and openness. Vessel use groups are indicated.

of biotite mica and rare dolomite grains among the naturally present inclusions. The main difference between the samples is the relative abundance and coarseness of the artificially added calcite grains. The vessels made with this fabric come from a variety of contexts inside Maharski prekop and can be attributed typologically and according to the radiocarbon dates to all phases at the site. Fabric 2 was identified in only 2 pottery samples, its main characteristic being the addition of crushed pottery or grog temper alongside monocrystalline calcite. The grog in fabric 2 has the same composition as fabric 1 pottery, which proves that the potters reused old and used, or perhaps destroyed, pots. The natural inclusions of fabric 2 are mostly similar to the composition of fabric 1. Fabric 3 was identified in 6 samples in hand specimen analysis, and only one of the samples was prepared as thin section. The main characteristic of this fabric is organic material added as temper that was mostly burned out during firing, leaving irregularly shaped voids, although some was still present in the paste. The natural composition of this fabric differs significantly from fabrics 1 and 2, since no chert, biotite or plagioclase feldspars were present in the natural paste.

The petrographic results and the results of the X-ray diffraction of clays collected near Maharski prekop at the Gornje mostišče location suggest that the naturally occurring raw materials have a comparable mineralogical composition to the pottery samples. The clays are mostly composed of monocrystalline and polycrystalline quartz, dolomite, muscovite and biotite mica, chlorite and plagioclase feldspars. The Pleistocene sediments in Ljubjansko Barje such as gravel, sands, silts and clays were mostly transported to this area by rivers such as Ižica, and the sedimentological analysis of sediments from the nearby archaeological site of Resnikov prekop showed that grains larger than 2mm were composed mostly of limestone, with rare tuff, sandstones, dolomite and chert (*Turk 2006.94–96*). From these results, we conclude that the clays for pottery production at Maharski prekop were collected locally on the Ižica floodplain; only calcite used as tempering material was probably collected on the karstic periphery of Ljubljansko Barje, where it could be collected from veins, druses and speleothems in caves (*Gams 2004.361–369*).

If we compare the fabric groups to the vessel groups, we observe that the most common fabric with calcite temper was used for creating all types of vessels, from small pots of less than 0.5 litres to large vessels of more than 20 litres. Only some vessels with lower rim diameters and low openness from the fourth group and the largest vessels from the fifth group were partly made with fabrics with added grog or organic material.

Conclusions

The production of pottery is closely related to a range of human activities: the transportation, stor-

Fabric group	Number of samples	Grid square	Calcite %	Quartz %	Mica %	Grog %	Organic material %
Fabric 1	6	1–8, 17, 18, 37	20–30%	5–10%	1–5%	0	less than 1%
Fabric 2	2	13	10–20%	5–10%	5%	5–10%	less than 1%
Fabric 3	1	44	0	5%	2%	0	3%

Tab. 4. The basic mineralogical composition of pottery fabric groups from Maharski prekop.

age, preparation, cooking and consumption of food. However, the interactions between the *chaîne opératoire* of pottery manufacture and the *chaîne opératoire* of food preparation and consumption are not straightforward. While vessel shape and fabric may suggest the intended function, the analysis of preserved lipids in pottery indicates what was actually cooked, boiled, stored or processed in the vessels. Interpretation is made even more difficult by the fact that the same vessels may have been used for different purposes, or may have been reused after being considered no longer fit for their intended function (*Rice 1987.207–208*).

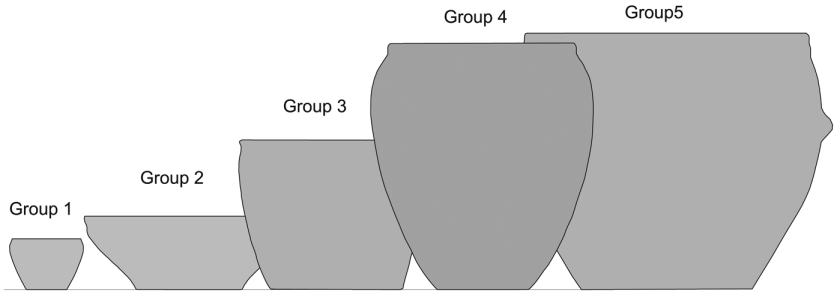

Fig. 10. Typical vessels from each defined use group from Maharski prekop.

The pottery assemblage from Maharski prekop is characterised by a large variability of vessels both in terms of their forms and dimensions. Five vessel groups were defined in our analysis; nevertheless, inter-group variability is also high. This variability can be explained by the non-specialised use of vessels, where they were deliberately designed to be able to perform a series of different functions. This is further supported by the technological analysis of fabrics. The identified fabric groups are very similar: pots were made using one general recipe characterised by the presence of added calcite as temper. No significant differences appear between vessel-use groups in terms of the presence of specific fabric groups. The differences between the three defined fabric groups cannot be explained by technological choices, but different traditions or individual idiosyncrasies. The generalised fabric recipe suggests that the intended use of a vessel was not predetermined during its manufacture.

Food residues on vessels, indicating that a vessel was used for cooking, are present on a wide range of vessels regardless of their capacity, openness or form. Food residues are absent only in groups 1 and 2, which were interpreted as vessels used for the individual consumption of food. Therefore, vessel groups 3, 4 and 5 could have been used for different purposes, including processing, temporary storage and serving of foodstuffs. The diversity and non-specialised use of pottery observed in the Maharski prekop assemblage is consistent with the analysis of lipids. The small number of analysed samples analysed thus far does not allow strong correlations between vessel shape and dimensions and their actual use for cooking. At the moment, 13 samples can be linked to individual vessels, their capacity ranging from 1 to 51 litres. The range of identified foodstuffs is also wide, since at least five samples have been identified as corresponding to a mixture of fatty acids (see *Ogrinc* et al. *this volume*). Therefore, the vessels at Maharski prelop were used for a variety of inferred purposes. No specialised vessels can be linked to a single function – the exceptions being groups 1 and 2, which can be interpreted as vessels for individual consumption.

In terms of the spatial distribution of the pottery, we were able to observe some clustering on the site. However, this clustering cannot be interpreted in terms of specific activities or the spatial organisation of activities connected to pottery use. It is naive to expect that the artefact distribution would reveal a functional division of the structures at Maharski prekop. Instead, artefact distribution should be seen as a material residue of long-term mundane practices, such as cleaning, dumping and abandonment, as well as post-depositional modifications, which at Maharski prekop are mostly associated with water erosion. What the artefact distribution does not reflect is a frozen snapshot of social organisation, revealing functional variations within the site. Dumping activities – with their large quantities of material produced – and abandonment processes are the most likely sources of major artefact variation, although the effect of functional variation cannot simply be dismissed. Thus, we can observe patterns at Maharski prekop that are the result of long-term processes of use, dumping and abandonment, which cannot be simply interpreted as a single event or a functional division of the site. The phasing of houses, the thickness and stratigraphic relations between features in the 'cultural layer', and the wide range of radiocarbon dates from the site further support the idea that Maharski prekop was a long-term and complex site.

ACKNOWLEDGEMENTS

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Pots and lipids: molecular and isotope evidence of food processing at Maharski prekop

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ABSTRACT – *The pottery assemblage from the Maharski prekop site was analysed to obtain insights into vessel use and husbandry practices. Total lipid extracts of pottery samples were subjected to gas chromatography (GC), gas chromatography–mass spectrometry (GC–MS), gas chromatography–combustion–isotope ratio mass spectrometry (GC–C–IRMS) and soft ionisation electrospray mass spectrometric techniques ESI Q–TOF MS and ESI Q–TOF MS/MS. The charred organic deposits on vessels were AMS ^{14}C dated. The results show that some vessels were used for cooking ruminant meat, while in other traces of mixed non–ruminant and ruminant meat or plants and animal meat cooking were identified. Some vessels were used for milk processing.*

IZVLEČEK – *Analizirali smo ostanke keramičnih posod z Maharskega prekopa, da bi dobili dodatne informacije o uporabi keramičnih posod in zgodnji živinoreji. Lipide, ekstrahirane iz ostankov keramičnih posod, smo analizirali s pomočjo plinske kromatografije (GC), plinske kromatografije sklopljene z masno spektrometrijo (GC–MS), plinske kromatografije sklopljene z masnim spektrometrom za analizo stabilnih izotopov lahkih elementov preko sežigne enote (GC–C–IRMS) in masnim spektrometrom z analizatorjem na čas preleta ionov (TOF) z elektrosprej ionizacijo (ESI Q–TOF MS in ESI Q–TOF MS/MS). Karbonizirani ostanki na posodah so AMS radiokarbonsko datirani. Rezultati kažejo, da so nekatere posode uporabljali za kuhanje mesa prežvekovalcev. V drugih posodah zasledimo ostanke kuhanja mešanega mesa prežvekovalcev in neprežvekovalcev ali ostanke kuhanja mešanice rastlinske in živalske hrane. Nekatere posode pa so bile uporabljene za predelavo mleka.*

KEY WORDS – *Eneolithic; pottery; organic residues; lipids; fatty acids; $\delta^{13}C$ values; TAG*

Introduction

Organic residues survive in two principal forms on archaeological pottery: as charred deposits encrusted on ceramic vessels, and/or as absorbed residues preserved in low concentrations in highly degraded and complex matrices in vessel walls. Both are closely associated with the *chaîne opératoire* of food storage, and food preparation, cooking and consumption.

In this article, we present direct chemical evidence for what we may recognise as preserved traces of cooked, boiled, stored or processed food through lipid characterisation using gas chromatography (GC), gas chromatography-mass spectrometry (GC–MS), gas chromatography-combustion-isotope ratio mass spectrometry (GC–C–IRMS) and soft ionisation electrospray mass spectrometric techniques ESI Q–TOF MS and ESI Q–TOF MS/MS.

The analyses were carried out on organic residues extracted from the Eneolithic vessels sampled from the Maharski prekop pottery assemblage. The analy-

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ses focused on 20 potsherds (Tab. 1), covering well-defined groups of vessel size and related fabrics (see *Mlekuž* et al. *this volume*). Charred organic deposits on the surface of 22 vessels from the Maharski prekop assemblage were directly dated by the AMS radiocarbon method (Fig. 1). The dates demonstrate a distribution of probabilities, with periods of intensive occupation dating between 4400 and 4000 and between 3800 to 3550 calBC. While the charred deposits on pottery dating has been broadly accepted, Anders Fischer and Jan Heinemeier (*2003*; see also *Craig* et al. *2007*) have noted that a number of dates obtained from vessel residues from prehistoric sites in northern Europe are too old with respect to the 'old' carbon effect, which was introduced into the residue through the processing of marine and freshwater organisms in vessels. However, we found no evidence that the pottery at Maharski prekop was used for freshwater fish, crayfish or mollusc processing.

The Maharski prekop site is located beside a palaeo-river channel in the Ižica flood plain. During the excavation in the 1970s, 2432 vertical wooden piles were recorded at the site. The arrangement of piles can be interpreted as the remains of nine houses with dimensions of around 10 x 3.5–4.5m arranged in parallel. The settlement is divided into two building phases. The pottery distribution within the 'cultural layer' is clustered in at least three distinct concentrations. However, we cannot confirm any direct relation between houses and pottery (see *Mlekuž* et al. *this volume*).

Palinological data indicate that the floodplain forest was mixed, comprising predominantly *Quercus*, *Corylus*, *Fagus* and *Alnus*, with some coniferous elements and open ground herbaceous taxa. In addition, the presence of cereal pollen is attested from at least 4000 calBC. A sharp decline in arboreal pollen and an expansion of herbaceous taxa, particularly cereals and *Poaceae*, and carbonised grains of *Hordeum* sp., support the notion of arable fields surrounded by forest (*Culiberg, Šercelj 1991.252; Gardner 1999.130, 165, 168; Šercelj 1975.121; 1981–1982.104*; see also *Andrič 2007*). The composition of the animal bone assemblage shows that domestic ruminant animals prevailed in local subsistence. The domestic package consists of sheep and goat (29.7%,), cattle (12.9%) and pig (5.1%). In addition, dog represents 12%. In the wild animal assemblage, red deer (18.1 %), roe deer (3.4%), boar (11.8%) and birds (3.0%) predominate (*Drobne 1975a; 1975b*).

Material and methods

We selected 20 pottery fragments for a pilot chemical study encompassing lipid distribution including fatty acids, stable isotope composition (bulk $\delta^{13}C$ or $\delta^{15}N$, and $\delta^{13}C$ of individual fatty acids) and the di- and triacylglycerols (DAGs and TAGs) distribution of organic residues. Within the assemblage, three samples (MP85, MP158A and MP181) were obtained from charred organic residues from vessel surfaces (Tab. 1). The sherds were surface cleaned to remove any exogenous lipids. The sub-samples were then ground to a fine powder. First, the isotopic composition of carbon and nitrogen was determined on the bulk samples (Tab. 1). Each sample was weighed in duplicate into tin capsules and analysed using a Europa Scientific isotope ratio mass spectrometer with ANCA–SL preparation module for solid and liquid samples (PDZ Europa Ltd, Crewe, UK). Stable isotope results are presented as $\delta^{13}C$ or $\delta^{15}N$ values in per mil (‰) relative to the VPDB and AIR international standard, respectively.

Lipid analyses were performed using the extraction procedure described in detail by Richard Evershed *et al.* (*1994*). Two grammes of fine powder samples were transferred into a 50ml glass vial. Lipids were extracted with a mixture of chloroform and methanol (2:1 v/v), and 20µl of an internal standard (*n*-tetratriacontane, 1mg/ml in *n*-hexane) was added to determine lipid concentrations. The solvent was extracted by ultrasonication (2 x 15min) and evaporated to dryness under a gentle stream of nitrogen to obtain the total lipid extract (TLE). One portion of the TLE was derivatised using BSTFA (N, O-bis(trimethylsilyl)trifluoroacetamide, 40µl; 70°C; 60min), evaporated to dryness and re-dissolved in *n*-hexane for GC and GC–MS analysis.

Further aliquots of the TLE were methylated using BF3/methanol to obtain fatty acid methyl esters (FAMEs) (14%, w/v; 100µl; Sigma Aldrich, Gillingham, UK; at 70°C for 1h). The methyl ester derivatives were extracted with hexane, and the solvent removed under nitrogen. FAMEs were re-dissolved in hexane for analysis by GC and GC–C–IRMS. GC–C–IRMS analyses were performed using an Isoprime GV system (Micromass, Manchester, UK).

The third TLE aliquot was used to identify the TAG content following the procedure described by Sigrid Mirabaud *et al.* (*2007*). The silica solid-phase extraction (SPE) cartridges (500mg, 3ml, Isolute, Biotage) were rinsed with 2ml of *n*-hexane, 2ml of

CH_2Cl_2/CH_3OH (2:1 v/v), and then 4ml of *n*-hexane. The first fraction of the sample containing hydrocarbons was eluted with 1ml of hexane, while the second fraction, which contains the TAGs, was eluted with 1ml of CH_2Cl_2. The fractions with TAGs were evaporated to dryness and then analysed. Mass measurements were run on a hybrid quadruple time of flight mass spectrometer (Q-TOF Premier) provided with an orthogonal Z-spray ESI interface (ESI-MS; Waters Micromass, Manchester, UK). The doping reagent of LiCl (Merck, Darmstadt, Germany) was added to the methanol sample solution for more efficient electrospray ionisation of long chain lipids. For ESI-MS/MS, the lithiated molecular ions $[M+Li]^+$ were selected in the first quadrupole, accelerated to an energy of 3kV, dissociated by using 10 to 30eV collision energy and analysed with the TOF analyser.

Results and discussion

Bulk C and N isotope composition

The carbon and nitrogen isotope composition of the organic remains in pottery vessels may reflect the average $\delta^{13}C$ or $\delta^{15}N$ values of the degraded food during vessel use and burning. It may provide important information, particularly on whether the food was based primarily on animals or plants (C_3 and C_4). The determination of the isotopic composition of C and N was possible in only 15 samples. The average and standard deviation from potsherd samples are -30.7 ± 1.3‰ and +1.0 ± 3.8‰ for $\delta^{13}C$ and $\delta^{15}N$, respectively (Tab. 1). These data fall in the range expected for degraded animal and plant tissues whose subsistence was based mainly on C_3 plants.

Three charred organic residue samples from Maharski prekop (MP158A, MP85, and MP181) exhibit higher $\delta^{15}N$ values ranging from +6.2 to +9.8‰. We suggest that these pots were used to process low-protein fat and/or high-fibre food (*Spangenberg* et al. *2006; Craig* et al. *2007*). However, the GC-MS analysis gives a more precise identification of food content. The $C_{16:0}/C_{18:0}$ fatty acid ratios of >2.0 and the presence of a homologous series of long chain *n*-alkanes from C_{16}-C_{33} (odd-over-even carbon number predominance) indicate the use of plants and the presence of degraded vegetable oils in samples MP85 and MP181. In sample MP158A, on the other hand, the low $C_{16:0}/C_{18:0}$ ratio of 0.1, and the presence of cholesterol and stable isotope data with $\Delta^{13}C$ value of -2.4‰ show the presence of ruminant adipose fat. These data match well with the results obtained for lipids in the bulk pottery sample MP158 from the same vessel, as we discuss below. The differentiating parameter between the two samples of a single vessel is the high $\delta^{15}N$ value of +9.8‰ determined in the charred organic residues on the inner surface of this pot (MP158A). It is worth pointing out that thermal degradation and microbial reworking of organic matter could significantly alter the $\delta^{15}N$ values, making this analysis less reliable, and should be used only as a general indicator prior to more specific chemical and molecular analysis such as lipid identification and stable isotope data.

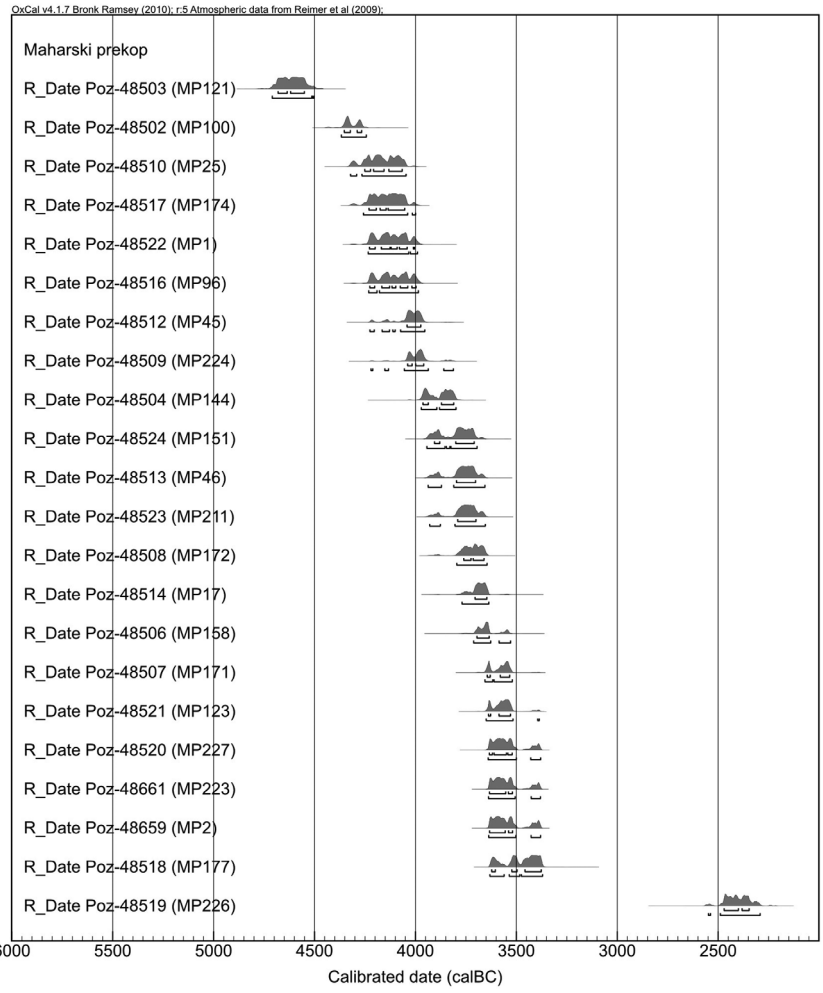

Fig. 1. Radiocarbon dates of charred organic deposits on the surface of 22 vessels from Maharski prekop.

Lab. sample no.	Labcode AMS radiocarbon dating	Conventional radiocarbon age (BP)	$\delta^{13}C_{bulk}$ ±0.2 (‰)	$\delta^{15}N_{bulk}$ ±0.3 (‰)	Lipid concentration ($\mu g g^{-1}$)	Fatty acids	$C_{16:0}/C_{18:0}$	$\delta^{13}C_{16:0}$ ±0.3 (‰)	$\delta^{13}C_{18:0}$ ±0.3 (‰)	Di- and triacylgricerols	Other constituents	Predominant commodity type
MP1	Poz–48522	5280 ± 40	–31.7	1.7	223	$C_{14:0}$, cis-$C_{15:0}$, $C_{16:0}$, $C_{16:1}$, $C_{18:1}$, $C_{18:0}$, $C_{20:0}$, $C_{22:0}$	1.8	–31.4	–31.4	n/a	odd carbon numbered higher alkanes	mixture
MP2	Poz–48659	4750 ± 35	n/a	n/a	0.75	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MP17	Poz–48514	4900 ± 40	n/a	n/a	0.05	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MP25	Poz–48510	5340 ± 40	–29.9	3.8	434	$C_{10:0}$, $C_{12:0}$, $C_{15:0}$, iso-$C_{15:0}$, $C_{16:0}$, $C_{18:1}$, $C_{18:0}$, $C_{20:0}$	2.0	–29.8	–29.9	D_{26}–D_{34}, T_{26}–T_{34}	$C_{29}H_{60}$	mixture
MP45	Poz–48512	5210 ± 40	–30.4	–4.0	189	$C_{12:0}$, $C_{16:0}$, $C_{18:1}$, $C_{18:0}$	1.1	–29.6	–29.9	D_{30}–D_{34}, T_{26}–T_{54}	n/a	ruminant, possible goat milk
MP46	Poz–48513	4980 ± 40	n/a	n/a	2.32	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MP96	Poz–48516	5270 ± 40	–29.7	2.2	129	$C_{10:0}$, $C_{12:0}$, $C_{13:0}$, $C_{16:0}$, $C_{18:0}$	10.7	–30.4	–30.3	n/a	wax, odd carbon numbered higher alkanes	plant
MP100	Poz–48502	5470 ± 35	–32.0	–0.4	3622	$C_{12:0}$, $C_{16:0}$, $C_{18:2}$, $C_{18:1}$, $C_{18:0}$, $C_{20:0}$, $C_{22:0}$	0.9	–28.3	–30.1	T_{40}–T_{54}	odd carbon numbered higher alkanes and alcohols, cholesterol	ruminant, cattle adipose fat
MP121	Poz–48503	5760 ± 40	–32.0	3.5	110	$C_{9:0}$, $C_{10:0}$, $C_{16:0}$, $C_{18:0}$, $C_{20:0}$, $C_{22:0}$	1.8	–30.7	–30.6	n/a	n/a	mixture
MP123	Poz–48521	4790 ± 35	–30.8	–0.2	870	$C_{9:0}$, $C_{10:0}$, $C_{16:0}$, $C_{18:0}$, $C_{22:0}$	0.2	–30.0	–29.8	D_{26}–D_{36}, T_{26}–T_{54}	odd carbon numbered higher alkanes	ruminant, possible goat milk
MP144	Poz–48504	5105 ± 35	n/a	n/a	0.43	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MP151	Poz–48526	5000 ± 40	–29.6	2.1	44.3	$C_{10:0}$, $C_{14:0}$, $C_{16:0}$, $C_{18:0}$, $C_{22:0}$	1.1	–30.4	–32.0	n/a	n/a	ruminant
MP158			–29.8	–0.6	456	$C_{9:0}$, $C_{10:0}$, $C_{14:0}$, $C_{16:0}$, $C_{17:0}$, $C_{18:1}$, $C_{18:0}$, $C_{22:0}$	0.9	–29.1	–30.7	T_{40}–T_{54}	odd carbon numbere higher alkanes, cholesterol	ruminant, cattle adipose fat
MP158A	Poz–48506	4860 ± 40	–30.0	9.5	118	$C_{16:0}$, $C_{18:0}$, $C_{22:0}$	0.1	–28.0	–30.4	n/a	odd carbon numbered higher alkanes, cholesterol	ruminant
MP172	Poz–48508	4940 ± 40	–28.9	–5.2	41.7	$C_{16:0}$, $C_{18:0}$, $C_{22:0}$	1.2	–30.4	–31.1	n/a	n/a	ruminant
MP174	Poz–48517	5310 ± 40	–33.8	–2.3	57.3	$C_{9:0}$, $C_{10:0}$, $C_{14:0}$, iso-$C_{15:0}$, $C_{16:0}$, $C_{17:0}$, iso-$C_{17:0}$, $C_{18:3}$, $C_{18:1}$, $C_{18:0}$, $C_{20:0}$, $C_{22:0}$	2.4	–31.7	–31.2	n/a	odd carbon numbered higher alkanes, cholesterol	mixture
MP177	Poz–48518	4700 ± 40	n/a	n/a	0,28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MP211	Poz–48660	4970 ± 40	–30.3	2.6	9.5	$C_{9:0}$, $C_{10:0}$, $C_{14:0}$, $C_{14:1}$, $C_{16:0}$, $C_{18:2}$, $C_{18:1}$, $C_{18:0}$, $C_{22:0}$	1.4	–29.7	–29.5	n/a	$C_{29}H_{60}$	mixture
MP85			–26.7	9.8	22.8	$C_{14:0}$, $C_{16:0}$, $C_{18:0}$	4.0	–32.5	–31.1	n/a	odd carbon numbered higher alkanes, $C_{22:0}$ ketones	plant
MP181			–25.2	6.2	21.7	$C_{14:0}$, $C_{16:0}$, $C_{18:0}$	2.4	–32.2	–30.0	n/a	odd carbon numbered higher alkanes, $C_{22:0}$ ketones	plant

Tab. 1. A summary of the analyses of the potsherds and organic residues from Maharski prekop.

Lipid identification in potsherds

The lipid residue analyses were performed with the GC and GC–MS methods. Lipid preservation was very good, with 75% of potsherds yielding an appreciable lipid concentration. Lipid concentrations of less than 5μgg^{-1} were considered unreliable and excluded from further interpretation (Tab. 1).

The well-preserved extractable lipids in 15 samples consisted mainly of free and bounded fatty acids identified by their methylesters (FAME) mass spectra. The most common distribution found in our samples was dominated by a high abundance of the $C_{16:0}$ and $C_{18:0}$ fatty acids derived from degraded animal fats (Fig. 2). The presence of degraded animal fats can be further recognised in the relative abundances of $C_{16:0}$ and $C_{18:0}$. In 11 samples (or 73%; numbers MP1, MP25, MP45, MP100, MP121, MP123, MP151, MP158 with MP158A, MP172, MP211) the $C_{16:0}/C_{18:0}$ ratios of fatty acids range between 0.1 and 2.0 (Fig. 3). They indicate ruminant adipose fat (*Copley* et al. *2005*). In 2 samples (or 13%; numbers MP96 and MP85) the ratios are greater than 3.0 and consistent with degraded vegetable oils (*Copley* et al. *2005*). The other two samples, MP174 and MP181, have $C_{16:0}/C_{18:0}$ ratios of 2.4, indicating the possible presence of dairy fats.

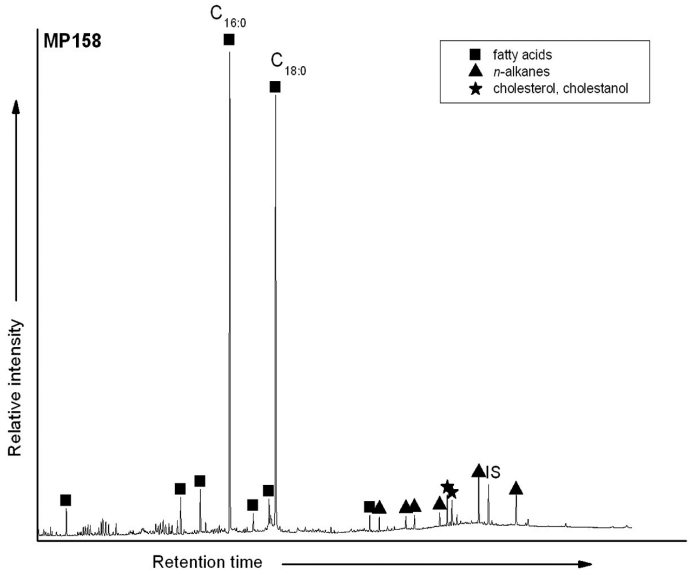

Fig. 2. The GC chromatogram displaying the trimethylsilylated lipid extract from the Maharski prekop pottery sample MP158 that is characteristic of degraded animal fats.

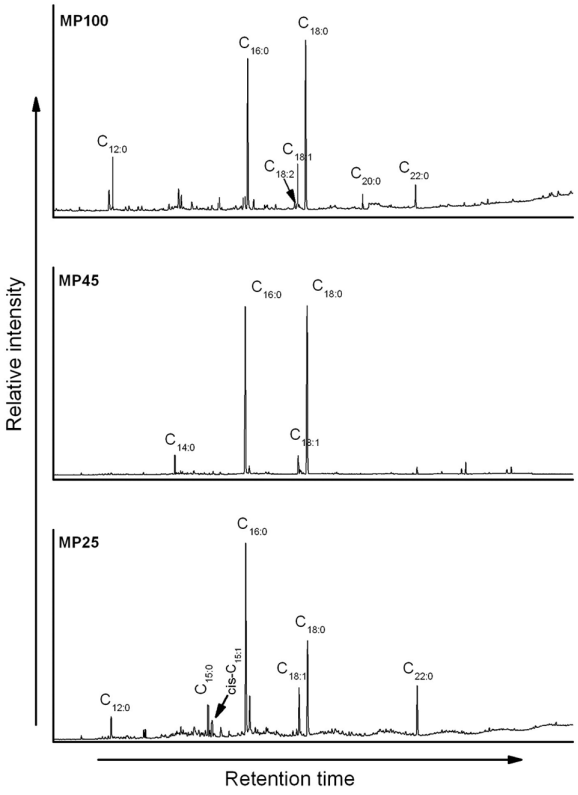

Fig. 3. The representative GC–MS total ion chromatograms of the fatty acids methylesters (FAMEs) with different $C_{16:0}$ and $C_{18:0}$ abundance extracted from the Maharski prekop pottery samples MP25, MP45 and MP100.

The $C_{16:0}/C_{18:0}$ ratios that range from 0.9 to 2.0 in 6 of the 11 potsherds extracts (MP1, MP25, MP45, MP100, MP158, MP211) and the ratio of >2.0 in MP174 are all consistent with degraded animal fats and clearly show evidence of fatty acid preservation. The main acids in these extracts are $C_{12:0}$, $C_{14:0}$, $C_{15:0}$, iso-$C_{15:0}$ $C_{16:0}$, $C_{17:0}$, iso-$C_{17:0}$, $C_{18:0}$, $C_{18:1}$, $C_{20:0}$ and $C_{22:0}$. Other fatty acids were less frequently observed ($C_{9:0}$, $C_{10:0}$, $C_{13:0}$). The isomers of $C_{18:1}$ with two different double bond positions at 9 and 11 were found in all 7 pottery samples mentioned above. The presence of branched iso-fatty acids with 15 and 17 carbon atoms was observed in samples MP1, MP25 and MP174. The presence of these acids together with two double bonds positional isomers of $C_{18:1}$ indicates ruminant animal fats that have been biosynthesized in the gut and rumen (*Christie 1981; Dudd* et al. *1999; Mottram* et al. *1999; Regert 2011*). The parallel biomarkers, *i.e.*, the cholesterol and its derivatives, were detected in four samples (MP158 with MP158A [samples relate to the same vessel], MP100 and MP174), confirming the presence of degraded animal fats (Tab. 1 and Fig. 2). A single $C_{18:1}$ isomer that reflects non-ruminant monogastric animal fat, such as porcine (*Enser 1991; Evershed* et al. *1997*), was not detected in any of the samples from Maharski prekop.

A homologous series of long chain *n*-alkanes from C_{16}–C_{33} (odd-over-even carbon number predominance) that originate from epicuticular waxes of vascular plants (*Bianchi 1995*) was present in 9 samples (numbers MP1, MP96, MP100, MP123, MP158 with MP158A, MP174, MP85, MP181) (Tab. 1). The highest abundance of *n*-alkanes associated with the highest abundance of $C_{16:0}$ in sample MP96 suggests the presence of plants as well. The correlation of long chain *n*-alkanes, the highest abundance of $C_{16:0}$ and the highest $C_{16:0}/C_{18:0}$ ratio of 10.7 indicate that the vessel was used for preparing or storing plant foods. The appearance of both animal and plant biomarkers observed in the other 8 samples (numbers MP1, MP100, MP123, MP158 with MP158A, MP174, MP85 and MP181) suggests that the pots were used for mixed food processing and storage (Tab. 1).

Stable carbon isotope composition of fatty acids

The $\delta^{13}C$ values determined by the GC–C–IRMS method in fatty acids in modern edible oils and fats can be used to access the origin of lipids preserved in archaeological ceramics (see *Copley* et al. *2003; Spangenberg* et al. *2006; Craig* et al. *2007*). The $\delta^{13}C$ values of the major fatty acids in oils from C_3 plants are plotted near the 1:1 line, while modern dairy fats plot below the $\Delta^{13}C$ = –3.3‰ line (*Evershed* et al. *2008; Copley* et al. *2003; 2005; Dunne* et al. *2012*) (Fig. 4a). Seven samples of Maharski prekop plot near the 1:1 line, while the other five samples fall below the 1:1 line in a zone of ruminant adipose fats. No evidence of fish, porcine or ruminant dairy fat was found in the samples when observing the $\delta^{13}C$ values.

A more precise differentiation between non-ruminant adipose, ruminant adipose and ruminant dairy fats can be seen in the diagram where $\Delta^{13}C$ values ($\delta^{13}C_{18:0}$–$\delta^{13}C_{16:0}$) are plotted against the $\delta^{13}C_{16:0}$ values (Fig. 4b). The comparison of the $\Delta^{13}C$ values of modern reference animal fats with those of the Eneolithic pottery residues show that 42% of these plot in the range for ruminant adipose fats. A further 58% of the samples fall close to the limiting value between non-ruminant and ruminant meat ($\Delta^{13}C$ = 0‰). However, the later samples may not be assigned to meat mixture exclusively, but also to a mixture of plant-animal fats. The $\delta^{13}C$ values indicate that three pottery vessels (MP100, MP151, MP158 with MP158A) could contain sheep/goat and cattle fats. None of the $\delta^{13}C$ values determined in our samples plot below the $\Delta^{13}C$ = –3.3‰ line, which was used as a criterion for the determination of dairy foods (*Evershed* et al. *2002; 2008; Copley* et al.

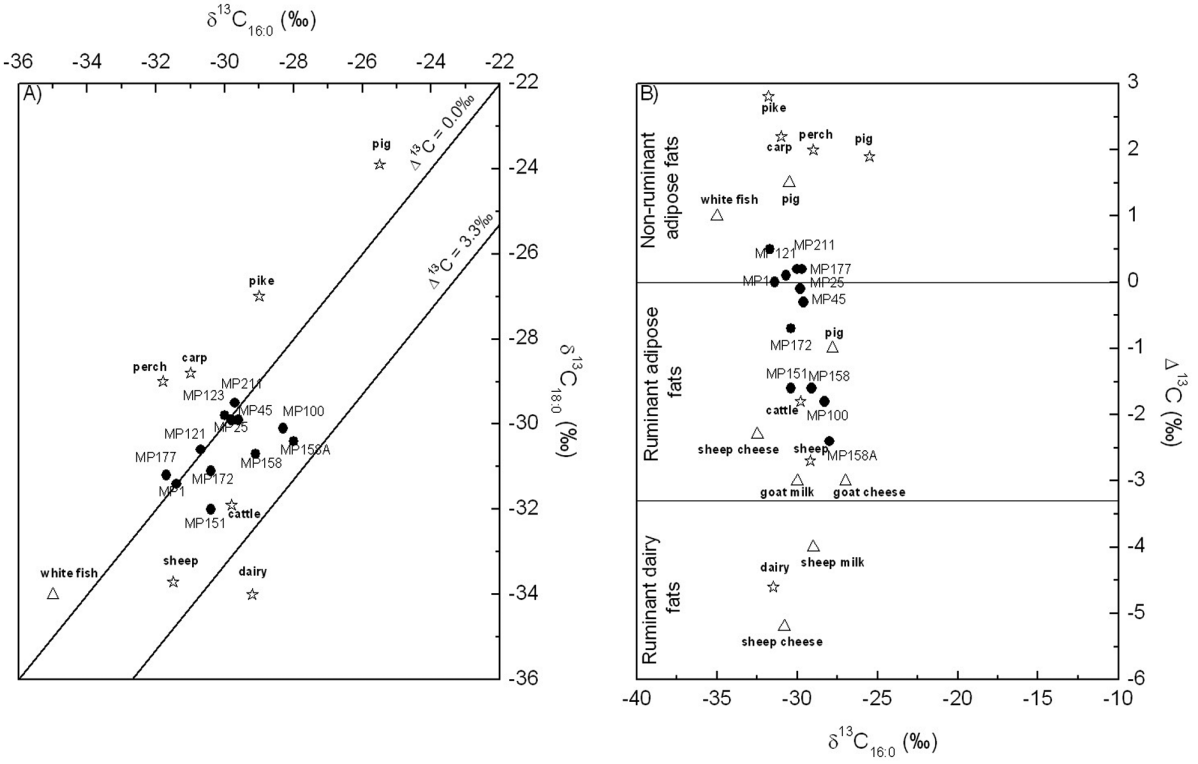

Fig. 4. Plot showing: A the $\delta^{13}C_{18:0}$ versus $\delta^{13}C_{16:0}$ values of modern reference animal fats and archaeological samples. B the difference in the $\delta^{13}C$ values of $C_{18:0}$ and $C_{16:0}$ fatty acids ($\Delta^{13}C$) versus $\delta^{13}C_{16:0}$ recovered from pottery extracts from Maharski prekop and modern reference fats (☆ data from* Craig *et al.* 2007; Gregg, Slater 2010*; Δ data from* Spangenberg *et al.* 2006*).

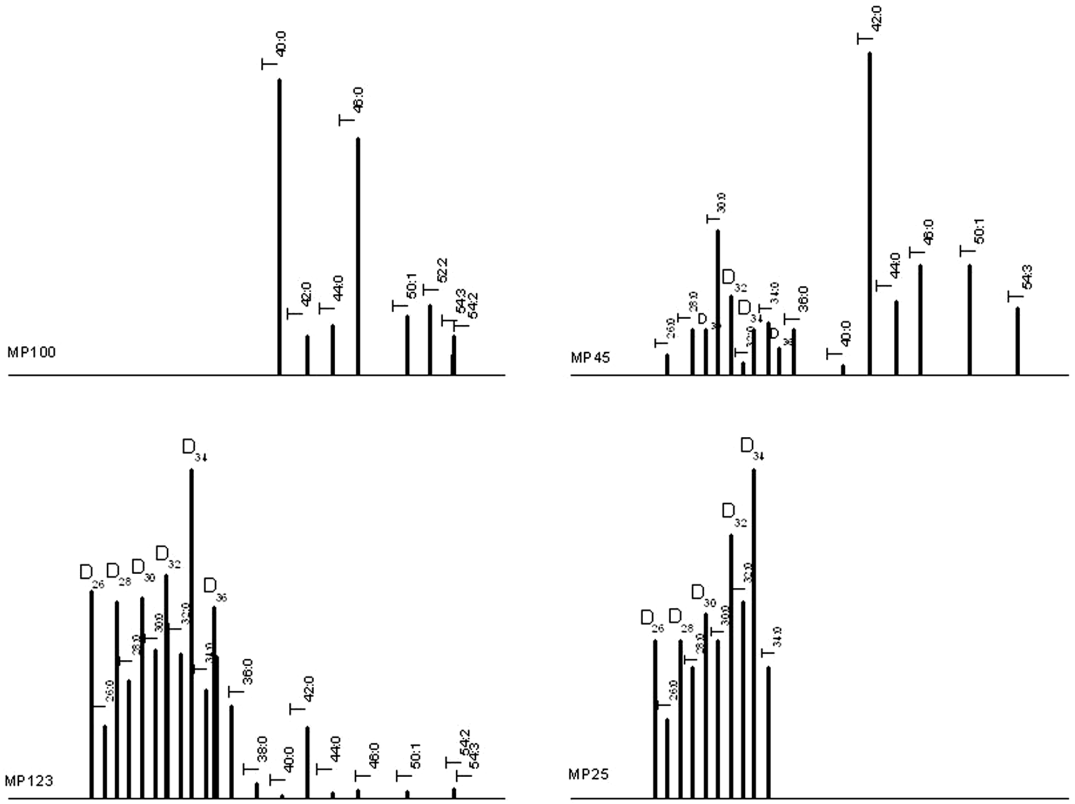

Fig. 5. ESI Q–TOF MS mass distribution of the TAG fraction from the Maharski prekop pottery samples MP25, MP45, MP100 and MP123.

2003; 2005; Mukherjee et al. *2007; Dunne* et al. *2012*).

Distinguishing animal fats by ESI Q–TOF MS

DAG and TAGs are indicative lipids of degraded animal fats. Previous work has shown that the TAG distribution could help to differentiate between fats of ruminant and non-ruminant animals and ruminant dairy fats (*Kimpe* et al. *2002; Mirabaud* et al. *2007; Regert 2011*). We applied the ESI Q–TOF MS and ESI–MS/MS methods to obtain information about the structure of TAGs in the Maharski prekop pottery samples. A major advantage of this method is its sensitivity, which overcomes one of the major difficulties raised by the low occurrence of TAGs in complex archaeological samples. A similar approach including the nanoESI–MS method was successfully applied to a series of modern reference fats and archaeological samples (see *Mirabaud* et al. *2007; Garnier* et al. *2007; Regert 2011*). The TAG analysis of modern fats of ruminants (*i.e.*, sheep, goat, and cattle), and non-ruminants (*i.e.*, pig) has shown clear differences between these two groups. The ruminant adipose fats contain TAGs that range from T_{42} (for cattle) or T_{44} (for sheep) to T_{54} (*Dudd* et al. *1999; Mukherjee* et al. *2007*). The non-ruminant adipose fats also show a narrow distribution that range from T_{44} to T_{54}, but with low quantities of T_{44}, T_{46} and T_{48}. A broad distribution that ranges from T_{28} to T_{54} is recognised in dairy fats (*Mirabaud* et al. *2007; Regert 2011*). It should be mentioned, however, that even if these distributions could partially resist degradation, they are modified in TAGs compositions to varying extents over time (*Dudd* et al. *1999; Mukherjee* et al. *2007; Regert 2011*).

The distribution of TAGs in five Maharski prekop samples shows that samples MP45 and MP123 have a large TAG distribution from T_{28} to T_{54}. In the other three samples, a narrower distribution runs from T_{26} to T_{34} (sample MP25) or from T_{40} to T_{54} (samples MP100 and MP158) (Fig. 5). Along the saturated TAGs, two $T_{50:1}$ and $T_{54:3}$ (sample MP45) four $T_{50:1}$, $T_{52:1}$, $T_{54:3}$, and $T_{54:2}$ (samples MP100 and MP158) unsaturated TAGs were detected. We compare these distributions with modern reference fats. We recognise the TAG distribution in samples MP45 and MP123 as indicators of dairy fat products (Fig. 5). The comparison of the TAG and DAG distributions in the identification of goat versus cow milk favours goat milk (*Mirabaud* et al. *2007*). More precise identification could be obtained from fatty acid distribution in $T_{44:0}$ using ESI–MS/MS fragmentation. This fragmentation was not possible in the Maharski pre-

kop samples due to the low amount and poor ionisation yield of $T_{44:0}$.

Maharski prekop samples MP100 and MP158 show evidence of the presence of cattle adipose fats, since the TAG distribution starts at T_{40}. This is in accordance with the $\Delta^{13}C$ values for these particular samples (Fig. 4B). Some samples (MP25) show only low molecular TAGs and DAGs, which suggest that lipids are of animal origin, although more precise determination was not possible (Fig. 5).

On the other hand, the TAGs and DAGs distributions in the Maharski prekop samples (MP45 and MP123) do not correlate well with the $\Delta^{13}C$ values. The values of –0.3 and 0.2‰ are higher than expected for cow or even goat milk (Fig. 4B). One of the possible explanations for this could be milk processing, since it was observed that $C_{16:0}$ and $C_{18:0}$ fatty acids are enriched in ^{13}C during heating, and thus the difference in the $\delta^{13}C$ values between the two acids becomes lower (*Spangenberg* et al. *2006*). Further investigation is needed, therefore, to understand the influence of milk processing (*i.e.*, warming and boiling) on the isotopic composition of fatty acids.

Conclusions

The results obtained from the lipid analysis of pottery from Maharski prekop indicate dietary trends involving animal and plant tissue. None of the total lipid extracts contained porcine or freshwater fish adipose fats or ruminant dairy fats. A good correlation in the interpretation of ruminant adipose fats, based on lipid identification and stable isotope analysis, was obtained in pottery samples MP100, MP151, MP158 with MP158A and MP172. Furthermore, the TAG distributions in MP100 and MP158 samples correlate well with the presence of cattle adipose fats recognised in the discriminating criteria found in modern fats. In other samples, the presence of different mixed fats either from non-ruminant and ruminant meat or from a plant-animal fats mixture was observed. Nevertheless, the TAG distribution in two samples (MP45 and MP123) showed the residues of dairy products that probably derived from goat milk. These data do not match the outcome of the stable isotope analysis completely, since the $\Delta^{13}C$ values in those samples are higher than expected for goat milk. One of the possible explanations for this distribution could be milk processing and dairy food production. Further investigation is needed to understand the inconsistencies that appear in the results obtained by different methods.

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^{14}C calendar chronologies and cultural sequences in 5th millennium BC in Slovenia and neighbouring regions

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ABSTRACT – *In the paper, Bayesian analysis of ^{14}C dates implemented in the OxCal program is used to develop calendric time-scale chronologies of individual sites and archaeological cultures of the 5th millennium calBC in Slovenia and Croatia. Case studies are presented in which ^{14}C dates are analysed and reinterpreted with the aid of contextual archaeological data. At the site level, stratigraphic sequences are used in models to constrain and then precisely date activities within them. At the regional level, the results of the chronological modelling of archaeological cultures are used to present them on a calendric time-scale and within a broader spatial framework of Central and Southeastern Europe. Special emphasis is placed upon critical comparison of modelled calendar and cultural sequences. On the basis of this comparison, some inconsistencies and contradictions in the relative chronological schemes of periods and archaeological cultures are presented.*

IZVLEČEK – *V članku uporabljamo bayesove analize ^{14}C datumov v kalibracijskem programu OxCal za oblikovanje koledarskih kronologij posameznih najdišč in arheoloških kultur 5. tisočletja pr. n. št. v Sloveniji in na Hrvaškem. Predstavljamo študijske primere, v katerih s pomočjo kontekstualnih arheoloških podatkov analiziramo in reinterpretiramo ^{14}C datume. Na ravni najdišč stratigrafska zaporedja služijo natančnejšemu datiranju najdišč in v njih prepoznanih aktivnosti. Na regionalni ravni rezultate kronološkega modeliranja arheoloških kultur uporabimo za njihovo umeščanje v koledarski časovni okvir in širši prostorski okvir Srednje in Jugovzhodne Evrope. Poseben poudarek namenjamo primerjavam med modeliranimi koledarskimi in kulturnimi zaporedji. Na osnovi teh primerjav predstavljamo nekatere nedoslednosti in protislovja relativnih kronoloških shem obdobij in arheoloških kultur.*

KEY WORDS – *^{14}C dating; time concepts; chronology; Neolithic; Eneolithic*

Introduction

Contemporary discussions of the concepts of time in archaeology are still concerned with problems of chronology. In contrast to the earlier and often polarizing discussions, it is now becoming increasingly apparent that both relative chronology and calendar (radiometric) chronology in many cases actually have the same basic flaws. In his book 'The Archaeology of Time', Gavin Lucas (*2005.10*) suggests that "*chronology – whether relative or absolute – is theoretically problematic and for one chief reason: it presents time as a uniform, linear phenomenon which has tended to define the model for historical explanation in a similar uniform, linear way ... Both the periodisation and the calendar flow in one direction and each is divided into discrete, non-overlapping units,* i.e. *periods or years. The main difference is that periodisation uses much larger units than the calendrical system but, in principle, they share the same structure. In short, they presume a specific conception of time as a uni-linear sequence or series.*"

Alternative approaches have been proposed which share the basic idea that different historical proces-

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ses operate on different temporal scales. These approaches borrow from the French historical theory developed by the Annales School and non-linear dynamics. Of the more influential theoretical discussions on the concepts of time in archaeology, Geoff Bailey's (*2007*) concept of time perspectivism and Michael Shanks and Christopher Tilley's (*1987*) concept of abstract and substantial time are worth mentioning. Bailey draws attention to the existence of different conceptual timescales and especially to "*... the relatively coarse temporal resolution and palimpsest nature of much of the archaeological record; the possibility that the increased time depth and varied time resolution of observation afforded by archaeological data might allow us to perceive phenomena and processes not visible at smaller scales of observation.*" (*Bailey 2007.199*). He goes on to argue that "*...the analysis of small-scale phenomena such as individual agency, inter-personal interactions and perception, which have become such a dominant tendency in recent archaeological interpretation, is better focused on observation of, say, present-day practices or recent historical periods rather than the deeper prehistoric past.*" (*Bailey 2007.201*). Shanks and Tilley (*1987.128*) criticise one specific detail of Bailey's position, namely that archaeology should deal with the long-term, and they consequently differentiate between two different kinds of time – abstract and substantial time. They equate the abstract with measured time, which is a notion that only recently emerged within the framework of the modern economic worldview. This is the (technical) time concept underlying the construction of relative and calendar archaeological chronologies. Substantial time, on the other hand, is the time of social practice, time as perceived by social actors in the short-term.

Shanks and Tilley and other post-processualists are concerned with the experience and flow of time, issues of the social construction of time, of memory and forgetting, and of the nature of the past in the past. With this focus, in the search for history and temporality, there is a natural tendency to downplay sequence as mere chronology both relative and absolute. (*Whittle* et al. *2011b.3*). In consequence, the discussion again becomes polarizing. At the same time, new methodologies have been developed within the framework of archaeological sciences that place much emphasis on the major (although earlier only qualitative) impact that metric, radiocarbon chronology has had on prehistoric archaeology (*Renfrew 1973*). Today, many tools are available, the common aim of which is the construction of chronologies that simultaneously take into account radiocarbon (^{14}C age) data as well as archaeological information in order to achieve more precise chronologies (*Bronk Ramsey 2008*). Interestingly, the existence of two entirely different concepts of time, as noted above, is even today not widely acknowledged, even to the point that the corresponding schools-of-thought remain largely ignorant of each other. As Robert Paynter (*2002. 97*) puts it, "*the theoretical side of archaeology lost track of time just as the methodological side of archaeology was acquiring the ability to create absolute chronologies*".

Recently the new 'Bayesian' approach to interpreting archaeological chronologies has been applied to the British Neolithic with present focus on long barrows and enclosures (*Bayliss* et al. *2007; Whittle* et al. *2011a*). The research incentive is not only to provide a more precise chronology, but also to bridge the gap between post-processual theoretical discussions and new calendar chronologies. The authors of these projects postulate there is a "*... need to determine the tempo of cultural change, the duration of activities seen in the archaeological record and the nature of temporality or the lived experience and marking of time. But it is hard to see how we can begin to attempt these goals without a framework of calendar dating. The calendrical time scale allows an assessment of elapsed time – how long is significant as well as when*" (*Bayliss* et al. *2007.2*).

Unfortunately, such ongoing theoretical discussions in the English-speaking community rarely meet a response in other European countries, including Slovenia. Here, questions relating to the measurements and conceptualization of time in the archaeological record are still widely treated within traditional chronological schemes, in which time is related to the assumed existence of cultural entities (such as the Neolithic and Eneolithic) and, on shorter timescales, to the assumed existence of archaeological cultures (such as Lengyel and Lasinja). Independent of any dating resolution, within this framework, ^{14}C dates can only be used to replicate such schemes in calendar years.

Problems of chronology

Chronology is fundamental to archaeology, since it allows the time-dependency of variations in the archaeological record to be distinguished from those determined by other factors. As widely recognized, it is inherently difficult to use the material record to distinguish between real historical processes and

processes that are only artificially reconstructed as a result of research methodology. Before calendar chronology was possible, only relative chronology could be established, based on the classification of artefacts into typological sequences. The 'cultural' (or 'comparative-stratigraphic') dating method is based on evaluating the superposition of archaeological deposits, to begin on a local or regional scale, and the results are then used in a transfer procedure to date other deposits, on a wider geographical scale. Since the origin of such generalizing periodisation schemes in the 19th century, their meanings constantly shifted, but individual cultural units (*e.g.*, periods) have always been represented as an entity which can be analysed as a coherent whole (*Thomas 1993.390*). Following the introduction of the concept of archaeological cultures in early 20th century, and the increasingly predominant critique of such concepts in the late 20th century, today – despite a general waning of chronological discussion – the application of such schemes became widespread. Importantly, archaeological culture is still today represented as an entity, which is internally stable, time-constant and altogether quite inflexible. Johannes Müller rightly criticizes this view when he writes that "*Most of the archaeologists reconstructed 'cultures' as spatially and temporally limited units that followed one after the other*" (*Müller 2009. 722*). If at all, some minor cultural flexibility is allowed to cover the possibility of some minor temporal overlap.

The general notion underlying all classification-based research programs is that culture is simply a materialized sequence of events. In relative chronology, this leads to a vicious cycle, since the material classification is not only used for dating purposes, but also simultaneously for the definition of what is being dated. This is already apparent for cultural dating with low resolution on the temporal level of major chronological periods (*e.g.* Neolithic, Eneolithic), but all the more when the dating is refined to cover the level of cultural units (*e.g.* Lengyel, Lasinja). On both levels, the typologically classified material culture is inevitably presented as temporally exclusive (despite possible contemporaneity). Simultaneously, any observed variability within the material record is used to define the supposedly fixed (and then accepted) limits of the classificatory units under study. In this manner, since these units can only be defined as homogenous, the allowed cultural variability regulates the precision of the cultural dating. The underlying world-view is that prehistory contains a long and steady sequence of artificially homogenous and internally stable periods or cultures that are separated from each other by relatively rapid changes in their material (typological) foundation.

The research program based on relating cultural change to the material variability found within any given sequence of time-exclusive periods and cultures has further (and again inherent) implications, the most important of which is related to the normative culture-historical interpretations, namely that differently classifiable material culture must be the product of different peoples (*Shanks, Tilley 1987. 79–95*). This is perhaps best exemplified by Gordon Childe (*1929.v–iv*): "*We find certain types of remains – pots, implements, ornaments, burial rites, and house forms – constantly recurring together. Such a complex of associated traits we shall term a 'cultural group' or just a 'culture'. We assume that such a complex is the material expression of what today would be called a 'people'*". When integrated within a research program, such concepts of how to understand variability within the archaeological record not only provides a chronological background, but also an interpretive framework within which it is possible to define certain norms in culture. The very concept of relating culture to chronology in this manner ultimately makes both constitutive of each other. It is therefore not only (technically) the case that "*the resolution of dating methods ... influences the form in which societies are reconstructed by archaeologists*" (*Müller 2009.721*), but also (ideally) that "*the conceptualization of time through chronology appears to operate through a historical process of accretion and adaptation rather than refutation*" (*Chazan 1995.464*). Ultimately, relative chronological schemes as well as cultural-historical interpretations of prehistoric society are maintained in such approaches, and this is independent of whether a natural-scientific or cultural approach is taken.

With the continuous refinement of radiometric dating (*e.g.*, ^{14}C–AMS) methods, new calendar chronologies can now be established that allow the dating of individual archaeological events irrespective of their relative-chronological and cultural attribution. In the past, this possibility has often been overlooked. ^{14}C dates are still today sometimes used only as occasional hooks onto which archaeological cultures and periods are hung (*Whittle 2011b.1*) and, if the results of the pre-established relative order are not confirmed, they can even be rejected with no further avail. In this way, relative chronological

schemes often established long ago and based on less abundant material compared to the variability known today are often simply replicated. Of course we should discontinue using ^{14}C dates in this manner, but to date activities and events that happened in the past. This new approach is supported by using statistical procedures implemented in a simple to use computer software. Earlier researchers initially applied quite simply implemented ^{14}C-age calibration software, wherein the data-input and the computer-output were perceived as representing independent scientific dates, as claimed by Renfrew (*1973.109*). Over the years, archaeologists have become increasingly aware of the necessity, prior to the statistical analysis, to provide a contextual and interpretive framework based on empirical archaeological information as well as on theoretical modelling. This framework merges the archaeological record with the excavation praxis (the source of the record), with archaeological theory (the interpretation of the record), and – in particular – with the basic principles of the applied dating method.

Bayesian modelling of archaeological chronologies

When handling ^{14}C data, it is important to understand that we are dating events in the past, but that these are seldom contemporary with the archaeological event we wish to date, which can be anywhere from the initial deposition of an artefact assemblage, to the construction of a house, its later burning, the beginning and end of any particular settlement or human occupation in a region as a whole.

From the biological perspective, ^{14}C date provides an estimate of the time that has passed since an organism stopped exchanging ^{14}C with the environment. It is therefore important to consider the time-width or the period during which the exchange of carbon was active. For 'short-lived' samples such as a cereal grain, this period is short (1 growing season), but for 'long-lived' samples, such as charcoal, it can be quite long (up to 100 years and more). Trees grow by the addition of rings and once these are laid down, the photosynthetic carbon exchange between the rings and the atmosphere ceases. Unfortunately, for the majority of charcoal samples that derive from any typical archaeological excavation, it is impossible to reconstruct whether the charcoal originates from the (older) heartwood or the (younger) sapwood. Strictly speaking, the time-difference between the calendric age of the charcoal sample and the felling of a tree, not to mention the use of its wood for building or fuel, remains unknown. To avoid the error-prone reconstruction of the 'average' calendric age of a 'typical' charcoal sample (and this is very clearly emphasized by Patrick Ashmore (*1999*), when he recommends only dating single and not multiple events), it is advisable to sample only 'short-lived' samples. As is well-known, the re-analysis of earlier ^{14}C-data is therefore seldom really fruitful, since in the past the large majority of dates were produced on charcoal. But today, the ^{14}C-AMS technique readily allows the dating of very small samples, such as cereals, small bones and organic residue on pottery. AMS-^{14}C-ages that have been obtained on such 'short-lived' samples obviously provide dates that are more closely related to events of archaeological interest, than dates on potentially long-lived charcoal samples.

Since radiocarbon results are supplied as statistical estimates, ^{14}C age values show a sometimes wide scatter around the true ^{14}C age, depending on the quoted error. When ^{14}C-measurements are age-calibrated, this initial scattering effect is further amplified, depending on the shape of the tree-ring based calibration curve in the relevant period. The true calendar ages of ^{14}C measurements can be represented in formally quite simple looking graphs, both for single as well as for grouped dates, but the resulting graph requires some actually quite complex interpretation, and the typically multi-modal distribution of calendric-scale dating probability shown in such graphs can hardly be intuitively understood. In consequence, due to the inevitable statistical scatter of ages in combination with the folding effects of the calibration curve, it is virtually impossible – by a mere visual inspection of calibrated age graphs – to obtain a realistic estimate for the actual age of the archaeological events of interest under study. In particular, due to the unrealistically wide spread of readings induced by the shape of the calibration curve, it is difficult to derive a statistically reliable estimate for the actual durations of the activities under study.

As an helpful alternative, it is possible to analyse extended sets of ^{14}C dates with the use of computer-based methods that are derived from probabilistic Bayesian theory. Such methods, that are becoming increasingly popular in the archaeological community, are capable of providing formally correct age estimates with quantified uncertainties for a wide range of applications. To this purpose, in the present study, we make use of the calibration software OxCal (*Bronk Ramsey 2009*), which implements Bayesian statistics and Markov Chain Monte Carlo sampling.

The underlying idea is to provide statistical constraints for the typically large multiplicity of calendric scale readings, with the aid of additional archaeological information. To be successful, this approach requires a refined look not only at the statistical properties of the ^{14}C-data under study, but also at the archaeological properties of the study samples.

The Bayesian approach to modelling archaeological chronologies has been under development for some 20 years now and has over the years been applied to wide variety of chronological problems. There exist many theoretical, methodological and practical studies that provide introductions to Bayesian calibration procedures. Most recently, the Bayesian methodology is described in detail by Christopher Bronk Ramsey (*1995; 1998; 2008; 2009),* Alex Bayliss *et al.* (*2007*) and Alasdair Whittle *et al.* (*2008; 2011a*). In a nut-shell, the Bayesian approach (as implemented in the OxCal-program) is simultaneously probabilistic as well as contextual, and enables input of the necessary archaeological information for a wide variety of archaeological study situations. In OxCal the analysis procedure is not simply a matter of entering data, and obtaining results (as sometimes assumed), but instead a question of experimenting with the data in the light of available archaeological information. The OxCal program supports this approach by providing a platform for convenient recalculation of the calibrated probability distributions of ^{14}C dates under different conditions. A particularly useful option is to estimate ages of events that have not been directly dated, as well as to estimate the duration of activities.

The OxCal program allows different chronological models to be produced. In these models, archaeological information is used to define the relationships between ^{14}C dates and archaeological events of interest, as is usually available as a stratigraphic or other kind of relative sequence. The two basic tools in OxCal with which basically any chronological problem can be addressed are 'Phases' and 'Sequences'. The former can be used to group ^{14}C dates, the relative chronological order of which is not known, but the data are assumed to be connected. The latter can be used when information is available for the relative chronological order of the dated samples. Phases and sequences can be nested one in another, so that we can, for example, have a sequence of phases within which ^{14}C dates are grouped. We make use of such a simple sequence of phases in the present paper when chronologically modelling the different Neolithic settlement phases at Moverna vas, whereas a more complex nesting of phases and sequences is used in the chronological modelling of the Vinkovci-Sopot site. In Bayesian terminology, archaeological information entered during the modelling process serves as an 'Informative' prior belief which strongly affects the chronological results and therefore has to be used knowledgeably and with an understanding of the chronological questions we wish to ask.

OxCal also uses what is called 'Uninformative' prior belief, the application of which is useful when ^{14}C dates are known to be related, for example when we date a period of past activity (which may be a period of settlement occupation or period of production of a certain pottery type). By implementing a uniform event distribution on the sample set, we assume that the activity began, then continued at a relatively constant rate, and then ended. The assumption, in this case, is that the available set of ^{14}C dates can be visualized as representing a random sample of dates within this period. According to Bayliss *et al.* (*2011.21*) this assumption allows the OxCal program to "*...asses how far the variation in the calibrated radiocarbon dates arises from variation in the actual dates of the samples, and how far from the probabilistic scatter inherent in radiocarbon dating and calibration process*". In short, this enables the program to set an upper limit on the statistical scatter of ^{14}C dates. In OxCal, the assumption of a uniform distribution is introduced by enclosing the phase within boundaries. We use this approach in all of our chronological models, but whereas the underlying assumptions are unproblematic for site-based case studies (Moverna vas and Vinkovci-Sopot), it is harder to substantiate in the case studies in which pottery distinctions are used to further subdivide cultural periods (Sava group of the Lengyel culture and Lasinja culture). The critical question, not only when applying the corresponding OxCal options, is whether pottery styles really do have a beginning and an end, or whether there is a gradual transformation from one style to the next. According to Bronk Ramsey (*1998. 462*), in general terms the validity of the specific assumptions underlying the choice of a uniform sample distribution of ^{14}C samples has only minor influence on the results of chronological models. For security, OxCal nevertheless provides a so-called 'Agreement index', in which the consistency between the archaeological prior information and the data is estimated. For threshold values at 60% or higher the agreement between the model (input)

and the chronological results (output) is considered consistent.

Bayesian chronological modelling not only provides a methodology either to constrain chronological data with the aid of archaeological information, or to limit the scatter of probability distributions, but also enables ages for events of archaeological interest, that are not directly dated, to be estimated (*Bronk Ramsey 2009*). In combination with the Phases and Boundaries options, OxCal also provides estimates for the individual calendar age values of the 'Start', 'End' and 'Boundary' of the individual modelled phases as well as other positions in a sequence. We use this OxCal option to estimate the age for the typological change between Sopot II–B and III typological phases. These are constrained in a sequence of superposed houses on the tell-site in Vinkovci-Sopot that will be presented in one of our case studies.

To conclude, the Bayesian approach to chronological modelling is a heuristic tool with which different chronological models combining ^{14}C data and contextual archaeological information can be tested and compared. The results are never absolute or final, and change when additional data becomes available. This 'hermeneutic spiral' (*Bayliss* et al. *2007.Fig. 2)* answers specific chronological questions, introduces new ones and is never complete.

Outline of the study

In the following, Bayesian chronological modelling is applied to five case studies: three from Slovenia and two from the Slavonian region of Croatia. For Bayesian chronological modelling, we used the OxCal program, version 4.1 (*Bronk Ramsey 2009*) with implemented IntCal09 calibration curve (*Reimer* et al. *2009*). All age estimates of dates and duration estimates are presented as 1 sigma or 68.2% probability ranges. It must be pointed out that a majority of the ^{14}C dates used in our models are on charcoal, so an 'old wood effect' must be taken into account. All the ^{14}C dates and the relevant contextual data we used in our models are presented in the appendix.

Two case studies deal with the calendar chronologies of individual sites, where archaeological data allows more precise dating of activities within them. Nesting of phases and sequences is used to model the relationships between ^{14}C dates as represented by the available archaeological information. These are the cases in which Bayesian chronological modelling is most useful, because it is a tool for the precise calendar dating of activities on sites irrespective of the more traditional relative dating by pottery. In the case of the Moverna vas site from Slovenia, the stratigraphic sequence will be used to constrain the dates from individual Neolithic settlement phases. This will provide a more precise calendar dating for pottery assemblages associated with individual settlement phases, as well as a preliminary assessment of the continuity of Neolithic occupation of this site. From the Slavonian region of Croatia, we present a more complex chronological model of a Neolithic site, at Sopot-Vinkovci. The superpositional relations of houses excavated on this site will allow the dates for individual houses to be constrained and precisely dated.

Three case-studies deal with calendar chronologies of periods in which certain types of pottery were produced. In this, we follow the approach to spatio-temporal modelling suggested by Blackwell and Buck (*2003*; see also *Bayliss* et al. *2011.58*). Bayesian chronological modelling is used in these cases to limit the scatter of probability distributions. This is done with the aid of the bounded phases with an assumption of uniform event distribution on the sample set. This kind of Bayesian chronological modelling is already biased, as it uses the relative chronological schemes to group ^{14}C dates from sites into discrete groups on the basis of the typological and cultural attribution of their pottery assemblages. It is used in our paper first to provide the dating of the periods in which certain types of pottery were produced (*e.g.* Sava group of the Lengyel culture, Lasinja culture) that is more precise than one obtained by simple group calibration, and summing the probability distributions. These periods, namely archaeological cultures, can then be better compared on the calendric time scale. Secondly, and perhaps more importantly, this kind of modelling is used to compare calendar and cultural sequences and to show some inconsistencies and contradictions in the latter. Chronological modelling of the Sava group of the Lengyel culture in Slovenia will limit the scatter of dates from sites associated with this cultural group. It will allow the period of pottery production, on the basis of which this group was defined, to be presented within a calendar time frame and compared with some other cultural sequences from Central and Southeastern Europe. In the last case-study from Slovenia, precisely dated burial activity in Neolithic Ajdovska jama cave site together with the constrained calendar dating of the 6th settlement phase in Moverna vas will be compared to ^{14}C dates from Lasinja culture sites in North-eastern Slovenia. It will be

shown that sites attributed to different, temporally exclusive periods and cultures can be contemporary. Information on the typological classification of some sequenced houses from Vinkovci-Sopot site will be used to estimate the date of the transition between typological phases II–B and III of the Sopot culture. This date will be compared to dates of the Lasinja culture sites in the same region. On this basis, it will be shown that a relative chronological sequence of cultures in this region is problematic.

In the discussion, the results of our case-studies are considered within a broader temporal and spatial framework by introducing a diagram in which we correlate calendar and some cultural sequences from Central and Southeastern Europe.

Moverna vas settlement phases

In Slovenia, Bayesian chronological modelling is applied to the Neolithic and Eneolithic site at Moverna vas in Bela Krajina. This is the only Slovenian Neolithic and Eneolithic site from which we have a long stratigraphic sequence together with a sequence of ^{14}C dates spanning the 5th millennium calBC. The stratigraphic sequence shows repetitions of natural processes identified as erosion and the deposition of layered deposits, with artefact assemblages deposited more or less accidentally, and anthropogenic activity identified as post-holes, refuse pits, hearths and burnt loam with post impressions. On the basis of their stratigraphic position within layered deposits, different anthropological traces were ascribed to individual settlement phases (*Budja 1993 (1994).18*) (Fig. 1).

Because all the available ^{14}C dates originate from natural layered deposits and not from immediate traces of anthropogenic activity, only the relative order of settlement phases can be modelled and not activities related to pit digging and house construction within these phases. Nevertheless, Bayesian modelling of the settlement phases enables a more precise dating of the pottery assemblages discovered in these deposits, as well as an assessment of the continuity of occupation of the site. ^{14}C dates are available only for Neolithic settlement phases, while Eneolithic phases are not dated. This is unfortunate, since if dates for Eneolithic phases were available, we could use the stratigraphic sequence to constrain and estimate the date when significant typological change that defines the boundary between Neolithic and Eneolithic (Lasinja culture) happened at the site in the late 5th millennium calBC.

In total, twenty-four ^{14}C dates are available from Moverna vas. Three dates obtained in the 1980s from the laboratory in Zagreb were excluded from analysis because their ages have been published inconsistently in different sources. Of the remaining dates, 6 on charcoal were produced in the Oxford Radiocarbon Accelerator Unit (*Budja 1993 (1994). Fig. 5*) and 15 dates on carbonised residue on pottery were produced in Poznań Radiocarbon Laboratory. Among the dates from Poznań, 10 were produced previously (*Žibrat Gašparič 2008.Fig. 5.1*), 5 new ^{14}C dates were obtained just recently and will be published here for the first time. A great majority of the ^{14}C dates were produced on carbonised residues adhering to the interior or partly exterior surfaces of pottery sherds. This material is probably the remains of charred food and, since the sherds of individual vessels refit within the same stratigraphic context, the pottery has a good chance of being in the place where it was originally discarded. Dates on charcoal, however, could be older than the context due to the 'old wood effect'. On the basis of their stratigraphic context and ascription to individual settlement phases, ^{14}C dates are grouped with-

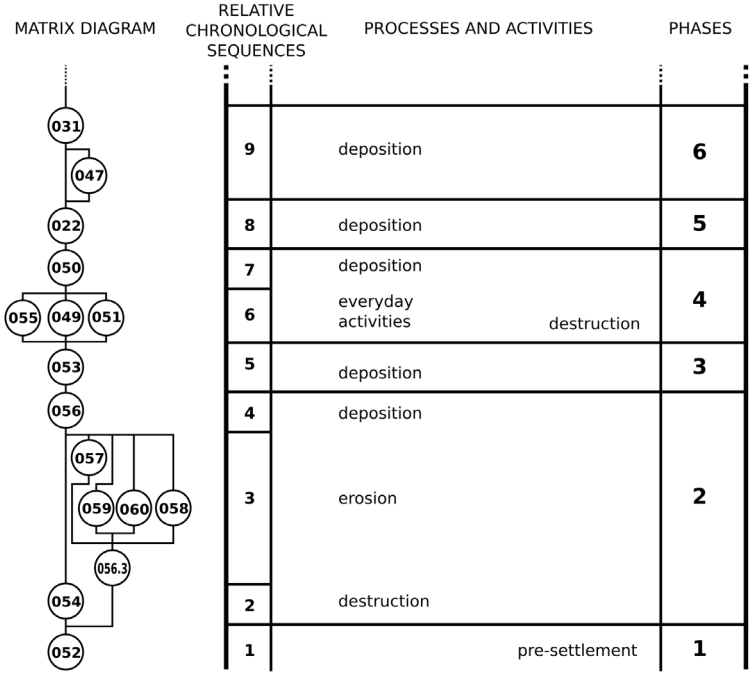

Fig. 1. Stratigraphic sequence and sequence of Neolithic settlement phases in Moverna vas (*Budja 1993(1994).Fig. 5*).

in five contiguous bounded phases that follow each other sequentially in the OxCal model. Phases are thus modelled without the possibility of temporal overlap between them. While the dates on carbonised residue on pottery are good, supposedly randomly distributed, samples from within individual settlement phases, this cannot be said of the charcoal dates, as their ages could be significantly older than the events of their deposition within the context, *i.e.* individual settlement phases. ^{14}C dates on charcoal are thus not fully incorporated into our model and are included only as *termini post quos* (*Bayliss* et al. *2011.56–58*). This means that they do not represent random samples from within the individual settlement phases and only constrain the dates for their endings, not their beginnings. One recently obtained ^{14}C date (Poz-48537) was also not incorporated into the model, because it was produced on a sample from older, non-stratigraphic excavations. A correlation of sections from two excavations (non-stratigraphic in 1984 and stratigraphic in 1988) allows us to situate the mentioned sample either within the 4th or the 5th settlement phase, which is in agreement with the probability distribution of this date.

The results of the chronological modelling presented in Figure 2 allows us to estimate the start and end dates of individual phases, the dates of the boundaries between them and the durations of individual phases, as well as the Neolithic settlement as a whole. The model has a good agreement index (115%) and the same holds for individual ^{14}C dates, except for one date (Poz-21404) from the 6th settlement phase, which seems to be too old and was thus excluded from the analysis. A sherd belonging to the same vessel as the inconsistent date was replicated (Poz-48534) in the newest ^{14}C series. It is in good agreement with the model so it seems that the first date on this vessel is erroneous. Our results are consistent with the interpreted sequence of settlement phases at the site. The oldest phase at the settlement, *i.e.* the 2nd settlement phase, starts in 4937–4801 calBC (68.2% probability). It is followed in 4649–4550 calBC (68.2% probability) by the 3rd settlement phase. This phase is objectified in the stratigraphic sequence by a thin layer with very few finds, and was probably formed by natural processes with very little anthropogenic activity. One date on pottery residue from this phase shows that some activity was present, as its age is clearly discerned from the ages of dates from the previous 2nd and following 4th settlement phases. On the basis of our present data, we cannot say if this isolated activity was preceded or followed by any gap in occupation. The dates of 4th and 5th settlement phases are tightly clustered, but we were able to separate them in our model on the basis of relative chronological information. The 4th settlement phase follows a lull of activity represented by the previous settlement phase in 4498–4419 calBC (68.2% probability) and is soon followed by the 5th settlement phase in 4426–4376 calBC (68.2% probability). The groupings of dates in these two settlement phases show that this was a period of high anthropogenic activity. The last Neolithic 6th settlement phase follows the 5th in 4389–4350 calBC (68.2% probability) and ends in 4324–4225 calBC (68.2% probability).

The Neolithic occupation at the site lasted for 512–703 years (68.2% probability). The estimated durations of individual settlement phases show that the oldest 2nd settlement phase is of the longest duration (Fig. 3). It probably lasted two to three centuries or more (178–365 years (68.2% probability)). Of shorter but still significant duration is the 3rd settlement phase (73–204 years (68.2% probability)). The disproportionately long duration of this phase when compared to the thinness of its deposit and lack of archaeological finds is an additional argument suggesting that this phase was a period of low activity. The durations of the following, well-dated 4th (0–78 years (68.2% probability)) and 5th settlement phases (0–42 years (68.2% probability)) are very brief and can be measured in terms of human generations. The last Neolithic 6th settlement phase lasted about more or less a century (38–161 years (68.2% probability)).

Beyond the mere relative sequence of Neolithic settlement phases in Moverna vas, our results not only provide more precise dates, but also durations. This allows us to better interpret the anthropogenic activity at the site and separate periods of low activity from periods of high activity. The oldest 2nd settlement phase at the site can now be dated from the 49th to 47th centuries calBC and thus represents the oldest well documented Neolithic activity in continental Slovenia. The low activity of the 3rd settlement phase can be dated to the 46th century calBC and the first half of the 45th century calBC, while a period of high activity in the 4th settlement phase is dated to the 45th and that of the 5th settlement phase to the first half of the 44th century calBC. The 6th and last Neolithic settlement phase can be dated to the 44th and 43rd centuries calBC. Interestingly, the end of the Neolithic settlement phases in Moverna vas around 4300 calBC is contemporary with the

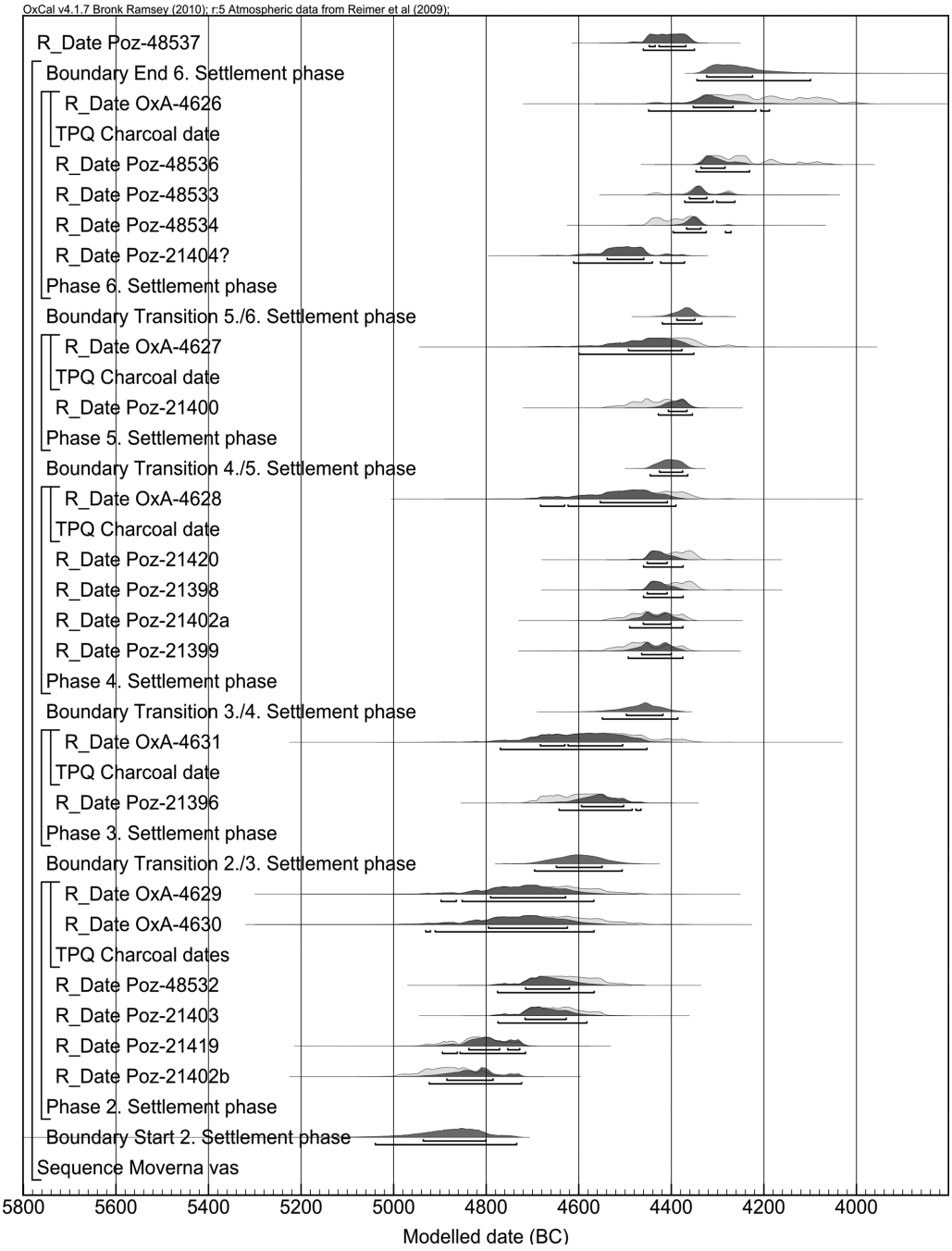

Fig. 2. Chronological model of Moverna vas settlement phases.

proposed beginning of the Eneolithic Lasinja culture in a broader spatial framework (*Balen 2008.22; Guštin 2005.14, Fig. 4; Oross* et al. *2011.182; Ruttkay 1996; Somogyi 2000*). Precisely dated settlement phases in Moverna vas also mean that its pottery assemblages are well constrained on the calendar time frame and can thus be more usefully compared with those from other ^{14}C dated or undated sites. Moverna vas, with its long stratigraphic and typological sequence, is a unique reference point in relation to other Neolithic and Eneolithic sites in Slovenia. The calendar chronology of its settlement phases is useful as an indirect calendar dating reference for other archaeological sites with comparable material.

Analyses of pottery from individual settlement phases in Moverna vas showed considerable changes in typology and technology between the 6th and the undated 7th settlement phases (*Tomaž 1997*). These changes are traditionally considered as marking the transition between the Neolithic and Eneolithic (Lasinja) cultures. Additional dates are needed from younger Eneolithic settlement phases in Moverna vas

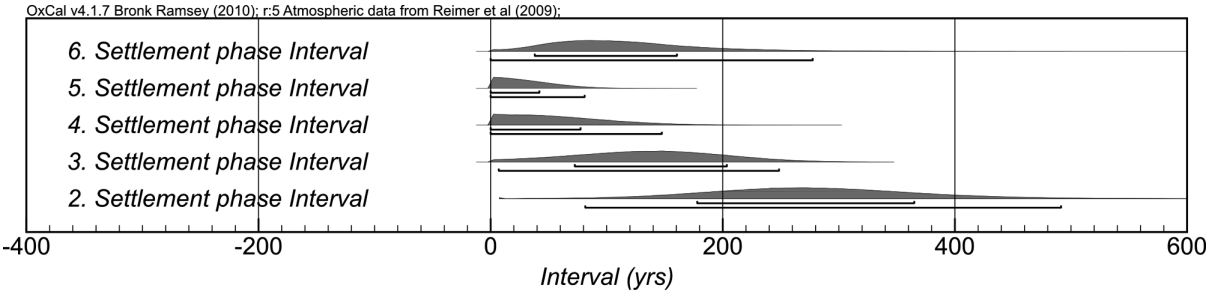

Fig. 3. Estimated duration of settlement phases in Moverna vas.

in order to date younger activities and to constrain the date of the supposed transition between the Neolithic and Eneolithic at the site. We will then be able to show whether similar typological and technological changes appear simultaneously at different sites, as is expected from a relative chronological viewpoint, or if the picture is more complicated. On the basis of the present chronological model of the Neolithic settlement phases in Moverna vas, we can at least put forward a *terminus post quem* date for the boundary between 6th and 7th settlement phases and associated typological changes of pottery at this site to around 4349–4257 calBC (68.2% probability). This is an age estimate for the end of the 6th settlement phase in our model (Fig. 2).

The Sava group of the Lengyel culture

In this case study, ^{14}C dates from sites associated with the Sava group of the Lengyel culture are modelled within a bounded phase in order to limit the inevitable scatter of individual dates and estimate the period in which this pottery type was produced. This Neolithic cultural group was recently defined on the basis of typological and technological analyses of pottery and comparison of sites discovered in new rescue excavations in Central Slovenia. It was synchronised with phase II of the Lengyel culture and roughly dated to the 1st half of the 5th millennium calBC, or from 4800 to 4500 calBC (*Guštin 2005.14–16*). ^{14}C dates from three sites allows us to model the period when this type of pottery was in use, while activities within individual sites cannot be dated precisely because there are no vertical stratigraphic sequences which would allow us to constrain the ^{14}C dates. Twenty dates are available from the site at Čatež-Sredno polje, excluding three significantly younger dates (*ibid.* Fig. 2). Measurements were performed in Leibnitz-Labor in Kiel. The Dragomelj site provides us with four dates measured by Beta Analytic in Miami (*Turk, Svetličič 2005.69; Turk 2010.43*). One date is again significantly younger and thus excluded. Two additional dates are available from Resnikov prekop, one older and less precise measurement from Zagreb (*Srdoč* et al. *1977. 472*) and one measured in Heidelberg (*Čufar, Korenčič 2006.Tab. 2*).

As presented in the introduction to Bayesian modelling, the underlying assumption of a bounded phase used in this model is that ^{14}C samples are randomly distributed within a period of activity. In our case, this period of activity is represented by the production of a specific variety of pottery, while our available ^{14}C dates act as random samples from within this activity. In this, our model is slightly biased, as ^{14}C dates are available from only three sites, and the majority comes from only one (Čatež-Sredno polje). Nevertheless, the results of our model represent the current state of research. Another problem affecting the results of the model is that all the ^{14}C dates were taken from charcoal samples, so the old wood effect has to be taken into account. Because of this problem, our estimated date for the start of the modelled period of activity is not reliable and should probably be younger, while our estimate for the end of this period should be close to the true value.

The results of the model are presented in Figure 4. The model has a good agreement index (74.4%), with only the oldest date from Čatež-Sredno polje being inconsistent. This was expected, due to the possibility of the old wood effect of the charcoal dates. The estimated beginning of the Sava group of the Lengyel culture is dated to 4786–4731 calBC (68.2% probability), but due to the old wood effect, we can expect it to be later. The end of this period is dated to 4582–4530 calBC (68.2% probability). Pottery associated with this cultural group was produced in the 48th, 47th and early 46th centuries calBC, for an estimated duration of 161–268 years (68.2% probability).

Concerning all the available ^{14}C dates from Slovenia, two major clusters of probability distribution appear. The one dating to the 48th–46th century calBC (Fig. 4) comprises sites of the Neolithic Sava

group of the Lengyel culture, while the second dated to 44th and 43rd centuries calBC comprises the first sites of the Eneolithic Lasinja culture, as well as sites still attributed to the Neolithic (Fig. 5). There is a lack of dated sites in the 45th millennium calBC, with the exception of two dates from two sites in the Prekmurje region (Bukovnica and Murska Sobota-Nova Tabla; see Fig. 11). It cannot be determined whether this gap in the calendar sequence is the result of research orientation or real settlement patterns. The time difference between the two clusters of dates, *i.e.* between the end of the Sava group phase and the beginning of the Lasinja culture sites, the chronological modelling of which is presented below, is 150–233 years (68.2% probability).

The contemporaneity of Neolithic and Eneolithic sites in Slovenia

We now turn to the series of available ^{14}C dates from the second half of the 5th millennium calBC. This period is characterised in traditional relative cultural chronology by the transition from Neolithic to Eneolithic (Lasinja) cultures, which are viewed as temporally exclusive, following each other sequentially with no temporal overlap. We present three chronological models together and try to show that a temporal overlap is possible, or at least synchronicity between differently chronologically and culturally classified sites in Slovenia.

Ajdovska jama in southeastern Slovenia is a cave site where human burials were discovered within two thin layers (stratigraphical units 44 and 43). There is evidence of a funerary ritual in which the deceased were supposedly exposed in the right cave shaft to putrefy before they were finally buried (*Horvat 2009.28–29*) in the cave. Many radiocarbon dates from the burial contexts were measured on charcoal and cereal grain by the Ruđer Bošković Institute in Zagreb, but these dates are old and have large standard deviations. They are not used in the chronological modelling, as new and much more precise AMS ^{14}C dates on human bones have been obtained (*Bonsall* et al. *2007. Tab. 1*). Together with the publication (*ibid.* Fig. 5), 10 ^{14}C dates were modelled within two bounded contiguous phases that correspond to the two stratigraphic layers from which the dates originate. The results show that burial deposition began after 4340–4286 calBC (68.2% probability), lasted for only 0–62 years (68.2% probability) and ended before 4295–4235 calBC (68.2% probability). These precise estimates show that people were buried in Ajdovska jama for only about two generations or less, some time in the second half of the 44th century and the first half of the 43rd century calBC. Ajdovska jama is the only Neolithic site in Slovenia where human burials have been discovered and is dated to the period in which the transition between the Neolithic and Eneolithic is expected, while the pottery assemblage associated with the human burials is supposedly Neolithic in terms of typology and technology (*Horvat 2009.25*).

In North-eastern Slovenia, we have a series of ^{14}C dates from sites with pottery assemblages that have been attributed to the Eneolithic Lasinja culture on the basis of their typological and technological analysis and inter-site comparisons. We consider only dates that fall within the second half of the 5th millennium calBC. All the available dates from Lasinja culture sites refer to charcoal, so we need to take the old wood effect into account. Dates are available from four sites attributed to Lasinja culture. The Sodolek and Malečnik sites provide only one ^{14}C date each. Eight dates measured in Miami are available from supposedly Lasinja culture features from Ormož-Hardek (*Žižek 2006.130*), but three had to be excluded from the model because they appear erroneously too old or too young. From Turnišče-Gorice (*Plestenjak 2010.156–161*) five dates are available, but two must again be excluded because they are significantly younger and fall outside the range proposed for Lasinja culture. They are erroneous or date younger occupations of the site. The significant dates from Turnišče-Gorice were measured in Kiel and in Waikato Radiocarbon Dating Laboratory. Dates are modelled as a bounded phase of activity similarly to the modelling of the Sava group of the Lengyel culture described above. With the assumption of a random distribution of samples, we try to limit the scatter of probability distributions and estimate the date for the beginning of pottery production associated with the Lasinja culture in Slovenia. The beginning of the Lasinja culture estimated on the basis of our model is expected to be 4384–4337. As all of the ^{14}C dates are on charcoal, this estimate should probably be set later.

The chronological modelling of the settlement phases at Moverna vas presented in the first case study allowed us to estimate the beginning of the 6th settlement phase after 4389–4350 calBC (68.2% probability) and its end to 4324–4225 calBC (68.2% probability). This last Neolithic settlement phase can thus be compared with the dates for the Lasinja culture sites and Ajdovska jama burials. As shown by pottery analyses at Moverna vas, crucial typological

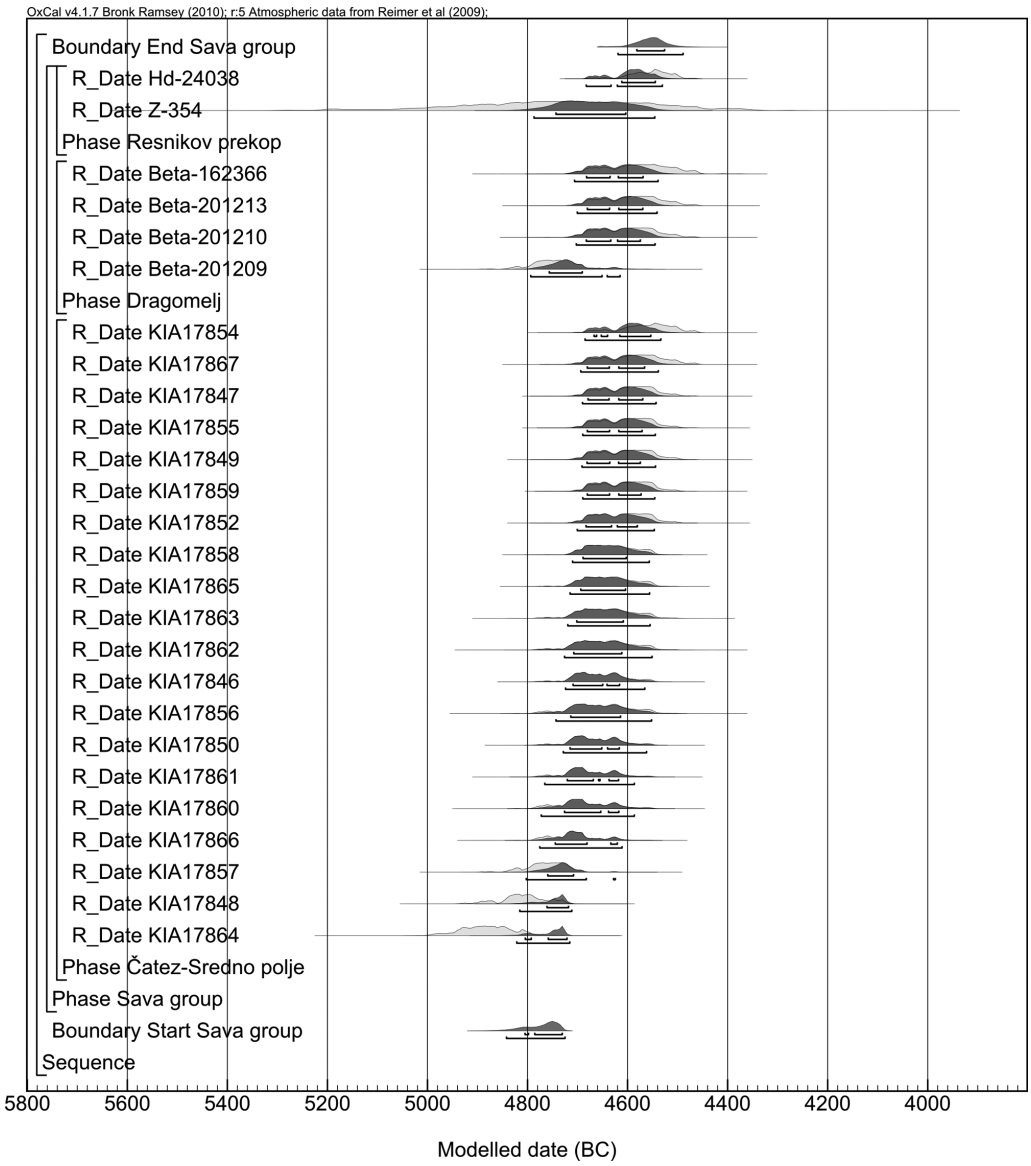

Fig. 4. Chronological model of the Sava group of the Lengyel culture in Slovenia.

and technological changes in pottery connected with the appearance of the Lasinja culture are attested for this site no earlier than the next, undated 7th settlement phase.

A comparison of the results of three different chronological models (Ajdovska jama burials, Lasinja culture sites and the last Neolithic settlement phase at Moverna vas) on the Figure 5 shows that all the modelled dates are grouped tightly together within the 44th and 43rd centuries BC. There seems to be a significant temporal overlap between Neolithic (burials at Ajdovska jama and last Neolithic settlement phase in Moverna vas) and Eneolithic (Lasinja culture) sites. On the basis of the calculated difference between the end of burial activity in Ajdovska jama and the start of Lasinja culture this overlap lasted for about a century or so (50–135 years (68.2% probability)); the same holds for the overlap between the 6th settlement phase at the Moverna vas and Lasinja culture sites (29–148 years). Interestingly, the calculated difference between the start of both the 6th settlement phase in Moverna vas and Lasinja culture is close to zero (–23–47 years (68.2% probability). This means that at the time when sites with pottery attributed to the Eneolithic Lasinja culture were being founded, pottery in Moverna vas was still being produced in more or less traditional 'Neolithic' ways, with changes coming a century or so later. Even if we consider the overlap as being partly the product of the old wood effect on the Lasinja culture dates, the demonstrated tight grouping of dates in our models show that it must be assumed that both Ajdovska jama and the 6th settlement phase in Moverna vas and Lasinja culture sites were contemporary. Thus sites with Neolithic pottery tra-

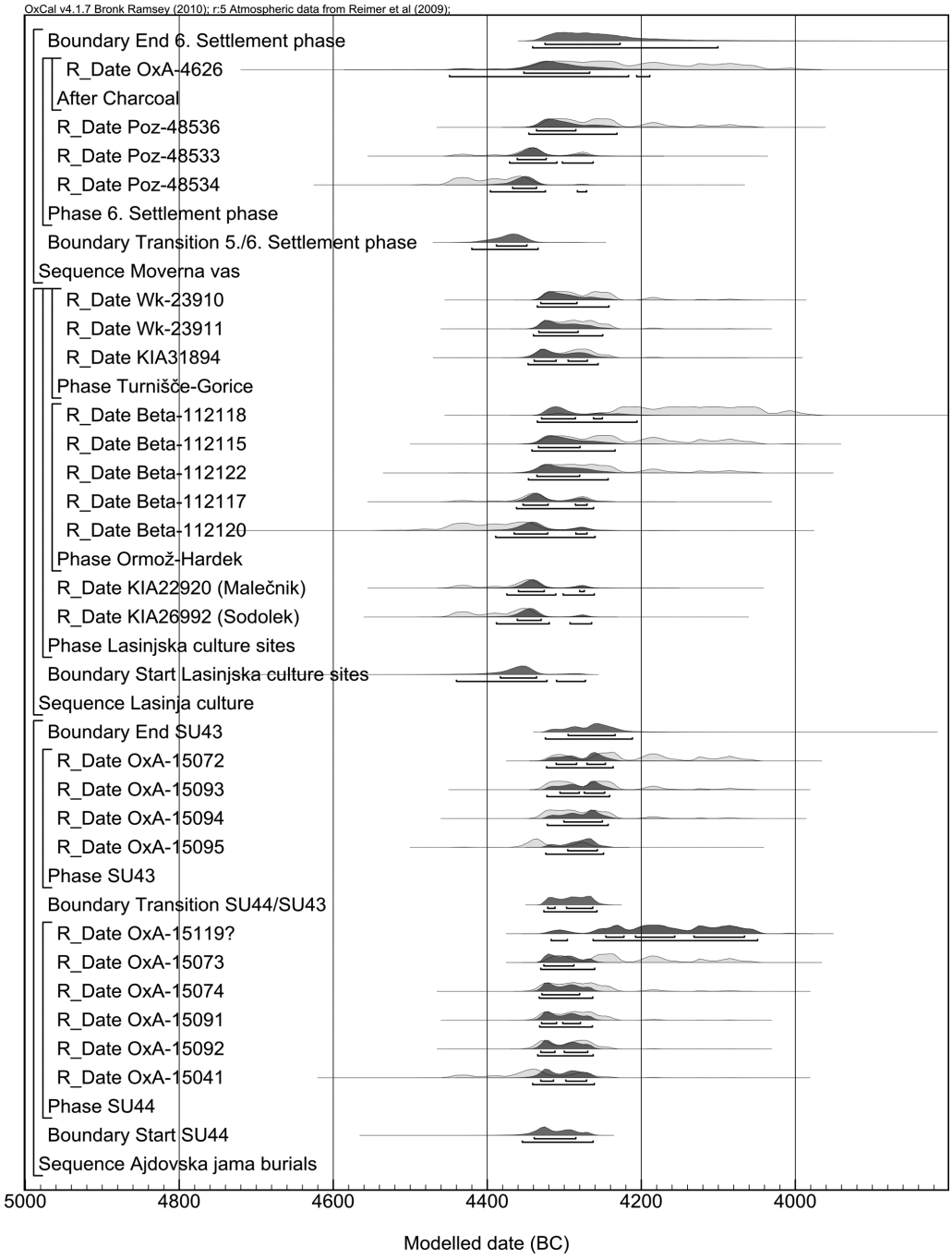

Fig. 5. Comparison of chronological models of Ajdovska jama burial activity, 6th settlement phase in Moverna vas and Lasinja culture sites in Slovenia.

ditions and sites with Eneolithic pottery types seem to be contemporary.

Our results show that the calendar time-scale temporal patterning of pottery assemblages is more complicated than relative chronologies suppose. It has to be pointed out that ascription of sites to different periods and cultures is highly dependent on the excavator's experience and viewpoint concerning pottery typology, the comparison of pottery assemblages and relative chronological schemes. The pottery assemblage from Ajdovska jama, for example, although interpreted by the excavator as having Neolithic traditions and dated to the "*Pre-Lasinja period*" (*Horvat 2009.25*), was also used to show similarities in pottery typology with sites attributed to the Eneolithic Lasinja culture (*e.g. Plestenjak 2010. 35*). It seems that the contradictions between the relative chronology and the calendar chronology are more products of inconsistencies of interpretation between different researchers. More cases of researchers disagreeing on the attribution of sites to Neo-

lithic or Eneolithic Lasinja culture can be found in a recent article by Milena Horvat (*Horvat 2009*). Inconsistencies in relative chronology can be considered a product of the assumptions underlying the time concepts of temporal exclusiveness and sequential order of relative chronological blocks. This is not the place to argue about whether a site should be considered Neolithic or Eneolithic. The interpretations of the excavators were simply used and compared to the results of calendar chronology to show that there are some problems of interpretation concerning the relative chronological schemes, which have to be addressed in the future. Calendar chronology allows the independent dating of pottery assemblages and sites irrespective of their relative-chronological and cultural attribution and will help to clarify these chronological problems and the underlying concepts of time.

In addition to similar traits in pottery typology (*Horvat 2009*) and period attribution to the Neolithic 6th settlement phase at Moverna vas and burial contexts in Ajdovska jama dated to this time frame have another thing in common. They are both situated in southeastern Slovenia, while all of the relevant Lasinja culture sites lie in northeastern Slovenia. For this reason, we should perhaps also consider regional differences in the appearance of pottery traits associated with the beginning of the Eneolithic period. Additional data is needed to present evidence for or against this proposition. Other observation we wish to put forward is the fact that at Moverna vas, with a long stratigraphic and typological sequence (*Tomaž 1997*), pottery forms and decorations change gradually within Neolithic settlement phases, while on Lasinja sites, where there is no continuity from the Neolithic, pottery forms and decoration appear as novel. This perhaps contributes to the inconsistency of chronological attribution to the Neolithic (continuity of pottery typology) versus Eneolithic (novel pottery typology) periods between different excavators.

The time scale of our models is no longer several centuries, as was possible to achieve in the past, but several decades or spans of a few generations. Using such precision, we have to be careful about our conclusions, as we have reached the limit of the ^{14}C dating method. We have to attend more closely to the shape of the calibration curve and its 'plateaus', which presents an obstacle even when ^{14}C dates are well constrained by archaeological data. One such plateau is present in the time frame of the 44th and 43rd centuries calBC that we deal with in this section and this has an effect on the probability distributions of ^{14}C dates and, eventually, on our conclusions.

Sequence of houses at Vinkovci-Sopot

Recently, new radiocarbon dates from the eponymous tell-site of the Sopot culture – Vinkovci-Sopot in the Slavonian region in Croatia – have been published, together with some archaeological information concerning the superposition of houses, some of which have been ^{14}C dated (*Krznarić Škrivanko 2011*). Published ^{14}C dates were measured on charcoal and animal tooth samples at the Ruđer Bošković Institute in Zagreb, Croatia and Beta Analytic laboratory in Miami, USA. Activity connected to individual superposed houses is mostly dated by one or rarely two charcoal samples found on house floors. Because most of the dates are on 'long-lived' charcoal there is a possibility that the ages of ^{14}C samples are significantly older than house activities, and because few dates on 'short-lived' animal teeth do not date the same contexts, the extent of this time difference cannot be estimated. Despite these problems, the publication of ^{14}C dates from Vinkovci-Sopot together with some contextual archaeological information provides an opportunity to model the calendar chronology of the site in OxCal and constrain the dates of individual houses based on prior archaeological data.

We have modelled the calendar chronology of the settlement on the basis of description of stratigraphic relations published together with ^{14}C data. Relations were described only in text format so we decided to show relevant stratigraphic relations, used in our model, on Figure 6. Period of occupation of the settlement was modelled within two bounded overlapping phases. Within the first ('Starčevo culture occupation'), a phase of sterile layers (SU80 and SU143) is followed in a sequence by a date for the only Starčevo pit-house discovered so far at the site (SU519). Followed by a supposed gap of occupation, the second bounded phase ('Sopot culture occupation') is separated into three unrelated phases that correspond to two different locations on the site ('South-West', 'Plateau') and one phase that contained dated contexts not mentioned in the text ('Other'). Within the 'South-West' phase, we nested the following sequence: a phase connected to house SU23 (house SU23 and its rubble SU6 in a sequence, and neighbouring layer SU21 unrelated to this sequence) followed by two phases, each containing ^{14}C dates of house SU20 and SU11, respectively. Un-

related to the sequence, but still within the 'South-West' phase is house SU53. Within the Plateau phase there are two sequences of houses, both followed in a sequence by one of the channels (SU222) that destroyed the youngest horizon of houses at this part of the site. Within this broader sequence, one sequence represents a series of three (SU255, SU235 and SU207) and the other of two houses (SU301 and SU183a). Unrelated to this sequence of houses and a channel, but still within the Plateau phase, are one house (SU403) and the rubble of another house (SU332). Within the Other phase, two dates from the channel fills (SU238 and SU405), dates on two houses without a context number and a date from a layer (SU24) are modelled as unrelated. These contexts are not mentioned in the description, but their ^{14}C dates have also been published.

The model has been run in OxCal, and the results allowed us to constrain the dates for those houses which are in a sequence. Results are presented on Figure 7. The model has a good agreement index (111.4) and all of the standardised likelihoods (^{14}C dates) passed the 60% threshold for accepting the agreement as good. It has to be pointed out, however, that two dates were excluded from the model (Z–2826 and Z–3868), as their ages are considerably older than others from the same contexts (SU11 and SU183a) and also considerably older than other dates for the Sopot culture occupation at the site. The ^{14}C dates on sterile layers and the only Starčevo culture pit-house are almost contemporary and we can date the beginning of the 'Starčevo culture' occupation to around 6000 calBC. We do not have any other dated contexts attributed to this culture, so we cannot model the duration of its occupation, but we calculated the time difference between the end of the Starčevo culture occupation (based on available date) and the start of the Sopot culture occupation to be 966–1157 years (68.2% probability). The Starčevo culture occupation part of the model is not presented in Figure 7. The Sopot culture occupation of the site lasted for 661–871 years (68.2% probability), from 4936–4816 calBC to 4191–4046 calBC (68.2% probability). The sequence of houses above the ditch in the southwestern part of the site is the longest, as it contains both the oldest and youngest dated house (SU23 and SU11, respectively).

On the basis of the 'Order' function in OxCal, we can determine the most probable temporal order of the dated houses in the settlement. The oldest is house SU23, constructed above the ditch in the southwestern part of the tell in the 49th century calBC. It is followed by the houses on the Plateau in the following order: SU255, SU207, SU301, SU183a. These houses were constructed from the 48th to the 45th century calBC. These houses are followed in a sequence by channel SU222, which destroyed the youngest horizon of houses at this part of the site; but there is a gap of 326–473 years (68.2% probability) between the last dated house, SU183a, and channel SU222. This gap is only partly filled by the sequence in the southwestern part of the site, where house SU20 was constructed long after (430–595 years (68.2% probability)) house SU23 in the 43rd century calBC, followed by house SU11 in the same, or probably the next, century. This last dated house in the 'South-West' could be contemporary with the channel that destroyed the last houses on the Plateau. The modelled sequence of dated houses from different parts of the site shows two continuities of occupation in which the houses follow each other in relatively quick succession. The first continuity is represented by houses SU23, SU-

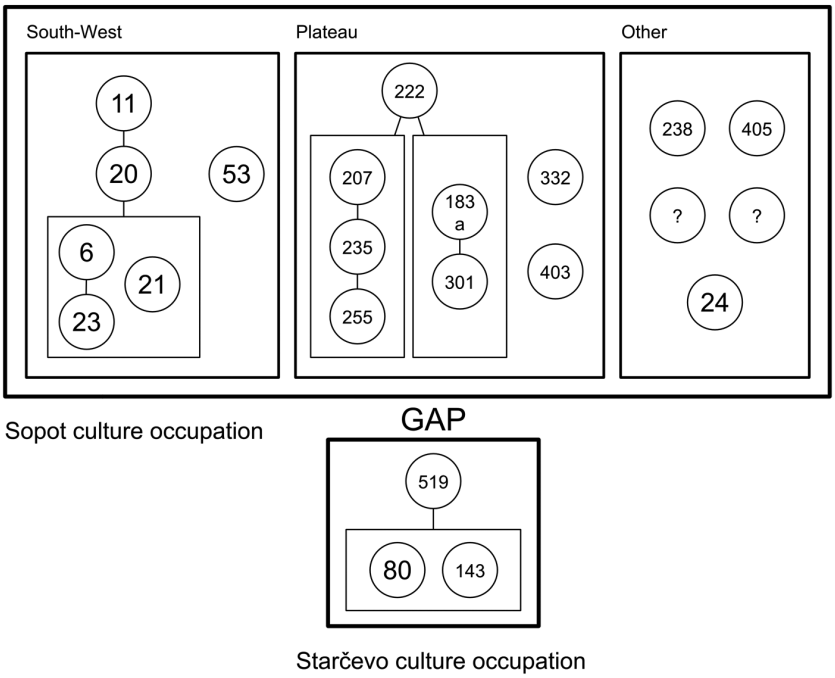

Fig. 6. Diagram of relationships of ^{14}C dated contexts in Sopot-Vinkovci (On the basis of the description in* Krznarić Škrivanko 2011*).

255, SU207, SU301 and SU183a, built in the course of some two and a half centuries from the 49th till 46th century calBC. This continuity is followed by the already mentioned gap of about three centuries from the 46th till 44th century; a continuous sequence is then resumed with houses SU20 and SU11 in the 43rd and 42nd centuries calBC. The reason for the gap in our model could be due to the lack of ^{14}C dated houses and contextual archaeological data, as some unsequenced and thus less precise dates (for houses SU53, SU403 and layer SU24) also cover this period. On the other hand, however, if the sequence of houses in the 'South West' with houses SU23, SU20 and SU11 is complete as presented by Maja Krznarić Škrivanko (*2006.12–14, Fig. 2*), this gap is realistic.

Houses SU255, SU207, SU301 and SU183a from the Plateau are presented together with house SU11 from the 'South West' as belonging to the youngest phase of settlement in an article by Krznarić Škrivanko (*2006.12*). According to the results of our model, however, the houses were constructed four to five centuries before the end of the settlement, *i.e.* channel SU222 that, according to the excavator, destroyed the youngest horizon of houses in this part of the site (*Krznarić Škrivanko 2011.213*). Although these houses are perhaps the latest in the stratigraphic sequence, they are quite early in the calendar chronology of the site. After the gap in the calendar sequence of houses, they are followed in the southwestern part of the site by the youngest houses, SU20 and SU11.

Houses SU23, SU20 and SU11 above the ditch from southwestern part of the tell, the dates of which are constrained well within a sequence, have a pottery assemblages attributed to individual typological phases of the Sopot culture (*Krznarić Škrivanko 2006*). This allows us to check the consistency between the typological relative chronology and ^{14}C data and to propose dates when changes in typology happened.

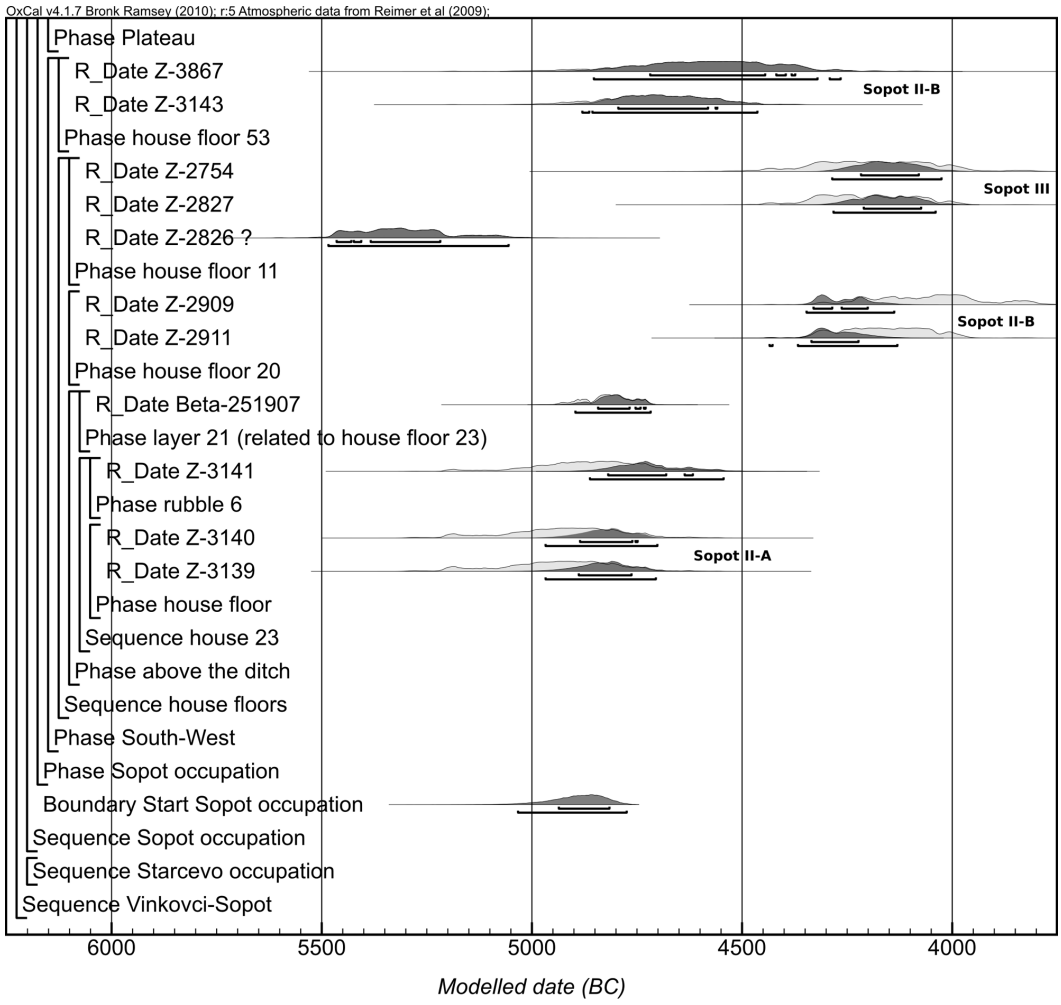

Fig. 7. Chronological model of the Sopot-Vinkovci tell site (typological phase attribution of individual dated houses is labelled).

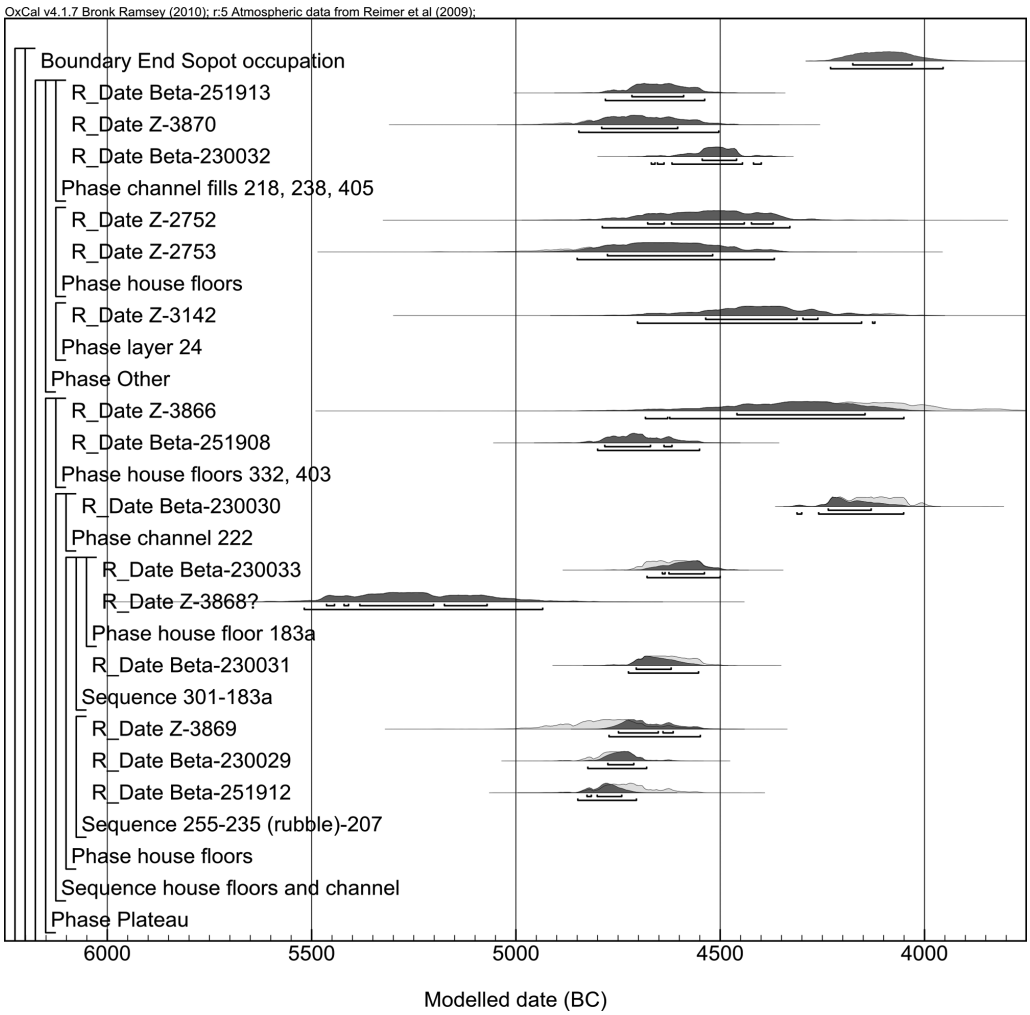

Fig. 7. (continued)

There seem to be no inversions of typological phases when the calendar chronology and typological attribution of pottery from the sequenced houses are compared (Fig. 7, labelled dates). Houses SU20 and SU53, with pottery attributed to typological phase II–B, are both dated after house SU23, with pottery attributed to phase II–A and before house SU11, with pottery attributed to phase III; so the relative chronological order of these typological phases of Sopot culture is consistent with the ^{14}C data, at least at the eponymous Sopot-Vinkovci site, according to the available ^{14}C dates and archaeological data. This is not surprising, as the separation of typological phases of the Sopot culture except for the oldest phase was largely based on material from Sopot-Vinkovci (*Dimitrijević 1979; Krznarić Škrivanko 2002*).

On the basis of our model, we can propose the dating of individual typological phases of the Sopot culture in Vinkovci-Sopot and compare it to the calendar chronology proposed by Obelić *et al.* (*2004*). The authors of this article used an informal approach of visual inspection of 68.2% probability ranges pertaining to the summed probabilities of all ^{14}C dates belonging to individual typological phases from different sites. In our model, the well constrained dates for house SU23 with pottery attributed to typological phase II–A represent a *terminus post quem* for the end of this phase, probably in the 48th century calBC. This date agrees with the proposed age for the end of typological phase II–A around 4770 calBC presented by Obelić *et al.* (*2004.Tab. 3*). The dates for houses SU53 and SU20 with pottery attributed to phase II–B can be used to date this phase approximately from the 48th to the 43rd century calBC. This again agrees well with the time range of 4800–4250 calBC proposed by Obelić *et al.* (*2004.Tab. 3*).

The continuation of the sequence above the ditch is represented by house SU20, with pottery attributed to typological phase II–B, followed by house SU11, with pottery attributed to typological phase III. If only simple calibration is performed, then pro-

bability distribution of ^{14}C dates of these two houses overlap. Archaeological data on the superposition of these two houses allow us to constrain their dates within a sequence and counter the broad scatter of probability distributions due to the shape of the calibration curve in the latter 5th millennium BC. This precise dating now allows us to estimate the age of the event when the typological shift from phase II–B and III can be expected at the Vinkovci-Sopot site. This is achieved in OxCal by entering additional date parameter in the model between the dates for houses SU20 and SU11 in a sequence. The program then estimates the age of this date as constrained in the model to 4287–4162 calBC (68.2% probability) (Fig. 8).

It must be pointed out that this age estimate is meaningful only if a sharp typological change in pottery production is realistic. In the theoretical discussion at the outset of this paper, we argued that the classification of material culture within relative chronological schemes of temporally limited and exclusive units that follow one after another can produce artificially homogenous and unchanging periods separated by relatively rapid typological changes. This is unrealistic, as pottery types are expected to change gradually. Much more meaningful are the other results of our model, namely, the precise constrained dates of individual houses and their sequences, together with estimated durations of occupation. Nevertheless, an age estimate for the boundary between the typological phases II–B and III of the Sopot culture at the Vinkovci-Sopot eponymous tell-site will be used in the following section as an argument for the contemporaneity of the Sopot and Lasinja cultures.

Contemporaneity of Sopot and Lasinja cultures

As argued in the theoretical discussion, archaeological cultures are still today represented as internally stable, time-constant entities that follow each other sequentially, meaning that there should be no temporal overlap between them. Figure 9 (*Minichreiter, Marković 2011.Fig. 2*) shows that in the Slavonian region of Croatia, where the Vinkovci-Sopot site is situated, phases III and IV of the Sopot and Lasinja cultures are expected to follow each other in such a sequential order. By using the results of the Vinkovci-Sopot model and chronological modelling of available dates for the Lasinja culture from Slavonia, we can check the consistency between the relative and calendar chronology and try to show that this relative cultural sequence is flawed.

In the section above, we presented the estimated date for the transition between typological phases II–B and III of the Sopot culture at the eponymous Vinkovci-Sopot site, where it is well constrained in a sequence of houses, the pottery of which has been attributed to individual typological phases. From the Slavonian region, we also have ^{14}C dates from several Lasinja culture sites excavated before the construction of a highway between Đakovo and Osijek (*Balen 2008.Tab. 1; Minichreiter, Marković 2011. Fig. 2*), which are situated about 30km from Vinkovci-Sopot. The Lasinja culture dates will be modelled as a bounded phase of activity. As mentioned in the introduction to Bayesian modelling, a bounded phase with a beginning and end assumes that the ^{14}C samples represent a random sample of dates within a period of activity, in our case the production of the Lasinja culture pottery type. This assumption is often used in order to limit the statistical scatter of the ^{14}C measurements, especially when the calibration curve is almost horizontal, as in our case.

On the Figure 10 we present our well constrained date for the transition between typological phases Sopot II–B and III in Sopot-Vinkovci, together with ^{14}C dates for the Lasinja culture sites (Tomašanci-Palača, Jurjevac-Stara Vodenica, Đakovački Selci-Pajtenica and Beketinci-Bentež). The estimated date for the start of the Lasinja culture on the basis of the ^{14}C dates for sites attributed to this culture is 4423–4256 calBC (68.2% probability), while our estimated date for the transition between the typological phases of Sopot II–B and III is 4287–4162 calBC (68.2% probability). After calculating the time difference between these estimates, we can say that the transition between Sopot II–B and III is 50–196 years (68.2% probability) younger than the date for the start of Lasinja culture, and on the basis of the 'Order' func-

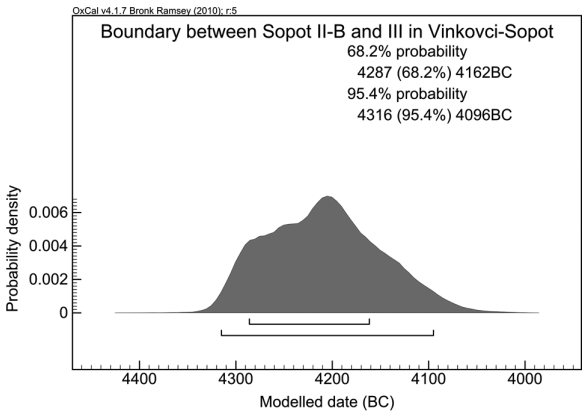

Fig. 8. Estimated age of the boundary between the II–B and III typological phases of Sopot culture as constrained by the Sopot-Vinkovci model.

tion in OxCal the probability of it being older are negligible. If our constrained date represents the start of the Sopot III typological phase, then according to the relative sequence, we should have additional time reserved for the duration of this typological phase before the start of Lasinja culture, especially since in the relative chronological scheme (Fig. 9) there is a whole cultural block (Sopot IV typological phase, defined by *Marković 1994*) between the end of Sopot III and start of Lasinja culture. Our results, on the contrary, show a significant temporal overlap between the two cultures and provide a good argument for this cultural sequence being flawed.

Discussion

The chronological models presented show how it is possible to constrain the dates of prehistoric activities for individual archaeological sites and how to overcome the inevitable scatter of ^{14}C dates of typological phases and archaeological cultures at the regional scale. By comparing calendar with typological and cultural sequences, we showed some inconsistencies and contradictions in relative chronological schemes. These will now be discussed within a broader temporal and spatial framework, together with synchronicities of different cultural sequences.

On Figure 11 we present a diagram in which we correlate calendar chronologies and some cultural sequences from Central and Southeastern Europe. It has to be pointed out, that only a selection of archaeological cultures are presented on the diagram, so cultural sequences from individual regions are not complete. The diagram was produced on the basis of Bayesian ^{14}C chronological models and simple group calibrations as well as the calibrations of single ^{14}C dates. For larger ^{14}C data sets from individual sites or archaeological cultures estimates of their calendric time spans are presented on the basis of results of Bayesian analysis, while for single or few ^{14}C dates calibrated ranges within a 68.2% probability are presented. Boundaries between typological phases of some archaeological cultures are marked with the aid of median values of estimated boundary dates. Left part of the diagram shows calendar time-scale positions of Slovenian sites on the basis of available ^{14}C dates (*Bonsall* et al. *2007.Tab. 1; Čufar, Korenčič 2006. Tab. 2; Guštin 2005.Fig. 2, 3; Plestenjak 2010.156, 160; Turk, Svetličič 2005.69; Turk 2010.43; Žižek 2006.Fig. 2*) and the long calendar sequence for Moverna vas, presented in our first case study (*Budja 1993(1994).Fig. 5; Žibrat Gašparič 2008.Fig. 5.1*). From Croatia, we present our results of the chronological modelling of the eponymous Vinkovci-Sopot site (*Krznarić Škrivanko 2011.Tab. 1*) and the chronology of the Sopot culture proposed by Bogomil Obelić *et al.* (*2004.Tab. 1*). The Lasinja culture span in Croatia is also presented (*Balen 2008.Tab. 1; Minichreiter, Marković 2011.Tab. 1; Bekić 2006.22, 95*). We show also the results of the Bayesian chronological modeling of the eponymous Vinča-Belo brdo site from Serbia, produced by Dušan Borić (*2009.Tab. 7*). From Austria, the results of the Bayesian modelling of the relative chronology of the Moravian-Eastern-Austrian group of the Lengyel culture (MOG) are presented (*Stadler, Ruttkay 2007*) as well as a span of Kanzianberg-Lasinja culture (*Ruttkay 1996.47*). From Moravia, in the Czech Republic, we produced a similar modelling of the relative chronology of Moravian painted ware culture (MMK) from the available dates (*Kuča* et al. *2009a.Tab. 1; 2009b. 319, 320; 2010.157*), while one date is available for the Jordanóv culture (*Pavelčik 2002.Tab. 2*). From Hungary, the overlapping phases of Transdanubian Linear Pottery Culture (TLPC), Sopot and Early Lengyel cultures are presented (*Bronk Ramsey* et al.

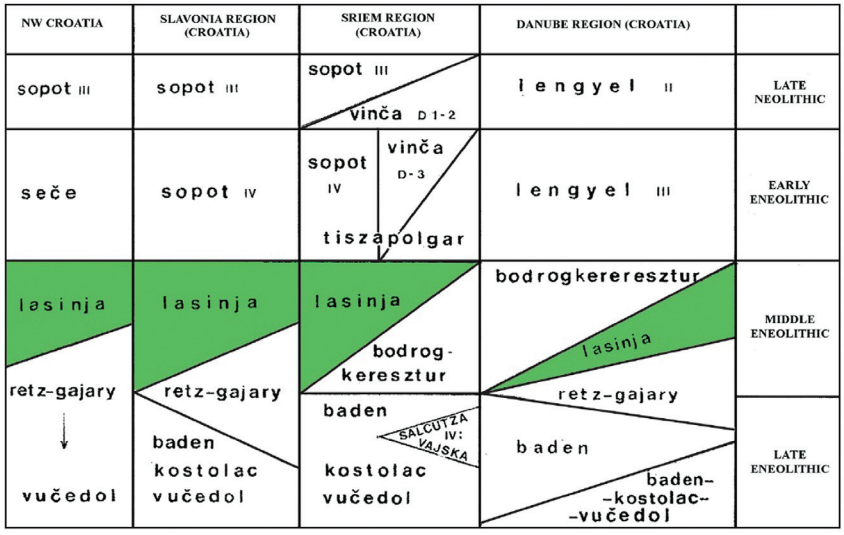

Fig. 9. Relative chronological scheme showing (among others) the temporally exclusive cultural sequence of Sopot III, Sopot IV and Lasinja cultures in Slavonia, Croatia. (*Minichreiter, Marković 2011.Fig. 2*).

1999; Horvath, Kalicz 2003.20; Barna 2007.367; Kalicz et al. *2007.44, 45*), as well as spans for phase III of the Lengyel culture (*Ehrich 1992.353; Hertelendi 1995.105–111; Ilon 2004.Sl. 26*) and Balaton-Lasinja culture (*Ehrich 1992.353; Kalicz 1995.41; Figler* et al. *1997.Tab. 2; Oross* et al. *2010.Tab. 1*). From Slovakia, the span of the settlement in Svodín is presented (*Němejcová-Pavúková 1995.168*) and that of the Ludanice culture from Jelšovce (*Görsdorf 1995.205, 206*).

The second settlement phase in Moverna vas represents the oldest well documented and ^{14}C dated Neolithic activity in continental Slovenia, and its beginning in 49th century calBC can be dated to before the appearance of the Lengyel culture in a broader spatial framework (Lengyel culture in Hungary and Slovakia, MOG in Austria and MMK in Moravia). The second settlement phase is also synchronous with the transition between the C and D typological phases of Vinča culture and the II–A typological phase of the Sopot culture as constrained by the Bayesian chronological modelling of the site at Vinkovci-Sopot. It is also synchronous with the later part of the Sopot culture and Formative and Early phases of the Lengyel culture in the Transdanubian region of Hungary. On the basis of culturally mixed deposits and the temporal overlap of ^{14}C dates between Transdanubian Linear Pottery culture and Sopot culture on one and Sopot and Lengyel culture on the other hand, the possibility that individual archaeological cultures lived contemporaneously in the same region has been proposed (*Barna 2007; Kalicz* et al. *2007*). This argument is problematic, because it is based on the assumption that differently culturally attributed pottery was produced by different people. The authors themselves acknowledge that differently classified pottery shows many similarities and is hard to differentiate (*Barna 2007.371*). The cultural attribution of pottery thus seems to be more

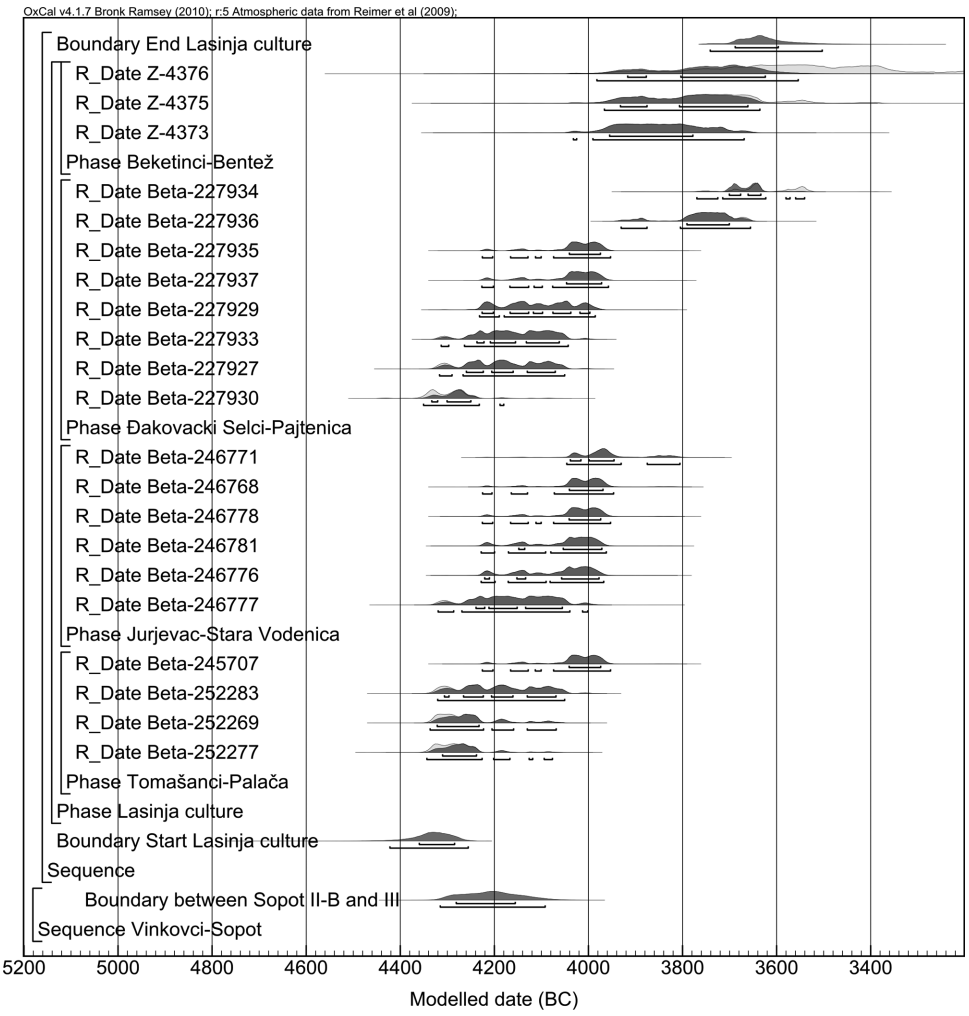

Fig. 10. Comparison of the estimated age of the boundary between the II–B and III typological phases of Sopot culture and chronological model of Lasinja culture in Slavonia, Croatia. (*Minichreiter, Marković 2011.Fig. 2*).

the result of the experiences and decisions of archaeologists rather than something pertaining to real patterns of material culture.

The sites of the Sava group of the Lengyel culture in Slovenia, dated from the 48th to the 46th century calBC also partly fit this temporal framework, but not with certainty because of the possibility of the old wood effect on the charcoal dates from these sites. The Sava group is contemporaneous with the early typological phases of MOG, *i.e.* formative phase Ia0 and phases Ia and Ib, which is also postulated on the basis of a typological comparison of pottery (*Tomaž 2010.180*). The general appearance of Lengyel culture in different regions is dated to around 4800 calBC (*Stadler, Ruttkay 2007*). The sites of the Sava group of the Lengyel culture are also contemporary with the older sequence of houses at Vinkovci-Sopot and with typological phases II–A and partly II–B of the Sopot culture.

The lull in activity at Moverna vas in the third settlement phase and the end of the Sava group in Slovenia are synchronous with the end of a long calendar sequence on Vinča-Belo brdo and thus probably also with the overall Vinča cultural sequence. This period can be dated to the 46th century and the first half of the 45th century calBC. Interestingly, the gap in the sequence of superposed ^{14}C dated houses at Vinkovci-Sopot can also be dated to this period. In Southeastern European periodisation, the end of Vinča culture marks the beginning of the Eneolithic. Also contemporaneous are the IIa typological phase of MOG and MMK in Austria and Moravia, respectively, and the beginning of phase III of Lengyel culture in Hungary. These typological phases of Lengyel culture are represented as the Earliest Eneolithic phase in traditional periodisations (*Pavúk 2000*), with the exception of Austria, where the term Eneolithic is not used. The transition from the Neolithic to Eneolithic in the traditional relative periodisation can be dated to around the middle of the 5th millennium calBC.

After the end of the Sava group of the Lengyel culture in Central Slovenia, a gap of some two centuries appears in the radiocarbon sequences before the beginning of the Lasinja culture, dated on the basis of sites in north-eastern Slovenia. Well constrained dates for the 4th and 5th settlement phases in a continuous stratigraphic sequence at Moverna vas date the period of high activity on the site to the second half of the 45th century and the first half of the 44th century calBC. This period is synchronous with later typological phases of the Lengyel culture. In the 44th and 43rd centuries calBC we pointed out the contemporaneity of sites attributed to the Neolithic (the Ajdovska jama cave site and the 6th settlement phase at Moverna vas) and Eneolithic or Lasinja culture (sites in North-eastern Slovenia). The overall appearance of Lasinja culture and other related cultures of the so-called Epilengyel cultural horizon (Kanzianberg-Lasinja in Austria, Balaton-Lasinja in Hungary, Ludanice in Slovakia and Jordanów in Czech Republic) can probably be dated to around 4300 calBC or earlier. The beginning of Lasinja culture around 4300 calBC has also been proposed by other researchers (*Balen 2008.22; Guštin 2005.14, Fig. 4; Oross* et al. *2011.182; Ruttkay 1996; Somogyi 2000*).

Conclusion

The case studies presented here show different possibilities of modelling calendar chronologies with the aid of a Bayesian statistical framework implemented in the widely available OxCal calibration program. While this approach enables the dating of archaeological deposits and sites irrespective of their periodic or cultural attribution, it is far from an independent dating method, as the accuracy and understanding of our archaeological information and assumptions are crucial to the production of realistic models. On the other hand, ^{14}C sampling at archaeological sites needs careful planning in order to obtain relevant samples whose relation to archaeological events of interest is understood. We must bear in mind that Bayesian modelling of archaeological chronologies is only a heuristic tool; it does not provide final or absolute results. Our calendar chronologies will change as new data becomes available and as we decide to model them in different ways. Our results are only a first glimpse into what can be achieved with Bayesian modelling of calendar chronologies.

In Moverna vas, the stratigraphic and typological sequence of Neolithic settlement phases was provided with precise dating of pottery assemblages from within these phases as well as with their durations. On the basis of the estimated duration of individual settlement phases, the depth of layered deposits and abundance of material within them, we proposed that the 3rd settlement phase was a period of low anthropogenic activity, while the opposite is true of the 4th and 5th settlement phases. The end of Neolithic occupation at the site corresponds well with the proposed beginning of the Eneolithic Lasinja culture in neighbouring regions, while the Lasinja sites in Slovenia seem to be at least partly contempora-

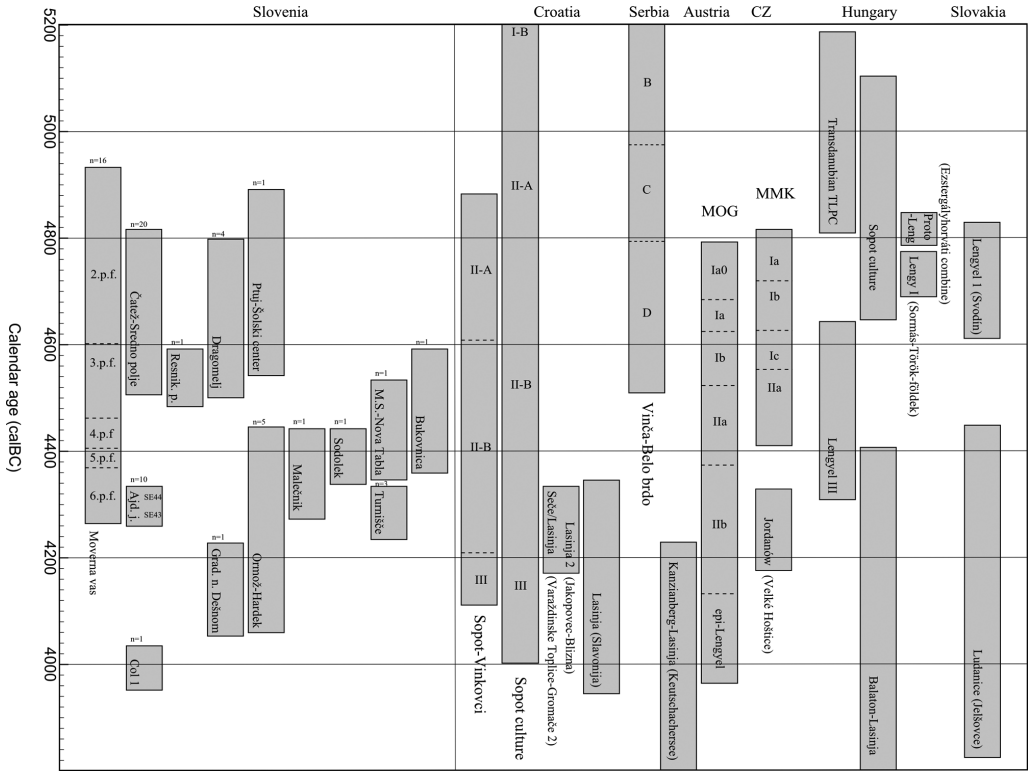

Fig. 11. Diagram of the correlation between calendar and cultural sequences. The cultural sequences of some archaeological cultures as well as individual sites from Central and Southeastern Europe are shown.

neous with the last Neolithic settlement phase in Moverna vas.

^{14}C dates from sites attributed to the Sava group of the Lengyel culture in Central Slovenia were used to provide an estimated calendar date for the beginning and end of this cultural group and an estimate of its duration. We pointed out two clusters of ^{14}C dates from Slovenia, one belonging to this group and the other to Lasinja sites in North-Eastern Slovenia (besides ^{14}C dates from Ajdovska jama cave site). A significant temporal gap can be discerned between these two clusters in the middle of the 5th millennium calBC.

By comparing the calendar chronology model of human burials discovered in Ajdovska jama cave and the calendar chronology of the last Neolithic settlement phase in Moverna vas with the chronological model for the Lasinja sites in North-Eastern Slovenia, we exposed inconsistencies in cultural attribution of contemporaneous sites. Sites that are contemporary according to their ^{14}C dates are interpreted by different researchers as belonging to different periods and archaeological cultures. We also considered the possibility that differences in the periodical and cultural attribution of pottery assemblages from contemporary sites could be the result of regional differences in the appearance of pottery traits associated with different periods and archaeological cultures.

The complex calendar chronology model of the Vinkovci-Sopot tell-site, which utilises the available ^{14}C dates and archaeological data about the superposition of houses, allowed us to date individual houses precisely and propose the most probable order in which they were constructed. The ^{14}C dated and sequenced houses were built within two continuous periods separated by a gap. With the aid of information on the typological attribution of the pottery assemblages from some sequenced houses, we were able to estimate the age of the event when the boundary between the II–B and III typological phases of the Sopot culture can be expected at the Vinkovci-Sopot site.

This event, dated to around 4200 calBC, is considerably later than the appearance of the Lasinja sites in the same region in Croatia. Unlike the relative cultural schemes which present Sopot III and Lasinja culture as not only temporally exclusive, but also separated by another Sopot IV typological phase, our results provide a good argument for a temporal overlap between them and for an inconsistency in the relative chronological scheme of archaeological cultures.

Despite the problematic theoretical nature of chronology, it is crucial to archaeological practice. Bayesian modelling of calendar chronologies is a way to bridge the gap between chronology and theoretical discussions concerning the experience and flow of time, issues of social construction of time, of memory and forgetting and the nature of the past in the past. Particular events that happened in the past can now be assigned to specific centuries and even spans of decades and we can start thinking in terms of human generations and lifetimes. The people who participated in these events are no longer timeless and faceless, but particular people in particular places and particular times.

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Appendix

Site	Lab Code	Age (BP)	SD (±a)	Material	Stratigraphic Context	Typo-chronological scheme	Reference
Ajdovska jama	OxA-15041	5485	50	human bone	44	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15072	5365	31	human bone	43	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15073	5369	31	human bone	44	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15074	5416	35	human bone	44	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15091	5421	30	human bone	44	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15092	5436	30	human bone	44	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15093	5389	30	human bone	43	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15094	5405	31	human bone	43	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15095	5471	31	human bone	43	Neolithic	*Bonsall* et al. *2007.Tab.1*
Ajdovska jama	OxA-15119	5340	36	human bone	44	Neolithic	*Bonsall* et al. *2007.Tab.1*
Čatež-Sredno polje	KIA17846	5804	30	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17847	5747	32	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17848	5935	31	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17849	5751	33	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17850	5811	30	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17852	5758	33	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17854	5718	32	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17855	5750	31	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17856	5806	42	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17857	5888	36	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17858	5782	30	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17859	5752	30	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17860	5828	36	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17861	5820	30	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17862	5797	40	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17863	5791	37	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17864	5992	36	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17865	5787	33	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17866	5839	30	charcoal		Sava group	*Guštin 2005.Fig. 2*
Čatež-Sredno polje	KIA17867	5737	39	charcoal		Sava group	*Guštin 2005.Fig. 2*
Dragomelj	Beta-162366	5730	50	charcoal		Sava group	*Turk, Svetličič 2005.69*
Dragomelj	Beta-201209	5870	40	charcoal		Sava group	*Turk 2010.43*
Dragomelj	Beta-201210	5750	40	charcoal		Sava group	*Turk 2010.43*
Dragomelj	Beta-201213	5740	40	charcoal		Sava group	*Turk 2010.43*
Turnišče-Gorice	KIA31894	5435	35	charcoal		Lasinja	*Plestenjak 2010.156*
Turnišče-Gorice	Wk-23910	5396	30	charcoal		Lasinja	*Plestenjak 2010.160*
Turnišče-Gorice	Wk-23911	5416	30	charcoal		Lasinja	*Plestenjak 2010.156*
Malečnik	KIA22920	5503	38	charcoal		Lasinja	*Guštin 2005.Fig. 3*
Moverna vas	OxA-4626	5390	80	charcoal	031.4 (6. phase)	Neolithic	*Budja 1993(1994).Fig. 5*
Moverna vas	OxA-4627	5580	80	charcoal	022 (5. phase)	Neolithic	*Budja 1993(1994).Fig. 5*
Moverna vas	OxA-4628	5640	80	charcoal	050.2 (4. phase)	Neolithic	*Budja 1993(1994).Fig. 5*
Moverna vas	OxA-4629	5830	80	charcoal	057 (2. phase)	Neolithic	*Budja 1993(1994).Fig. 5*
Moverna vas	OxA-4630	5830	90	charcoal	056.3 (2. phase)	Neolithic	*Budja 1993(1994).Fig. 5*
Moverna vas	OxA-4631	5720	90	charcoal	053 (3. phase)	Neolithic	*Budja 1993(1994).Fig. 5*
Moverna vas	Poz-21396	5750	40	pottery residue	053.1 (3. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21398	5550	40	pottery residue	050.2 (4. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21399	5630	40	pottery residue	050.1 (4. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21400	5610	40	pottery residue	022.1 (5. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21402a	5620	40	pottery residue	050.1 (4. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21402b	5990	40	pottery residue	050.2/056 (2. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21403	5800	40	pottery residue	planum 7 (2. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*

Site	Lab Code	Age (BP)	SD (±a)	Material	Stratigraphic Context	Typo-chronological scheme	Reference
Moverna vas	Poz-21404	5670	40	pottery residue	031.4 (6. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21419	5940	40	pottery residue	planum 7 (2. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-21420	5550	40	pottery residue	050.2 (4. phase)	Neolithic	*Žibrat Gašparič 2008.Fig. 5.1*
Moverna vas	Poz-48532	5780	50	pottery residue	056.1 (2. phase)	Neolithic	first published here
Moverna vas	Poz-48533	5490	40	pottery residue	031.4 (6. phase)	Neolithic	first published here
Moverna vas	Poz-48534	5540	40	pottery residue	031.3 (6. phase)	Neolithic	first published here
Moverna vas	Poz-48536	5390	40	pottery residue	031.4 (6. phase)	Neolithic	first published here
Moverna vas	Poz-48537	5580	40	pottery residue	planum 6 (4. or 6. phase)	Neolithic	first published here
Ormož-Hardek	Beta-112115	5380	50	charcoal		Lasinja	*Žižek 2006.Fig. 2*
Ormož-Hardek	Beta-112117	5480	40	charcoal		Lasinja	*Žižek 2006.Fig. 2*
Ormož-Hardek	Beta-112118	5300	50	charcoal		Lasinja	*Žižek 2006.Fig. 2*
Ormož-Hardek	Beta-112120	5530	60	charcoal		Lasinja	*Žižek 2006.Fig. 2*
Ormož-Hardek	Beta-112122	5410	50	charcoal		Lasinja	*Žižek 2006.Fig. 2*
Sodolek	KIA26992	5524	37	charcoal		Lasinja	*Guštin 2005.Fig. 3*
Beketinci-Bentež	Z-4373	5057	81			Lasinja	*Minichreiter, Marković 2011.Fig. 2*
Beketinci-Bentež	Z-4375	4954	108			Lasinja	*Minichreiter, Marković 2011.Fig. 2*
Beketinci-Bentež	Z-4376	4787	168			Lasinja	*Minichreiter, Marković 2011.Fig. 2*
Jurjevac-Stara Vodenica	Beta-246768	5200	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Jurjevac-Stara Vodenica	Beta-246771	5160	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Jurjevac-Stara Vodenica	Beta-246776	5240	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Jurjevac-Stara Vodenica	Beta-246777	5330	50	bone		Lasinja	*Balen 2008.Tab. 1*
Jurjevac-Stara Vodenica	Beta-246778	5210	40	tooth		Lasinja	*Balen 2008.Tab. 1*
Jurjevac-Stara Vodenica	Beta-246781	5230	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227927	5350	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227929	5270	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227930	5450	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227933	5330	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227934	4840	40	bone		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227935	5210	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227936	4970	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Đakovački Selci-Pajtenica	Beta-227937	5220	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Tomašanci-Palača	Beta-245707	5210	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Tomašanci-Palača	Beta-252269	5400	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Tomašanci-Palača	Beta-252277	5420	40	charcoal		Lasinja	*Balen 2008.Tab. 1*
Tomašanci-Palača	Beta-252283	5360	50	charcoal		Lasinja	*Balen 2008.Tab. 1*
Vinkovci-Sopot	Z-3139	6020	100	charcoal	23	Sopot II-A	*Krznarić Škrivanko 2011.Tab. 1*

Site	Lab Code	Age (BP)	SD (±a)	Material	Stratigraphic Context	Typo-chronological scheme	Reference
Vinkovci-Sopot	Z-3140	6010	100	charcoal	23	Sopot II-A	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3141	5960	100	charcoal	6	Sopot II-A	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2752	5675	120	charcoal		Sopot II-B	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2753	5790	125	charcoal		Sopot II-B	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2909	5220	100	charcoal	20	Sopot II-B	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2911	5330	90	charcoal	20	Sopot II-B	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3143	5840	100	charcoal	53	Sopot II-B	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2754	5360	130	charcoal	11	Sopot III	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2826	6339	99	charcoal	11	Sopot III	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-2827	5380	98	charcoal	11	Sopot III	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3142	5550	130	charcoal	24	Sopot	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3866	5415	195	charcoal	332	Sopot	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3867	5715	155	charcoal	53	Sopot	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3868	6295	135	charcoal	183a	Sopot	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3869	5900	75	charcoal	207	Sopot	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Z-3870	5840	80	charcoal	238	Sopot	*Krznarić Škrivanko 2011.Tab. 1*
Vinkovci-Sopot	Beta-230029	5880	40	charcoal	235	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-230030	5300	40	charcoal	222	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-230031	5780	40	charcoal	301	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-230032	5680	40	charcoal	218	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-230033	5760	40	charcoal	183a	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251907	5940	40	tooth	21	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251908	5840	50	tooth	403	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251909	7120	50	tooth	80	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251910	7100	50	tooth	519	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251911	7110	50	tooth	143	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251912	5860	50	tooth	255	Sopot	*Krznarić Škrivanko 2011.Tab. 2*
Vinkovci-Sopot	Beta-251913	5800	50	tooth	405	Sopot	*Krznarić Škrivanko 2011.Tab. 2*

BACK TO CONTENTS

Alsónyék-Bátaszék: a new chapter in the research of Lengyel culture

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ABSTRACT – *There can be no doubt that one of the major archaeological discoveries made in Hungary during the past ten years was the prehistoric settlement at Alsónyék–Bátaszék. The area was intermittently occupied from the Early Neolithic to the end of the Late Neolithic and the onset of the Copper Age. The prehistoric settlement attained its greatest extent during the Late Neolithic Lengyel period, as shown by the 2359 burials and over 100 post-framed buildings uncovered at the site. This preliminary report describes previous research on the architecture of the Late Neolithic Lengyel culture in Hungary and the Lengyel settlement at Alsónyék and its architecture.*

IZVLEČEK – *Prazgodovinska naselbina pri kraju Alsónyék-Bátaszék je nedvomno eno izmed največjih odkritij na Madžarskem v zadnjih desetih letih. Območje je bilo s prekinitvami poseljeno od zgodnjega neolitika do konca poznega neolitika in začetka bakrene dobe. Prazgodovinska naselbina je doživela svoj največji razpon v pozno-neolitski kulturi Lengyel, kar dokazuje 2359 izkopanih pokopov in več kot 100 stavb, grajenih v tehniki sohaste gradnje. V tem preliminarnem poročilu opisujemo dosedanje raziskave arhitekture pozno-neolitske kulture Lengyel na Madžarskem in arhitekturo lengyelske naselbine pri kraju Alsónyék.*

KEY WORDS – *Late Neolithic; Lengyel culture; settlement structure; architecture; above-ground timber-framed buildings*

Introduction

The Alsónyék–Bátaszék site lies in south-eastern Transdanubia, in the south-western part of the Tolna Sárköz region (Fig. 1).[1] It is bounded by the Szekszárd Hills in the west and by the wide alluvial plains of the former Danube channels in the east. The site rises above the alluvial plain of the Danube. Its surroundings are dotted by island-like ridges lying at 92–94m a.s.l., higher than the average 86–87m a.s.l. of the area, as well as of the infilled river and stream channels. The bed of the Lajvér Stream extends across the middle of the excavated area (Pl. 1). The river regulations had completely changed the original geomorphological features of the area by the late 19th century.

The site lies near the Danube, the main natural communications artery, and at the meeting point of two different regions, the Transdanubian Hills and the Great Hungarian Plain. On a larger scale, it lies in the contact zone between the Neolithic populations of the northern Balkans and Central Europe. This geographical location left its imprint on the archaeological record, which is reflected in clear signs of cultural influences from the south in the material of all Neolithic periods recorded at the site.

The site was investigated during the archaeological excavations preceding the construction of the M6 motorway between 2006 and 2009. In addition to

1 Abbreviated as Alsónyék in the following.

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the Institute of Archaeology of the Hungarian Academy of Sciences, several other institutions also participated in the excavations conducted at several locations independently of each other owing to the tight excavation schedule (Pl. 1). However, it soon became clear that the different locations were all part of a single, very extensive Neolithic site. The roughly 15 000 features uncovered reflect the site's intensive occupation and the large, *c.* 250 000m^2 area of the excavations. About 90% of the uncovered features could be assigned to the Neolithic: the *Starčevo culture*, the *Central European Linearbandkeramik* (*LBK*), the *Sopot culture* and *Lengyel culture*. The proportion of finds from other periods (Bronze Age, Iron Age, Roman Age) was considerably smaller. Several studies discussing the site and its finds have already been published, ranging from preliminary reports (*Bánffy* et al. *2010; Gallina* et al. *2010; Gelencsér 2010; Majerik* et al. *2010*) to articles devoted to a particular aspect (*Zalai-Gaál 2008; Zalai-Gaál, Osztás 2009a; 2009b; Zalai-Gaál* et al. *2009; 2010; 2011a; 2011b; 2012*).[2]

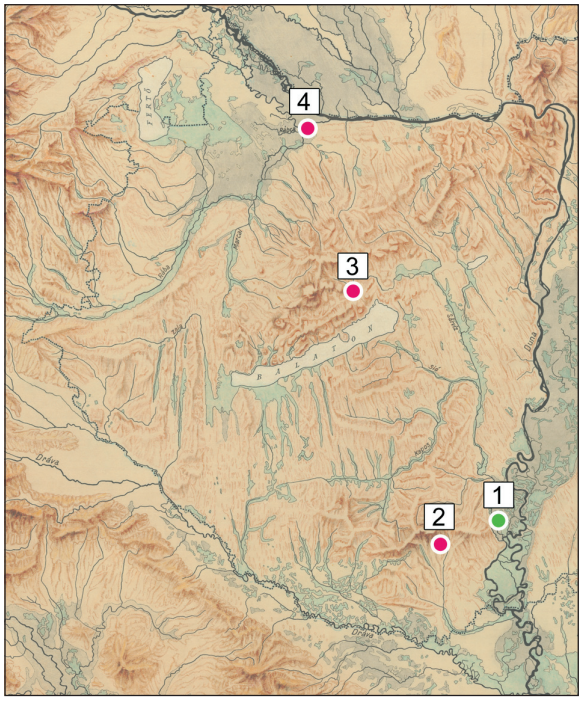

Fig. 1. Location of Alsónyék–Bátaszék and the main Hungarian sites of Lengyel culture with timber-framed houses. 1 Alsónyék–Bátaszék; 2 Zengővárkony; 3 Veszprém–Jutasi út; 4 Győr–Szabadrét-domb.

The occupants of Alsónyék before the Lengyel culture

The Starčevo culture

The first Neolithic inhabitants in the area were population groups of the Starčevo culture. In Hungary, the archaeological investigation of this culture began in the 1970s, when the culture's first sites were discovered. Since then, over 30 sites have been documented in Transdanubia, most of which lie in the Danube and Dráva valleys, the Sió–Sárvíz valley and in the north to south stream valleys (*Kalicz* et al. *2007a.25; Kalicz 2011.105–107; Abb. 1.1*). In terms of its location, the Alsónyék site fits into the chain of already known sites. Our knowledge of Starčevo culture is based on small-scale excavations and salvage operations, and the findings of field surveys (*Kalicz 2011.111*). Some 500 features of the Starčevo settlement were uncovered in the south-eastern part of the excavated area at Alsónyék (Fig. 2). We must mention the roughly 100 ovens and thirty graves in which the deceased were buried in a contracted position.[3] The archaeological features have their best parallels in the Starčevo sites in Croatia, as far as the large, irregular pits, the oven types and the burials are concerned (*Minichreiter 2007.Fig. 5, Figs. 15–16, Fig. 21a–b; Minichreiter, Botić 2010*). Knowing that the northern fringes of the Balkan–Aegean Early Neolithic culture province lay in southern Transdanubia, it is hardly surprising that these sites are most closely allied to settlements in Croatia and the Srem, because all three regions were part of the same cultural complex (*Kalicz* et al. *2007a. 25*). The typological traits and decoration of the ceramics indicate that one part of the Starčevo settlement at Alsónyék can be dated to the culture's late phase (*Bánffy* et al. *2010*), although an earlier occupation can also be assumed, as some finds exhibit the traits of an earlier phase.

It is generally assumed that surface-level, timber-framed buildings had existed already during the Starčevo period, because the presence of post houses has been documented on sites of the contemporaneous Körös culture (for a recent overview, *cp. Raczky 2006*). However, the number of Starčevo sites is well below the currently known Körös sites

2 The cleaning and conservation of the finds from certain excavation areas are still in progress. The assessment of a part of the finds is performed as part of a research project directed by Eszter Bánffy, supported by Grant K 81230 of the Hungarian Scientific Research Fund (OTKA).

3 The settlement features and the most important finds from the Early Neolithic settlement have been described in a preliminary report (*Bánffy* et al. *2010*). This description is based on the excavation data of the intensively occupied Starčevo settlement in the south-eastern part of the excavated area. The exact number of ovens and burials has since been modified (*Gallina* et al. *2010*).

Pl. 1. Alsónyék–Bátaszék. Plan of the excavations. 1 Site M6 TO 10/B, Alsónyék–Kanizsa-dűlő. Excavated by the Institute of Archaeology of the Hungarian Academy of Sciences and Archeosztráda Ltd. between 2006 and 2008, excavation conducted by Anett Osztás and István Zalai-Gaál. Excavated area: 42 076m²; 2 Site M6 TO 10/B, Alsónyék–Kanizsa-dűlő. Excavated by Ásatárs Ltd. in 2006–2007, excavation conducted by Zsolt Gallina. Excavated area: 47 038m²; 3 Site M6 TO 046, Lajvérpuszta. Excavated by the Field Service for Cultural Heritage in 2008–2009, excavation conducted by Vera Majerik. Excavated area: 6799m²; 4 Site M6 TO 11, Bátaszék–Malomrét-dűlő. Excavated by Ásatárs Ltd. in 2006–2007, excavation conducted by Péter Hornok and Zsolt Gallina. Excavated area: 67 095m²; 5 Site M6 TO 11, Magtár. Excavated by the Field Service for Cultural Heritage in 2008, excavation conducted by Vera Majerik. Excavated area: 16 253m²; 6 Site M6 TO 5603/1, Bátaszék–Mérnökségi Telep and Bátaszék-56-os út. Excavated by the Institute of Archaeology of the Hungarian Academy of Sciences and Archeosztráda Ltd. in 2008–2009, excavation conducted by Anett Osztás. Excavated area: 63 488m²; 7 Site M6 TO 5603/2, Alsónyék Hosszú dűlő. Excavated by the Wosinsky Mór County Museum in 2008–2009, excavation conducted by János Ódor. Excavated area: 10 210m².

(*Bittner 2012a; 2012b; Dani 2012; Kustár 2012; Paluch 2012; Siklósi 2012*). Not one single surface-level, timber-framed Starčevo house has yet been found in Hungary, and the Alsónyék site is no exception in this respect.

The LBK

A major settlement of the Central European LBK was uncovered in the central area of the investigated area (Fig. 2). In addition to various pits and a few ditches, a substantial number of the long pits (*Längsgrube*) flanking the houses were also uncovered. The remains of some 20 houses were identified in all. However, indications of the timber framework of these buildings could only be observed in a few cases and thus these house plans are unsuited to a more detailed architectural analysis. None of the burials could be securely dated to the LBK period. Excavations conducted as part of the M6 salvage operations at another LBK settlement discovered at Tolna–Mözs lying some 20km north of Alsónyék brought to light the remains of 47 surface-level, post-framed buildings (*Marton, Oross 2012*). The significance of these sites lies in that they represent the southernmost LBK settlements in Transdanubia. Disregarding the southern shores of Lake Balaton, none of the previously known sites in southern Transdanubia yielded the remains of above-ground, timber-framed houses (*Oross, Bánffy 2009.Fig. 9*). The sites are also remarkable regarding their find material, which to some extent reflects the geographical location of these sites, as the pottery assemblages indicate strong cultural influence from the Vinča A culture during the early LBK period in southern Transdanubia (*Marton, Oross 2012*). Nándor Kalicz (*1994. 72*) had already pointed out that Vinča wares could be distinguished in the ceramic assemblages from some of the region's early LBK settlements. The preliminary assessment of the pottery finds from Alsónyék and Tolna–Mözs conclusively proves the exis-

tence of a contact zone and cultural interaction between the two cultures.[4]

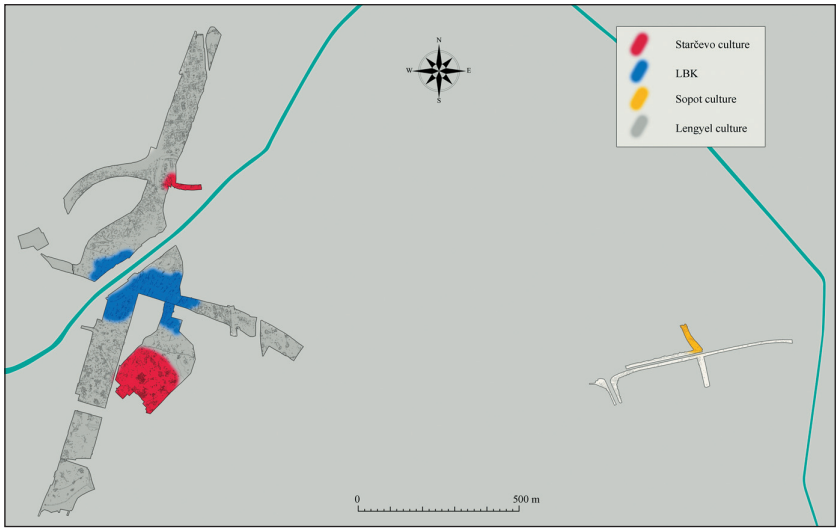

Fig. 2. Spatial distribution of Neolithic cultures at Alsónyék–Bátaszék.

The Sopot culture

A Sopot culture site was identified about 1km east of the large excavation area at Alsónyék (Fig. 2). Twenty burials and the remains of what was possibly an enclosure came to light at this site of the Sopot culture,[5] whose relation to and contact with the Lengyel culture is one of the key issues in Hungarian Neolithic studies. Very little was known about the Sopot culture in Hungary, even though our knowledge has grown considerably since the 1960s and 1970s, when the culture's first sites were identified. No more than three sites were known at the time: one of these was Bicske in Fejér County; the other two were Hidas and Izmény, both of which lie fairly close to Alsónyék (*Kalicz, Makkay 1972*). Finds of the eastern Transdanubian variant of the Sopot culture, characterised by a slightly differing artefactual material, have since been found also in south-western Transdanubia, in part from the excavations at Becsehely and in part from a series of sites in Zala County investigated during the salvage operations preceding the construction of the M7 motorway (*Horváth, Kalicz 2003; P. Barna 2007*). These sites share numerous similarities with the Brezovljani group of the western, Slavonian branch of the Sopot culture (*P. Barna 2011.31*). Large settlements of the culture can be found at Fajsz–Garadomb and Fajsz–Kovácshalom on the left bank of the Danube. Burials and the remains of possible buildings were uncovered at the former.[6] The tell site at Fajsz–Kovácshalom has been surveyed and systematically cored (*Bánffy 2003*). Dated to the transition between the Middle and the Late Neolithic, Sopot culture was assumed to have played a crucial role in the emergence of Lengyel culture as the medium and transmitter of southern elements (*Kalicz, Makkay 1972. 12; Regenye 2002.32*). Recent studies suggest that the Sopot and formative Lengyel phases were perhaps partly contemporaneous (*Kalicz* et al. *2007b. 44–45*). Until recently, virtually nothing was known about the culture's houses or mode of construction. The large-scale excavations conducted over the past decades have brought a welcome change in this respect, too. Large Sopot settlements have been investigated at Petrivente, Sormás–Törökföldek and Sormás–Mántai-dűlő during salvage excavations along the planned route of the M7 motorway (*Horváth, Kalicz 2003; P. Barna 2007*). A systematic overview of the settlement features and houses uncovered at the latter two sites has been published by Judit P. Barna (*2009; 2011*), together with a typological classification of the Sopot and early Lengyel houses.

Research on Lengyel architecture in Hungary

The earlier settlement territory of the Central European LBK was populated by the Lengyel culture during the Late Neolithic of the Carpathian Basin. The Lengyel distribution reached its greatest extent by the late Lengyel period (*Raczky 1974.209; Regenye 2007.381*). Research on the Lengyel culture began over 120 years ago. Over 300 sites are known in Hungary, about one-half of which can be found in southern Transdanubia (*Zalai-Gaál 2008.243, Abb.2*). The Alsónyék settlement lies near the culture's emblematic sites such as Zengővárkony, Mórágy–Tűzkődomb and the eponymous site at Lengyel. The early excavations at Lengyel and Zengővárkony ac-

4 Our discussion of the LBK material from Alsónyék is based on the finds from the areas excavated by the Institute of Archaeology of the Hungarian Academy of Sciences.

5 The assessment of the finds is currently in progress. We would here like to thank János Ódor for kindly allowing the publication of the site and its finds.

6 The site was investigated between 2006 and 2008 as part of a collaborative research project between the Institute of Archaeology of the Hungarian Academy of Sciences and Tübingen University. The excavations were directed by Eszter Bánffy and Jörg Petrasch.

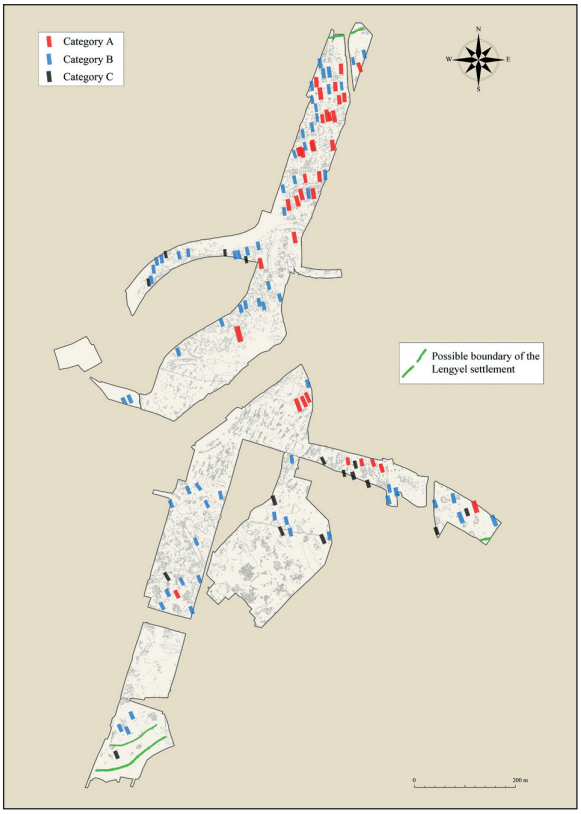

Fig. 3. The Lengyel settlement at Alsónyék–Bátaszék with the distribution of the timber-framed houses and possible boundary of the settlement.

quainted the archaeological community with the culture's material heritage, its burial customs and the grave goods deposited in the burials.

The beginning of research on the Lengyel culture is synonymous with Mór Wosinsky's activity in the late 19th century. He excavated 'narrow habitations' which he described as lowly hovels at the Lengyel site (*Wosinsky 1885. 38*). In his view, the 'habitations' included sunken pits whose sidewalls of daubed witling rose above the ground (*Wosinsky 1896.31–49*).

Wosinsky's excavations were followed by an upsurge of archaeological interest in the Lengyel culture during the 1930s, especially in southern Transdanubia, marked by a series of larger excavations and research projects, whose key figure was János Dombay. He investigated several sites in Baranya County, the most important of which were Pécsvárad–Aranyhegy, Villánykövesd and Zengővárkony. The many features excavated at the latter site and the 368 burials uncovered during the site's investigation made Zengővárkony into the period's best-researched archaeological site (*Dombay 1939*).

Based on the observation made during his excavations at Pécsvárad and Villánykövesd, Dombay believed that the dark, ashy patches forming straight rows visible on the surface represented former habitations, under which he discovered elaborate 'pit systems'. He concluded that these large pits, yielding a rich array of finds, were the remains of the sunken huts and outbuildings of the settlement's occupants. He interpreted the ashy levels mixed with charcoal and soot as the remains of the collapsed roof (*Dombay 1958.58–69; 1959.69*).

He made similar observations at Zengővárkony. He carefully analysed the house remains, which inspired a series of elaborate reconstructions (*Dombay 1960.156–192*). The oft-quoted house plan, which for a long time was the single known above-ground, timber-framed building of the Lengyel culture, was uncovered at Zengővárkony. As a matter of fact, the house plan represented not one, but three buildings, because the original house had been renewed twice. Taking the differing colour and composition of the fill of the postholes as his starting point, Dombay (*1960.57–65, Abb. 17*) attempted to distinguish the different building phases and made reconstructions of the building in each phase. Later, Pál Patay (*1985*) also devoted a study to the house plans at Zengővárkony. He noted that the three houses had been built in the same architectural tradition. He was not wholly satisfied with the reconstructions

Fig. 4. Alsónyék–Bátaszék. House 2401, view from the north.

proposed by Dombay and Müller-Karpe (*1968.233, Taf. 188.M*), and thus created his own version (*Patay 1985.550, note 15*). We also revealed several successively renewed buildings at Alsónyék and found that the buildings became slightly larger with each renewal. Based on this observation, each of the three earlier reconstructions can be challenged on the grounds that the later buildings could hardly have been smaller than the initial one (*Patay 1985.551, Abb. 1*). It remains unclear with which occupation phase the buildings found at Zengővárkony can be associated. According to Juraj Pavúk's (*2003.464*) chronological framework, the house plans can be dated to the Lengyel I or Santovka phase.

Fig. 5. Alsónyék–Bátaszék. House 7003, view from the north.

Dombay's influence on later research can also be seen in Rezső Pusztai's work, who in 1948 uncovered a 7 x 5m large pit at Szemely, also in Baranya County, in whose central area he found a hard-beaten clay floor and a hearth. Quoting Dombay's observations from Pécsvárad and Zengővárkony, Pusztai claimed that the round pits had been habitations and that this house type represented the domestic architecture of Lengyel culture (*Pusztai 1956. 39–41*).

Until the 1960s, research on Lengyel culture was largely restricted to south-eastern Transdanubia. Even so, the repeatedly renewed, timber-framed building found at Zengővárkony remained the only one of its kind for a long time.

The investigation of the early Lengyel settlement at Aszód in Pest County was begun in the 1960s. The site lies on the north-eastern boundary of the Lengyel distribution, so its excavation offered insights into the culture's cultural contacts with other regions. The burnt remains of five wattle-and-daub buildings were uncovered. Lying at a shallow depth below the modern surface and greatly disturbed by ploughing, the houses were spaced some 30–35m apart with no apparent pattern. The small buildings were outlined by the 8 x 5m and 6 x 4.5m patches of burnt debris. No postholes of the timber structure were identified. The floor level was indicated by hearths and the position of various artefacts. Nándor Kalicz interpreted the houses as buildings occupied by small nuclear families. Comparable surface-level houses with wattle-and-daub walls were known only from Csabdi, a settlement lying in the culture's eastern distribution (*Kalicz 1985.15–20*). In view of the fact that houses of this type were unknown in the entire Lengyel complex and that the finds from Aszód reflected contacts with the Tisza culture, Kalicz suggested that the origins of the architecture at Aszód should be sought outside the culture's distribution (*Kalicz 2008.10, 13*).

The next major discoveries were made in western Transdanubia in the late 1960s. In 1968, Mária Károlyi conducted a rescue excavation at Jánosháza–Fürdődomb, where she uncovered an 'Early Copper Age residential building'. Károlyi noted the likeness between the round ground plan and various other elements of the house that she had excavated and the building uncovered earlier at Szemely. She reconstructed a small settlement with seasonally occupied buildings and dated the settlement to the Lengyel III period on the basis of the finds (*Károlyi 1992.6–7, 78*). Also on the strength of the find material, she interpreted a similar pit measuring 4 x 10m brought to light at Kisunyom–Nádasi tábla as a sunken house dating from the period between the Lengyel culture and the Balaton–Lasinja culture (*Károlyi 1982.295–296*). The sunken structures of this type in Austria and Moravia were recently discussed by Ângela Carneiro (*2006.78*) in her publication of the sunken feature at Mannersdorf an der March. Quoting also the structures uncovered by Károlyi in Hungary, she concluded that these features were probably workshops.

A few sunken buildings with a clearly discernible occupation level were discovered in Zala County du-

ring the 1970s. Two of these structures were dated to the early Lengyel period (*H. Simon 1987.7–8*). A number of research projects in the 1980s and 1990s gave fresh impetus to archaeological investigations in Zala County (the Hahót Valley Project, the archaeological investigations related to the Little Balaton Reconstruction Project). The field surveys and excavations conducted during these projects yielded invaluable new data for the settlement patterns of the Lengyel culture, indicating a dense settlement network during the culture's early (Lengyel I) and late (Lengyel III) phase (*Bánffy 1995a; 1995b; Bondár 1995*). The above-ground, timber-framed buildings of the Lengyel culture have not been found at these sites.

The story of the culture's architectural research continued in Veszprém County. In the early 1970s, Marietta Csányi and Pál Raczky uncovered a part of a building at the Veszprém–Felszabadulás út site. The large, north to south oriented building measuring 18 x 9m had an apsidal end. The 40–50cm thick posts of the timber framework were dug into a 25–50cm wide bedding trench. However, postholes were observed only along some sections and no more than a small part survived of the bedding trench for the apsidal end. The building had a floor of hard-packed yellow clay (*Raczky 1974.186*). The building remains unparalleled in Hungary. The other major contribution of the Veszprém site to Lengyel studies was that – through a minute comparison with the material from other sites – it allowed Raczky to distinguish the late Lengyel phase (Lengyel III) in the culture's Hungarian sequence (*Raczky 1974.205*).

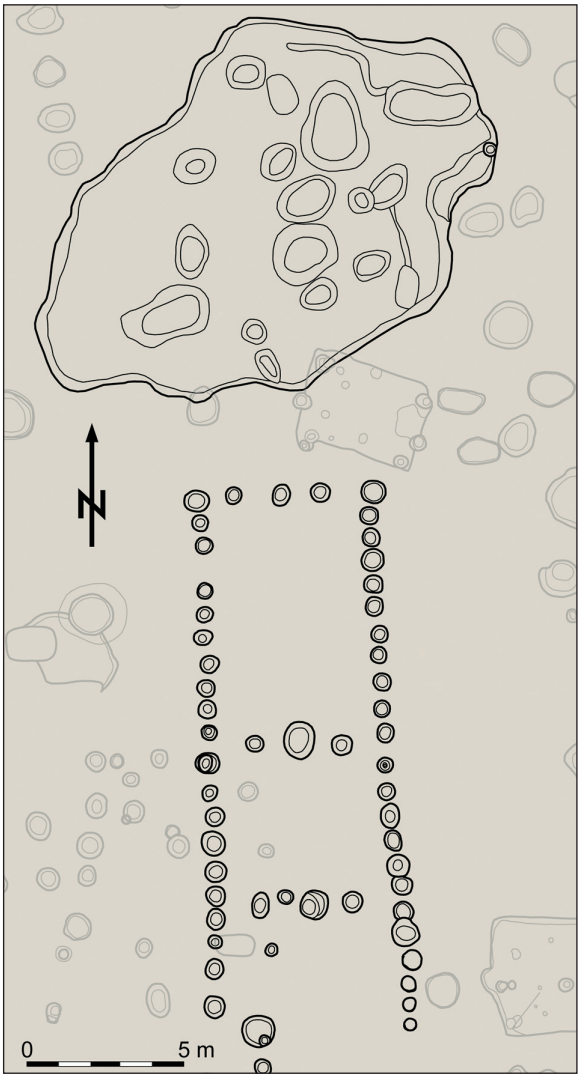

Fig. 6. Alsónyék–Bátaszék. Plan of House 498.

Breaking the linear narrative of research history, a later excavation at the same site should be mentioned. In 2003, Judit Regenye investigated another part of the Veszprém site during a rescue excavation, which yielded important new data on the settlement patterns and architectural traditions of Lengyel culture. This was the settlement where the classic post-framed houses of the culture were documented again, for the first time since the excavations at Zengővárkony. Regenye (*2004.25; 2007.381*) had revealed nine surface-level, timber-framed houses, which she dated to the end of Lengyel II and Lengyel III. The large rectangular or slightly trapezoidal buildings were all built around a framework of upright timbers, indicated by the closely spaced oval posthole, which in some spots formed bedding trench-like sections. The houses are all basically of the same type, although with slight variations. Most had an internal partitioning wall supported by two or three massive posts dug to a considerable depth and another heavy post in the middle of the southern end. The consistent lack of a southern wall suggested that this room was either open or porch-like, or that this wall had been of a flimsier construction whose posts had barely been dug into the ground. The posts providing the frame of the sidewalls of the southern room were in all cases driven deep into the ground, raising the possibility that they had perhaps also supported a second floor. Regenye (*2004.29; 2007.386*) quoted the buildings from Zengővárkony and the houses from Santovka and Žlkovce assigned to Type 3a by Pavúk as the best analogies to the Veszprém buildings.

Other investigations in the Veszprém area focused on identifying the workshops of the Szentgál–Tűzköveshegy flint deposits (*Regenye 2000; 2001*). Several smaller settlements were recorded which had been established for the protection of the mine and

for exploiting its deposits. These settlements yielded buildings entirely different from the Veszprém–Jutasi út site. At Szentgál–Teleki-dűlő, for example, an irregular rectangular house plan with a row of postholes across its middle was uncovered after the removal of the burnt daub debris. The building's sidewalls were outlined by smaller postholes. The building's width conformed to the usual width of the large Lengyel houses, but its length was about one-half of the culture's standard norms. Similar buildings were found at Ajka–Pál-major and Városlőd–Újmajor, while debris of burnt daub was excavated at the Szentgál–Füzi-kút site; no post holes were found under the debris. Regenye contended that these structures and the similar buildings uncovered at Aszód, Tekenye, Zalaszentbalázs and in the distribution of the Moravian Painted Pottery culture indicated the existence of another house type, and suggested that villages with houses of this type represented another element in the Lengyel settlement network. She distinguished these villages from the more central, densely occupied settlement with large timber-framed houses that were engaged in specialised production or in the organisation of trade, which in her view was also reflected in the nature and spatial organisation of the settlement (*Regenye 2004.31–32; 2007.395; 2011.63*).

Our knowledge of Copper Age architecture was substantially enriched by new information recovered from the sites investigated during the salvage excavations preceding the construction of the M1 motorway and other major construction projects on the Small Hungarian Plain, first at Győr–Szabadrétdomb, Mosonszentmiklós–Pálmajor, Lébény–Bille-domb, Lébény–Kaszás-domb, Mosonszentmiklós–Egyéni-földek, Győr–Marcalváros-Bevásárlóközpont in Győr-Moson-Sopron County (*Figler 1993; 1997; Németh 1994; M. Egry 2001; 2003*) and later at Szombathely–Metro áruház in Vas County (*Ilon, Farkas 2001*). The buildings discovered at these sites have been analysed in detail (*M. Virág 2004; 2005; M. Virág, Figler 2007*). In addition to the house plans assigned to the Balaton–Lasinja/Ludanice culture, the remains of buildings with bedding trenches possibly dating to the late Lengyel period were also uncovered during the excavations at Győr–Szabadrétdomb and Mosonszentmiklós–Pálmajor. House 500 at Győr–Szabadrétdomb was a large, two-roomed building with an open porch. The building had a bedding trench and was divided into two rooms by a wall indicated by three posts. A large posthole for a massive beam supporting the roof was uncovered in both rooms (*M. Virág, Figler 2007.347, 348, Fig. 2.2*). This building resembled the houses reported from Veszprém–Jutasi út and the Slovakian ones assigned to the Lengyel II period by Pavúk, the only difference being that the latter lacked a bedding trench. This house plan at Győr–Szabadrétdomb can probably be dated to the beginning of the Lengyel III period (*M. Virág, Figler 2007.350*).

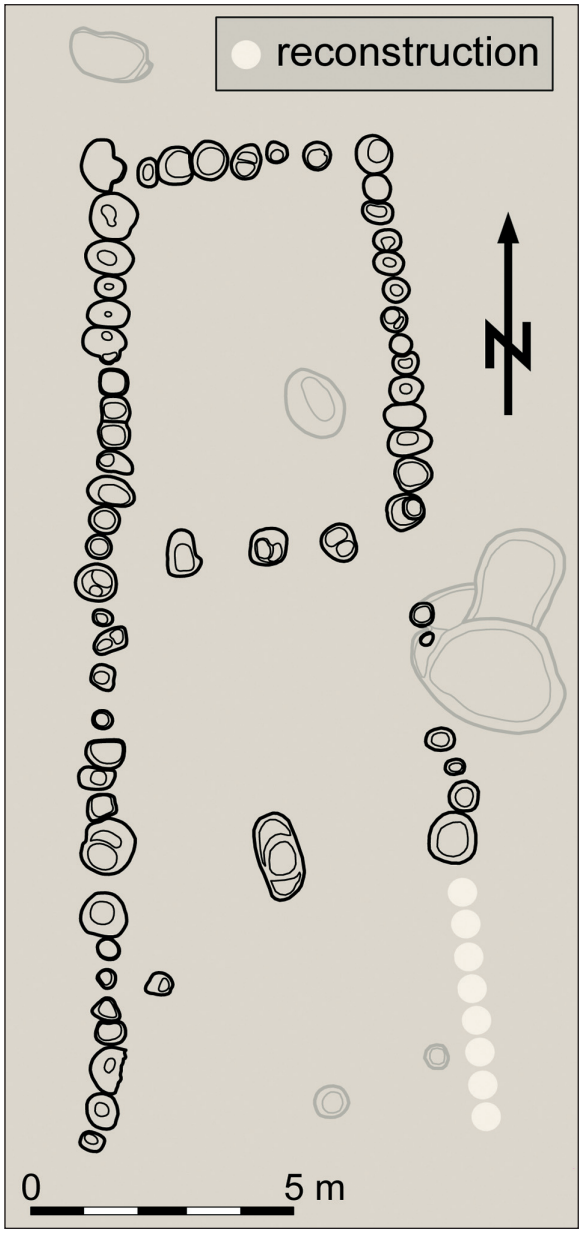

Fig. 7. Alsónyék–Bátaszék. Plan of House 7644.

Several buildings with bedding trenches, differing from the house described above, came to light at the Győr–Szabadrétdomb and Mosonszentmiklós–Pálmajor sites. In the view of Zsuzsanna M. Virág and András Figler, the best parallels to these buildings are the house plans discovered at the late Lengyel/epi-Lengyel sites in Austria and the similar buildings of

the Balaton–Lasinja period (*M. Virág, Figler 2007. 350, 352, 357, 358, 360*). As the finds of both periods (late Lengyel and Balaton-Lasinja) were brought to light at these two sites, there is no conclusive evidence for dating the house to one or the other culture, as it is almost impossible to date the buildings on typological grounds alone without the support of stratigraphic data, radiocarbon dates and a clear association of finds with a particular building (*Virág, Figler 2007.360*).

Returning to south-eastern Transdanubia, research in the later 20th century was principally concerned with the assessment of the enormous body of finds unearthed earlier. The over 600 burials found in south-eastern Transdanubia during previous and more recent excavations (Mórágy–Tűzkődomb) were discussed by István Zalai-Gaál (*2001; 2010*). The typological analysis of the finds and socio-archaeological analysis of the cemeteries brought major new insights regarding the period's social organisation and relative chronology in south-eastern Transdanubia. New Lengyel buildings did not come to light during more recent excavations, so studies of the region's architecture lag behind compared to other regions.

Following research by Zalai-Gaál (*1990*), the intensive survey and mapping of the Lengyel enclosures in Baranya County was begun (*Bertók, Gáti 2011*). In addition to a better knowledge of the structure, function and chronology of enclosures, the work by Gábor Bertók and Csilla Gáti also provided new information on the culture's settlement network, because settlements could be assumed near the enclosures. The remains of 16 enclosures of the Lengyel culture were investigated in Baranya County, using mostly non-destructive survey techniques. Four of the 16 sites identified through aerial archaeological photography were investigated in greater detail with a magnetometer survey and small sounding excavations. Two of these were the enclosures at Villánykövesd and Zengővárkony, two of the sites excavated by Dombay. One interesting finding of the survey at Zengővárkony was that the projection of the old excavation trenches onto the survey plan revealed that Dombay's trenches had all missed the enclosure, explaining why he had made no mention of it (*Bertók, Gáti 2011.7, Abb. 5d*). Another intriguing discovery was that the magnetometer survey also indicated the presence of what were probably large buildings inside the enclosure at the Szemely–Hegyes I, Belvárdgyula and Szarkahegy sites (*Bertók, Gáti 2011.10–11, Abb.7–8, 12, 13, 18–19, Abb. 13–14*).

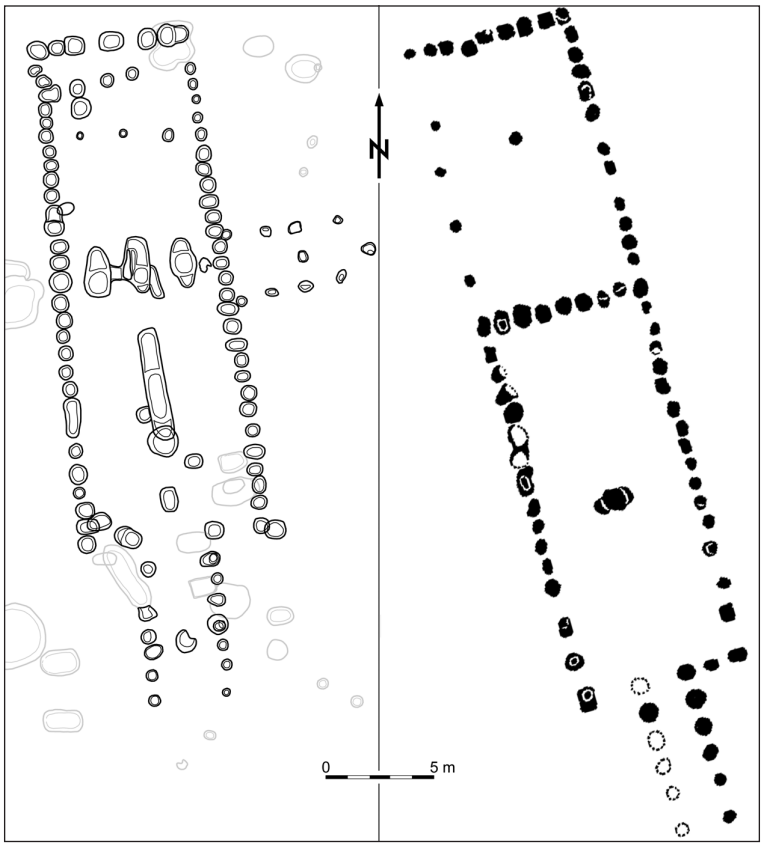

Fig. 8. Plan of House 6150 at Alsónyék–Bátaszék (left), House 52 at Žlkovce (right, after* Pavúk 2003.Abb. 9.1*).

The large-scale excavations have opened up entirely new perspectives in the research of prehistoric settlements. These investigations have called for new approaches to the study of settlement size and settlement layout, as well as to how prehistoric societies were organised. The many new finds of above-ground, timber-framed houses have called for a re-assessment of earlier views. By this time it had become clear that the sunken structures/pits previously interpreted as residential buildings were temporary shelters or features used for various activities (*e.g., Kalicz 2003.8; Raczky 2005.24; Pavúk 2003.464*).

It must also be noted that several problems are encountered when interpreting the house plans discovered during salvage excavations. Very often, they are incomplete because some of the structural elements were

not dug into the virgin soil and thus the surviving house plans are unsuitable for architectural reconstructions or for an assessment of the possible variations between various buildings and the differences in their architectural details. With the lack of a sufficient body of evidence, the reconstructions are strongly hypothetical. Also, despite the large area investigated, very little in the way of new information has come to light regarding the internal furnishing of houses.

The Lengyel period is characterised by a new architectural innovation compared to the preceding LBK period. One hallmark of the new architectural canon was the disappearance of the internal longitudinal rows of posts supporting the roof and a new roof construction. In the German terminology, this new roof structure is called 'Sparrendach' (*von Brandt 1980.424, 497–499; Masuch, Ziessow 1985.64; Lichter 1993.61–63; Pavúk 2003.456, 466–467; Raczky 2005.26*). In this new construction, the load of the roof was borne entirely by the side walls. Pavúk argued that the large post supporting a second storey made additional timbers unnecessary inside the house. In Pavúk's view, this architectural innovation was probably mediated to the Lengyel culture by the Vinča–Pločnik culture (*Pavúk 2003.456, 466*).

The Lengyel settlement at Alsónyék

The remains of at least 118 above-ground, timber-framed buildings were uncovered at the Alsónyék site (Fig. 3),[7] and additional buildings probably lie in the still unexplored area beyond the investigated section of the motorway's planned path. As a comparison, Pavúk listed a total of 150 buildings from Slovakia, which he assigned to various phases of his Lengyel sequence (*Pavúk 2003*).

About one-third of the house plans (Fig. 3) uncovered at Alsónyék survived with indications of the structural elements and their foundations virtually intact (Category A, 35 houses). The majority of the house plans, however, were incomplete, but were well fairly preserved and thus the original building could be reconstructed in many cases (Category B, 67 houses). The remaining buildings were houses of which only a few characteristic elements survived to indicate their presence (Category C, 16 houses).[8] These elements include the deep and sturdy foundations of partitioning walls and the remains of entrances. Obviously, the latter could not be included in the architectural analysis, but they contribute useful information regarding the layout of the settlement. The many postholes would suggest that there had once been considerably more buildings on the settlement than suggested by the surviving house plans, but we saw no sense in including hypothetical houses on the map. However, the differences in the preservation of the buildings as reflected in the three categories (A–C) clearly show that not only certain structural elements, but also entire houses can perish during the salvage excavations preceding large-scale construction projects owing to the mechanical removal of the topsoil. The partially surviving house plans are insufficient for studying possible architectural innovations and variations, which could indicate changes in the architectural traditions of a site or period.

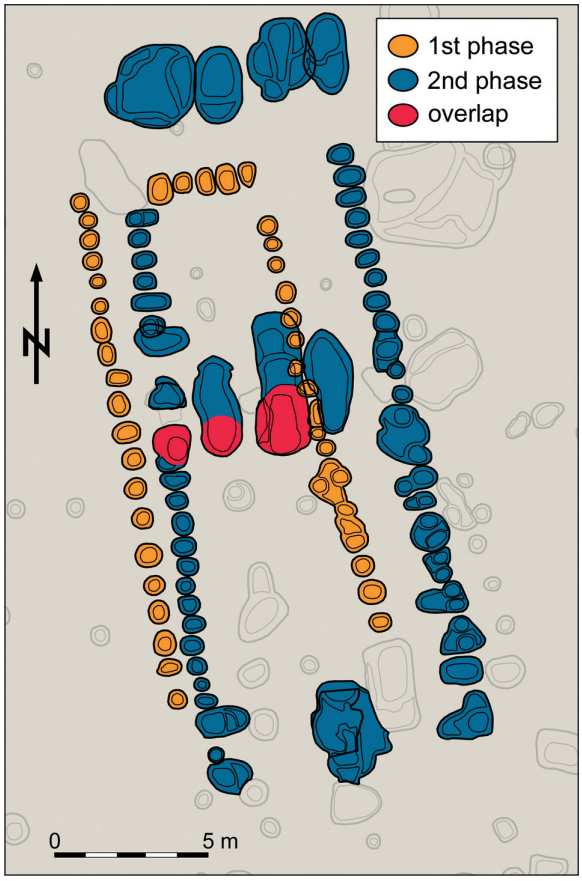

Fig. 9. Alsónyék–Bátaszék. Plan of Houses 6132 and 6133.

The majority of the house plans suitable for a detailed architectural analysis (complete houseplans of Category A) came to light in the northern part of the

7 The exact number of buildings was not known at the time the preliminary reports were published (*Zalai-Gaál, Osztás 2009.45; Gallina* et al. *2010.12*).

8 Similar categories were used in the assessment of the buildings of the LBK settlement at Balatonszárszó–Kis-erdei-dűlő (*Oross 2008*).

investigated area, where we found closely spaced buildings, many of which had been repeatedly renewed. There were 43 house plans in this area, most forming rows, although we had no way of establishing which buildings had been contemporaneous. The area was relatively densely and evenly built up in the northern and eastern trenches extending from the planned motorway. The southern part of the area appears to have been more loosely occupied. At the same time, a visible decline in occupation intensity could be noted in two areas: one in the central area of the excavated area, where the LBK settlement had been established, and the other in the south-eastern area, where the Starčevo settlement lay, where we did not register any traces of a Lengyel occupation. The remains of the Lengyel settlement could be documented across almost the entire part of the excavated area: it was *c.* 1500m long from north to south and 800m wide from east to west. The site's estimated size is approximately 80ha (Fig. 2).

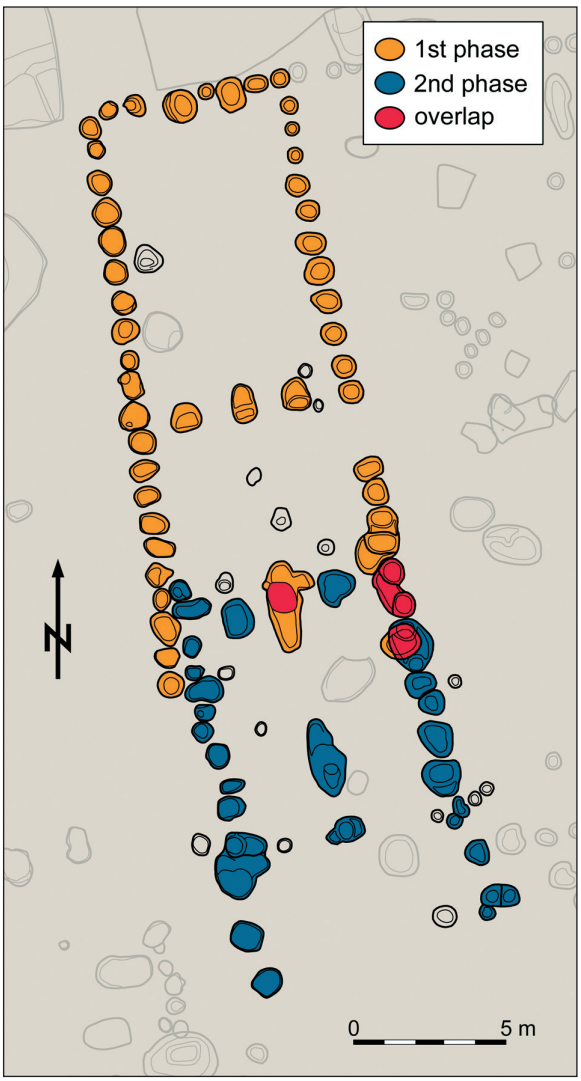

Fig. 10. Alsónyék–Bátaszék. Plan of House 4400, a renewed building.

The houses at Alsónyék were all large, post-framed buildings with one or two internal partitioning walls and an open porch on the southern side. We found no other types of residential buildings or sunken structures used for various activities. The houses all had a uniform north-north-east to south-south-east alignment, with slight variations across the entire settlement. The length of the buildings, including the porch, generally ranged between 14m and 22m, although a few were longer. Their width varied between 6m and 8m. They had rectangular or slightly trapezoidal ground plans, the sole difference between them being one of size, as the structures were virtually identical. The frames of the walls were indicated by densely spaced postholes, a feature noted at Santovka, Žlkovce and Veszprém. The postholes for the massive timbers of the wooden framework were sometimes dug at an angle, a practice also observed at Veszprém and the Lengyel houses in Slovakia (*Pavúk 2003; Regenye 2004; 2007*). The northern wall generally had five or seven posts, with the occasional building having nine. Pavúk has pointed out that the northern wall of the houses assigned to Type 3a at Žlkovce were consistently constructed with seven or nine posts and that the partitioning walls usually had the same number of posts as the northern wall (*Pavúk 2003.459*). At Alsónyék, however, we often found northern walls with five posts, while the partitioning walls were usually indicated by three very deep postholes (Figs. 5–10). The long walls were outlined by closely spaced round and oval postholes, whose number varied between 20 and 30. In some cases, the postholes had a more irregular or larger oval form and formed smaller bedding trench-like sections, as at Veszprém (Figs. 4–5; *Regenye 2004.29*) and in the case of the Lengyel houses in Slovakia (*Pavúk 2003*). Some houses had a bedding trench on the western side (although with few postholes inside), while others appeared to have a bedding trench for the northern wall (*Gallina* et al. *2010.14–15, Fig. 7, Pl. 70.17*). One house plan had features resembling a bedding trench interrupted by gaps along both long walls (*Gallina* et al. *2010.71, Pl. 18.2*). During the removal of the upper humus layer, we often found that the edges of the soil marks indicating postholes were contiguous.

The Alsónyék houses were divided into a larger northern and a smaller southern or middle room by an inner partitioning wall. A similar sized porch often adjoined the smaller southern room, making the

building three-roomed. The posts of the porch were usually dug to a slightly shallower depth than the timbers of the walls and it was therefore difficult to determine how large these additions had been because their traces were not always well preserved. In some cases, however, we were able to accurately establish that they were roughly the size of a room (Fig. 7). The porch was open, at least in the sense that there was no indication of a more massive wall with deeply dug posts. However, possible traces of less deeply dug posts may have perished when the topsoil was removed prior to the excavation. The entrance to the houses probably lay on the southern side. Our preliminary assessment indicated that the houseplans at Alsónyék were remarkably uniform and it seems likely that the architectural practices were similarly consistent. Some variability can be noted in the construction of the porch: one type has the porch separated from the second room from the north by a regular partitioning wall and the building thus has the semblance of a three-roomed structure (Fig. 6). Another type is characterised by the presence of a massive post at the house's southern end and the continuation of the two long walls beyond the line of this post (Figs. 7 and 10). The latter type is typical for the buildings of Type 3a in Slovakia and most of the buildings uncovered in Veszprém (*Pavúk 2003.461; Regenye 2004*). Yet a third type also has a narrow entryway (Fig. 8). The latter is represented by several houseplans at Alsónyék, which are slightly larger than the other buildings, but are no different otherwise regarding their other structural elements. Described as Bau mit Eingangskorridor by Pavúk (*2003.462*), the buildings of this type unearthed at Žlkovce (assigned to Type 3b) were believed to have a special function in view of their location (*Pavúk 2003.461*) because they lay inside the central enclosure, farther from the densely occupied settlement section, and were thus initially assumed to have been the settings of rituals or the residence of an economic and political elite, and thus a possible reflection of social ranking (*Pavúk 1991. 356*). In his latest study, Pavúk (*2003.460*) contended that these buildings had been the settings of ritual activities. Six buildings of this type were unearthed at Žlkovce. Although their exact chronological position remains unknown, Pavúk assumed that a building of this type had stood in each occupation phase of the settlement. He quoted a building found at the Gomolava site of the early Vinča–Pločnik culture as the best parallel to this type and regarded the similarities between the two as additional proof of the role played by Vinča culture in the emergence of Lengyel culture (*Pavúk 2003.462–463*). At Alsónyék, the buildings with an entryway do not appear to have been set apart from the other houses. Their exact chronological position remains unknown for the time being. They may have originally formed a separate cluster, but this is not apparent from the plan of the site, which shows a densely built-up settlement. However, given their size, we cannot exclude the possibility that these buildings were perhaps an expression of social inequalities (*Siklósi 2010.41*). Buildings with an entryway have been reported from the Hulín–Pravčice-Višňovce site in Moravia (*Kalábek* et al. *2009.248–249, Fig. 7; Dobeš* et al. *2010.58, Abb.3*); their large dimensions perhaps support an interpretation along these lines.

The renewal of a house on the same spot could be noted in several cases in the northern part of the excavated area (Fig. 9). The more sturdy construction of the partitioning wall and the northern wall can probably be explained by the enlargement of the buildings. In terms of its structure, the new building did not differ from the earlier one, save in its dimensions, reflecting the intention to increase the building's size. The preservation of the earlier structure could be documented in the case of one building to which an extra room was added at the southern end (Fig. 10). The house plan reveals that the open porch on the southern side had been walled up, creating a new partitioning wall between the new room and the entrance, which was virtually reproduced. The practice of renewing houses on the same spot was also observed at Zengővárkony and Veszprém (*Dombay 1960; Regenye 2004*).

Virtually nothing is known about the internal furnishing of Lengyel houses and the functions of the different rooms. Very few houses had burned down and even fewer had preserved some part of their furnishings. Two notable exceptions can be cited from the Nitra and Budmerice sites. A hard-burnt clay layer was found at the latter, which Pavúk (*2003.455–456*) interpreted as the remains of a second storey or the ceiling. Obviously, the floor level of the houses may have been destroyed by later intrusions and ploughing. Very often, we found large chunks of burnt daub directly under the plough zone. In a few cases, we uncovered burnt daub fragments, especially in the large postholes of the partitioning walls, perhaps an indication that the house had perished in fire. We also found burnt daub fragments in some spots and, in one case, we found intact vessels amidst the remains of what we assumed to be a burnt wall section (Fig. 11). Burnt daub fragments regularly occurred in the fill of the large refuse pits,

***Fig. 11. Alsónyék–Bátaszék. Burnt debris of a Lengyel building with vessels* in situ.**

providing additional proof that some structures had been destroyed by fire and, also, that the rubble had been cleared away, *i.e.*, that the occupants had kept the house areas clean.

The best architectonic parallels to the houses uncovered at Alsónyék come from nearby Zengővárkony and the buildings excavated at Veszprém, and they also share numerous similarities with Pavúk's Type 3a and 3b, even though the latter are usually larger and have a rectangular ground plan, while the Alsónyék buildings are smaller and slightly trapezoidal. House plans of Type 3b, buildings with an entryway, have also been found at Alsónyék. However, there is one major difference between the houses of Type 3a and 3b in Slovakia and the buildings at Veszprém and Alsónyék, namely the lack of a heavy post in the longitudinal axis of the innermost room, a feature typical of the Slovakian house plans which Pavúk (*2003.460–461, Abb. 7–9*) believes supported a second storey (*ibid. 456*). We do not want to take a definite stand concerning a possible second storey at this point, because in order to assume the existence of a second storey based on differences in the depth of postholes (*Regenye 2004.29*) requires a minute analysis of an enormous body of data. However, a few preliminary remarks can be made. A large posthole was found inside the Type 3a houses at both Žlkovce and Santovka, and while these were not always located in the centre of the room, they were positioned along the building's longitudinal axis (*Pavúk 2003.461, Abb. 8*). The same feature was recorded in the buildings at Hulín, a more recently investigated site (*Kalábek* et al. *2009.248–249, Fig. 7*), where several large postholes were uncovered along the axis of some houses, especially the larger ones such as House 45, an exceptionally huge building. One of the buildings uncovered in Veszprém had two postholes along the building's axis, probably for supporting the roof (*Regenye 2004.43, Fig. 18*). The currently available scanty evidence does not provide conclusive proof of the existence of a second storey/loft in the Lengyel buildings, and it is therefore possible that together with the middle posts of the partitioning wall, these posts had also played a role in supporting the roof structure. Since large posts of this type did not occur in the inner rooms of the buildings at Alsónyék, the presence of a second storey/ loft above these rooms can be rejected. The single large posthole along the building's axis was found in the centre or the end of the porch-like southern room (Figs. 9–10), making it unlikely that this post had supported an upper storey or loft. It seems more likely that it had a static function. It is possible that, together with the central post of the northern wall and the partitioning wall, it supported the roof, a possibility suggested also by the fact that the central posts of the northern wall and the internal partitioning wall(s) were usually larger and dug deeper than the other ones. Obviously, a reconstruction along these lines can be confirmed or dismissed only after a minute analysis of the available data. Nonetheless, the preliminary architectural assessment of the buildings uncovered at Alsónyék suggests that there were no major changes in architectural practices during the settlement's occupation. The house plans at the site and their architecture reflect a fairly uniform and consistent practice. It would appear that certain standard procedures were followed in house construction which remained virtually unchanged during the settlement's life-time.

One of the crucial issues remains how the chronological position of the houses relative to each other can be determined. In other words, how can we securely identify the finds which can be associated with a particular house and which pits and other featu-

res can be linked to one or the other building? How can we date individual buildings? In some cases, we found large pits extending along the northern wall which can in all likelihood be associated with the building (Fig. 6). Some of these pits, dug into each other, formed a ditch extending parallel to an entire row of buildings in some areas of the site. These pits were probably borrowing pits, opened when the house was built and later filled with household refuse (Fig. 12). Their enormous size raises the possibility that they can be linked to several contemporaneous houses, and thus – in addition to the data from archaeometric analysis – the superpositions, a minute examination of the site plans and comparison of various features of the find material can shed light on diachronic changes in the settlement's layout.

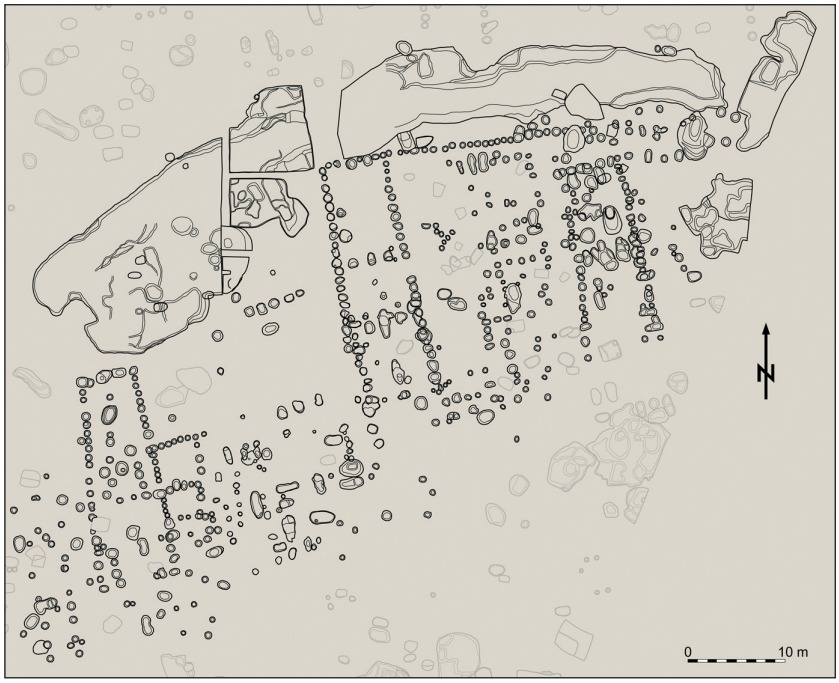

Fig. 12. Alsónyék–Bátaszék. Row of Lengyel houses with borrow pits dug into each other.

The Lengyel settlement probably continued in almost all directions beyond the excavated area. How can we determine the boundaries of such a large settlement? To answer this question, we considered the following points: the settlement extended to the eastern edge of site M6 TO 46 towards the west, where we found Lengyel burials and two timber-frame buildings which could be confidently assigned to the Lengyel culture (Fig. 3; *Majerik* et al. *2010*). A nearby hill limited the settlement's expansion in this direction. We uncovered a few ditch sections lying far from each other in the northern, eastern and southern ends of the excavation trenches, which we interpreted as marking the possible boundaries (Fig. 3). The ditch (Feature 4305) extended along the entire width of the motorway's planned path in the northern part of the excavated area. Only a small section was found in the east (Feature 2218), while two parallel ditch sections were identified in the southern part of the excavated area. The section of the ditch indicated a V-shaped structure, 2m deep and 1–1.5m wide. We did not find any post-holes in the bottom of the ditch or any traces suggesting a palisade or structure on the inner side of the ditch. The fill, the dimensions and the presence of certain structural elements suggested that these sections were part of the same ditch. An exact counterpart of the structure perpendicular to the ditch is known at Sormás–Törökföldek, where it was interpreted as a wooden bridge (*P. Barna 2010.97, 114, Fig. 8.1*).

One oft-encountered problem in estimating the size of the community occupying the settlement is that population estimates based on the number of houses (and their inhabitants) is often at variance with the number of excavated burials. Very often, the number of burials is quite low compared to the houses uncovered during the excavation of extensive areas (*Raczky, Anders 2006.25*). The obvious question, then, is where did the occupants bury their dead? At Alsónyék, we found 2359 Late Neolithic burials which formed groups, the smallest of which contained 25 to 30 burials, the largest as many as 100. The latter reflect the continued use of a burial ground or perhaps a change in mortuary customs. A few solitary graves were also uncovered, some of which lay on the site of former houses and occasionally formed smaller clusters. The burials reflected a strict burial rite: the deceased were aligned east or west with the face to the south and they were laid to rest in a contracted position. One element of the Lengyel burial rite, graves containing some sort of a wooden structure, was first observed at the Alsónyék site. Compared to the usual oval or oblong grave pits, these graves were rectangular, larger than average and dug to a greater depth. Most of the grave pits

Pl. 2. A selection of burials and grave goods from Alsónyék-Bátaszék.

measured 2 x 2m and had a large posthole in each corner, indicating the presence of a wooden bier or funerary structure erected over the burial (*Zalai-Gaál* et al. *2012*). The rich variety of grave goods – costume adornments, jewellery articles, prestige items and other artefacts reflecting social status – suggests that these graves can be regarded as those of the community's high-status members, and can thus be seen as a reflection of early social ranking (Pl. 2). About 100 burials of this type were uncovered. The preliminary anthropological assessment of the skeletal remains revealed that men and women were buried in these graves in roughly equal numbers.

The Lengyel settlement of Alsónyék is unique among the culture's known sites and represents a flourishing period in the life of the culture. During its occupation, the settlement grew into a regional centre of the type noted at Zengővárkony, eclipsing the smaller settlements of the dense settlement network. The assessment of the artefacts and analysis of the pottery, lithic finds and copper and shell jewellery from the graves will take several years. Little can be said at present about the settlement's internal chronology. The preliminary assessment of the grave goods indicates that the cemetery was in use from the south-eastern Transdanubian Lengyel Ib period. Most burials yielded material typical of the Lengyel IIa1–2 period. The architectonic features of the houses and their resemblance to the buildings uncovered at Veszprém and the Lengyel sites in Slovakia indicate that the site was occupied continuously during the Lengyel II period.

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BACK TO CONTENTS

Another facet of man – Red deer relationship in prehistory: Antler exploitation at the Eneolithic settlement at Hârşova-tell (Constanţa County, Romania)

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ABSTRACT – *The significant quantity of antlers identified in the Gumelniţa A2 level in different stages of processing, from finished objects to consumed debitage waste, motivated us to try to reconstruct the management of the modalities of this raw material, of the processing techniques used and activities developed with the help of antler tools. In other words, the series of antler-made tools presents an important evidence of the activity of the Hârşova-tell community. The mentioned series reunites all the conditions for achieving such a study: the numerical importance of the remains, the good conservation stage – which allows for the identification of technological and functional traces – the variety of types of pieces* etc.

IZVLEČEK – *V plasti Gumelniţa A2 prepoznana večja količina rogovja v različnih stopnjah obdelave od končnih izdelkov do odpada nas je usmerila v poskus rekonstrukcije nadzora nad modaliteto te surovine, uporabljenih tehnik obdelave in razvoja dejavnosti, ki ga omogočajo rožena orodja. Povedano drugače, serija orodij, izdelanih iz rogovja, predstavlja pomemben dokaz dejavnosti skupnosti naselbine tipa tell Hârşova. Omenjena serija ima vse pogoje za izvedbo takšne študije: kvantifikacijski pomen ostankov in dobra ohranjenost najdb – kar omogoča prepoznavanje tehnoloških in uporabnih sledi, tipološka raznolikost itn.*

KEY WORDS – *Eneolithic; antler; Cervus elaphus; antler-made tools; processing techniques*

Introduction

The tell at Hârşova (Constanţa County) in southeast Romania is located within the present boundaries of the city; it is *c.* 13m high, with an area of *c.* 200 x 150m, while the thickness of the anthropic sedimentation reaches *c.* 11.20m. Regarding the levels of Prehistoric occupation, the oldest remains are of the Boian and Hamangia cultures (dated to the first half of the 5th millennium BC), continuing with the Gumelniţa (dated to the second half of the 5th millennium BC) and Cernavoda I (dated to the beginning of the 4th millennium BC) cultures.

The first archaeological research was conducted in 1961 (*Galbenu 1962*), but in new excavations from 1993 onwards the excavation strategy changed fundamentally (*Popovici* et al. *1998–2000; Randoin* et al. *1998–2000*). The informational level of the various types of stratigraphic units (SUs) discovered during research was tested in these excavations to allow an elaboration of a sampling strategy appropriate for the purposes of the investigation. Given that the research is being carried out on a tell, thus a multilayered settlement, with an extremely complicated stratigraphy, the principle aim was to evaluate the content of the different SUs, which consisted of either indoor (rarely) or outdoor occupational remains. The screening of sediments from other contexts was performed only in exceptional cases (occupational SUs inside dwellings, remains resulting from combustion structures *etc.*). In this sense,

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the samples were primarily water sieved in screen columns in order to obtain significant data. The research methodology allowed a very fine analysis of the evolution of occupation, unique until now in the history of archaeological research in Romania. There were individualised specific deposits that characterised certain human behaviours, of which some special areas had a housekeeping nature (a type of complex defined for the first time during the archaeological research at this site), that appeared to be very well defined spatial complexes. Moreover, the chronology of the stratigraphic succession of this type of complex has been determined, with significant results for the acquisition of data.

The significant quantity of antlers identified in the level Gumelniţa A2, in different stages of processing, from finished objects, to consumed debitage waste, motivated us to attempt a reconstruction of the ways of managing this raw material, of the processing techniques employed and of activities developed with the aid of antler tools, in other words the productive economy of the Hârşova-tell community. Otherwise, the stratigraphic series reunites all the conditions achieving such a study: the numerical importance of the finds, a good state of conservation – allowing the identification of technological and functional traces – the variety of the type of pieces *etc*. We must add that due to the relatively reduced surface only a very small number out of *c.* 400m^2 of complexes could be studied completely, a fact that obviously limits our interpretation. Also, only *c.* 58% of the pieces of antlers included in the present study come from excavations after 1992, for which the stratigraphic data are much more precise.

Cultural context

The archaeological remains from hard animal materials contain significant potential data, making them essential in interpreting archaeological assemblages and, globally, reflecting on prehistoric life. Thus, starting from the study of these artefacts, on the one hand, we can reconstruct the methods of exploiting the animal environment for non-alimentary purposes, and by identifying the processing techniques of the tools and manner of their use we can reconstruct an image of their users' world. Moreover, in the study of the evolution of human behaviour, tools made from hard animal materials were considered a definitive characteristic of an improvement in modern humans' cognitive capacities (*Henshilwood* et al. *2001*).

A review of the local bibliography reveals a certain lack of technological and functional analysis of hard animal material industry for Gumelniţean assemblage. Generally, the excavation reports, even recent ones, offer as unique information an almost standard phrase: *the inventory is completed by tools made of silex, bone and antler* or, in the best of cases, an enumeration of the main typological categories, with no consideration of a functional or technological nature. In this context, some older excavation reports become significant, such as those of Vladimir Dumitrescu on the settlements at Gumelniţa and Căscioarele (*Dumitrescu 1924; 1965; 1966*), in which the hard animal material industry is given special status, the illustrations also being eloquent. In special studies, we will mention those of Eugen Comşa (*1985; 1986*) concerning harpoons; those of Radian Andreescu (*1995; 1997; 2002*) on bone statuettes; Valentina Voinea's study (*1997*) of hard animal material from the settlement at Borduşani-Popina, or that of Valentin Parnic and Andreea Paun (*2004*) on the industry at Măriuţa settlement (Călăraşi County). If the analysis of other types of artefact have a precedent, and we refer mostly to the ceramics, the working hypothesis established for the study on hard animal material from the Eneolithic in the Romania is in its beginnings and must be correlated with complementary analyses on other archaeological material and archaeo-zoological studies.

Raw material

Antler, already exploited by Neanderthals in the Middle Paleolithic (*d'Errico, Laroulandie 2000; Villa, d'Errico 2001*), gradually becomes important in prehistoric communities due to its technical and cognitive qualities, being used for the production of a wide range of objects: weapons (projectile points, harpoons); tools necessary for the processing of wood, ceramics, and stone tools (chisels, mattocks, hammers *etc.*), and even for ritual objects with no apparent utilitarian function, which accounts for its presence in most activities in these communities.

Antler is an excrescence of the frontal bone specific to all species of *Cervidae* (*Christensen 2004*), being the exclusive privilege of the male in the *Cervus elaphus* species. It is composed of compact and cancellous tissue, the proportion between the two varying according to the species and irrigation during growing (*MacGrégo 1985*). The proportion and texture of the cancellous tissue depend on position in the antler branch (*Averbouh 2000*). According to specialists, of all the osseous matter, the antlers are

the hardest and most elastic bones, and according to this they are best adapted for the manufacture of various tools specific to prehistoric periods (*Billamboz 1977; Michels, Zurbruchen 1991; Averbouh 2000; Riedel* et al. *2004; Vercoutère* et al. *2007*). It absorbs shock and impact, due to the important proportion of organic matter in its structure (*MacGrégor 1985*). Russell Dale Guthrie (*1983.279*), who made reinforcements from three types of raw material (bone, antler, lithic), concluded that the antler was the best material because it is easily worked, shaped or straightened when wet, resistant to breakage, easily sharpened, and in most cases readily available.

Artefact composition: products and sub-products

Finished objects – made on whole blanks

Hammers. We attribute to this category a single piece, fractured both proximally and longitudinally (Figs. 1.1, 1.2). It might have had two active areas, but only one, positioned laterally, can be identified with certainty, its outline being oval and in profile convex-concave. The piece was obtained from the basal part of a shed antler, the active part being actually the burr, the edges of which were removed; the technique employed cannot be identified due to subsequent alterations. The utilisation of the basal part was not random: it provides a blank with a form and dimensions already similar to the tool. It was produced by the removal of the antler's external structure; the surface was strongly shaped to obtain a regular shape. The shaping followed the creation of the active part, the convexity, but we cannot identify the technique, as the traces were removed by deterioration of the active part. At the proximal level, a rectangular perforation can be seen, which was made by progressively deeper cuts (Fig. 1.4, 20x magnification). The inside of the perforation is lisse, and well-polished, resulting from wear by the handler.

The active part has numerous depressions oriented approximately transversally to the antler's vertical axis. At the same time, we identified a series of cuts (Fig. 1.3, 75x magnification) with a microscope that are possibly the result of the contact with hard lithic material, which is probable due to the periodic change of the form by shaping, in order to retain the convexity. Specialists have shown that the use-life of this kind of hammer was quite long, a fact that can justify its rarity among archaeological remains (*Averbouh, Bodu 2002*).

Wedges. In this category we include four items, made from a tine and exploiting the natural form of the antler. The items have different fractures at the proximal level (Figs. 2.1, 2.2), so we can identify the removal technique from the shed antler in only one sample, which was sawn around the entire circumference by rotating the piece. At the cancellous tissue level, in order to detach it from the shed antler, percussion seems to have been used, due to the regular plan of the removal surface. The arrangement of the active part in bevelled technique was made by two methods: removal by direct percussion, in oblique plan, superposed by scraping (Fig. 2.3, Fig. 2.4, 30x magnification) or directly by deep longitudinal scraping. In all the samples, the distal end is very blunt, with various ramming and fractures. The proximal end, so much as survived, appears to have been rammed and chipped, and on the rest of the surface at the medial level there are peripheral removals, longitudinally developed, evidence of a powerful shock. We consider these artefacts as intermediate tools due to fractures that are present at both ends.

Projectile points. We refer to two items processed from a secondary tine (Fig. 3.1). Both are fractured at the proximal level, one by saw teeth fracture (Fig. 3.2, 20x magnification), and the other *en languette*. The entire surface of the items show hand deep, lon-

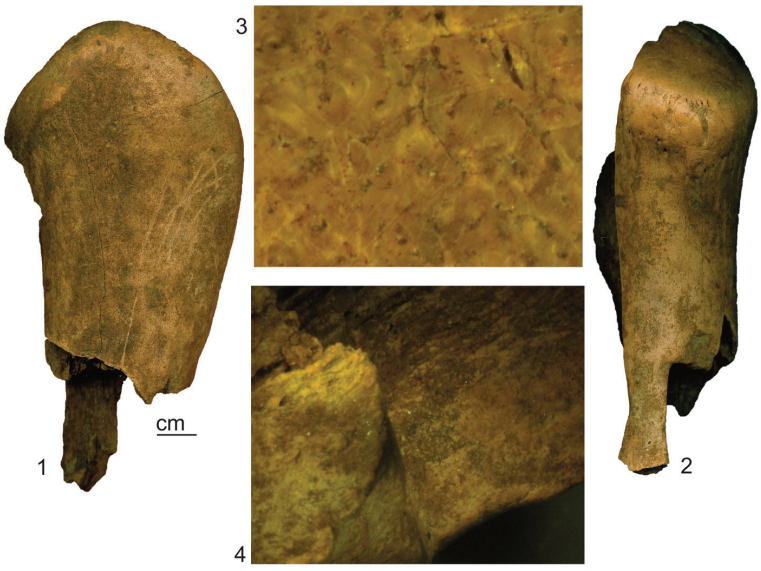

Fig. 1. Hammer made from the basal part of a shed antler.

gitudinal grooves (Fig. 3.3, 100x magnification). Macroscopically, the distal end is strongly *emoussé* with usage polishing, with the entire removal of scraping traces, while the microscope reveals a series of longitudinal, possibly functional, scratches (Fig. 3.4., 100x magnification). The original length of the pieces cannot be established, but both items have an average diameter of 1.6cm. We do not assert that they were used for working the land (as a planter), which is the usual interpretation in the specialised literature, because the usage area is not extended in surface. It seems more probable that they were used as projectile points, but we cannot identify the hafting system, because of a proximal fracture.

Mattocks. We attribute two pieces to this category. The artefacts are made from a beam, and have both longitudinal and transversal fractures, preventing full reconstruction of their morphology. In the first sample, the active part has convergent convex edges, a convex-concave section, and sharp bifacial end (Fig. 4.1). The technique of removal from the antler cannot be determined due to the fracture. There is a perforation at the medial point with rectangular morphology, made with successive cuts (Fig. 4.3, 20x magnification). The inside of the perforation is perfectly *lisse*, a fact that proves a long period of usage. The active part was formed by longitudinal cutting, in order to create a bevelled end, seemingly by percussion (as seen in one side that was not entirely shaped), then the two percussion sides were shaped, the active part emerging from their intersection. They present an *emoussé*, rounded aspect (Fig. 4.2, 50x magnification), with visible functional scratches on both sides developed parallel to the axis (Fig. 4.4, 150x magnification). The second item (Fig. 4.5), although fractured, was included in the same category as its active part has a slightly sharpened morphology and the manner of use is quite similar to that of the previous item (Fig. 4.6, 100x magnification; Fig. 4.7, 150x magnification). The distal end is a sub-rectangular intersection, with convex-concave edges, and a biconvex end in profile. The fracture prevents the identification of the processing techniques, but we can still assume that the arrangement of the active part resembles the first sample. The shaping covered only the distal end, extending only toward one of the fracture edges. It actually constituted the active part, which was developed laterally, towards the inner side.

Bevelled objects – chisels. Chisels are represented by six finds, all ending with a bevelled morphology. They were made from a main beam (4), tine (1) and basal area of antlers of game animal, using both the pedicle and the burr. The last item has traces of burning that contributed to surface exfoliation, destroying the fine marks. The basal area was removed from the antler by percussion. At this level, the detachment surface remained in a raw state, but has small detachments and ramming. We do not know how the find was detached from the skull, but percussion was used to form the active front. It is the only item with an intact proximal end. In the other three samples, only fragments of perforation remain; two were made by percussion (Fig. 5.1) and one by sawing, which ensured transversal hafting, while the last two samples are distal fragments.

Technological and functional traces on the active parts vary, probably in accordance with use. For instance, in one of the samples, the end is extremely blunt, becoming concave, with an extended polish on the superior side (unmodified) and quite limited on the surface. The conclusion is that it was worked in a longitudinal movement in an opened angle. On another piece (Fig. 5.1), the regularisation of the fracture edges was made only towards the distal part through abrasion to create the bevelled shape (Fig. 5.2, 30x magnification), which is still present in the peripheral area, but the abrasion was removed by a long period of use. The technological marks are superposed by strong polish, which is visible macroscopically and characterised by few functional traces (Fig. 5.3, 200x magnification). In another case (Fig. 5.4), the arrangement of the active side was accomplished only from the inferior side and the po-

Fig. 2. Intermediate tools.

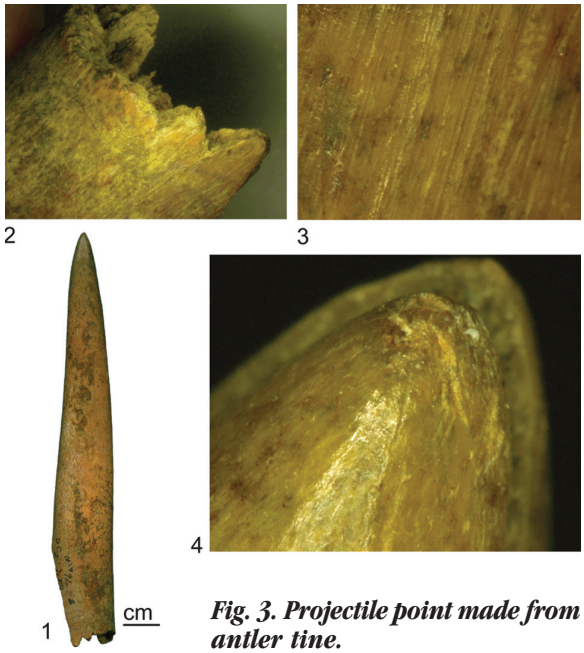

Fig. 3. Projectile point made from antler tine.

lish from the superior side was exclusively functional. A couple of cuts remain in the peripheral area of the bevelled edge (Fig. 5.5, 30x magnification). The inferior side was subsequently shaped by abrasion. The active part is blunt, with a high polish, and very extensive on the surface, especially on the inferior side, which covered the traces of previous work. Functional traces can be observed at an angle to the axis of the item on the superior side (Fig. 5.6, 150x magnification).

Handles. The first item in this category was made from a main beam, retaining the eye tine (the length is 36cm) (Fig. 6.1). The cutting was accomplished by direct percussion at the extremities and without regularisation of the cutting area. The shape of the item allowed for an easy grip by means of the tine. The cancellous tissue was entirely excavated, ensuring the hafting. The second artefact also includes a fragment from a main beam and a tine (Fig. 6.3). Unlike the previous find, a longer fragment from a beam was sectioned, which allowed the creation of two extremities for hafting (double handle). The segmentation was made by direct percussion around the circumference at both extremities.

Next we have three handles made on an eye tine, with lengths between 20 and 33.5cm. The removal from the antler was made by direct percussion around the entire circumference in two of the find; in the third artefact modern fractures made the diagnosis impossible. Inside, the cancellous tissue was completely hollowed out in order to create a gloving opening. One of the samples has a longitudinal fracture that may have been caused by utilisation after a shock (Fig. 6.2).

Four other artefacts made from a tine that had fractures, sometimes at both extremities, were attributed to this category. Only two samples preserve marks made by direct percussion, when they were removed from the antler. It is certain that they have hollows that seem intentional, ensuring hafting by longitudinal insertion.

Indeterminate function. In this category we include a series of 14 finds, unfortunately heavily fractured, in order to establish a diagnosis of their function; each has the whole blank and the presence of a perforation. In only three of the pieces we were able to identify a circular perforation. The first (Fig. 7.1) is a tine detached from an antler by direct percussion with still visible cuts (Fig. 7.3, 20x magnifi-

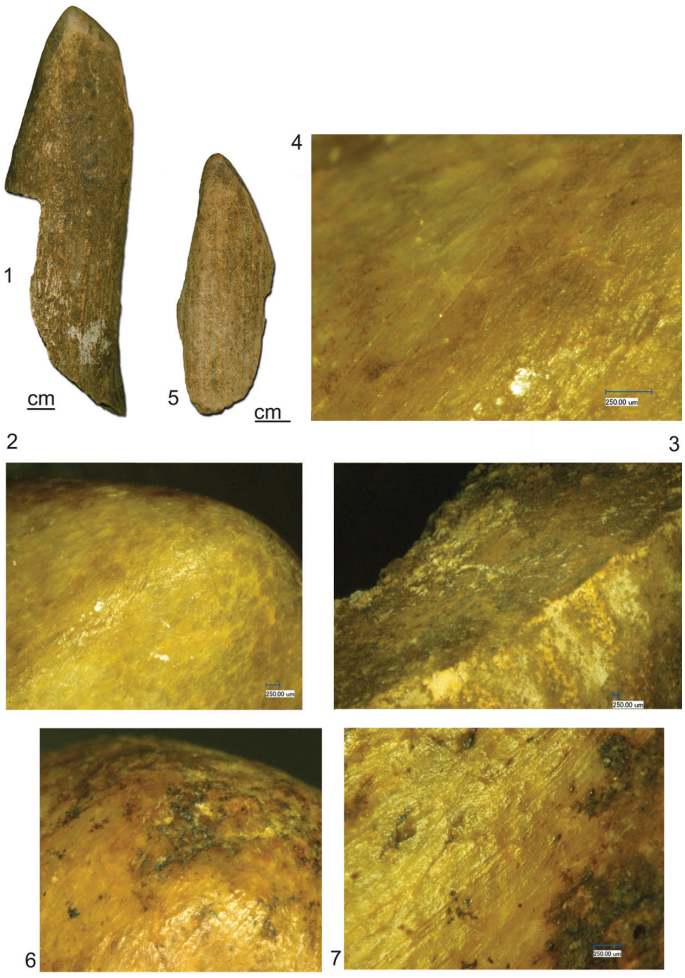

Fig. 4. Mattocks made from antler.

cation), with a circular perforation with similar diameters at each end (Fig. 7.2, 20x magnification), after which the entire surface of the piece was thoroughly shaped, including the area of the removal from the branch, probably by cutting and followed by very fine polishing. The piece has a saw tooth fracture at the perforation that is possibly functional and caused by shock. Unfortunately the morphology of the functional end remains unknown due to the fracture.

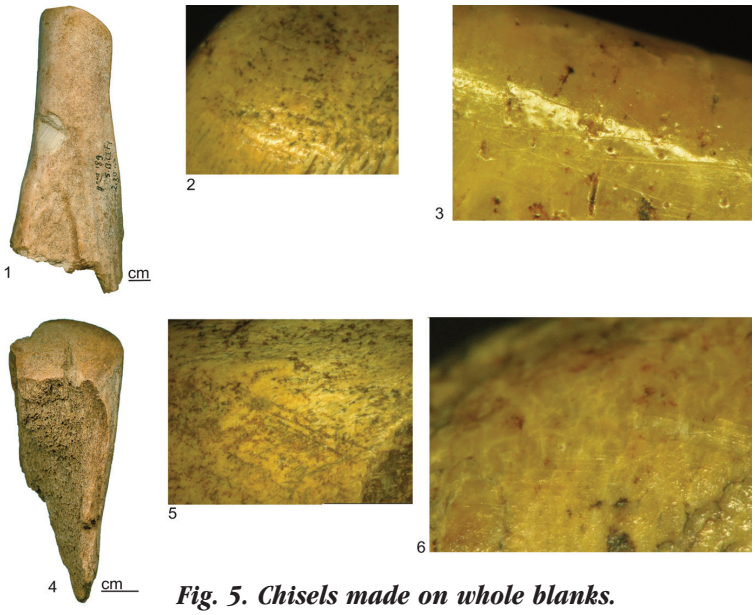

Fig. 5. Chisels made on whole blanks.

The second fragment has interesting traces as well (Fig. 7.4). First of all, there is an obvious perforation made by cutting from both sides. But the item is fractured around the perforation (which prevents us from identifying the method of removal from the branch); the piece was hafted longitudinally and the cancellous tissue was entirely removed. The end was used in an abrasive action, for smoothing, since the area is highly polished and the end blunted to the cancellous tissue, which makes it non-functional.

The last piece seems to have been made from an antler base (probably at burr level); it is fractured both longitudinally and transversally (Fig. 7.5). The perforation is circular, made with an unidentifiable technique; the inside is highly polished, which is an evidence of its use. One of the extremities is bevelled, with numerous deep removals, superposed by very high polishing that blunted the surface. Still, we cannot say for sure if it was an active part.

An additional set of eleven pieces which are heavily fractured, that contain no fragments of active parts, but only indications of perforation was included in this category. In all these examples, the method was the same – sawing, which resulted in a rectangular perforation.

Finished objects – made on flattened blanks

Chisels. The first artefact (Fig. 8.1), made on main beam, is actually a distal fragment. The antler was cut longitudinally, but the technique is unknown, because the inferior side was submitted to an extremely thorough abrasion (Fig. 8.2, 20x magnification), until the surface became flat. The active part was developed also on the superior side of the tool, but it the result of utilization. It is very blunt with loss of matter and macroscopic polish. At the microscopic level deep multidirectional traces appear on both sides (Fig. 8.3, 150x magnification).

The second chisel (Fig. 8.4) has multiple fractures with a convex-concave section, a concave end and an unifacial arrangement. The artefact was worked in the main beam by longitudinal cutting. We were not able to identify the technique, because the entire inferior face was regularized by abrasion and the oblique scratches are still visible at peripheral level (Fig. 8.5, 20x magnification). The distal end is very blunt, giving it a concave morphology, with a strong polish that also extended on the superior side of the tool (Fig. 8.6, 150x magnification). The active part on the surface is not extended, which probably means that it was worked under opened angle. The functional traces are parallel with the tool's axis that was developed on both sides.

Projectile points. This typological category includes a distal fragment (Fig. 9.1), that was possibly used as an arrowhead, but was unfortunately burned and fractured. The distal part of the tool presents convergent rectilinear edges, a triangular section and a sharp end. We don't exactly know The technique of the detachment from the antler is unknown, because of the subsequent marks made on the tool, but we can assume that a splint was extracted from the block of raw material both by longitudinal and transversal debitage. It has an active, sharp part, made by longitudinal scraping (Fig. 9.2, 50x magnification), that was applied on three sides, creating the triangular section and the very regular aspect of the surface. The projectile point is blunted

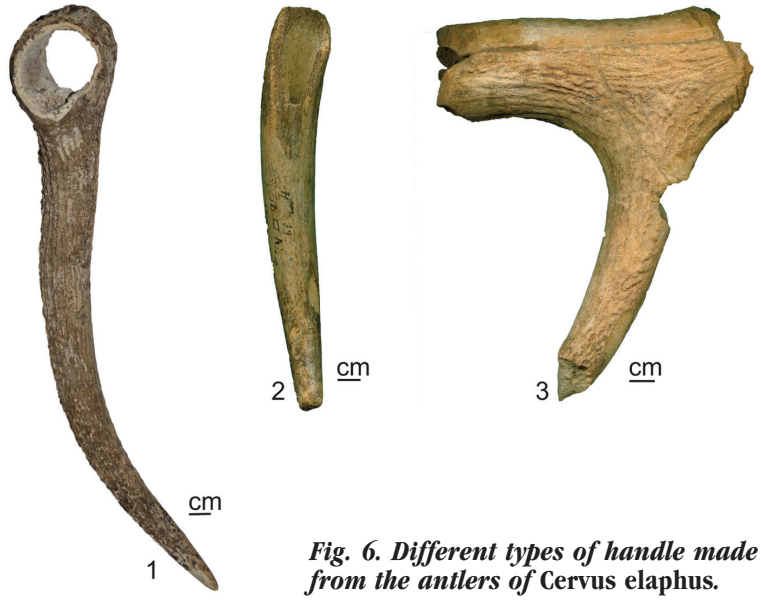

***Fig. 6. Different types of handle made from the antlers of* Cervus elaphus.**

with loss of matter that transposes in depressions and is microscopically visible (Fig. 9.3, 150x magnification).

Harpoons. In the settlement from Hârşova we identified 19 harpoons made from *Cervus elaphus* antlers, out of which 6 complete samples, 9 proximal fragments, 2 distal fragments, 1 medial fragment, a harpoon that misses a fragment at medial level were discovered, and an additional artefact that is still being analysed. The pieces were divided into two categories, in accordance with the barbs' unilateral and bilateral character, and the subcategories are divided according to the barb's morphology: unilateral harpoons, with convex barbs (3 artefacts); bilateral harpoons with convex barbs (8 artefacts); bilateral harpoons with sharp barbs (4 artefacts); and the morphology of the remaining 4 artefacts could not be identified, because the barb was entirely fractured (*Mărgărit, Popovici 2011*).

For the manufacturing of the antler a blank was extracted out of the branch by transversal and longitudinal debitage, but the techniques could not be identified due to the subsequent technological interventions. The manufacturing of the base implies three stages: the regularization of the surface after the extraction of the blank, the pre-forming of the tool and the forming of the specific elements (barbs). The tools are not always made in this process because sometimes the barb was cut first and was only later formed and shaped. In the same time, some artefacts still retain the external structure that is specific for the antler, while in other examples the first operation may represent regularization and a sharpening of the superior and the inferior side of the future harpoon. In the clearing of barbs, an operation which consists of progressively deepened incisions, alternatively, on both sides (Fig. 10.4, 50x magnification), the direction of the incisions determines the morphology of the future barbs. For the barbs that are positioned far from the shaft, the purpose was to create a space between barbs, by removing an approximately rectangular shape remnant. Thus sawing is applied starting from three levels: the proximal edge of the first barb, the space between barbs and the distal edge of the next barb. The second procedure, which seems more adequate for convex-concave barbs, is to create two incisions by sawing, representing the distal edge of a barb and the proximal of the other one, both gradually deepened so that they reunite. In the end, the projectile point is thinned by scraping (Fig. 10.2, 100x

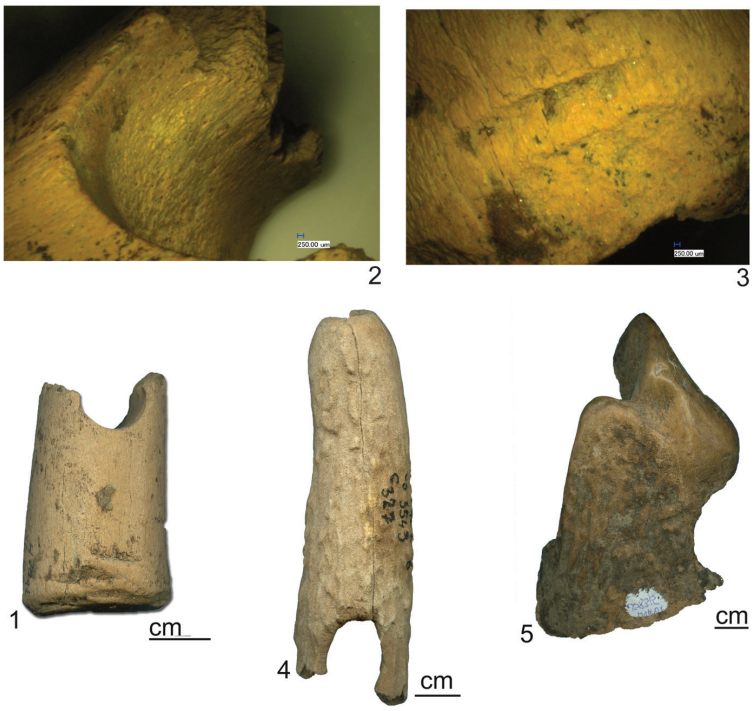

Fig. 7. Pieces of indeterminate function, endowed with a perforation.

magnification; Fig. 10.3, 30x magnification), that may be peripheral, thus obtaining a conical or bifacial end, in order to get a circular shape; points are cleared after barbs, especially those which are set in continuation of the distal edge of the last barb.

The proximal part has two types of hafting. The first and the most representative refers to the extremities provided with protrusions, which are made using the same technique as that of barbs (Fig. 10.5, 50x magnification); and the second has a proximal part in the continuation of the shaft that was shaped through scraping. Ethnographical examples show that these different morphologies of the proximal part do not necessarily depend on a fix or mobile hafting (*McClellan 1975*).

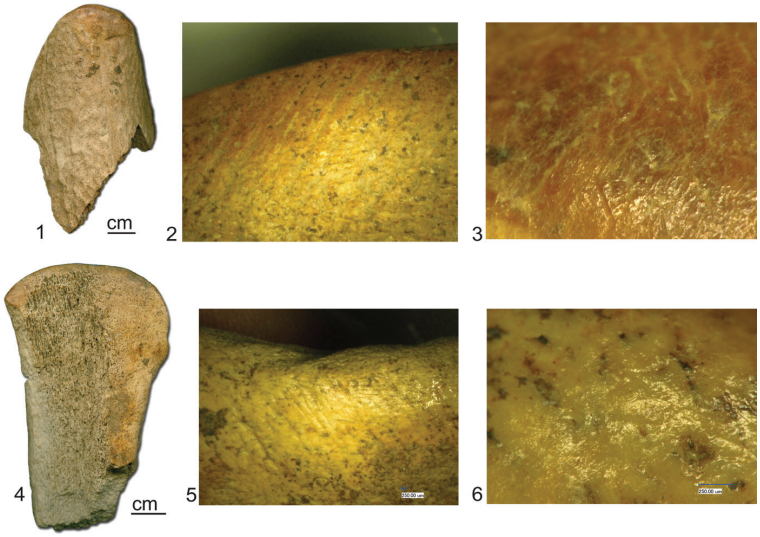

Fig. 8. Chisels made on longitudinally cut antler.

Indeterminate. In this category we included 6 artefacts, all of them made on flattened blanks, which could not be included in a typological category, either because their function is unknown, or because they are too fragmented; but they represent finished tools since they had typical marks.

The first artefact is proximally fractured in saw teeth style, being formed from a rod and a branched distal part (Fig. 11.1). The rod has a circular section with approximately rectilinear parallel edges. The distal part presents a triangular end, a biconvex section and two teeth oriented toward the middle part, with biconvex section, convex-concave edges and a slightly rounded end. A fragment from the main beam was used for shaping this tool, because only this area of the branch offers wide blanks, in this case the width of the preform is over 4cm. The entire surface of the tool was thoroughly polished on both sides and that created a circular and biconvex section, and this destroyed all traces of previous actions. The marks of the cutting therefore are no longer preserved. The antler was cut longitudinally and transversally, obtaining a rectangular chip. The composing elements were chipped out by sawing, and only a few traces remains of this technique (Fig. 11.2, 50x magnification), that were not entirely removed by polishing (Fig. 11.3, 30x magnification). We assume that this was a prestige object, since the tools was thoroughly and finely made. In addition, the object was excavated in an occupational level.

The second artefact (Fig. 11.4) presents a normal side with convex-concave morphology, while the opposite side is endowed with three characteristics with different morphologies, but detached with the same technique as that of the barbs. The normal side was shaped by scraping and later finished by polishing.

The next two examples have an approximately rectangular form (Fig. 11.6). The characteristic element is a perforation (fractured in both cases), that was made by rotation from both sides. One of the artefacts has two unfractured sides, which illustrates that a regulated shaping was used.

The fifth artefact (Fig. 11.5) is an antler rod, fractured at distal level and with a subrectangular morphology. The antler was fractured transversally and longitudinally, seemingly by percussion, proved by small removals that remained on one of the detaching sides. At distal level a perforation was made by rotating the tool from both sides, but it is unfortunately fractured. The entire surface of the artefact, including

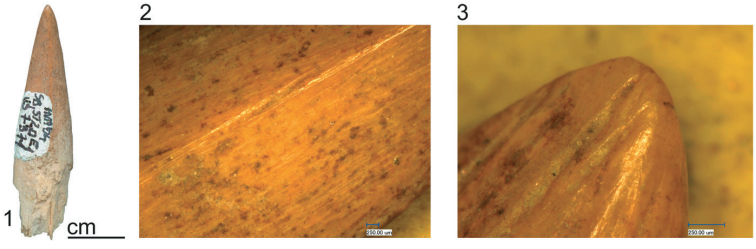

Fig. 9. Projectile point made on flattened blank.

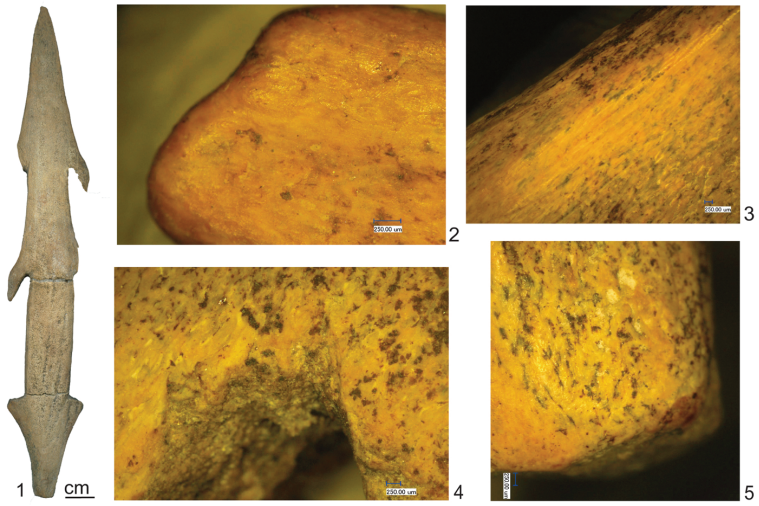

Fig. 10. Harpoon made from antler of Cervus elaphus.

the fracture edges, was thoroughly shaped, until the pearling was removed.

The last artefact from this category has very interesting marks (Fig. 11.7), that raises a series of questions concerning its framing (and due to its powerful fracture). It presents convex-concave morphology, one of the sides is of convex shape and the other has two protuberances. The antler was fractured longitudinally, from the main beam, if we consider the width of the piece, but the exact technique is unknown due to subsequent modifications. The longitudinally fractured side still retains an area of the distal part, that is obliquely arranged – bevelled style, with a strong usage polishing. Because of this shape the artefact was probably a finished tool. But when we observe the opposite side, two protuberances are, that were removed by two different methods; the rest of the protuberances are unfortunately fractured. When we observe the artefact from the proximal part, the first protuberance is distinguished from the superior side by successively deeper and deeper removals, whose marks are still marginally visible. A new longitudinal sawing is applied on the protuberance, starting from the inferior side that is different from the second protuberance. But the area appears coarse since it has not finishing or usage marks. We may assume that the tool was fractured and later recycled and transformed into another type of tool. This action wasn't completed and in this case we may speak about a preform.

Preforms – made on whole blanks

We included three tine points, out of which two eye tines and a bez tine, to this category of preforms. The removal from the branch was made by direct percussion (in 2 artefacts) and by indirect percussion (1 artefact). In the first sample, the arrangement of the active part begun with direct percussion as the main method of surface modification, but the action was not finished. In the second sample, at distal level the brands of shaping by longitudinal scraping are visible, under a fracture that seems natural, and this suggests that the artefact was a preform. Finally, the third sample, a bevelled (Fig. 12.1) part was created at distal level by percussion in an oblique plan (the marks of the percussion are still visible at the periphery of the bevelled piece), but the tool was not finished.

A second category is represented by two eye tines, where the arrangement of the perforation suggests that a volume modification was intended. The tine was removed from the branch by direct percussion

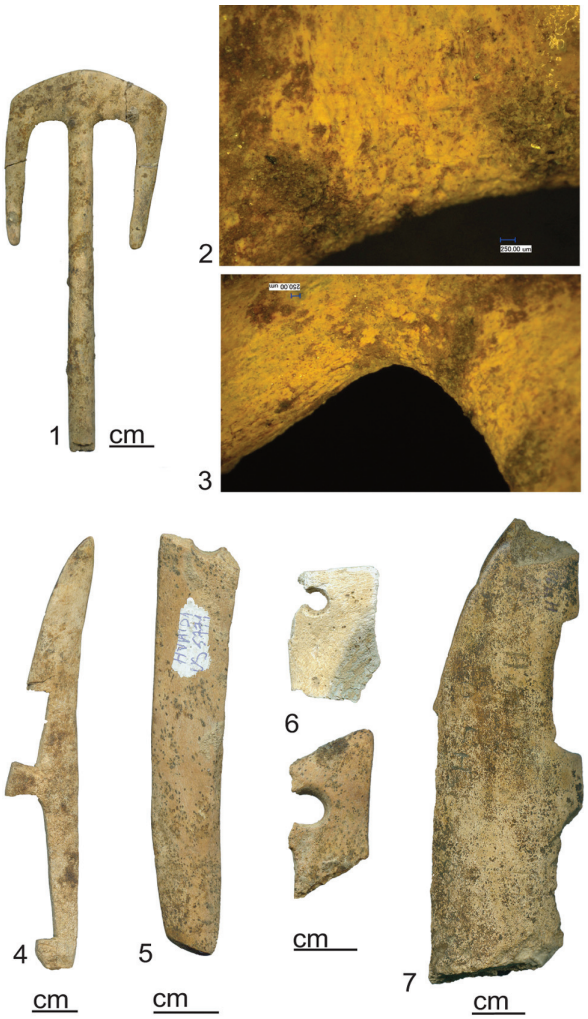

Fig. 11. Functionally indeterminate artefacts.

along the entire circumference. The perforation was made with successive percussion technique, that deepened the cavity to perforation, but the operation was not finished. The distal end was recently fractured in both samples.

Preforms – made on flattened blanks

For the manufacturing of one of the artefacts an intersection area between two bez tines was used at the rim, thus attaining a triangular morphology (Fig. 12.2). The traces of cutting by percussion are still visible in the intersection. Then a longitudinal and deep scraping was applied, that is visible in the marginal areas, which removed the pearling, and is superposed by an oblique and deep abrasion, probably for the regularization of the area. The artefact has no usage traces, which probably means that it was a preform.

The second artefact could also be a preform according to the arrangement of a polisher. It has traces of burning that destroyed a series of marks due to the altering and chipping of the surface. The section of the artefact is plan-convex, with convex convergent edges and fractured ends. The antler was longitudinally fractured and the fracture edges and the lower part of the tool were flattened due to abrasion. The artefact probably had the end arranged in a bevelled form, but it is unfortunately fractured.

A beam fragment with subrectangular morphology, a convex-concave section and concave edges is also present. The technique of transversal debitage is unknown, because both ends were fractured. The antler was longitudinally cut off by percussion (bipartitioning). At one of the ends the decortications of the pearling by percussion can be seen despite the fracture, which is superposed by a longitudinal scraping.

Finally, a tine point was included into the category, which had no identifiable detachment technique from the antler, because the end was not preserved (Fig. 12.3). A blank was extracted out of the base, probably by percussion as proven by some peripheral marks that could also derive from a delineating action. Then the fracture edges were regulated on their entire length by fine cuts that formed the surface and may be assigned to the *taille au canif* technique (*Provenzano 2001*) (Fig. 12.4, 30x magnification). The same fracture marks appear on the other three tine fragments that also belong to preforms.

Preforms – made on intermediary blanks

Three artefacts could be assigned to this category and they have a longitudinal extraction as a specific element, not for the formation of a blank, but for another preformed tool to process the original matrix. This is a method of volume modification. The first artefact is made on tine and fractured at one of the ends. The branch was removed by direct percussion around the entire circumference, followed by final regular removal percussion. Towards the other end an extraction method can be identified, that was made by a direct transversal and a longitudinal percussion, maybe for the creation of a ditch, given its narrow size, a fact that would have not allowed the extraction of a splint with optimum dimensions, but other conclusions are difficult to make due to the fracturing of the tool.

The second artefact is an eye tine (Fig. 13.4) that had the pearling removed with the decortication technique at the proximal and middle part on the concave side. In a second stage, a ditch was made at proximal side by successive splintering (Fig. 13.5, 30x magnification).

The third example (Fig. 13.1) was removed from the branch by direct percussion around the entire circumference, followed by bending. In longitudinal sense, a percussion ditch was created with superposed splintering alternating on both sides of the ditch (Fig. 13.2, 20x magnification). On the distal side the pearling was partly removed and sharpened, probably in order to arrange the active side of the tool (Fig. 13.3, 20x magnification). With the percussion technique several etching sides were created. Unfortunately, the distal extremity is fractured and we do not know its morphology.

Whole blanks

We identified three blanks (two on tine and one on beam), that were obtained by the transversal debitage of the antler by indirect percussion around the entire circumference until the cancellous tissue was touched, and in two samples, followed by the removal by percussion (Fig. 14.3; Fig. 14.4, 30x magnification) or, in one sample, bending. The direct percussion (Fig. 14.5, 30x magnification; Fig. 14.6) was used to obtain seven blanks on beam and eleven blanks on tine, cut at both ends with a debitage method by sectioning.

Flattened blanks

They aren't numerous, but are dominate over the whole blanks. We identified two artefacts deriving from the beam at the intersection part of the tine (probably the rim), transversally cut at all the ends by percussion, where the specific cuts are still visi-

Fig. 12. Different types of preforms.

ble. The same technique seems to have been used also for the longitudinal debitage of the antlers. Another type of blank was made on the point of the tine and transversally cut by direct percussion in two artefacts. Then a process of bipartition or longitudinal cutting was initiated by direct percussion that was quite irregular.

Finally, we will mention three blanks made on beam with a rectangular (Fig. 14.2) and triangular (Fig. 14.1) morphology and a convex-concave section. The sectioning method was the transversal removal from the antler, made by direct percussion in 2 artefacts and by indirect percussion in one artefact. The longitudinal debitage was made by indirect percussion either parallel (in 1 sample) or convergent (in 2 samples). According to their dimensions the blanks could have been used for the forming of harpoons.

Wastes – made on whole blanks. We identified two possible debris or tine points. The first artefact was removed from the branch by direct percussion that was applied around the entire circumference. The marks are obvious at the peripheral part of the etching area under the form of some cuts. The negatives are in scale and with an irregular form. A bending was probably applied at the part of the cancellous tissue, since the saw teeth fracture of the detaching plan was the irregular. The second artefact was removed by direct percussion, made on 2/3 of the antler circumference, after which the bending was applied.

Another type of waste is represented by two tine points, where the removal was made by indirect percussion, which created removal negatives, with a regular surface and quite wide. The percussion was made around the entire circumference. Percussion was applied in the end in the first artefact, creating a regular removal plan, and bending (saw teeth fracture) in the second artefact. The segment of a point, whose sectioning was made by direct percussion at both ends, was identified in the third sample.

Finally, we identified a tine point that could not be attributed to this category without problems (Fig. 15.1). It was assigned to the category of wastes since a blank for a possible tool was extracted from it. The debitage method implied the first stage of forming of the future blank by direct percussion while tracing a line that functioned as a *bande d'arrêt* (Fig. 15.2, 20x magnification). The extraction itself seems to have been made by indirect percussion in the longitudinal direction. The remained piece was not finished and could have been used as a blank for another tool. Moreover, it was excavated in an occupational level, which means it was not abandoned as waste.

Wastes – made on flattened blanks. On artefacts is a beam fragment with three concave ends from a transversal debitage and a plan-convex section from a longitudinal debitage (Fig. 15.3). The transversal debitage was made by direct percussion around the entire circumference, followed by removal percussion. On one of the parts a longitudinal debitage was applied by percussion, which produced a 11,3cm long, 5,3cm wide and only *c.* 0,8cm thick blank.

Another is an antler fragment, possibly a beam due to its pronounced pearling, with a subrectangular

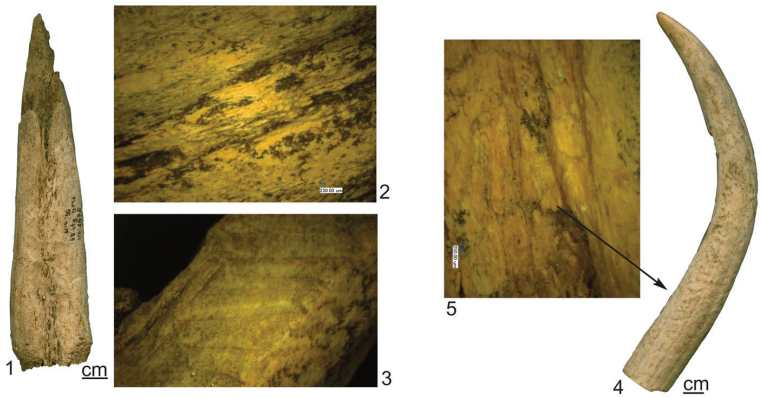

Fig. 13. Preforms made on intermediary blank.

form. The removal marks can be seen at one of the ends, which is transversal debitage made by direct percussion. That was followed by a longitudinal debitage made by percussion. At the opposite part a triangular end was created by small successive removals, which presents the rest of a projectile point debitage (Fig. 15.4).

One sample is a fragment that was made from the intersection between two tines. A splint was extracted by longitudinal convergent debitage out of the branch using the indirect percussion technique.

Conclusions

The exploitation system of the animal resources by a human community is based on a series of technical sub-systems (*Arbogast* et al. *2006*), that always follows the same stages: acquisition, transformation and consummation. They refer to a series of modifications made to the raw material, and later to the products obtained from it. The regrouping of all the elements results after an operational sequence – wastes and finished objects, their analysis concerning the acquisition of raw materials, the technological processes from which they resulted and their use, do not constitute only an archaeological study method, but also play a crucial role in the understanding of the material conditions of the human life (*social production*) (*Risch 2008*) in prehistory.

Acquisition

The antler can be obtained from two possible sources: hunting for sub-products and collecting. Thus, if it derives from a hunted animal, the acquisition of the antler is secondary in nature, since the main objective is nutrition. If we are talking about a shed antler, the acquisition was made for a purely technical purpose without any nutritional reason in order to gather sufficient quantity from an optimum material. According to specialists, the shed antler is suitable for processing, because the surface of the sections with compact tissue (the area used for processing) is more extended since it is at its developmental maximum. Knowing the specific properties of each material and their morphology and anatomy was essential for the prehistoric populations in order to select the best materials and to exploit the optimum areas for technological processes. And, indeed, the study of these artefacts allowed us to conclude that the majority of the fragments belonged to shed antlers. Nevertheless, we must underline that inside the material from the Hârşova-tell the number of basal fragments is reduced and, in most of the cases, their quality is not that of debitage waste, but of finished tools. This is problematic if, in certain situations, the branch wasn't partially cut outside the site and introduced under the form of blanks. In the specialty literature it is often mentioned that the antlers were soaked before further processing: shrouded in leather and permanently humidified with water (*Chech 1974*); immersed in boiled water (*Zurowski 1973; Check 1974*); macerated in solution of plants (*Ulbricht 1978*); or impregnated (*Möller 1983*). Our experimental studies demonstrated that the mere immersion in water at ambient temperature for a couple of days softens the superficial layers of the antler, which facilitates further processing. Additionally, there are studies that demonstrated that the processing is more efficient, especially in the longitudinal debitage by indirect percussion, if the antler is dry (*Tejero* et al. *2012*), because it can absorb the impact in the case of impregnation with water.

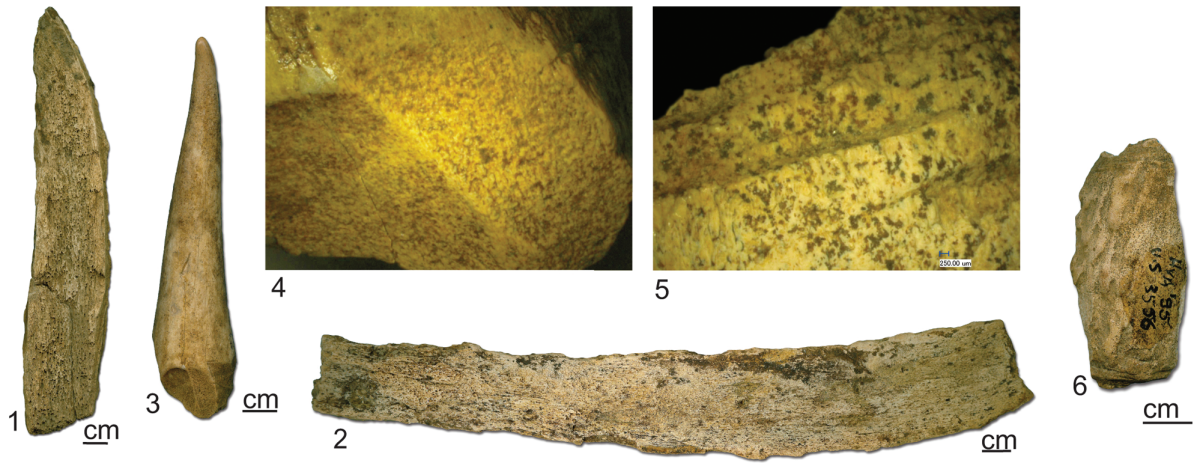

Fig. 14. Different types of blanks.

In the Gumelniţa tell from Hârşova, the provision with antler is local, since numerous bones of *Cervus elaphus* were discovered at the settlement. Furthermore, the *Cervus elaphus* was the second most hunted animal at the site, only preceded by wild boar (*Bălăşescu* et al. *2005*). The antlers grow from april to july, when they reach maximum calcification, and they fall off at the end of the winter, *i.e.*, in march for the adult specimens (*Provenzano 2001*). The antler can then be attacked by rodents, carnivores, invertebrates, even by the stag shortly after its fall (*Averbouh 2000; 2005; van Gijn 2007*) and the community from Hârşova needed it in a good shape. In these conditions, the collection could be made only in the period when the antlers fell off. So we can assume the existence of a seasonal cycle of acquisition, towards the beginning of spring. The experimental studies already showed a special resistance of weapons and tools made of antler, so the renewal of the objects was made after a certain amount of time. On the other hand, a surplus of raw material in the form of untransformed blanks was maintained at the tell, therefore the expeditions for antlers were not too frequent and at no times there appeared to be a problem or a 'crisis' of raw materials despite the seasonal availability of the antler. These blanks illustrate a pretty big standardization in dimensions, a fact that may suggest a preferential gathering. Moreover, we identified that there was a selection of the hunted animals, since male animals were preferred, because they provided a bigger quantity of raw materials (*Bălăşescu* et al. *2005.146*). In conclusion, we can talk about an attentive management of the raw material, which ensured a permanent availability of the antlers in order to replace the damaged tools.

Fig. 15. Debitage wastes.

The collection of antlers has no archaeological evidences, but we can argue that the ethnographic examples, in which a certain economic activity is ritualized (*Choyke, Darockzi-Szabo 2010; Boguszewski, Lozny 2011*), are numerous and the social context seems to prevail over the technical nature for what the social value of a certain kind of artefact represents (*Pétrequin* et al. *2006*). In the same time, studies show that the production is strongly divided by gender (*Wood, Eagly 2002; Waguespack 2005*), meaning that it is executed only by a single gender, following some strict stages that are impossible to ignore. For instance, in the population on the river Sepik in New Guinea, women make most of the pottery, but ceremonial vessels – like the big cups or the big jars – are only modelled by women, and later decorated by men with a complex decoration, because only they have the power to manhandle the dangerous signs of the world of spirits (*Pétrequin, Pétrequin 2006*).

Transformation

Most specialists agree to the statement that technology depends on social attitudes in the first place (*David 2007; Dobres 1995; 2010; LeMoine 1997; Stone 2011 etc.*). In these conditions the regrouping of all the elements resulted after a technical transformation sequence and the identification of the repetitive operation sequence in raw material processing can offer the key for the identification of some cultural traditions. The technical transformation sequence of the antler is quite long, from a branch obtaining several tools, and implies numerous techniques, strongly influenced along the mentioned cultural limitations by the raw material restrictions (dimensions, mechanical properties, form *etc.*). These are more obvious in the case of antler in contrast to other materials (*e.g.*, lithics), because they are predetermined by the anatomical form of the material.

Since we excavated all the constitutive parts of antler at the Hârşova-tell, we would ideally be able to

reconstruct assemblages like they are made for the lithic industry. But the specific techniques for antler industry – like percussion, sawing, grooving, and scraping – remove some small-sized splints from the raw material and these cannot be recovered and the components of one branch of antler cannot be connected. Nevertheless, we identified four types of antler products in our inventory:

- debitage wastes – wastes deriving from the extraction of the blank or processing of the antler that can no longer be reused;
- blanks – unshaped products with debitage marks that can be later transformed into finished objects;
- preforms – pieces in different processing stages, important because they keep the marks of the operational sequence especially of the shaping stage;
- finished objects, that were used for different activities.

The attribution of artefacts to one of these categories is not simple, since a lot of the samples are problematic either due to their fractures or to the fact that they were processed with different objectives (*e.g.*, the object was debitage waste in the first stage, when a blank was detached from the antler's base; and later it became a finished object in the second stage, because the debitage piece was still big enough to be transformed into a tool). Another problem is to differentiate between marks made by the technological process and those of function when the antlers were still in use by the animal considering that the stag used its antlers as a 'tool' or 'weapon', which then led to fractures, chiselling, polished areas *etc.* (*Jin, Shipman 2010*), and therefore we should be cautious when interpreting artefacts made from antler.

The *Cervus elaphus* antler industry from Hârşova-tell includes a total of 127 artefacts, which were attributed to four categories of products and sub-products according to the operational sequence. Numerically speaking the finished products predominate the assemblage (66 artefacts or 52%), followed by blanks (28 artefacts or 22%), debitage waste (9 artefacts or 7%), preforms (16 artefacts or 13%) and undetermined samples that were too fractured to be attributed to the other categories (8 artefacts or 6 %) (Fig. 16).

The numbers and percentage of the finished products are presented in the next table according to the different typological categories of finished products (Fig. 17).

The study of these categories leads to the identification of two specific technological stages – debitage and shaping – necessary for the obtaining of a finished product. With the debitage three types of blanks could be achieved: whole blanks, flattened and intermediary blanks. Axes or parts from the basal range were used for the flattened supports, because blanks with a significant width were normally preferred for the clearing of the barbs for harpoons (the most significant category of finished tools produced on flattened blanks). For the whole blanks (especially when we speak about those that remained in this stage) we identified standardization in the choice of the branch from which the blank derived, a fact that illustrates, once more, the selection of the raw material. When we look at the percentages, we can see a preference for the utilization of the blanks in anatomical volume (73%), in contrast to flattened blanks by longitudinal debitage (46%). We can also speak of strong productivity, since all the parts of a branch were used and no wastes were produced in the technological process, which is most obvious in the bipartition example where two similar blanks were obtained from the same area.

When we look at debitage blocks (*e.g.*, blanks, waste) and finished tools that still bear these marks, we identified two blank production methods: a transversal debitage where blanks are produced by sectioning (which is the most frequent method at Hârşova-tell) and a longitudinal debitage where blanks are produced by bipartiotion and extraction. In transversal debitage the following techniques are used: removal by direct percussion (identified in 53 samples – the number is probably bigger, but many pieces are fractured at extremities and therefore difficult to identify), followed by indirect percussion (7 samples), then by sawing (1 sample) and scraping (1 sample), always associated with a bending or a direct percussion for the final separation each of them leaving specific traces for its identification. In longitudinal debitage (*fendage*) indirect percussion (16 samples) was used as the main technique, since the grooving technique could not be identified for the technical transformation sequence by bipatition, while for the blank production by extraction direct percussion was used (3 samples).

For the surface transformation scraping was the most used technique. It can give the object its final form, since it is in some cases the only stage of shaping (the case of the points on whole blanks). The next technique, present with these procedures, is removal by direct percussion, used mostly for clearing.

These two techniques can be combined with abrasion and, rarely, with polishing. For the method of volume modification, the main technique used was perforation made by the following techniques: by cutting – sawing (15 samples), percussion (4 samples) and by drill rotation (4 samples). Another volume modification technique was sawing, used for the detachment of the harpoons barbs and of the different protuberances (23 samples). We identified an additional technique, called *taille au canif* (*Provenzano 2001*), on several preforms, which was used for the arrangement and regularization of the fracture edges.

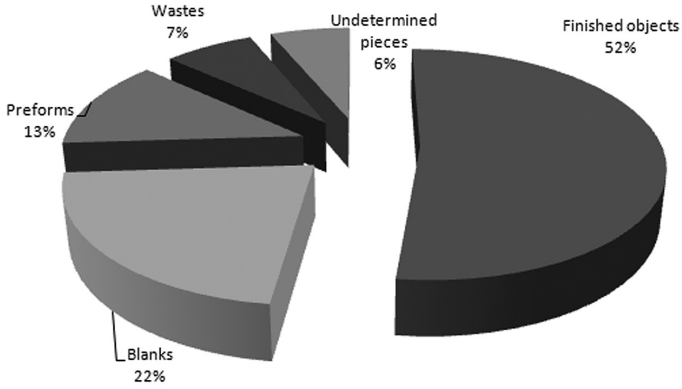

Fig. 16. The percentage of the debitage products and sub-products.

Generally, the techniques and methods used are quite varied and the dimensions of the blanks are superior to the finished pieces, since the initial size of blanks is reduced at different stages of the operational sequence. The result of this operational sequence is congruence between the blanks and the debitage waste on one hand, and between blanks and finished objects on the other.

Production

In literature numerous types of tools are united under the generic term of bevelled objects, the common element between them being the arrangement of the active parts by the intersection of two convergent sides. The main question for us was whether these tools had an identical function. The variations observed in the morphology of the distal part, in the dimensions of the pieces, and in the morphology of the fractures may indeed correspond to different functions, because the function of the tool depends on its morphological and technological characteristics. Still, this hypothesis is hard to prove (one type of morphology for one type of function), therefore we analysed micro-traces on each artefact in order to see what could be identified from the activities to which the artefact was submitted. A powerful impediment in the identification of the function of these artefacts is the fact that all were fractured at a proximal level except for one. We could attribute the traces at the distal end – a strongly *emoussé* end – which was rounded with strong polish and fine perpendicular scratches, visible with the naked eye, to the category of transformation tools used for the processing of slender materials.

The artefacts that we attributed to the mattock category are characterized by specific traces of usage, *e.g.*, longitudinal polishing and scratches (appeared at the contact with the abrasive particles from the soil) and cutting (from the shock against the gravel). Moreover, in agricultural areas in Bulgaria red deer antler tools were used until the end of the 19th century that were able to penetrate the soil up to 6–8cm deep (*Skakun 1992*).

We attributed the artefacts to the intermediary category, when they exhibited specific traces of hard impact on both extremities. The proximal ends with a rectilinear initial morphology present peripheral and superposed longitudinal subsidence and cutting after use. The distal ends, that present specific bevel-

Typological categories	Num. of artefacts	Percentage
Harpoon	19	29%
Hammer	1	1%
Wedge	4	6%
Projectile point	3	5%
Mattock	2	3%
Beveled object	8	12%
Handle	9	14%
Indeterminate	20	30%

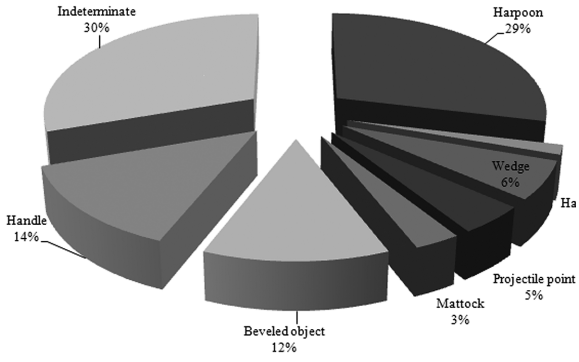

Fig. 17. The percentage of the finished pieces made from* Cervus elaphus *antler.

led ends, also exhibit ramming and cutting disposed on *fil du tranchant* and an intense polish with longitudinally developed stripes. All these traces are typical for chisels, used for wood or for removing the crust, and the fact that a hard hammer was used in their production.

Antler points can be assigned to projectile points, if they fulfil these conditions: "*non seulement parfaitement acuminées, mais aussi soigneusement raclées, voire polies, ogivales pour combiner à la fois la faculté de pénétration et la solidité, et enfin calibres*" (*Rigaud 2006.230*). Our points are indeed compatible with these elements and that means the antler points were used as weapons.

The antler hammers that were identified in the assemblage from the tell show traces that can be associated with carving, with retouching and with laminar debitage according to professional literature on this subject.

The greatest number of artefacts at the tell can be attributed to harpoons and several are made from *Cervidae* antler. Traditionally, the harpoons are connected to fishing. The studies at Hârşova-tell illustrated that fishing, next to hunting and the gathering of molluscs, represent the main food sources for this community. Among the species suitable for fishing with a harpoon are catfish, zander, cyprinids and even crap, during spawning (*Bălăşescu* et al. *2005*).

Finally, many artefacts were used as handles, which are useful for hafting tools made from hard animal matter, lithic or even copper, enabling these tools to be handheld.

Recycling

We identified two types of fractures in our assemblage that according to experimental data (*Legrand 2000; Petillon 2006*) seem to be of functional nature, belonging to bending fractures, produces after the shock caused by utilisation:

● The saw teeth fractures – in our artefacts they are mostly located at proximal side in the hafting area. But they may also appear at the intermediary part at the distal side, *e.g.*, when they are used as wedges for splitting wood.

● The *en languette* fractures– in our assemblage they are mostly located at the distal side and they seem to be the result of a strength obliquely exerted to the axis of the tool. This forms a fracture of two opposite sides, resulting or not to a triangular intermediary fragment (*Legrand 2000; Goutas 2004*) – we could not identify any such fragments in our assemblage.

When an object is damaged, it may be mended or abandoned if the type of fracture makes the rearrangement impossible. The recovery may also be made in two ways (*Goutas 2008*):

● By mending, if the tool can be repaired, keeping its original form and function. In this case the identification is quite difficult because it usually implies the use of some shaping techniques (abrasion, polishing), that can destroy the previous actions of fixing the fractures. The only two samples that can be included to this category are a harpoon from the subtype A2, where the surface of the fractured barb was mended by scraping, and a harpoon from the sub-type B2 that presents a functional *en languette* fracture at the distal part, where they tried to fix the point by removing the fractured surface, but the operation was not finished.

● By recycling, if they could not be kept in their original form and function. Unfortunately, we could identify only few recycled tools in our assemblage, where the fracture at the perforation was mended to ensure a transversal hafting and the creation of an orifice for a longitudinal hafting. Another recycling example is that of a piece chisel that, after fracturing, was recycled by removing some protuberances, but the tool remained in a preform stage.

Archaeological context

According to the stratigraphic context of the analysed artefacts, we cannot discern if specialized structures such as workshops existed at this site, but which could be identified at the site Borduşani-Popină, dated to the same period as Hârşova-tell and attested by agglomerations of debitage waste, blanks, preforms and specialized tools (*Mărgărit* et al. *2010*). All types of artefacts were deposited randomly at the site and are different types of production are mixed. Only the finished objects can be attributed to occupational contexts (dwelling, inhabiting, construction), which means that these tools were still in use, while only one mattock and an intermediary piece were excavated in the waste area, both are strongly fractured, which suggests that they were abandoned. And as was already mentioned, in the Hârşova-tell community recycling of antler tools is

not obvious; generally they were abandoned after losing their function or after fracturing. Blanks, preforms and debitage wastes were mostly excavated in filling pits and occupational layers.

Chisels, which are finished tools, were more frequent in the later occupational layers which could correspond to the last period of habitation by the Gumelniţa community. It is possible that the absence of chisels in earlier layers points to a certain specialization that, for the moment, is difficult to interpret. This could be due to the fact that operations that acquired the use of antler chisels were more common in later occupational periods or could point to a certain specialization in the community that is difficult to outline. Additionally, the analysed artefacts present many whole objects in the younger layers, which may show that antler processing was more intense in these than compared to the older layers.

Among the other types of tools only the harpoons projectile points (19 samples) allow for more sufficient observations. Their frequency stands for the activities in which they were used. Nevertheless, 6 of the samples have traces of secondary burning, which means they were probably burned in their finished form. And from these burned projectile points only three were discovered in the destruction layers of two burned dwellings (SL 50 and 58), the others were discovered in the exterior occupational contexts. The question remains whether these three projectile points were intentionally deposited in the dwellings that were later burned. But if that was the case, the presence of the remaining three projectile points found in the external occupational layers can be explained only by an accidental burning, a fact that makes this interpretation difficult.

Therefore we could attribute symbolic value to the contexts in which harpoon projectile points were intentionally deposited. But if we bear in mind that other types of harpoon points were discovered in dwellings (even if they were only partially researched), *e.g.*, two undetermined fragments in SL 58 and a support, a projectile point and an undetermined fragment in SL 19, we may also confirm that these also presented the inventory of these dwellings and that they were kept for various reasons. The same tools were excavated in dwellings no. 26, 42 and 54, but were unburned. The discovery of these tools inside dwellings, next to other tools that were part of the daily inventory (*e.g.*, lithic tools or ceramic recipients *etc.*), may be considered a very probable reflection of reality. This situation is not exceptional since it was observed also in other geographic or cultural areas (*Stefanović 1997.364; Popovici 2010. 99*).

In this study we tried to present an integrated image of the different ways of exploitation of animals by Eneolithical communities for obtaining tools made of hard animal material and different ways in which these objects were reintegrated in the cycle as a way to exploit the environment. From a technological perspective, the study is not relevant if it is not discussed also in the social context in which these activities took place or the relations between the respective community and its natural resources are analysed. In other words, "*traces are defined as all physical attributes resulting from the social life of subjects as well as objects*" (*Risch 2008.516*). We started our work on this premise, but were unfortunately faced with some methodological limitations, which are interdependent with those of the research field, but also contextual, as we already underlined, due to the lack of similar studies for other Gumelniţean settlements, which could allow for a technical-economic and social description of this culture in the context of hard animal material industry.

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A hoard of flint items from Verbicioara, Romania

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ABSTRACT – *Specialists have always been interested in object depositions from prehistoric settlements. Such depositions have been analysed in relation to their respective contexts, structures and significance. This paper tabulates unpublished Sălcuța culture flint objects from a hoard found at Verbicioara, Dolj County in Romania. A series of comparisons with other Lower Danube similar discoveries is made to establish the possible significance of this discovery.*

IZVLEČEK – *V članku predstavljamo depo kamenih orodij kulture Sălcuța, ki je bil najden na najdišču Verbicioara v okrožju Dolj v Romuniji. Depoji te vrste so vedno vzbujali zanimanje. Pri njihovem študiju je bila vedno v ospredju kontekstualnost, strukturiranost in pomen. Predstavljamo primerjave z drugimi podobnimi depoji ob Spodnji Donavi in mogoč pomen odkritja.*

KEY WORDS – *silex; hoard; Sălcuța culture; pit; Verbicioara*

Introduction

During a reconsideration of the old collections at the National Museum of Antiquities (The Vasile Pârvan Institute of Archaeology of the Romanian Academy) a flint object hoard from Verbicioara settlement in Dolj County, Romania (Fig. 1) was found. Archaeological research in Verbicioara was carried out during four campaigns (1949, 1950, 1951 and 1957) by a team directed by Dumitru Berciu. The hoard consists of 36 items (Tab. 1). It is obvious that many of them come from the same core. Typologically, the following tools can be identified: 4 grattoirs (scrapers), 24 blades, 3 flakes, 3 blade-shaped flakes and 2 atypical flakes (Fig. 4).

The information on the hoard's context of discovery is imprecise. Dumitru Berciu, the Verbicioara excavations author, vaguely mentions the context of discovery in a short excavation report dedicated to the first archaeological investigations of this settlement. He specifies that the hoard was found 'in a pit bottom' of the Sălcuţa culture area (*Berciu 1950. 104*). The items are marked 'Section II, –2.20m'. Apart from these details we have no other information, such as the dimensions of the pit, the stratigraphic level from which the complex was dug, or to which phase the Sălcuţa pit is attributable. When analysing such Lower Danube Eneolithic hoards and their context of discovery, it is noticeable that most of them (8) were discovered in pits (Fig. 2), while 8 come from the cultural layer, 6 were found inside vessels and 4 were discovered inside dwellings. Special reference can be made to three hoards found in Bulgaria in certain places: the one in a vessel found in the level IV sanctuary at Ruse, the one from Peklyuk – interpreted as a symbolic burial – and the one from Drama found in the enclosure ditch filling (*Avramova 2008.212–213; Lichardus, Lichardus-Itten 1993.18*). 22 hoards contained exclusively flint artefacts, while 7 also had other types of item as well as the silex examples (Fig. 3). Doubtless, John Chapman's article is one of the most interesting studies on Neo-Eneolithic pits. According to Chapman (*2000. 64*) "*[the] pit filling is, by definition, a metaphor for reincorporation of current material into a context defined by earlier deposits*". Especially at tell type settlements, the digging of pits can be seen as mediating an exchange with the ancestors: the new material for the old, when the pit is dug into earlier

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cultural layers. One of the key concepts used by Chapman (*2000.65*) is 'structured deposition': the deliberate accumulation of varied materials, the association of which is rare, and the structuring of such association being unusual.

For a long time, it has been thought that pits are depositions of 'waste', but this twentieth-century concept has nothing to do with the prehistoric mentality. Approximately in the same way Mark Edmonds (*1995.128*) believes that the digging and filling of pits could have served in certain contexts "*to reaffirm the links between particular people, their descendants, and specific places in the landscape*". As mentioned above, 6 hoards were found in clay vessels. We find the pit-vessel analogy very clear: both are made of clay, on the one hand in a natural state, and on the other hand transformed by fire. Both are receptacles, but the vessel's advantage is its mobility: it can be carried to many places, inside or outside the settlement. The two substances merge at the moment the vessel is buried. The first returns to its creative substance, thus ending a cycle. 'Enchainment' is another key concept discussed by Chapman. When placing a fragmentary object/artefact inside a grave or pit, a relationship is established or strengthened between those persons connected by such special deposition and other persons in the living world/surrounding world (*Chapman 2000.82*).

Tool	Colour	Max. lenght	Max. width	Reference
1. Grattoir	beige with white spots	8cm	4cm	(Figure 5a)
2. Grattoir	beige with white spots	6.4cm	2.8cm	(Figure 5b)
3. Grattoir	beige with white spots	6.1cm	3cm	(Figure 5c)
4. Grattoir	beige with white spots	5.5cm	3cm	(Figure 5d)
5. Blade	beige with white spots	6.3cm	2.4cm	(Figure 6a)
6. Blade	beige	5.8cm	1.5cm	(Figure 6b)
7. Blade	beige with white spots	3.6cm	1.9cm	(Figure 6c)
8. Blade	brown with white spots	3.5cm	1.5cm	(Figure 6d)
9. Blade	beige with white spots	3.8cm	1.4cm	(Figure 6e)
10. Blade	brown with white spots, retouched on both sides	4.4cm	1.8cm	(Figure 6f)
11. Blade	beige with white spots	4.7cm	1.9cm	(Figure 6g)
12. Blade	beige with white spots	2.7cm	1.5cm	(Figure 6h)
13. Blade	brown, translucent	3cm	1.2cm	(Figure 6i)
14. Blade	beige with white spots	2.5cm	1.3cm	(Figure 6j)
15. Blade	beige with white spots	3.5cm	1.5cm	(Figure 6k)
16. Blade	beige with white spots	2.9cm	1.9cm	(Figure 6l)
17. Blade	brown with white spots retouched on one side	3.9cm	1.5cm	(Figure 6m)
18. Blade	grey with white spots	6.1cm	2.8cm	(Figure 6n)
19. Blade	beige with white spots	6.4cm	1.5cm	(Figure 6o)
20. Blade	beige with white spots	4cm	2cm	(Figure 6p)
21. Blade	beige with white spots	5.7cm	2.7cm	(Figure 6q)
22. Blade	beige with white spots	5.3cm	2.2cm	(Figure 6r)
23. Blade	beige with white spots	7cm	2cm	(Figure 6s)
24. Blade	beige	6.5cm	1.7cm	(Figure 6t)
25. Blade	beige	7.4cm	2.7cm	(Figure 6u)
26. Blade	beige with white spots	9.8cm	2.5cm	(Figure 6v)
27. Blade	beige with white spots	9.1cm	1.5cm	(Figure 6w)
28. Blade	beige with white spots	8.2cm	2.8cm	(Figure 6x)
29. Flake	beige with white spots	5.6cm	3cm	(Figure 7a)
30. Flake	beige with white spots	6.5cm	3.3cm	(Figure 7b)
31. Flake	beige with white spots	6.8cm	3.1cm	(Figure 7c)
32. Blade-shaped flake	beige with white spots	6.5cm	3.1cm	(Figure 8a)
33. Blade-shaped flake	beige with white spots	8.8cm	3.7cm	(Figure 8b)
34. Blade-shaped flake	beige with white spots	8.8cm	3.1cm	(Figure 8c)
35. Atypical flake	brown with white spots	3.3cm	1.2cm	(Figure 9a)
36. Atypical flake	beige with white spots	2.2cm	1.8cm	(Figure 9b)

Tab. 1. The contents and the description of the Verbicioara stone tool deposition.

Two similar situations regarding hoards are discussed in this study: from Romania (Leşile) and Bulgaria (Peklyuk). Both consist of structured depositions of vessels (*Nania 1965.311–321; Avramova 2008. 213*) together with flint and stone items and also fragmentary anthropomorphic figurines. The idea that such situations can be interpreted as symbolic burials could gain more support if more examples of this type from the South-Eastern European Eneolithic had been found.

As noted above, the Balkan Eneolithic was a period when 'set accumulation' becomes very important. Compared to the Neolithic, the number, extent and diversity of sets strongly increase in Eneolithic, including five types of sets: costume sets, figurine scenes, burials, burnt dwellings and hoards. As of 2000, over 70 Balkan Neolithic and Eneolithic hoards with different compositions were known (*Gaydarska* et al. *2004.28*).

Unfortunately, the excavation methods and low quality of the system of recording data from many Lower Danube sites is the main reason for the lack of detailed information which would allow a more precise analysis of such depositions. In many cases, archaeological complexes were not recorded in drawings or photographs, so we do not know the items' actual position, the pit structure or other data essential for a complete analysis. In those cases in which such data exists, interesting conclusions can be drawn; for example, that in some cases artefacts were selected in a particular way before being deposited without having a special arrangement. In other cases, items were positioned in a specific way; but

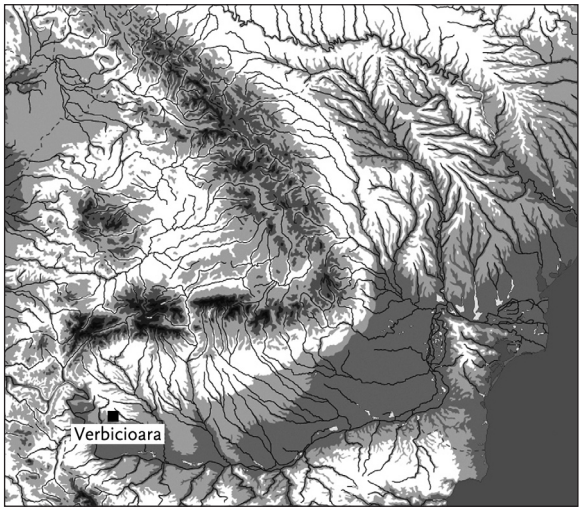

Fig. 1. The settlement of Verbicioara, Dolj County, Romania.

there are also cases in which the objects were simply thrown together, a situation improperly called the disposal of 'rubbish' (*Garrow 2007.14*) (Tab. 2).

Other authors have identified an 'aesthetics of deposition' in the British Neolithic. Therefore, artefact depositions in settlement enclosure ditches, as well as in pits, have been reported. Moreover, a refinement of these practices in Late Neolithic has been noticed in comparison with the early Neolithic period (the same as in the Balkans, see below). The depositions are composed of interesting 'fresh' and 'transformed' material: 'tool kit' style selection of flint implements, 'exotic' items such as foreign stone axes and marine shells, and unusual assemblages of wild and domesticated animal bone (*Pollard 2001. 325*). A conclusion which can be drawn is that the

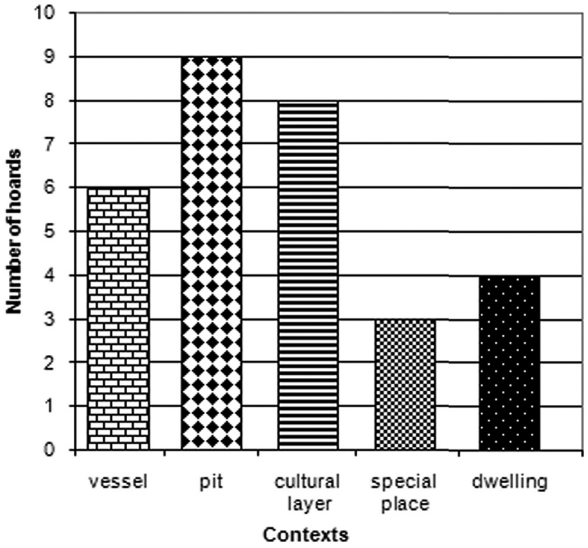

Fig. 2. The contexts of Chalcolithic flint hoards in the Lower Danube.

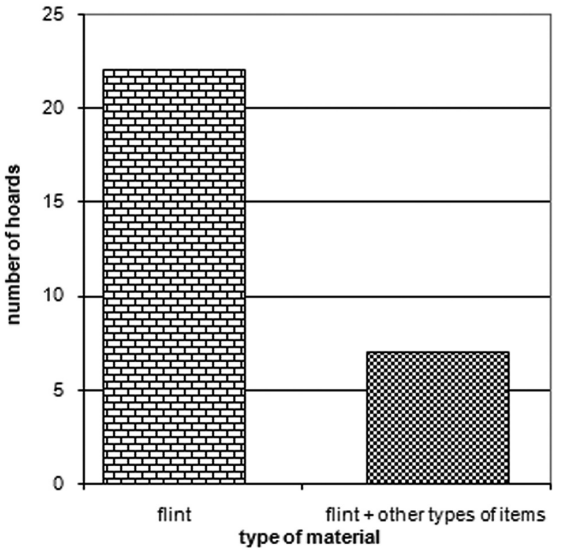

Fig. 3. The structure of Chalcolithic hoards in the Lower Danube.

1. Aldeni – 'Gurguiul Balaurului', Romania: 9 silex blades and three (?) small plate axes; at the base of lower layer; Stoicani-Aldeni (*Comşa 1963.13*).
2. Ariuşd, Romania: 15 silex items, including a knife blade, a striker and a scraper; deposited in a vessel; Cucuteni-Ariuşd (*László 1911.257*).
3. Băbăiţa, Romania: 16 complete and fragmentary blades; isolated find; Gumelniţa (*Torcică 2011.133–142*).
4. Bikovo – 'Deneva mogila', Bulgaria: a hoard consisting of 5 blades and 6 scrapers stemming from the same core; Karanovo VI (*Lichardus, Lichradus-Itten 1993.18*).
5. Brebeni, Romania: 20 flint blades; isolated find; Sălcuţa (*Nania 1965.315, Note 6*).
6. Bulgarene, Bulgaria: silex knife hoard; deposited in a vessel, about 7km SW of the village; Chalcolithic (*Avramova 2008.212*).
7. Cjakmaka, Bulgaria: at the tell-settlement some pits were investigated which contained cores, flakes and debitage from flint production; Chalcolithic (*Avramova 2008.213*).
8. Drama – 'Merdžumekja', Bulgaria: in the filling of 360/1 enclosure a hoard consisting of 3 blades and a scraper was found; Karanovo VI (*Lichardus, Lichradus-Itten 1993.18*).
9. Gumelniţa, Romania: 6 silex blades; cultural layer; Gumelniţa A2 (*Dumitrescu 1966.57*).
10. Hotnica, Bulgaria: 24 non-retouched items, without traces of use; in dwelling N5 from the 3rd horizon; Gumelniţa-Karanovo VI (*Avramova 2008.213*).
11. Ipoteşti, Romania: flint tools and flakes, a small chisel and a fragmentary axe; pit; Vădastra I (*Comşa 1962.217*).
12. Karanovo, Bulgaria: hoard consisting of 7 blades with lengths between 4.4 and 15cm; cultural layer; Karanovo VI (*Lichardus, Lichardus-Itten 1993.17*).
13. Kosharna, Bulgaria: a hoard consisting of 23 flint artefacts, shells, *Spondylus* fragments, *etc.*; found in a jar during the 2009 campaign; Gumelniţa-Karanovo VI (*Gurova 2011.180, 185*).
14. Leşile, Romania: 18 blades, 9 scrapers, 7 spearheads and 5 arrowheads (all flint), 3 small chisels and 2 axes (stone), a fragmentary anthropomorphic figurine; isolated find; the items were deposited in a vessel; Gumelniţa B1 (*Nania 1965.311–316*).
15. Lîga, Bulgaria: hoard consisting of 9 blades stemming from the same core; found near an oven in House 3; Sălcuţa-Krivodol (*Albek 2005.114–115*).
16. Omurtag, Bulgaria: 11 fragments of *Spondylus* bracelets, 8 small *Spondylus* fragments, a *Cardium* shell, a broken perforated bone pendant, 1 polished stone bead, 2 bone plates, 3 pig incisors, 2 flint proximal blade segments, a piece of pumice (imported), 1 trapezoidal miniature polished stone axe and 2 quartzite polishing pebbles (smoothers); in a vessel; Chalcolithic (*Gaydarska* et al. *2004.11–34; Avramova 2008.213*).
17. Ostrovul Corbului, Romania: 15 silex items; cultural layer; Sălcuţa (*Berciu 1939.62*).
18. Peklyuk, Bulgaria: 6 silex knives associated with other items discovered in a circular feature interpreted as a symbolic burial; Late Chalcolithic (*Avramova 2008.213*).
19. Piatra Şoimului (Calu), Romania: 12 flint axes and chisels on the slope of a hill; Cucuteni A (*Mătasă 1959.729*).
20. Pietrele – 'Gorgana', Romania: 11 flint blades; near a hearth; Gumelniţa A1 (*Berciu 1956.505*).
21. Radovanu, Romania: a hoard found between dwellings B and C of the second settlement which contained 10 medium size flint blades; another hoard of the same settlement was found in a small pit, near dwelling 1, and contained 50 blades detached from the same core; Boian-Spanţov (*Comşa 1990.30*).
22. Ruse, Bulgaria: in the tell-settlement, 4 flint hoards were discovered at various depths – 1 was found at 2.20m which contained 15 long curve knives with traces of use; the second was found at 3.70m and contained 24 silex knives without traces of use; the third was found in dwelling N2, at 4.70m depth, and contained 30 flint knives and scrapers; the fourth was discovered in a vessel from the sanctuary belonging to the settlement's fourth level; Gumelniţa-Karanovo VI (*Avramova 2008.212–213*).
23. Sălcuţa – 'Piscul Cornişorului', Romania: 4 microlithic tools, 2 or 3 fragmentary knives, an arrowhead, few splints, a core; in 'pit a' from trench I; Sălcuţa I (*Berciu 1961.195, 198*).
24. Smyadovo, Bulgaria: 59 stone items (axes, scrapers, knives and blades, without traces of use); on the floor of a destroyed house; Gumelniţa-Karanovo VI (*Avramova 2008.213*).
25. Valea Adâncă-'Dealul Nucului', Romania: 5 flint axes and a fragmentary core; in a pit; Cucuteni A–B (*Florescu 1960.215–222*).
26. Verbicioara – 'La Trestii', Romania: 36 flint items: four grattoirs, 24 blades, 3 flakes, 3 blade shaped flakes and 2 atypical flakes; in a pit; Sălcuţa.

Tab. 2. The stone tool depositions in Neolithic and Eneolithic settlement contexts in Lower Danube.

object/person dichotomy is false and must be overcome in order to understand "*how the agency of things structures the way people deal with them*" (*Pollard 2001.330*).

A different non-ritual explanation for flint object deposition in pits could be their preservation for the purpose of being processed more easily in a subsequent phase. This could also explain why such discoveries are rare in certain areas in Europe – after a while the items were taken from the pit and processed or used as such (*Saville 1999.108*).

As mentioned above, the 36 items in our hoard are of different types of silex (at least 3). Their deposition can be related to a commemorative act, or an act to commemorate the memory of the identity of the Verbicioara Sălcuţa community (Pauketat, Alt. 794). The interpretation of these hoards can be related to ritual meanings; probably potlatch-type rituals (*Mauss 1993.40–44*).

Three structured types of deposition can be observed in the stone tool hoards from Cucuteni, Gumelniţa-Karanovo VI and Sălcuţa-Krivodol cultural areas (*Mircea, Pandrea 1997.180*):

❶ hoards comprised exclusively of flaked silex tools and flint blades, which only appear in settlements;
❷ hoards comprised of flint blade-shaped tools and polished stone axes, which appear in settlements and outside settlements;
❸ hoards encountered only outside settlements consisting exclusively of polished stone axes.

Until 19th century, Neolithic stone axes were considered as 'thunderbolts'. Their actual function was established after ethnographic comparisons (*Neustupný 1971.37*). Mircea Eliade (*1992.89*) expresses a very interesting point of view when describing a Roman ritual: "*The oak was reserved for Jupiter (as for Zeus) being the most frequently thunderstruck tree. The Capitol oak tree belonged to Jupiter Feretrius, qui ferit, he who strikes, also named Jupiter Lapis, who was represented by a silex. Like all gods, Jupiter punished with lightning thunder strikes bolts; above all, he punished people who broke their word, or who violated a treaty. Jupiter Lapis consecrated international treaties; a special priest sacrificed a pig with a sacred silex, proclaiming: "If the Roman people violate the treaty, may Jupiter strike them, as I am striking now this pig with the stone.""* (see also *Avramova 2008.212*).

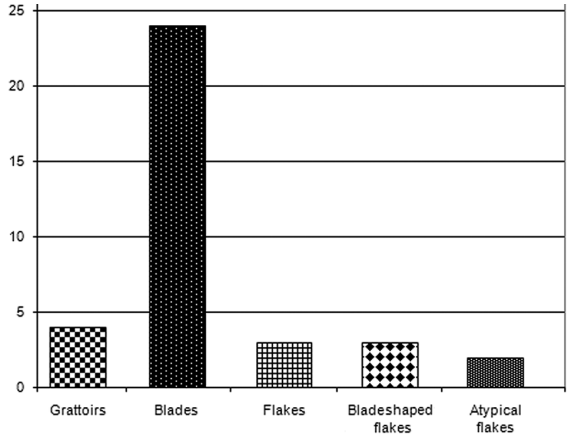

Fig. 4. Types of flint items of the hoard from Verbicioara, Romania.

Why silex? Probably because striking it produces sparks, and therefore fire (smaller, more controllable lightning). For Central American Indians, silex, which in ancient times was used in sacrifices, kept its magic value, that of removing charms and evil spirits. In Mexico, flint is worshiped, being considered the son of the primordial goddess couple who attended every creation. An interesting practice which illustrates two opposed functional associations of the same symbol is encountered in the Aztec case: healing wounds were covered with an ointment containing flint powder – flint has the power both to open and close human tissue (*Chevalier, Gheerbrant 1993.228–229*).

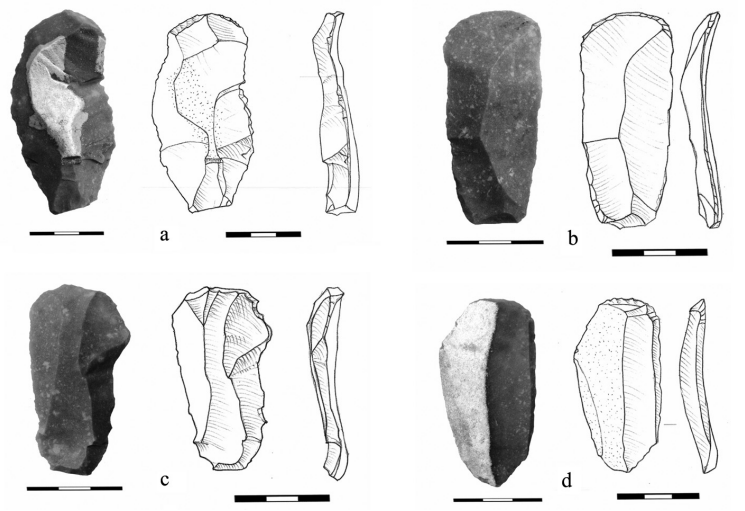

Fig. 5. Grattoirs (scrapers) from the Verbicioara hoard (photo and drawings Cristina Georgescu).

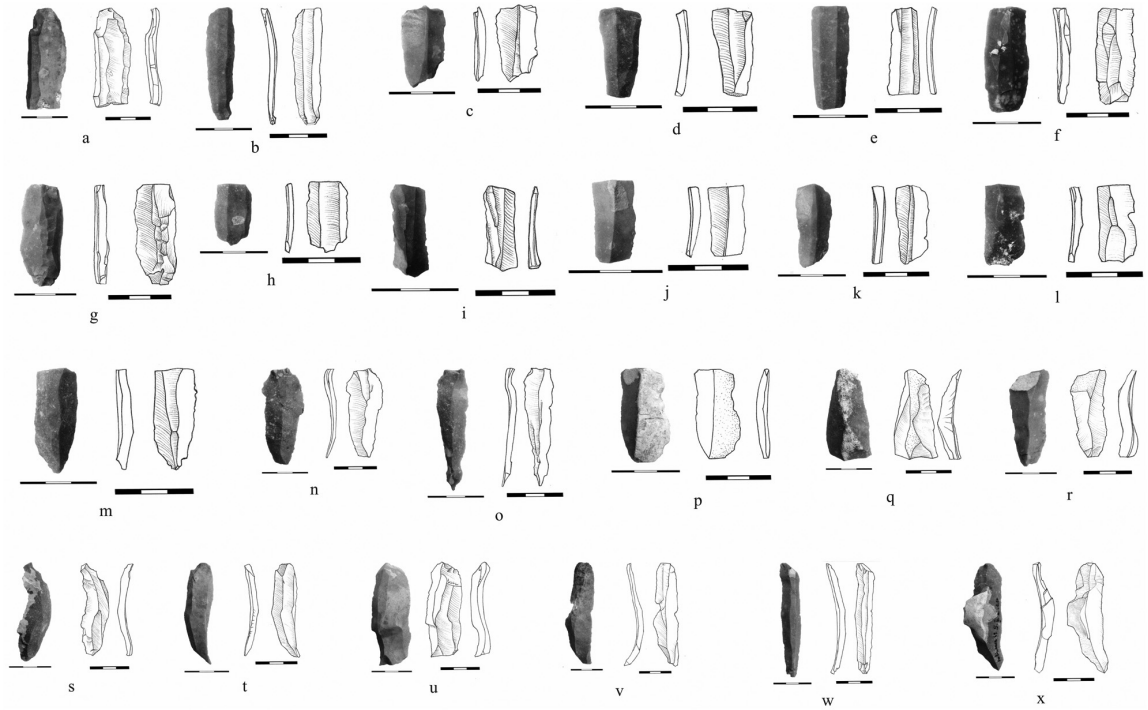

Fig. 6. Blades from the Verbicioara hoard (photo and drawings Cristina Georgescu).

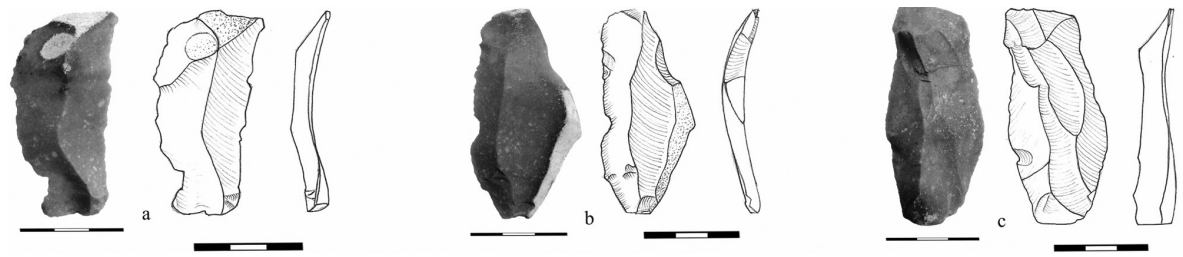

Fig. 7. Flakes from the Verbicioara hoard (photo and drawings Cristina Georgescu).

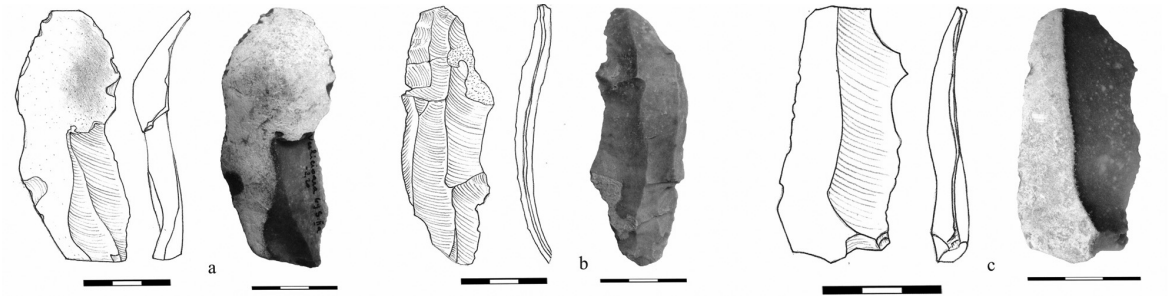

Fig. 8. Blade-shaped flakes from the Verbicioara hoard (photo and drawings Cristina Georgescu).

Fig. 9. Atypical flakes from the Verbicioara hoard (photo and drawings Cristina Georgescu).

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The system of local supply of stone tools in Amzabegovo-Vršnik culture from Neolithic Macedonia

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ABSTRACT – *Although the number of Neolithic sites excavated in the territory of the Republic of Macedonia is considerable, the stone tools pertinent to these sites are still less known because they have never interested investigators. The results of surveys in the Kratovo-Zletovo area and analyses of stone assemblages from several archaeological sites of the Amzabegovo-Vršnik culture point to a system of local supply for stone tools used by the local communities. The aim of this paper is to draw attention to areas abundant in lithic raw materials and suggest that they were local sources for the production of stone artefacts in the Amzabegovo-Vršnik culture in Neolithic Macedonia.*

IZVLEČEK – *Kljub temu, da je bilo na prostoru Republike Makedonije izkopano veliko število neolitskih najdišč, so kamnita orodja iz teh najdišč še vedno slabo poznana, ker ponavadi niso pritegnila zanimanja raziskovalcev. Rezultati terenskih pregledov na območju Kratovo-Zletovo in analize zbirov kamnitih orodij iz številnih arheoloških najdišč kulture Amzabegovo-Vršnik kažejo na sistem lokalne preskrbe s surovinami. V članku opozarjamo na območja, bogata s kamnitimi surovinami, in predlagamo, da so le-ta predstavljala lokalne vire surovin pri proizvodnji kamnitih orodij v kulturi Amzabegovo-Vršnik.*

KEY WORDS – *Neolithic; Amzabegovo-Vršnik; Macedonia; raw materials; stone tools*

Introduction

The Kratovo-Zletovo palaeo-volcanic area (Fig. 1) in the eastern part of the Republic of Macedonia is known as a region abundant in various types of rocks and minerals. It covers an area of 970.1km^2 and has been the subject of various investigations due to its polygenetic landscape (*Serafimovski 1993; Arsovski 1997; Boev, Yanev 2001; Milevski 2005; 2010*). The geomorphic features of this region, combined with the presence of prehistoric archaeological sites, require detailed surveys and research of the raw materials found in the stone assemblages in some of the excavated archaeological sites which are in, or are near, this area. Exploring the origin of the raw material that might have been used in the production of stone implements at the Neolithic archaeological sites like Amzabegovo (*Korošec, Korošec 1973; Gimbutas 1976*), Rug Bair (*Sanev 1975; Dimitrovska 2011b; Dimitrovska, Boev 2012*), Alin Dol (*Zdravkovski, Šurbanovska 1983.111–123*), Vršnik (*Garašanin, Garašanin 1961.7–40; Grbič 1954.115; Gockova-Slavska 1955.19*), Grlo (*Nacev 2009.8*), and Grnčarica (*Nacev 2009*); or Eneolithic archaeological sites such as Bogoslovski Kamen (*Nacev 2009.5*), Burilčevo (*Nasteva 1989.49; Sanev 1961*), St. Atanas (*Atanasova 2010*), Grad-Delčevo (*Koništrkoska Nasteva 2006.38–53*), Cocev Kamen (*Dimitrovska 2010b*) and Viničko Kale (*Dimitrovska 2011a*), leads to the issue of the system of local supply of stone tools in Amzabegovo-Vršnik culture.

The raw material from Amzabegovo and Rug Bair

Amzabegovo-Vršnik culture (*Garašanin 1979.79–212*) was spread across the eastern part of the Republic of Macedonia, including the middle and northern part of the country (*Sanev 1995*), and territorially overlapped with the Kratovo-Zletovo region. For

millennia, the environment, which is abundant in volcanic rocks and minerals, provided the prehistoric inhabitants of the region and its immediate periphery with access to various resources needed in the manufacture of stone tools.

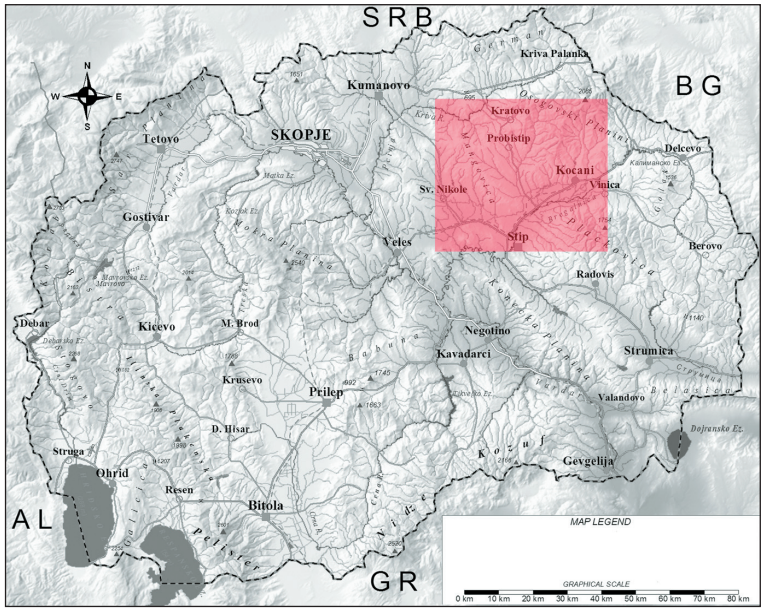

Fig. 1. Kratovo-Zletovo region.

A thorough analysis of the raw material used in the production of stone tools was performed on material from two archaeological sites pertaining to the Amzabegovo-Vršnik cultural group: Barutnica, the eponymous site of this culture, and Rug Bair (Fig. 5). A common feature of Amzabegovo and Rug Bair is the presence of serpentinite, volcanic rocks of andesite and basalt, and sandstones from which the large majority of the ground and abrasive stone tools at both sites were produced. The investigation confirmed that most of the artefacts from these sites were made of a raw material of local provenance that the inhabitants were able to collect near the sites (*Waide 1976; Dimitrovska 2011b*). The deposits of raw materials found in the lithic assemblages from Rug Bair are (even today) still accessible on the surface near the site (*Dimitrovska, Boev 2012*). The immediate proximity of Rug Bair and Amzabegovo (16km distance), and the similarity in the stone assemblage raises the question of whether it is possible that the quarrying of local resources was carried out in the same region and that these two Neolithic communities collected raw material in the same place (Fig. 2).

The most telling feature regarding the local origin of the raw material sources at Amzabegovo and Rug Bair is the use of serpentinite (Fig. 3). When the raw material at Amzabegovo was examined, the authors determined a big percentage of stone tools made from so-called 'green stone', from outcrops on the slopes of Mt. Bogoslovec. The green stone at Amzabegovo was described as rock consisting of minerals with the highest percentage of serpentine and jade, with intrusions of asbestos (*Smoor 1976*). The term 'green stone' can refer either to serpentines which are rocks made up of serpentine; jadeite and nephrite, which are the minerals described in the Amzabegovo assemblage under the term 'real jade', or eventually could be the green schist available in the Kratovo-Zletovo region (*Dimitrovska 2011b*). Nephrite is confirmed in the Neolithic stone assemblages in neighbouring countries, with an attempt to define a so-called 'nephrite culture' in the Balkans (*Kostov 2005*). It is not disputed that some samples of Amzabegovo might be made of nephrite acquired by importation, trade or exchange. It is also possible that nephrite is of local origin, an assumption that needs to be proven with field research.

According to the excavators, 'green stone' was also found in the assemblage at Rug Bair (*Sanev 1975*). The microscopic analysis of the samples from this site showed that the serpentine was of local provenance (*Dimitrovska, Boev 2012*), possibly originating from Mt. Bogoslovec. Because no petrographic analyses were performed during past examinations, this new information on the provenance of the Rug Bair material raises many questions regarding the similarity of the raw material at both sites and the system of local supply for the other Amzabegovo-Vršnik sites.

Primary deposits of raw material

A more comprehensive approach to studying the local supply of stone tools in Amzabegovo-Vršnik culture will be possible when the analyses of chipped

Amzabegovo	Rug Bair
• jasper	• jasper
• calcedony	• calcedony
• flint/chert	• quartz
• opalit	• quartzite
• quartz?!	• tahilite

Fig. 2. Raw material for chipped stone tools.

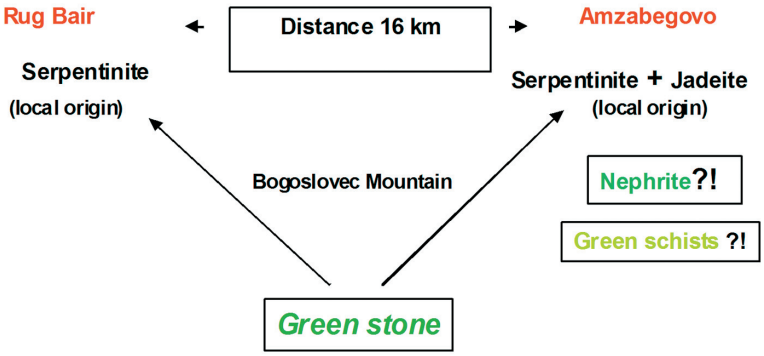

Fig. 3. Raw material for ground and abrasive tools at Amzabegovo and Rug Bair.

stone industry from the archaeological sites of Grnčarica, St. Atanas and Cocev Kamen have been completed. In relation to the stone industry, we can make the assumption that the supply of raw materials was probably local, due to the fact that sources of used types of rock have been confirmed in the vicinity.

Grnčarica is a single layer Early Neolithic site, where the surface deposits of raw material (chalcedony) are found on the outskirts of the site. This is the only Neolithic site where it has been confirmed that the raw material in the field is compatible with the raw material in the chipped stone assemblage[1] (*Nacev 2009*). A large array of various raw materials was used in the production of chipped stone tools, including opalised white tufa. This raw material can be collected in the vicinity of the settlement at Strmoš, where an operational mine is still located. Its main activity is mining and processing opalised white tuff, quartzite and dolomite. Tools of opalised tuff have been found at Rug Bair (*Dimitrovska 2011b*), which allows the assumption that perhaps the inhabitants of these two settlements collected raw material for their stone tools from the same place.

The Eneolithic sites at St. Atanas and nearby Burilčevo are located in the region of Češinovo-Spančevo near the 'Opalite' mine, which is still operational today and produces opal, agate, chalcedony and opalised wood. Tools made from these materials were found during excavations at the aforementioned sites (*Nasteva 1989; Atanasova 2010.9–14*). The results of the investigation bring us very close to resolving the problem of the identification of local supplies of stone tools in the Eneolithic period. Considering the number of prospected and excavated sites in the vicinity (*Arheološka karta 1996*), in the future it will be possible to connect the products of this mine with the stone assemblages from Neolithic settlements, specifically those belonging to Amzabegovo-Vršnik culture.

Cocev Kamen is an archaeological site with a span of periods, from the Neolithic to the late Middle Ages, when the region was settled. The surface finds of grey chalcedony of extremely high quality used for chipped stone tools (*Dimitrovska 2010b.35–36; Milevski, Dimitrovska 2011*) overlap with the area of the 'Silex' mine 5km distant, which is still in use and produces various non-metals (Fig. 4). The abundance of cores, rejuvenation artefacts and waste, indicate the existence of a workshop at this same location. It is also possible that stone tools were made within the settlement and that the mine was a source of the materials used.

The map of excavated Eneolithic and Neolithic sites in Eastern Macedonia between Kratovo-Zletovo area and Bregalnica River shows their locations near or within the range of mines which are still active producing non-metals (Fig. 5). The existence of primary deposits of some types of raw material is further evidence that Neolithic communities living in this region

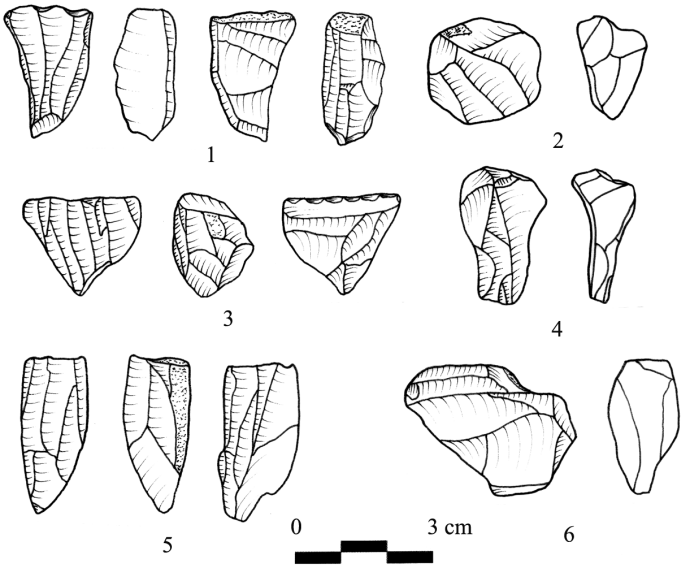

Fig. 4. Cocev Kamen (Neolithic/Bronze Age), surface finds from chalcedony (drawing V. Dimitrovska, after* Dimitrovska, Milevski 2011.Fig. 6*). See legend: 1 double platform pyramidal core for flakes and blades; 2, 4, 6 rejuvenation flakes; 3, 5 single platform pyramidal core for blades.

1 Personal examination of the stone assemblage by the author.

exploited local resources. This assumption should be further verified in the field and compared with the stone assemblages from archaeological excavations. Also, these factors show a strong need for the further study of the system of Eneolithic and Neolithic settlements that could have played the role of consumer, but also supplying centers for stone materials. A detailed study could contribute to identifying local resources for stone tools, as well as the identification of mines and Amzabegovo-Vršnik workshop sites.

Balkan flint from Macedonia

In the chipped stone collections from Neolithic sites in the Republic of Macedonia, we should emphasise the presence of chalcedony of a yellow-brown or honey colour with sporadic whitish spots that is very well-know and is often referred to as 'Balkan flint' (*Kaczanowska, Kozłowski 2008.12; Kozłowski, Kozłowski 1984; Voytek 1985*).

Artefacts made of Balkan flint were found at Early Neolithic sites of the Starčevo-Körös-Criș culture (*Bonsall 2008.271*), at sites within the Iron Gate along the Danube (*Borić 2007.36, 39*), at some Croatian (*Šošić Klindžić 2010*) and Bulgarian sites (*Gatsov 1993; Gurova 2008*), at Early and Middle Neolithic sites in Serbia (*Šarić 2002*) and along the River Pindos in Greece (*Perlès 2001*).

The common feature of all the Neolithic chipped stone assemblages from Amzabegovo-Vršnik culture that have been examined is the presence of artefacts made from Balkan flint. Their shape shows signs of prepared-core techniques, and the artefacts can mostly be defined as bilateral retouched blades or end scrapers on bilateral retouched blades, with semi-abrupt retouch, sometimes with a silica shine (Fig. 7). Balkan flint in the Republic of Macedonia was discovered at archaeological sites at Na Breg (North Macedonia), Zuniver (Central Macedonia), Mramor (Central Macedonia) and Tumba Madžari (North Macedonia). According to researchers, except in the case of Mramor, which is Late Neolithic (*Jovčevska 1993*), the chipped stone assemblages from Na Breg (*Zdravkovski 1988*), Zuniver (*Arheološka karta 1996*) and Tumba Madžari (*Sanev 1988*) derive from the middle Neolithic layers that are contemporary with Amzabegovo (*Elster 1976*) and Rug Bair, where the presence of this raw material was also confirmed (*Dimitrovska 2011b*).

We have to question the assumption that the production of 'Balkan flint' tools took place outside the village, because many Neolithic sites in the territory of the Balkans suggest that artefacts were made within settlements. Pieces of Balkan flint with cortex, flakes, blades and waste found together in many of the discussed sites, and especially at Rug Bair, are additional evidence in support of this hypothesis. 20 Balkan flint artefacts were discovered at Amzabegovo, and 11 such specimens were documented at Rug Bair. 6 of these artefacts were identified as tools, including a typical crested blade and two pieces considered lithic waste (Fig. 6). The small collection of Balkan flint is completed with two unretouched flakes, one bearing the cortex on less than 50% of its dorsal side (*Dimitrovska 2011b*).

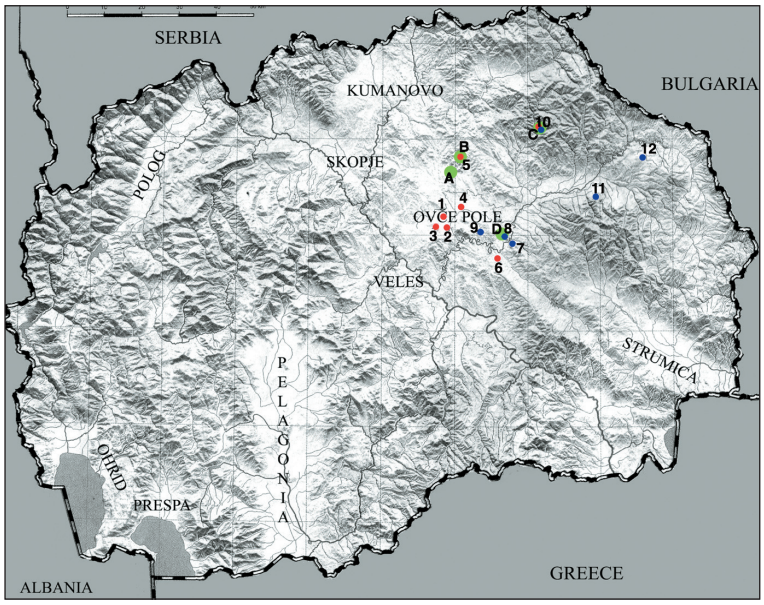

Fig. 5. Excavated Neolithic and Eneolithic sites in East Macedonia and the location of possible prehistoric sources of non-metals[2]. See legend: red (Neolithic sites); blue (Eneolithic sites); green – active natural resources for non-metals. 1 Rug Bair. 2 Amzabegovo. 3 Grlo. 4 Alin Dol. 5 Grnčarica. 6 Vršnik/Tarinci. 7 Burilčevo. 8 St. Atanas. 9 Bogoslov Kamen. 10 Cocev Kamen. 11 Viničko Kale. 12 Grad-Delčevo. A Mine 'Strmoš (Probištip). B Grnčarica. C Mine 'Silex' (Kratovo). D Mine 'Opalit' (Češinovo-Spančevo).

2 Map from *Naumov 2009.Fig. 1.3, 4.*

Secondary deposits of raw material

Regarding the fact that East Macedonia is characterised by an abundance and diversity of raw materials, a survey was conducted to find and record new Palaeolithic and Mesolithic sites. During the prospecting, no open air sites were discovered in the Kratovo-Zletovo micro region, which is considered one of the richest ore zones in Macedonia (*Filipovski 1974*). The survey confirmed the presence of secondary deposits rich in silicate. A survey of 7 locations revealed the distribution of local materials such as opal, opalised wood, quantities of pebbles and cobbles of jasper, quartz and quartzite, as well as andesite and basalt of local origin. A large concentration of jasper, vulcanite and metamorphites fragments which derive from the Neokazi jasper quarry was also found (*Šalamanov-Korobar 2006*). Since the results showed no traces of stone production, the question of local supply of raw materials and the correlation with the neighbouring sites in the Neolithic, will remain open. The lack of Palaeolithic, Mesolithic, and Early Neolithic sites in the Republic of Macedonia excludes the possibility of discussing issues related to evolutionary trends of artefacts and a comparison of raw stone materials used at Amzabegovo-Vršnik sites (*Dimitrovska 2010a*).

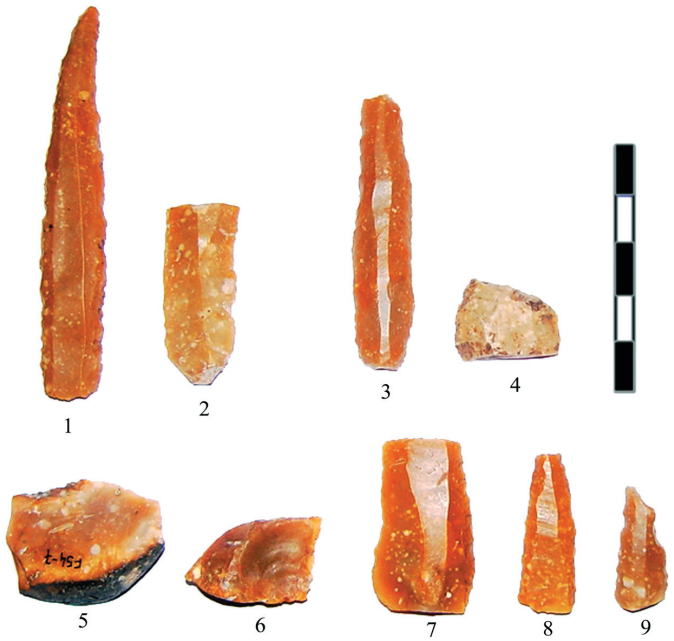

Fig. 6. Balkan flint from the Republic of Macedonia (photo V. Dimitrovska). See legend. 1 Bilaterally retouched blade (Tumba Madžari). 2, 7 Bilaterally retouched blade with fragmented distal part. 3 Double end scraper on bilaterally retouched blade. 4 End scraper with fragmented proximal part. 5 Waste with cortex. 6 Waste. 8 Retouched truncation on bilaterally retouched blade. 9 Perforator on bilaterally retouched blade (Rug Bair).

Conclusion

The Kratovo-Zletovo palaeo-volcanic area located within the territory of the Amzabegovo-Vršnik culture has been known since prehistory as a region abundant in lithic raw materials. It is clear from the situation in the field that in the Neolithic period, an abundance of raw materials could be found and exploited in the wider area around the sites, making them available to other prehistoric and historical cultures in this region. Some sources of raw material were located relatively close to the sites, and the rocks and minerals could be collected from primary or secondary deposits.

Mines and quarries of non-metals in Eastern Macedonia have not been the focus of scientific inquiry of Macedonian archaeology, unlike in neighbouring countries (*Bogosavljević-Petrović 1999; 2005*). The reasons for reconsidering their modern function are indications leading to the resolution of the problem of identifying stone mining and workshop sites. This connection will permit us to establish the relations between the raw material found at the archaeological sites pertaining to Amzabegovo-Vršnik culture and the local sources in their vicinity.

These mines and quarries can provide answers to many questions relating to the identification of mining and workshop sites in this region in terms of the local supply of raw materials for stone tools, especially in prehistoric periods such as the Neolithic. The study of these resources can provide information about the socio-economic structure of the settlements and the level of technological development within certain settlements, which can reveal locations and parallels in the prehistoric stone industry in the Republic of Macedonia in relation to some assemblages in Serbia (*Šarić 2002.11–26; 2006a.197–210; 2006b.9–45*) and Bulgaria (*Gatsov 1993; Gurova, Nachev 2008.29–35*) which have already been described.

According to some researchers, the issue of Balkan flint is very important, since it was listed among the elements that characterise the earliest processes of Neolithisation in the Balkans (*Gurova 2008; 2009*). Indications of the existence of primary resources of certain raw materials for stone tools in Eastern Mace-

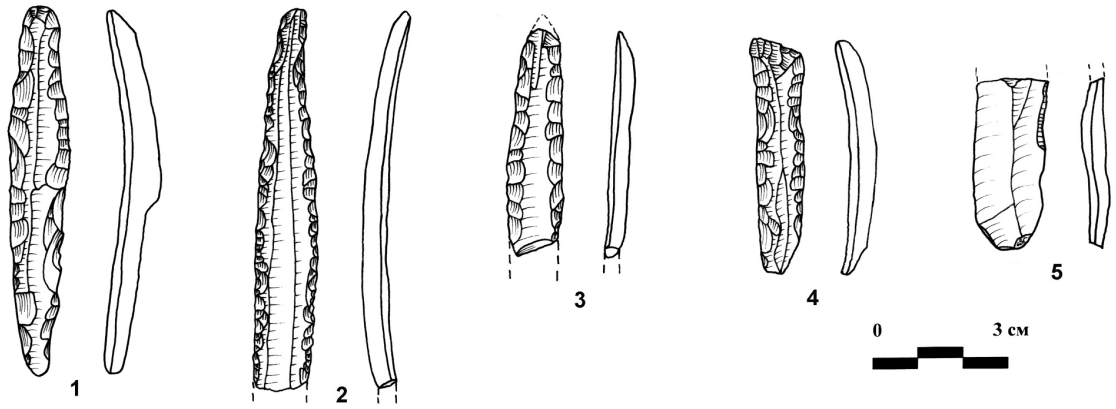

Fig. 7. Balkan flint from the Republic of Macedonia (drawing V. Dimitrovska). 1 Zuniver. 2, 5 Tumba Madžari. 3, 4 Mramor.

donia, in particular mines and quarries for non-metals like Češinovo-Spančevo, give rise to the possibility that Balkan flint found at Neolithic settlements of the Amzabegovo-Vršnik culture was not imported, but of local provenance. This has already been confirmed in the case of Balkan flint artefacts from Amzabegovo (*Smoor 1976*), where a comparison of examples based on macroscopic examination was made with Romanian and Bulgarian flint, which has inclusions of silica or nummulites (*Elster 1976.265*). The Geological Map of the Republic of Macedonia combined with field prospecting and the existence of primary deposits of raw materials that could be collected in the vicinity of Neolithic settlements (*Jovanovski* et al. *2004.111–141; Makreski* et al. *2004. 171–184*) allow us to test and subsequently confirm or disprove their local origin, following future surveys in the field.

At this stage of the investigation, it is very hard to reconstruct the mechanism by which raw stone materials used in manufacturing stone tools were acquired, transported and distributed through Amzabegovo-Vršnik settlements. Raw material documented in Neolithic stone assemblages in the Republic of Macedonia refers to the system of supply, complemented by the existence of similar material of local provenance. The primary and secondary deposits confirmed around the sites by the field survey allow us to propose that certain regions were possible local sources for the production of stone artefacts in Amzabegovo-Vršnik culture from Neolithic Macedonia.

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BACK TO CONTENTS

Indications of the presence of Middle Neolithic pottery kilns at Magoula Imvrou Pigadi, SW Thessaly, Greece

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ABSTRACT – *Red hot deposits were uncovered on the western edge of a Middle Neolithic settlement. With the extension of the excavation, a wide space of about 10m², confined between two clay walls, very much affected by high temperatures, was uncovered. A number of vases almost totally complete after their preservation and a clay model of a kiln were unearthed. Additionally, clay remains of constructions were uncovered. The whole context suggests an area where pottery firing activities took place. The possibility that these kilns could have worked as a specialized craft workshop for other settlements in the area is discussed.*

IZVLEČEK – *Na zahodnem robu naselbine iz obdobja srednjega neolitika so bili odkriti rdeče žgani depoziti. Z razširitvijo izkopavanj je bila odkrita površina ok. 10 m², ki je bila zamejena z dvema glinenima zidovoma, na katerih so bile vidne sledi visokih temperatur. Izkopanih je bilo veliko število vaz, ki so bile skoraj v celoti ohranjene, in glineni model peči. Poleg tega so bili odkriti glineni ostanki konstrukcije. Celotni kontekst kaže, da gre za lončarsko peč. V članku razpravljam o možnosti, da so te peči služile specializirani obrtniški delavnici za ostale naselbine v okolici.*

KEY WORDS – *Middle Neolithic; Thessaly; pottery kilns; craft specialization*

Introduction

The Magoula (Tell) Imvrou Pigadi is located on the southwestern edge of the Thessalic plain, which is under the administration of Phthiotis, Neo Monastiri (Municipality of Domokos) and very close to the Athens-Thessaloniki railway line (1200m south of the station at Domokos). Some other tells of the Neolithic period are visible in the vicinity of the area (Fig. 1), while numerous Neolithic settlements are located on the western Thessalian plain (*Nikolaou, Firfiris 1999*). Imvrou Pigadi seems to be one of the most outstanding, because of its significant height. The tell extends over *c.* 6000m², but since part of its western side was cut in the past during local road construction, we estimate that its original size would have been even larger.

The excavation started in 2002 at the top of the tell with a 5 x 5m square trench. The trench reached a depth of *c.* 2.50m, where most of the floor was covered by structural remains attributed to walls made of mud bricks that were not well preserved. We decided that these features should be kept intact for further study, analyses *etc.*, and therefore we could not extend the excavation into deeper layers, since the space between the structural remains was very limited. We chose to use the old western section of the tell cut by the road, which offered the possibility of a stratigraphic sequence. The section was bordered to the west by the original trench at the top of the tell, allowing us to test the thickness of the deposits. Indeed, the clearance of this 2.70m wide section extended to a depth of 3.50m and it was still apparent that the anthropogenic deposits went even deeper. By means of a second trench, which was placed at the road beneath the stratigraphic section, we set out to investigate the deposit at full depth.

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At 3.57m (measuring 'point zero' from the top of the tell), a solid clay wall was revealed (0.70 to 0.80m wide), which went even deeper, thus dividing the trench into two sections, north and south. From this depth onwards, the layers began to vary considerably: the northern side produced finds and layers relevant to the overlying ones, along with the characteristic presence of small carbons, while the southern side produced intense reddish burnt deposits (Fig. 2a–b), from which large parts of clay slabs were unearthed. Once pieced together, they produced interesting rectangular containers (22 x 23cm and 26cm high; Fig. 3), baked masses of clay with imprints of branches or reed on their inner surface, as well as a few figurines and tools. Furthermore, the excavation of the southern area revealed two vertical plastered clay walls, of relatively low height, forming a corner, together with a flat surface of clay at the bottom (Fig. 2b). Reddish burnt deposits were present in the whole sequence, together with big pieces of carbons. The context as a whole was identified as a house interior with side walls and floor, and as a layer of destruction. Fortunately, our scientific curiosity did not end there. These burned deposits seemed to extend towards the south and west, *i.e.* towards the road.

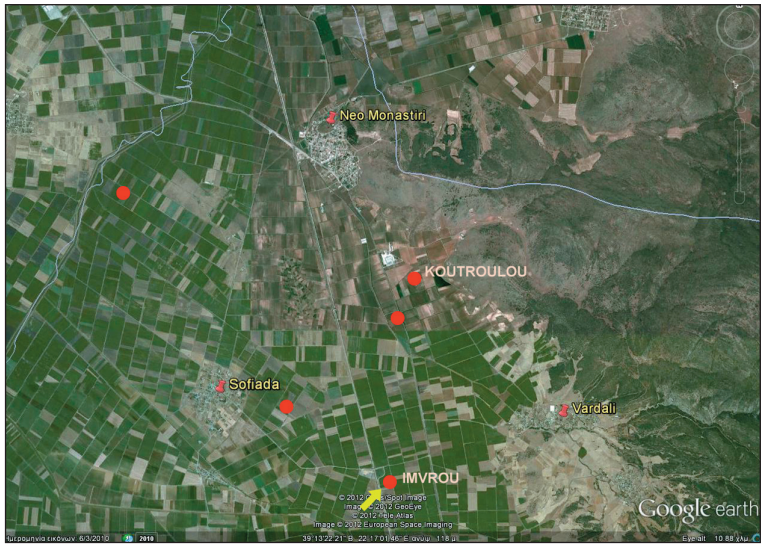

Fig. 1. Map of the area. Neolithic settlements located close to Imvrou Pigadi are marked in red.

We therefore expanded the trench in the direction of the burned deposits (south and west). Due to financial constraints, which did not allow for long excavation periods, it took some time to reach the corresponding depth in the expanded trench. However, when we reached that depth (in 2009), the same intense characteristics of burning were confirmed over almost the whole area, indicating the same use. These fired deposits produced pottery fragments that were later assembled to form several complete pots (Figs. 4–5) (nine vessels in total) that seemed to be unused. A complete clay model representing a kiln (Fig. 6) suggested the idea for the use of the space and an explanation for the intense red deposits. A similar interpretation of the presence of these deposits was offered by our colleague, geologist Panagiotis Karkanas, based on geological observations (and with no knowledge of the existence of the kiln model as yet): the strength and extension of the combustion had uniformly affected structures, in many cases one was on top of the other; furthermore, the characteristics of the deposits outside the burned surface formed multiple layers of ash, as if they had been thrown and left there after the clearing of a fire with the aim of reusing the space for a new fire (Fig. 7).

As the excavation continued, it became apparent that the clay wall extended to the west by a total length of 4.45m (Fig. 8), although it could have extended further, beyond the boundaries of the trench and under the asphalt (since the trench was located at the ditch adjacent to the road). This clay wall might also extend to the east, under the unexcavated deposits of the tell. In 2010, we reached the desired depth over the entire area of the extended trench and joined it with the initial deposit with the same characteristics uncovered south of the solid clay wall of the trench in 2003. It became obvious that we were indeed at the core of more than one pottery kiln (Fig. 9), inside which, we believe, would be even more 'just' finished and unused vessels *in situ*. But, of course, there would have been no point in ruining the burnt deposit, risking the destruction of part of the kilns, in order to find a few more vessels. This project requires time and caution, since it must be ensured that the structures of the kilns are not destroyed.

More interesting evidence was revealed in the form of another compact clay wall, parallel to the first, at a distance of 5m to the south, limiting the intense fire deposits between the two (Fig. 9 top). The burnt area, defined by these two parallel walls on the one side and by the two vertical and parallel sections of the trench from the other, create a rectangular space of about 10m^2 (we estimate that in total it would

be more extensive, since part of it continues to the west, under the road, as already mentioned). That this use of space is confined between the two clay walls is confirmed by the fact that in 2011 in the deposit at the south edge of the trench, beyond the south (second) wall, only ash residues with no ceramic or other finds (indicative of domestic or other use) were uncovered, with the exception of a few small random sherds. However, outside the second wall and at a distance of just 0.20–0.30m, another clay wall was unearthed, about 0.40–0.60m wide and affected by high fire temperatures. It is estimated that this new wall might be a boundary of another similar compound of kilns that extends south of the first one. In order to investigate this hypothesis a significant quantity of archaeological deposits has to be excavated. For the time being, it can only be tested with the use of drilling 'carrots'.

Description of the kilns and discussion

As soon as the structure became apparent, we believed it was just one kiln. However, as we continued removing the soil that had protected it, more surfaces were revealed: flat, angular, plastered, sometimes inclined like big jars turned to the side (Figs. 9a–b, 10), mud bricks and also the usual surfaces of baked clay, with imprints of branches or reed on their inner side. We then began to realize that this was more than one kiln. It became obvious that the plastered clay structural remains that we had found at the beginning of the excavation (2003) must have been part of a construction like this. These remains share the same characteristics and were identified at the time as house walls. We had then actually entered a kiln the roof of which has not been preserved; and the clay slabs that were found were the sides of a rectangular vessel (Fig. 3b). That is why they had not been destroyed – as they would have been in a construction layer as originally estimated – but were preserved in a good condition and could be totally restored. Similar vessels of the same size were later found close to the kilns.

Since the preserved parts of these constructions attributed to kilns seem to be *in situ* or partly fallen to the side, we believe that they constitute the base and sides of the kilns. The clay surfaces with branch imprints on the inner side (Fig. 11) probably formed part of the roofs of the kilns, which would not have been stable, and would have been replaced each time they were damaged, or when a bigger usable space was required, raising the roof higher. The hypothesis for the reconstruction of the kilns is based on the kiln model itself (Fig. 6), where a flat surface is used as the floor of the kiln (in the model, it is based on four legs not necessarily identical to the real kilns), and a convex surface as a roof with three openings, one at the entrance and two at the sides for the smoke to escape. Alternatively, the clay items with branch imprints could have served to conceal these openings when necessary, in order to regulate the temperature. Perhaps when the preservation program for all the surfaces is approved, assumptions like this can be confirmed.

The almost fully restored vessels mentioned earlier (Figs. 4–5) were collected over the whole of the southwest trench area. They were the first serious indication of the special function of the space as a kiln. All these vessels are monochrome with matt surface indicating that the pots were fired in monochrome and some were later painted or polished. Interestingly, the burnt deposits contained several deer horns, and probably of some other species, a material that has yet to be studied in detail. Their context does not point to ceremonial use, as in later periods, but this assumption needs further investigation (they could even be used as fuel). However, a quantity of burnt concentrated seeds (wheat, barley, possibly oat, and in lesser quantity, pulses: lentil, bitter vetch, common pea) was also collected from the area of the kilns in order to investigate whether cooking activities occurred parallel to the firing of pottery.

Apart from the vessels mentioned earlier, the pottery from the first trench at the top of the tell and from the west section and the deposits out of the burnt area at the second trench is characterised by a great variety of painted decorative styles, in which the dominant styles are the so-called A3b style (red or orange on white/brown on white) or conversely, white lines on red or brown, a variation of the A3a style (*Kyparissi-Apostolika 2006.609–610; 2009*). Scraped ware, sometimes in combination with painted decoration on the other side, is also observed, while the decorative motifs of the rich painted pottery include compact triangles, rhombus, crossed lines and steps (Figs. 12–13). These motifs are common throughout Thessaly in the Middle Neolithic (*Wace, Thompson 1912.13–24*), but we do not know where they were made, if they were made in each settlement, or if they were transferred via second-hand exchanges to several destinations. Anthropomorphic figurines of several types have also been found at this site (Fig. 14).

A reasonable question that arises is whether the kilns served the needs of this particular settlement, or even of others, as a kind of craft specialization, given that there are numerous other, perhaps smaller settlements in the vicinity, such as Magoula Koutroulou at a distance of *c*. 3km, where no similar space has been located, although it has been extensively excavated (*Kyparissi-Apostolika 2006; Kyparissi-Apostolika, Hamilakis 2012; Hamilakis, Kyparissi-Apostolika 2012*). Thermal constructions of the Late Neolithic have been found at Makryhori near Larissa (*G. Toufexis, personal communication*) and at Makriyalos, Pieria, also of the Late Neolithic, linked by the excavator on the basis of cooking procedures (*Pappa 2008.197*), while the oven inside the model of the interior of a house found at Platia Magoula Zarkou (Fig. 15) has a similar shape (*Gallis 1985*). Of the same structural and functional logic are kilns of much later periods, such as a Mycenean example found at Masholouri of Karditsa (*Vaiopoulou 2012*) and one found east of the village of Orfana in 1992 (*Rondiri 1999*) (Fig. 16) from the Classical period (and, of course, many other examples from later periods up until the present).

No other kiln models from the Greek Neolithic are known. However, a comparison could be drawn with a clay object from the Cucuteni culture (Poduri-Dealul Ghindary, 4750–4500 BC Precucuteni III), which was exhibited at the exhibition The Lost world of Old Europe: the Danube Valley 5000–3500 BC at the Goulandri Museum in Athens in 2010, where it was generally referred to as an architectural model (Fig. 17) (*Lazarovici 2010;* see also *Lazarovici 2002*).

At this point, it should be noted that ^{14}C dating of older samples taken from three depths (1.66m from section 1 at the top of the tell; 4.70m from the south area; 6.20m from the north area-section 2 of the ditch excavation in 2003) produced ages that range from 6962±25 BP (DEM–1434), 6923±36 BP (DEM–1435) and 6567±40 BP (DEM–1402). This chronological uniformity was not confirmed by the pottery, where the evolution between the upper and lower layers was obvious. This parameter was noted in the first publication of the site (*Kyparissi-Apostolika 2009*). If we assume that the area under consideration was indeed a complex of kiln constructions for large-scale pottery production, then I believe we can explain why the ^{14}C ages were similar in the upper and lower layers (given that the second dated sample was taken from the southern side of the excavation of 2003, namely where the red-hot deposits were first discovered): it seems that the kilns were installed at the western edge of the settlement and used throughout the Middle Neolithic, and not only in the deeper layers with which they appear to correspond statigraphically.

The Middle Neolithic has proved to be the richest period in prehistoric Thessaly, and the peak of a long continuous tradition that has its origins in the Early Neolithic (*Theocharis 1973*). This notion has come to replace older beliefs, based on stylistic differentiations, which treated the two periods as distinct. The finds from Imvrou Pigadi and especially the presence of kilns in such an early phase support this valuation.

For the time being, the excavation of the kilns has been halted in order to evaluate as thoroughly as possible the structural remains. Although they have not been preserved as solid constructions, they can provide important information, which can significantly help restore their original form and function. A lot of work has still to be done: a careful and thorough cleaning of the structural remains in order to uncover as much as possible of their original form, rigorous planning and photographing during the several stages of uncovering, conservation, and finally an interpretation of the formation of their form and function. Additionally, analyses of the burnt deposits and temperatures to which they were exposed should help us understand the nature of the functional areas.

In conclusion, I would like to stress that our insightful decision to further explore the horizontal stratigraphic differences in the initial trench led to the discovery of such an important find, which would otherwise have passed in the bibliography as yet another destruction layer in a house.

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Fig. 2a. The clay wall that separates the deposits: on the right (south) side are burnt deposits and on the left (north) ashy deposits with carbons.
2b. The trench with burnt deposits when they were first uncovered in 2003. Clay slabs, a floor surface and some stones are visible.

Fig. 4. A large, almost complete jar after restoration. It was unearthed from the burnt deposits.

Fig. 3a. Clay slabs as they were found during the excavation. 3b. The same slabs after restoration, producing a rectangular vessel.

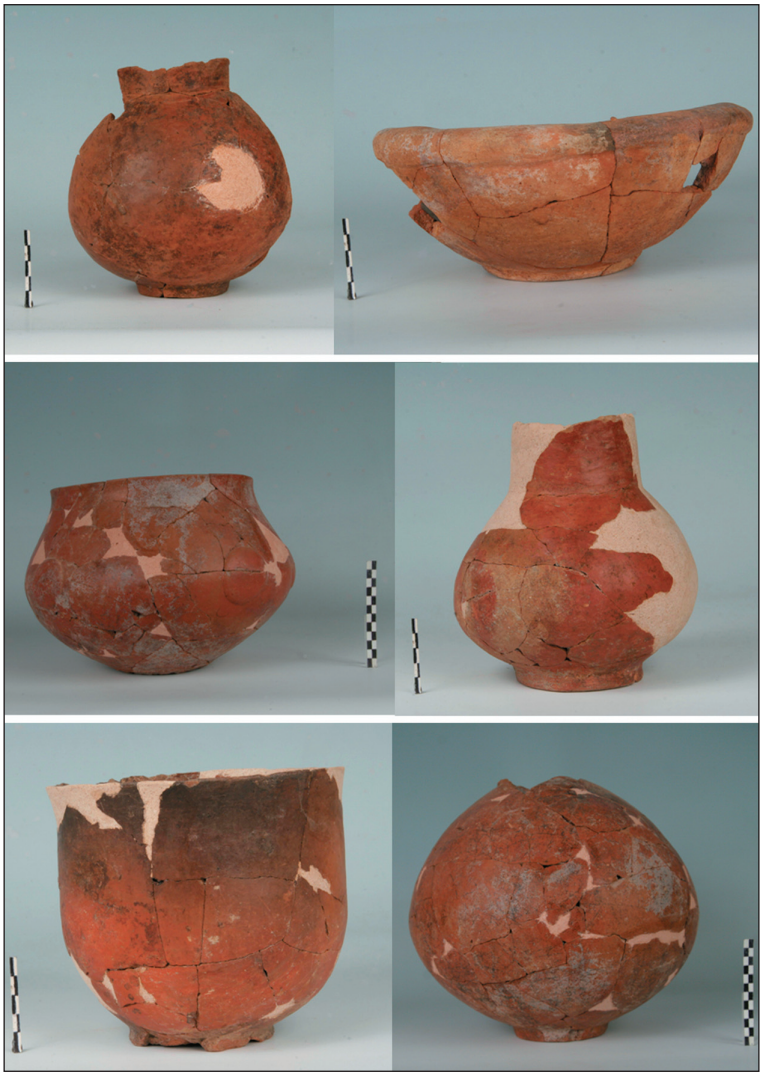

Fig. 5. Clay vessels, almost complete, unearthed from the burnt deposits.

Fig. 6. A clay kiln model that probably coincides with the kilns at the site. It was found together with the vessels in figure 5 among the burnt deposits.

Fig. 7. The ashy layers outside of the burnt deposits with many small carbon fragments.

Fig. 8. The first clay wall to the north after the extension of the excavations. It is 4.45m long.

Fig. 9. The remains of the structures attributed to kilns, which are defined between two clay walls, north and south.

Fig. 10. Detailed picture of one of the kiln structures.

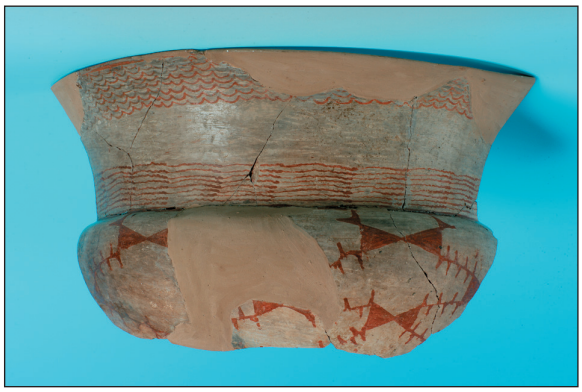

Fig. 12. A large piece of a vessel painted in A3b decoration.

Fig. 11. Details of the excavation, with clay slabs and branch imprints on clay surfaces.

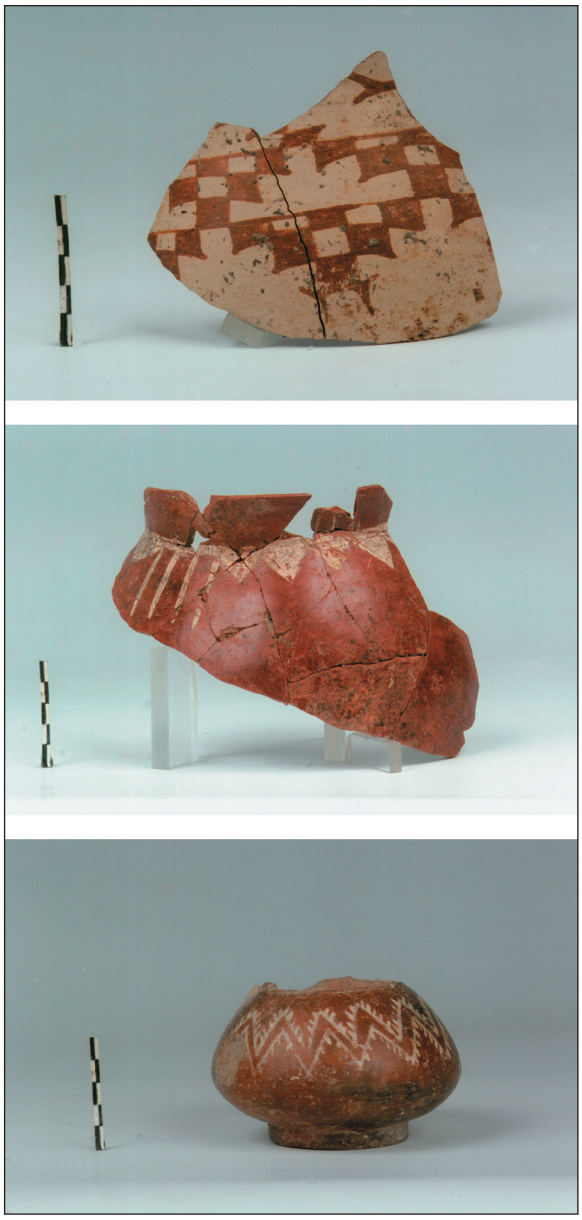

Fig. 13. Parts of decorated vessels in A3b (the upper one) and in A3a (the two others).

Fig. 14. A headless male figurine and the head of another (the latter with red on white painted decoration).

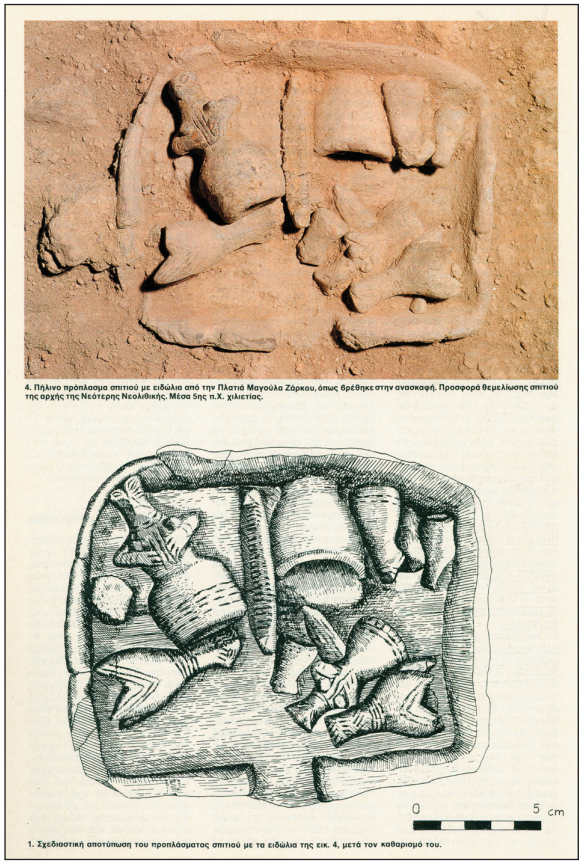

Fig. 15. The clay model of the interior of a Neolithic house found at Platia Magoula Zarkou. A food baking kiln is visible (after Gallis 1985*).*

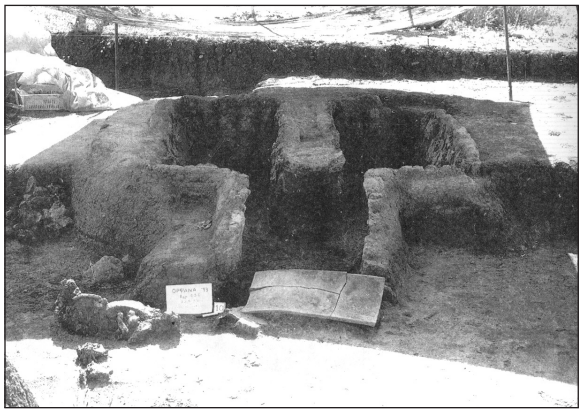

*Fig. 16. A kiln of the Classical period (*c. 5th century B.C.*) found at the village of Orfana, not far from Neo Monastiri and Imvrou Pigadi (after* Rondiri 1999.275–289, Fig. 4*).*

Fig. 17. The architectural model of Cucuteni culture (after Lazarovici 2010*) that could possibly be compared to our kiln model.*

Palaeolithic occupation of the Mehran Plain in Southwestern Iran

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ABSTRACT – *In terms of Palaeolithic studies, the Mehran Plain is already known due to the discovery of the Amar Merdeg site in 1999. But in spite of the high potential for occupation in different periods, the prehistoric settlement patterns of the plain had not been identified until the present survey in 2010, which resulted in the discovery of 15 Palaeolithic sites. Of these, 9 sites contain both Lower and Middle Palaeolithic remains and 3 more sites are attributed to the Middle Palaeolithic as well 3 sites to Upper Palaeolithic period and beyond. The distribution pattern indicates that easy access to raw materials, which are now visible among the chert pebbles scattered over hillocks on the plains, was the main reason to establish settling.*

IZVLEČEK – *V paleolitskih študijah je ravnica Mehran znana po odkritju najdišča Amar Medreg leta 1999. Kljub velikemu potencialu poselitveni vzorci v ravnici niso bili prepoznani vse do najnovejših terenskih pregledov leta 2010, ko smo odkrili 15 paleolitskih najdišč. Od teh 9 najdišč vsebuje starejše in srednje paleolitske artefakte; 3 najdišča smo uvrstili v obdobje srednjega paleolitika in prav tako 3 najdišča v obdobje mlajšega paleolitika in kasnejših obdobij. Poselitveni vzorec kaže, da je bil glavni razlog za naselitev lažji dostop do kamnitih surovin, ki so danes vidne na površju kot roženi prodniki, razpršeni po vzpetinah v ravnici.*

KEY WORDS – *Paleolithic; Mehran Plain; settlement pattern*

Introduction

Palaeolithic archaeology in Iran has been divided into three main stages; in the first stage, from the early 20th century to the late 1970s, all researches were conducted by western archaeologists building a foundation on which later researches rested; the second stage sees a 20-year gap in Palaeolithic studies, and the third stage began with the reopening of the fields to non-Iranian and also Iranian researchers, which led to the survey and excavation of a handful of new Palaeolithic sites since the early 21st century (*Vahdati Nasab 2011*). However, serious studies go back to the mid-20th century, when Carletoon Coon (*1951*) and then others carried out investigations in different areas (*Smith 1986; Olszewski, Dibble 1993*). The third stage coincided with research which mostly directed by Iranian archaeologists or jointly (*Roustaei* et al. *2002; 2004; Otte* et al. *2009*). In this ongoing stage, some sites were also revisited (*Roustaei* et al. *2004; Otte* et al. *2009*) and some areas have been studied for the first time (*Mohammadifar, Motarjem 2008; Biglari* et al. *2000; Biglari, Heidary 2001*). In this regard, the Mehran plain in the southern part of Ilam province in southwestern Iran, adjacent to the Iraqi border, was surveyed in the late 1990s, resulting in the discovery of Palaeolithic remains at Amar Merdeg (*Biglari* et al. *2000; Biglari, Shidrang 2006; Nokandeh 2010*). The plain is approximately 400km^2 in area, bounded by Pashmin Mountains to the north, the Hamrin Mountains to the south, the Iraqi border to the west and Mt. Anaran to the east (Fig. 1). It is also fed by three main rivers, the Konjam Cham, Gavi and Chan-

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goleh, which all spring in the northern mountains and flow into Iraq.

Archaeological project of the Mehran Plain: Paleolithic survey

Archaeological studies of the Mehran Plain were begun in the mid-1990s by Alimohammad Khalilian, who launched an investigation to identify all ancient remains, then continued by Gabriel Nokandeh resulting in 62 sites from various periods being recorded (*Nokandeh 2010*). Later research focused primarily on the Neolithic period (*Darabi, Fazeli 2009; Zeidi pers. comm.*). Geographically, the plain is located amidst three archaeologically important regions of Mesopotamia and the Susa plains to the west and east, respectively, and the Central Zagros to the north. Thus the Mehran Plain is much more important in terms of relationships between these regions. However, due to political problems such as Iraq-Iran war, very little was known about the prehistoric settlement change and continuity of the plain until a long-term research project named 'Archaeological Project of the Mehran Plain' was begun in 2010. Although the project is mainly focused on investigating both Neolithic and Chalcolithic periods, we also based one of our survey objectives on identifying Palaeolithic remains, which will be discussed in this paper. The survey directed by H. Darabi in the spring of 2010 resulted in the discovery of 36 prehistoric sites (Mr001–Mr036), of which 15 sites are attributed to various periods of the Palaeolithic on the basis of the stone finds. Table 1 shows basic information on the sites. We proposed that the northern calcareous mountains with their numerous caves and shelters and also the Pleistocene hillocks on the plain not buried by the later Holocene alluviation were occupied during the Palaeolithic. Due to a shortage of time, the survey coverage was limited to the plain itself, while the northern mountainous areas were not investigated. So, we have the plain information itself and hope to complete our research in future. However, 22 localities were mapped, of which 16 are techno-typologically dated. As the prehistoric settlements were affected by environmental and geomorphological elements, this needs to be taken into account here. The Mehran plain has an elevation above sea level varying from 150m in the west up to 400m in the east and is buried under post-Pleistocene alleviation, with deposits of varying thickness. The north-northeastern mountain areas were formed during the second and third geological era from various lime stones. It should be noted that the northern mountains are oriented northwest-southeast parallel to the Zagros chain. Geologically, the plain is located in the midst of both tectonic zones of the Zagros fault and lowlands of Khuzistan (*Brookes 1989*). But the prominent features in the plain are the numerous scattered hillocks which may have been formed by the accumulation of catastrophic flood alluviation during the Pleistocene (*Biglari* et al. *2000.749*). The

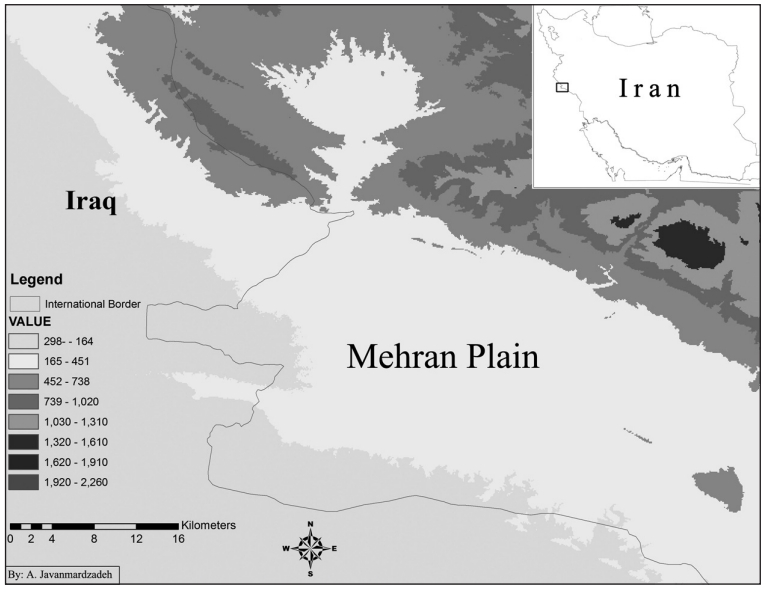

Fig. 1. Map showing the geographical position of the Mehran Plain.

Site name	Coordination		Z (a.s.l)	Area (m)
	X	Y		
MR003	644540	3657252	276	200x200
MR005	645723	3657736	304	50x50
MR009	639304	3664307	366	500x200
MR010	640592	3668975	507	20x30
MR012	635994	3662657	335	135x50
MR013	634444	3662671	333	300x1000
MR014	637495	3664775	370	400x200
MR015	617684	3670705	248	650x250
MR016	617345	3671048	238	350x150
MR017	615654	3672515	262	2000x1000
MR018	614262	3672985	256	2100x1000
MR021	612096	3671599	217	1600x800
MR023	611926	3667063	174	60x50
MR034	646242	3664232	472	12x6x3
MR035	644693	3659031	318	600x300
MR036	644696	3659031	318	4000x2200

Tab. 1. Table showing the variant primary information of the discovered sites.

source of the sediments is the Aghajari formation and the overlying and Bakhtiyari conglomerate of the Zagros front ranges (*Eyvazi 1995*). Abundant lumps of chert pebble, cobbles and nodules are found on the surface of most of the hillocks, which in terms of analysing the distribution pattern of Palaeolithic occupation are very significant (*Brantingham 2003; Biglari 2004; Heydari 2004; 2007*) and we will refer to this below.

Fig. 2. General view of Amar Merdeg as a cluster of hills, looking east.

Lower Palaeolithic

As mentioned, 9 sites contain a Lower Palaeolithic assemblage, which enhances our information on this period in the plain, as it was already known from only one site called Amar-Merdeg (Fig. 4). It should be noted that since this site covers a cluster of separate hills, we recorded it again as four localities in order to take more samples to be studied more exactly.

Mr003: where the Lashtar stream flows to the Changloleh River at the easternmost area of the plain, an assemblage of chipped stones was scattered over the left bank. Indeed, the site was established on a conglomerate terrace. Typologically, the pebbles, flakes and a small quantity of unifacial and bifacial choppers and unipolar cores were mainly by-products of working chert pebbles.

Mr009: some 2km to the north of Chalab village, many hills are visible over an area of *c.* 1.5km^2 at an elevation of 366m above sea level. Chert pebble, cobble and nodule are present on the hilly surfaces, these were used to produce various stone tool such as polyhedron cores (Fig. 3. 3), a partially bifacial chopper, a pointed chopper and bifacial tools (Fig. 3.4–6). We also found a single hand-axe like which was heavily flaked (Figs. 3.1; 5.1). The chipped stone has a different concentration on the basis of the density of raw material.

Mr012: 5km to the southwest of Mr009 and 1km to the west of Chalab village, abundant chipped stone is scattered among the chert raw material similarly to what is seen at the other sites, although most of the samples collected are attributable to later Palaeolithic periods, of which one bifacial tool with 6cm in length is notable. The distal end of this tool is rounded in form and was unretouched. However, the proximal end was flaked on one side, while

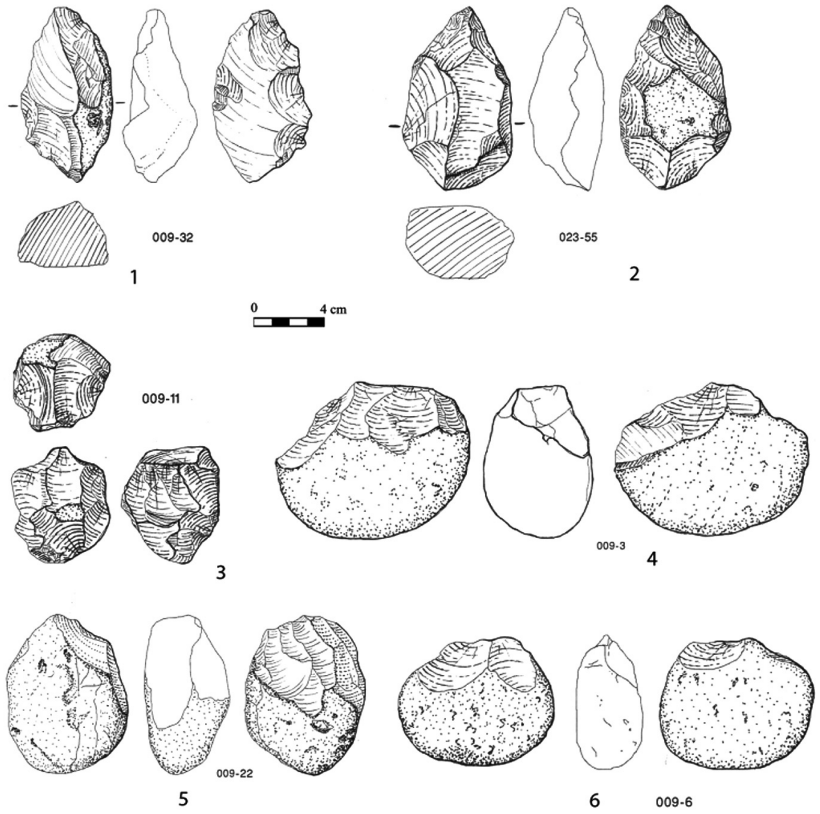

Fig. 3. Samples of Lower Palaeolithic tools. 1 bifacial. 2 hand-axe. 3 polyhedron. 4, 6 partially bifacial choppers.

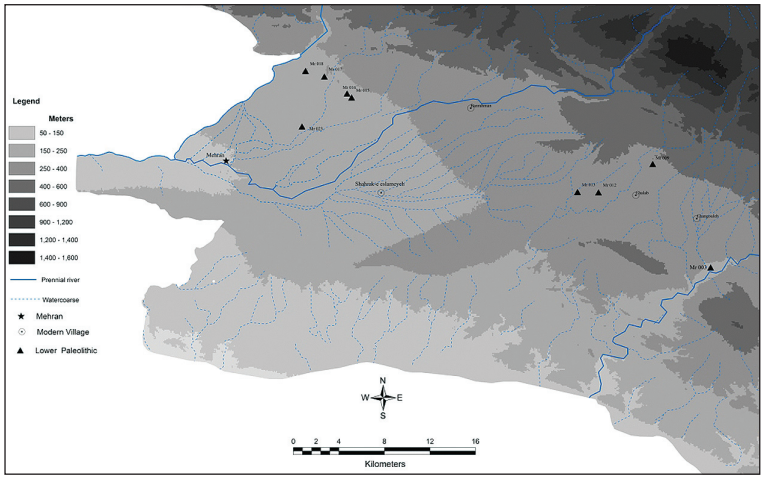

Fig. 4. Map showing the distribution pattern of Lower Palaeolithic sites on the Mehran Plain.

the other side is cortical. This bifacial tool is heavily patinated, like those found in Amar Merdeg (*Biglari pers. comm.*).

Mr013: this site, located some 4km to the west of Chalab village on the northern edge of the Mehran-Dehluran road, extends over an area of about less than 2km^2. Of the collected samples, two polyhedrons made from chert pebbles are attributed to Lower Palaeolithic period.

Mr015–16–17–18 (Amar Merdeg Collection): a cluster of hills extending over an area of *c.* 10km^2 less than 1km to the east of the Konjan-Cham river and 7km to the north of the town of Mehran, at 250–300m above sea level (Fig. 2). As a result of the previous survey in 1999, some of the samples collected from the site such as chopping tools were attributed to the Lower Palaeolithic (*Biglari* et al. *2000.749*). Additional fieldwork in 2001 and 2004 resulted in the discovery of four bifaces and partial bifaces and more core-choppers (*Biglari, Shidrang 2006.164*). Indeed, Amar Merdeg is among those hillocks which were formed as the result of catastrophic flood alluviation during the Pleistocene and have numerous cobbles, pebbles and nodules of chert over the surface. Because of the dangerous military waste remaining from the Iraq-Iran war in the 1980s, the previous survey was devoted to limited areas of the site. But, we tried to take as many samples as possible in the present survey. However, the samples indicate a pattern of technological typology similar to what is known. What is visible among the Amar Merdeg 1 (Mr015) and 2 (Mr016) assemblages is numerous core-choppers and tested pebbles. We also found many partially bifacial chopper and unifacial choppers. But no bifacial tools were found, which could be a result of a sampling error. In Amar Merdeg 4 (Mr018) one hand-axe was discovered, although it is not so typical due to the later natural modification through time (Fig. 5.2). The raw material is mainly based on the chert, sandstone, and small amount of quartzite cobbles which are scattered over the surface of the site.

Mr023: some 5km to the southwest of Amar Merdeg, we found Paleolithic stone tools among later materials in an area of *c.* 2000m^2 bounded by fields. It should be noted that the site of Mr023 is not so prominent that it could be seen easily and it seems that was buried by Holocene alluviation. The Palaeolithic tools with denser concentration in west area of the site are distinguished from the later lithics by their different raw material, techno-typology and patina. Of these, one hand-axe with 10cm in length and 7cm in width, were discovered. The hand-axe is heavily retouched and only a small cortical area on both sides was unretouched (Fig. 3.2). Although this artefact was made of mudstone, chert and sandstone was the primary raw material at the site.

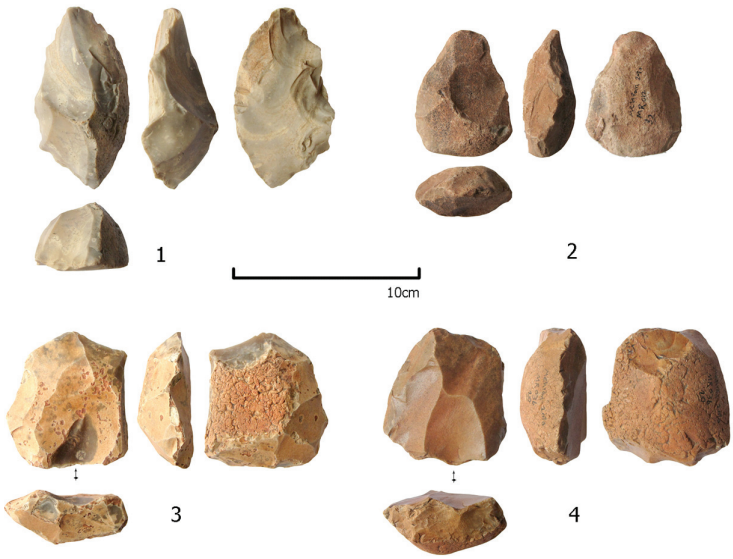

Fig. 5. The common presence of two techno-typologically different bifacial (top row) and Levalloisian (bottom row) tools on the Mehran Plain.

In terms of the Lower Palaeolithic period, two points can be made: first, as the raw material to produce tools, the abundant chert stones on the surfaces of hillocks attracted the inhabitants of the plain. Second, all the localities in this period contain later Middle Palaeolithic remains, indicating continuity of occupation continuation, as suitable raw material was easily acquired. This, however, makes it difficult to identify the tools from each period, although they appear as two techno-typologically different bifacial and Levalloisian tools, respectively (Fig. 5). It should also be noted that the Lower Palaeolithic tools have a heavier patina on the scar surface than those of the Middle Palaeolithic.

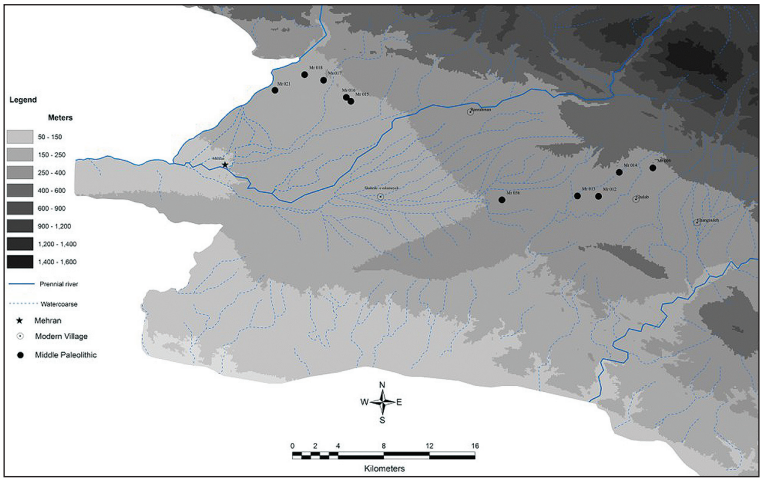

Fig. 6. Map showing the distribution pattern of Middle Palaeolithic sites on the Mehran Plain.

Middle Paleolithic

Since all the previous localities (except nos. Mr003 and 023) also yielded Middle Palaeolithic stone tools, the settlement pattern of this period somewhat resembles what is seen in the earlier period of the Lower Palaeolithic. Therefore, the geographical setting of these repetitive sites is here avoided and their typical stone tools are merely described. Moreover, the survey identified three new sites (Mr014–21–36; Fig. 6).

Mr009: most of the surface chipped stones at this site could be dated to the Middle Paleolithic period. Although no typical Levallois core was found, other indicators such as centripetal, bipolar and discoid cores along with their related tools are notable (Fig. 7.2, 3, 7). It should be mentioned that direct retouch was mainly used to produce tools such as scrapers.

Mr012: this site contained numerous techno-typologically Levalloisian tools over an area *c.* 3km^2. Apart from those related to the Lower Palaeolithic, Levallois cores – such as a sub-rounded one and related debitages – are also scattered over the surface. Flakes with *Chapeau de jendarme* platform were the most common type. Some of the tools had been reused.

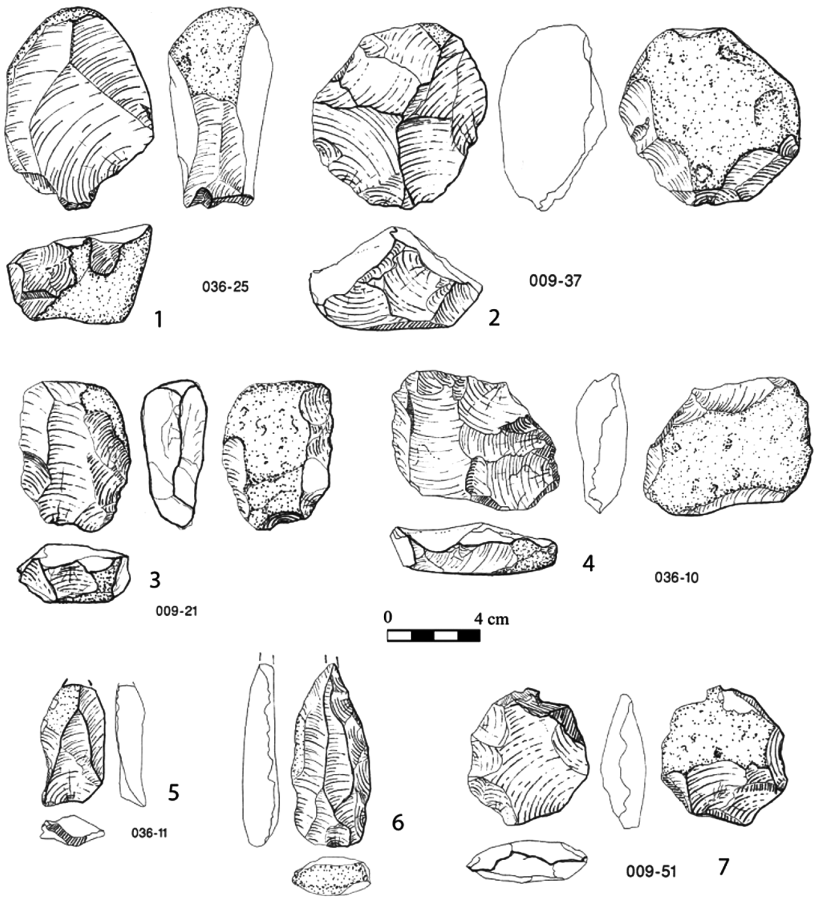

Fig. 7. Middle Palaeolithic stone tools from the Mehran Plain. 1 Levallois core; 2 centri-petal core; 3, 4 flake cores; 5 Levallois point; 6 side scraper; 7 discoid core.

Mr013: the Levallois technique could be also attested at this site on the basis of the presence of some tools such as a Levallois blade core and a double-sided scraper made on an elongated flake.

Mr014: this locality is located about 2km to the northwest of Chalab village in an area *c*. 2km^2 extending over several hillocks. Some single and multi-platform cores and different related debitages are visible on the surface, but no Levallois core was discovered, which could be a result of a sampling error. A scraper made on a *débordante* blade tentatively attributed to the Middle Palaeolithic is worth noting.

Fig. 8. General view of the Kellaw Pikeh rock shelter, looking north.

Mr015–16–17–18 (Amar Merdeg): most of the Amar Merdeg assemblage can be dated to Middle Palaeolithic with an emphasis on Levallois technology. Various tools such as a Levalloisian point with *Chapeau de jendarme* platform and various kinds of centripetal, discoid, single-platform and multi-platform cores are very common at the site.

Mr021: this site is located on the Chogha Khulami hillocks, covering about 1.2km^2 in area, 5km to the north of Mehran Town on the left bank of the Konjan-Cham River. The numerous chert stones seen on the surface of these hillocks were used as raw material, as at Amar Merdeg. The collected assemblage indicates an emphasis on Levallois technology. Moreover, some tools were produced as a result of direct percussion. Techno-typologically the sampled tools, however, show a similar pattern to those of nearby Amar Merdeg, and centripetal, discoid, single-platform and multi-platform cores are also visible here. Although the site is near Amar Merdeg to the east, it has yielded no Lower Palaeolithic tools so far. This might be related to a sampling error; we await the discovery of earlier material.

Mr036: 8km to the west of Mr012, numerous chipped stones are scattered in a vast area which is not precisely defined. Levallois cores and tools are visible among the abundant chert pebbles and cobbles. Moreover, the most prominent indicator is a Mousterian Point. Many other points with *Chapeau de jendarme* platforms should also be taken into account (Fig. 7.1, 4–6). However, various scrapers make up a high proportion of the assemblage.

Upper Paleolithic and beyond

The Upper Palaeolithic material is not as diagnostic as the Middle Palaeolithic. This prevents the easy attribution of the tools, which remains one of the most important research objectives for the future. However, a rock shelter known as Kelaw Pikeh has already been attributed to the Upper Palaeolithic (*Nokandeh 2010*). We revisited the site (Mr034) and took samples which are mainly based on different scrapers with no typical tool (Fig. 8). Two more sites were also dated to the Upper Paleolithic or even the Epi-Palaeolithic (Fig. 9).

Mr005: this site is located on the bank of the Lashtar stream in the easternmost part of the plain. Various tools such as scrapers, blades and cores made from red and light grey chert were collected from

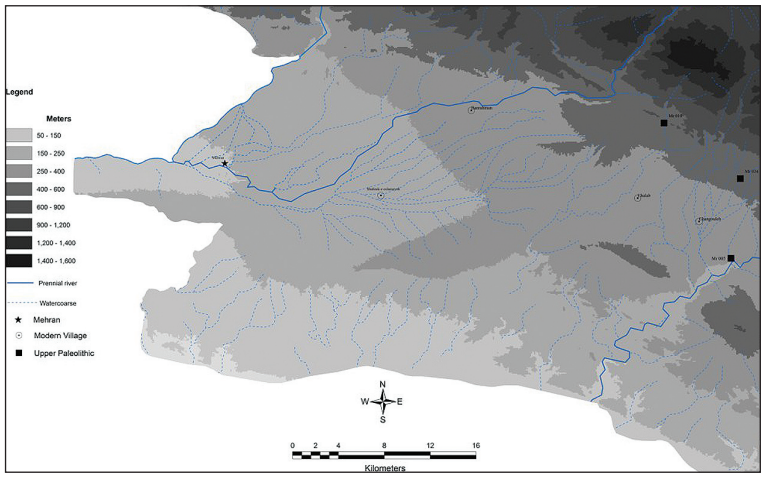

Fig. 9. Map showing the distribution of Upper Palaeolithic/Epi-Palaeolithic sites on the Mehran Plain.

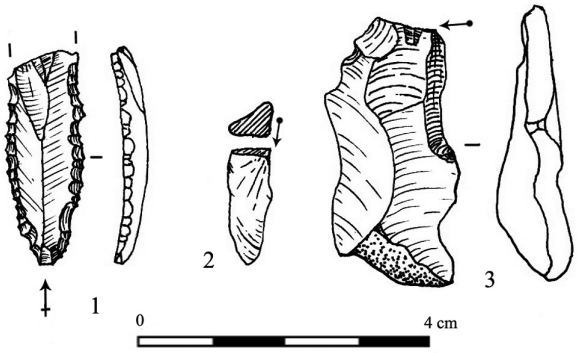

Fig. 10. Selected samples of Upper Palaeolithic/Epi-Palaeolithic tools. 1 double-side scraper; 2 Burin spall; 3 Burin.

the surface. However, a burin was also found which was made on a blade and could be assigned to the Upper Palaeolithic (Fig. 10.3).

Mr010: some 5km to the north of the Chalab village in the Daraw Palk Valley, a rock shelter is located which seems to have collapsed through time; a freshwater spring flows 300km to the northeast which is used by local nomads as their main supply water. Chipped stones distributed among large stone slabs. The most significant tools are cores, blades, bladelets and scrapers, all of which are made from dark grey flint. No blade cores were found. Most of the tools are made on blades, of which a double-sided scraper with heavy retouch is notable (Fig. 10.1). Moreover, a burin spall was also discovered (Fig. 10.2) which could be taken as an indicator of possible Epi-Palaeolithic occupation.

Finally, it should be noted that, although some of these tools are attributable to both the Upper Palaeolithic and the Epi-Palaeolithic periods, we need more data, which is expected to be found on the northern parts of the plain.

Discussion and conclusion

The present survey indicates Palaeolithic occupation of the Mehran Plain at different times. Techno-typologically, we based our chronology mainly on materials from the nearby region of the Central Zagros to the north (Tab. 2).

The finds indicate that the Mehran Plain could have been occupied first in the later Lower Palaeolithic. As mentioned above, the surface materials are hard to place within the Lower Palaeolithic, as in the case of the material found in the Hulailan Valley (*Mortensen 1993*). Most of the Lower Palaeolithic tools are chopping tools, which could not be dated individually to particular periods. However, the presence of bifacial tools and handaxes could be taken as a prominent indicator of Lower Palaeolithic occupation of the plain. These tools have been discovered in different areas, such as Gakia in Kermanshah (*Braidwood 1960*), Pal Barik in Hulailan (*Mortensen 1993*), Kuran Bozan Valley on the bank of the Seimarreh River (*Alibaigi* et al. *2011*) or even in East Ajarbaijan to the north (*Sadek-Kooros 1976; Singer, Wymer 1978*) as an indication of the Achuelian tradition. While one of the routes that early hominids supposedly took into Iran is

Years B.P.	Geological Period	Cultural Period	Mehran Plain	Central Zagros
10,000	Holocene	Neolithic		
		Epi-Paleolithic Zarzian	Mr010?	Hulailan sites Warwasi Ghar-i- Khar Pa Sangar
18,000				
		Upper Paleolithic Baradostian	Mr005 Mr010? Mr034?	Arjenah Yafteh Pa Sangar Warwasi Ghar-i- Khar
40,000	Upper Pleistocene			
	Last Glacial	Middle Paleolithic Mousterian	Amar Merdeg (Mr015-Mr016-Mr017-Mr018) Mr009-Mr012- Mr013-Mr014- Mr021-Mr036	Khorramabad sites Kuran Buzan sites Ghar-i- Khar Hunter's Cave Warwasi Kobeh Do-Ashkaft Mar Dodar Mar Aftab Mar Tarik
80-100,000				
	Inter-glacial	Lower Paleolithic Pebble/Chopping Tools - Acheulian	Amar Merdeg (Mr015- Mr016-Mr017- Mr018) Mr003-Mr009-Mr012-Mr013-Mr023	Pal Barik Gakia Kuran Buzan (H 102)?
150,000				
	Middle Pleistocene			
700,000				
	Lower Pleistocene			
1,800,000				

Tab. 2. Table showing the chronology of Palaeolithic sites found on the Mehran Plain in comparison with the Central Zagros (after* Roustaei et al. 2004.699, Fig. 6 *with some modifications).

from northern Mesopotamia and along the southwestern foothills of the Zagros range (*Rolland 2001*), the recent remains from Mehran Plain are worth noting.

However, Middle Palaeolithic occupation is much more easily recognised than Lower Palaeolithic on the Mehran Plain, similar to what is seen in highland Zagros. Excavations at several sites in western Iran, such as Bisotun cave *(Coon 1951; Dibble 1984*), Warwasi rock shelter (*Dibble, Holdaway 1993*), Ghar-i-Khar (*Smith 1986.18*) and Konj and Arjenah caves (*Baumler, Speth 1993; Hole, Flannery 1967*) have provided a sufficient basis for dating the Middle Palaeolithic occupation, based mainly on the occurrence of the Mousterian tradition. Unlike these sites, the Mehran plain yielded open-air sites with Levalloisian tools, although the calcareous northern mountains need to be surveyed in future for possible caves and rock shelters with Middle Palaeolithic deposits. However, the present survey indicates that Palaeolithic occupation was concentrated primarily on hillocks where chert pebbles and cobbles of various sizes are visible. It seems that these hillocks were partly buried by the later Holocene alleviation, and therefore those areas which remained from the Pleistocene period contain Palaeolithic artefacts on the surface. We think the abundant raw materials attracted the Palaeolithic inhabitants at various times, resulting in the presence of different typo-technologically stone tools from both the Lower and Middle Palaeolithic periods. In terms of later occupation, the finds were so few that no conclusion may be drawn, and therefore it should be regarded as a significant issue for future research.

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New evidence of the Neolithic period in West Central Zagros: the Sarfirouzabad-Mahidasht Region, Iran

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ABSTRACT – *Because the eastern region of the Mahidasht Valley in the Sarfirouzabad region, to the south-east of Kermanshah Province, had not been studied by archaeologists, this area of central Zagros was surveyed in 2009 by a team from Tehran University. We identified 17 sites dating to the Neolithic period. The finds indicate that the formation of sedentary societies began in the pre-pottery Neolithic in this area and was followed by a considerable increase in the number of sites during the pottery Neolithic period. Preliminary analyses of these sites will be presented in the present article.*

IZVLEČEK – *V vzhodnen delu doline Mahidasht v regiji Sarfirouzabad, jugovzhodno od province Kermanshah arheoloških raziskav še ni bilo, zato je to območje v centralnem Zagrosu s terenskimi pregledi leta 2009 raziskala arheološka skupina iz Univerze v Teheranu. Prepoznali smo 17 najdišč iz neolitskega obdobja. Najdbe kažejo, da se je oblikovanje družb s stalno poselitvijo na tem območju začelo že v obdobju pred-keramičnega neolitika, ki mu je sledilo občutno povečanje števila najdišč v obdobju keramičnega neolitika. V tem članku predstavljamo preliminarne analize teh najdišč.*

KEY WORDS – *archaeological survey; Neolithic settlement; Sarfirouzabad; central Zagros*

Introduction

As a result of the increasing number of archaeological studies in the 1960s and 1970s, and following Robert J. Braidwood's excavations (*Braidwood 1960a; 1960b; 1961; Braidwood* et. al. *1961*), the central Zagros area of Iran was identified as a key region with great potential for studying the process of Neolithisation in the Near East. After Braidwood, other areas of central Zagros, including Hulailan (*Meldgard* et al. *1963; Mortensen 1972; 1974*), Lurestan (*Goff 1971; Young 1966; Hole, Flannery 1967; Pullar 1990*), Mahidasht (*Levine 1974; Levine, McDonald 1977*), the Kermanshah suburbs (*Smith 1976; 1990; Smith, Mortensen 1980*), and Kangavar (*Young 1969; 1975*) were also investigated and excavated by archaeologists from different countries; this period of research is called the Golden Age (*Wilkinson 2000*). With the Islamic revolution in Iran, Neolithic studies came to a halt. Although laboratory and field studies have recently recommenced (*Zeder 2005; Matthews* et al. *2010; Darabi* et al. *2011*), the lack of research caused a change in the views of researchers about the status of studies of central Zagros in the process of the Near Eastern Neolithisation (*Hole 1999*). One of the complicating factors in researching the Neolithic in this region, compared to areas like the Levant, is the inadequacy of identified and excavated sites, which has led to the assumption that some parts of the region were abandoned and deserted (*McDonald 1979; Hole 1987*).

Therefore, the identification of a considerable number of Neolithic sites in the Sarfirouzabad area in the 2009 survey will greatly enhance our knowledge about central Zagros in the Neolithic period.

Meanwhile, new excavations and recent studies point to the significance of the Zagros area and its valleys

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as one of the earliest focuses of plants and animals domestication (*Matthews* et al. *2010; Nikzad 2011; Darabi* et al. *2011*).

Geographical setting

Sarfirouzabad is located 30km west-southwest of Kermanshah and measures 971km^2 in area (Fig. 1). Geographically, Sarfirouzabad is the natural continuation of the Mahidasht plain, which is located to the south-south-east; the southern part is bounded by the Saimareh River and Luristan Province. Sarfirouzabad is a large compound syncline surrounded by two mountainous southwestern and northeastern chains. The northeastern chain includes Mts. Khowra-tav and Sefid, while the southwestern mountains are lower and include the Nesar, Kaleh Mol, and Lal-abad mountains. Another natural morphological feature of the plain is the Mereg River, which is a tributary of Iran's third long river, the Karkheh. The region is considered to have a rich environment and has abundant water resources, chert outcrops, and abundant forests and pasture.

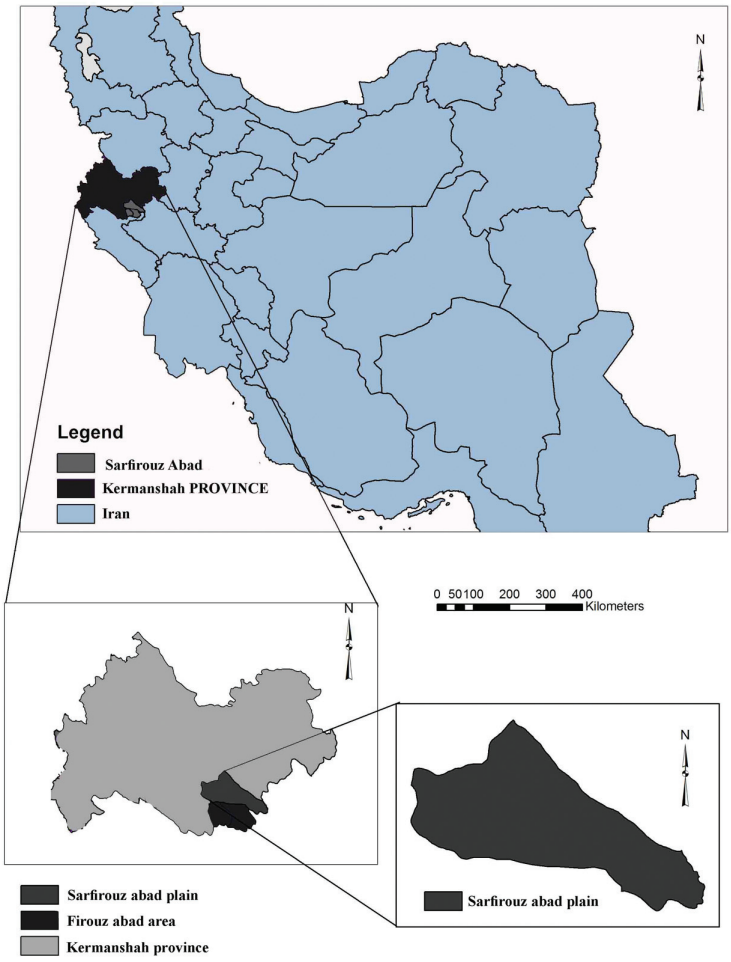

Fig. 1. Map of the Sarfirouzabad area.

Archaeological studies in Sarfirouzabad

Despite the fact that Sarfirouzabad shares a border with Mahidasht, its archaeological research is less well-known. Until the 2009 survey, only two expeditions had been able to conduct a limited survey in the Sarfirouzabad area. During the first, between 1963–1967 when Clare Goff was investigating Pishkoh district in Luristan, she was able to visit Sarfirouzabad (south-east of Mahidasht) and recorded a few sites (*Goff 1971*). But she never published data on the number or chronology of the sites she identified.

Later, during the Mahidasht project, Louise Levine was able to visit some parts of the Sarfirouzabad area (*Levine 1974; 1975; Levine, McDonald 1977*), although Levine never referred to any recognised sites in the area. However, Mary A. McDonald mentioned in her PhD thesis that there were three sites with pottery Neolithic remains in Sarfirouzabad (*McDonald 1979.552*).

The 2009 survey

In 2009 a team supervised by Kamal-Aldin Niknami conducted an intensive field survey of the Sarfirou-

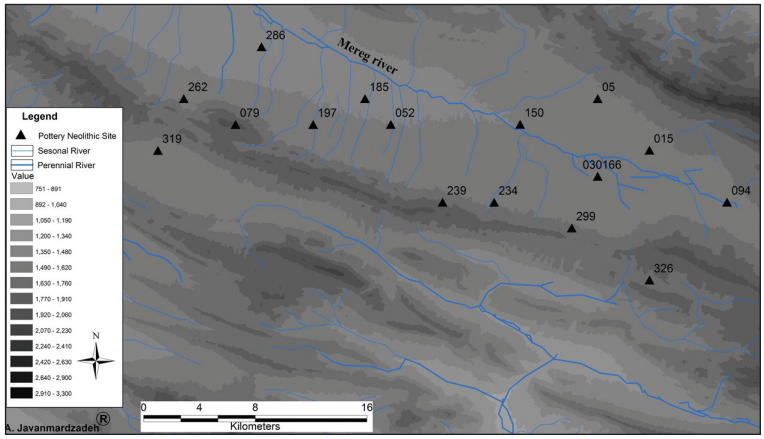

Fig. 2. Map of the distribution of Neolithic sites on the Sarfirouzabad plain.

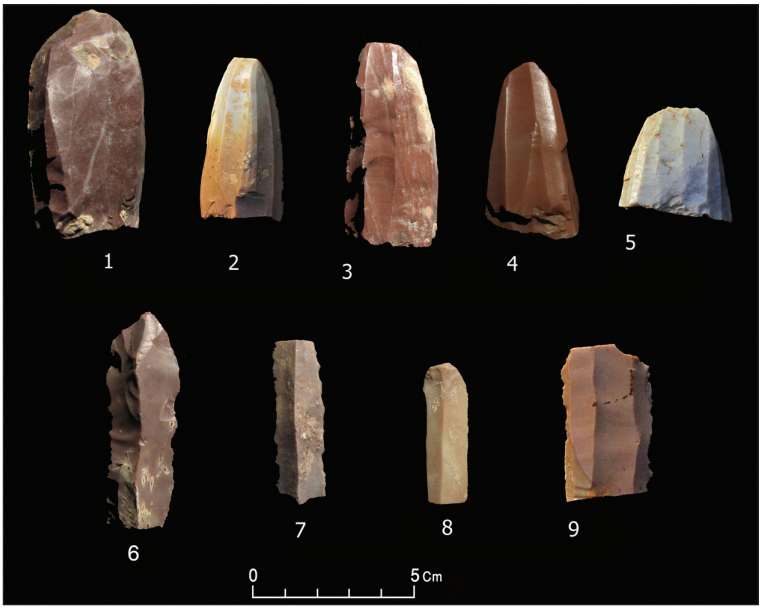

Fig. 3. Pre-pottery Neolithic stone artefacts from Chia Chakhmagho.

zabad region over a period of 60 days (*Niknami 2010*). The survey, which consisted solely of field-walking, covered all areas suitable for settlement, including agricultural flatlands, the terraces of the Mereg River and the hillocks on the border of the plain. During the survey, 332 sites from the Palaeolithic to late the Islamic period were identified, including 17 settlements with remains attributable to the Neolithic period (Fig 2).

Neolithic settlements

According to the surface finds study, three sites – Chia chakhmagho (SF.5), Banbavani 1 (SF.166) and Chelleh Olia 1 (SF.286) – yielded remains from the pre-pottery Neolithic. The significance of these sites lies in the fact that sites of this age have never been reported from previous research at Mahidasht (*Braidwood 1960a; 1960b; 1961; Levine 1974; 1975*). Brookes *et al.* believe that the absence of such sites was due to geological phenomena and extreme sedimentation in Mahidasht, which perhaps buried the early sites (*Brookes* et al. *1982*). However, Phillip E. L. Smith and Cuyler T. Young (*1983*) note that settlements of this age should not be sought on wide, open plains, but in narrow and open river valleys, since such valleys are considered attractive and significant to early Neolithic societies in terms of providing food security for both people and livestock. They also mention that river valleys provided hunter-gatherer societies with a number of ecological niches and special food resources during particular seasons of the year.

The proximity of food resources such as game animals, grains, acorn, and other nuts and fruits, and also easy access to springs and the food security required for wild goat herds throughout the year were probably among the factors in the border valleys that attracted the first sedentary societies on the Sarfirouzabad plain, or in other words, in Mahidasht. Pre-pottery Neolithic sites are located at 1509m a.s.l., and all three sites are located at a distance of 250m from reliable water sources; the sites cover less than one hectare each and are located in places which benefit from various niches. Surface finds from these sites include a bullet-shape core, a backed and sided blade, a sickle blade, micro-blades, a scraper and end scraper, flakes, a blade core and flake core, a discoidal flake core and an amorphous flak core (Figs. 3 and 4).

However, Neolithic pottery remains were collected from 15 sites; 14 of these were settlements. In fact, the only site which had both pre-pottery and pottery Neolithic remains was the Chia chakhmagho mound (SF 015). These settlements are located from 1476m a.s.l. (Ghomesh Dar Amroo S.F 52) to 1647m a.s.l. (Dom-e khor khor S.F 319), of which 4 are located in the northern basin and 11 in the southern basin of the Mereg.

Most of the Neolithic settlements were formed on the first hillock of the southern edge. The water sour-

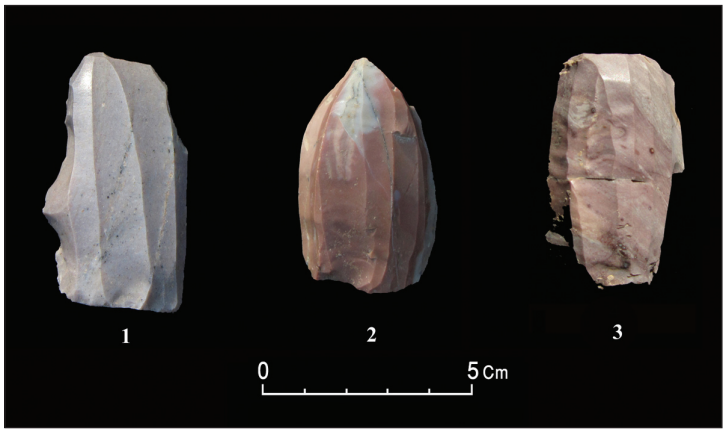

Fig. 4. Pre-pottery Neolithic stone artefacts from Ban Bavani.

ces of most settlements (10) consisted of streams and seasonal drainages of the Mereg, most of which are located at distances less than 250m from the sites. The sites of this period include settlements and seasonal sites. Some settlements were probably used seasonally and for purposes such as hunting, fishing, and grazing *etc*. given the lack of cultural deposits, distance to water, and proximity to hillocks and pastures, and the scarcity and simplicity of the pottery finds. In conclusion, in the pottery Neolithic of Sarfirouzabad plain settlements with areas of approximately 1–2ha were concentrated in the southern basin of the Mereg River and the north side of Mt. Nesar. The reason for the centralisation of these settlements in the southern basin must be sought in the environmental richness of this area. Factors such as abundant drainages of the Mereg outcrop chert and flatter lands and forest are among the attractions and factors in the formation of pottery settlements in the southern basin of the plain. Most surface settlements on these sites yielded coarse, plain, buff, hand-made, chaff tempered and basic forms of pottery (Fig. 6).

Only a small quantity of painted pottery distinctive of the central Zagros Neolithic – relating to Sarab linear and geometric pottery – was obtained from Tape Sarab Sarfirouzabad (SF095) (Fig. 5).

Fig. 5. A sample of Neolithic painted pottery (geometric Sarab style) from Tape Sarab-e Sarfirouzabad.

Conclusion

The results of the survey in 2009 showed that Neolithic sites are merely identified by field-walking surveys, since these settlements are located in areas remote from accessible paths and modern villages, and the absence or scarcity of sites identified is not due to their actual absence, but to approaches taken in field surveys. According to the surface finds and settlement patterns, environmental variables play an important role in locating settlements, as we expected. Settlement patterns show that in the pre-pottery Neolithic period hunting was still very important, while agriculture was probably not the basis of subsistence.

Generally, pottery Neolithic settlements in Sarfirouzabad were based on animal husbandry, hunting, and dry farming and were very dependent on natural resources near rivers and mountainsides; in regard to the location and dispersal of sites and surface finds we can observe the following characteristics: (i) the presence of permanent and semi-permanent settlements with a mixed economy with the evident prevalence of livestock and husbandry; (ii) an increasing tendency of patterning in adopting sedentism; (iii) sufficient knowledge from environmental variables; (iv) relative superiority of a herding economy.

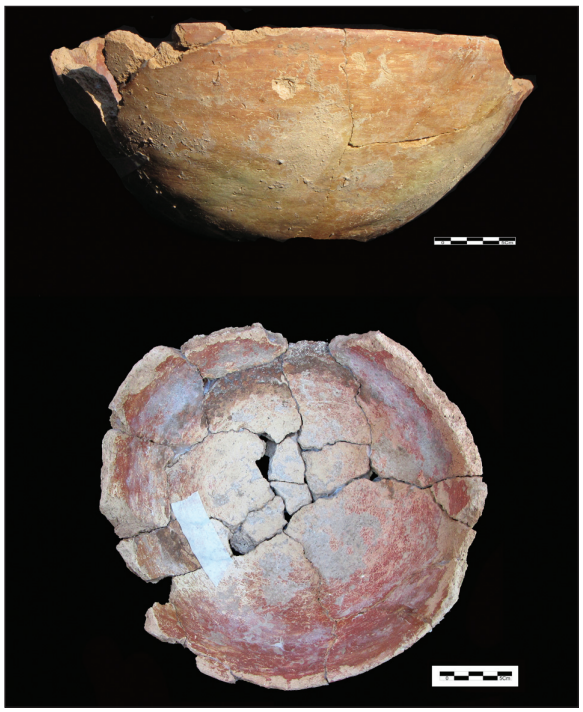

Fig. 6. A sample of plain pottery from Tape Sarab Sarfirouzabad.

ACKNOWLEDGEMENTS

Appreciation is offered to the Iran National Science Foundation (INSF) for a grant to collect site data which were used for this research. The authors would like to thanks all the members of the survey team for their kindly cooperation and A. Javanmardzadeh and S. Alibeigi for providing the map of the region and comments. Grateful thanks to the Cultural Heritage Organization of Kermanshah that provided access to site locations.

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Early villages and prehistoric sites in the Abharroud Basin, northwest of the Iranian Central Plateau

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ABSTRACT – *The Abharroud basin is an important region in archaeological studies of the northwestern outskirts of the central plateau, and the west and northwest of Iran. Considering its environmental capabilities and geographical location, studying the region can leads us to a better understanding of regional relations and also inter-regional interaction between the cultural-geographical regions. During the two seasons of archaeological survey, 257 archaeological sites were discovered, dating from the lower Palaeolithic to recent ages. Of these, 34 sites contained prehistoric remains. Most of the identified sites are the remains of scattered villages and seasonal camps in different areas of the basin, on the plain and also impassable heights.*

IZVLEČEK – *Kotlina Abharroud je pomembna regija v arheoloških študijah severozahodnih obronkov osrednje planote ter zahodnega in severozahodnega Irana. Ob upoštevanju njenih okoljskih možnosti in geografske lege lahko s študijem te regije bolje razumemo kulturno-geografske odnose znotraj regije in med regijami. V dveh sezonah arheoloških terenskih pregledov smo odkrili 257 arheoloških najdišč, ki sodijo v čas od zgodnjega paleolitika do mlajših obdobij. 34 najdišč vsebuje prazgodovinske ostanke. Večina prepoznanih najdišč predstavlja ostanke vasi in sezonskih taborov, ki so razpršeni na različnih območjih kotline, tako v ravnini kot v težko dostopnem višavju.*

KEY WORDS – *survey; the Abharroud basin; settlement; prehistoric period*

Introduction

Archaeological surveys were frequent in the western and especially in southwestern Iran, but unfortunately, we know only little about the past cultures of Zanjan province since no adequate attention has been paid to the cultural and historical remains of this province. Hence, there is very little information about the prehistoric cultures of the region. Considering that the region was attractive to various human groups at different times and the unique location of the region among three different cultural zones on the central plateau in western and northwestern Iran, the study of ancient settlements and the evaluation of their features seemed necessary. Thus, an archaeological project was carried out through two survey seasons in 2003 and 2005 in order to study and identify the archaeological sites of the Abharroud basin (*Aali 2003a; 2003b; 2006a; 2006b*). The project, which was conducted by Abolfazl Aali, provided valuable information about the region from very ancient times up to the present; this paper presents the settlement patterns of the prehistoric sites.

The objectives of the survey

Zanjan province, especially its eastern parts, has always attracted various human groups. The region is rich in natural resources necessary for habitation, such as fertile plains, permanent rivers, streams and springs, animal and plant resources, which makes it a popular area for occupation. The province is located between two mountain ranges to the north and south and the main transport route was always through the plains of Abhar and Khorram Darreh. As this region has been a natural and principal way to connect the central plateau with northwestern

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Iran since the Neolithic, the study of settlement through time is of great value. This region is also important because the road to Great Khorasan passes through it to the east. Therefore, studying the settlement patterns of the region can provide valuable information and a better understanding of the interaction between nearby cultural-geographical regions. The main objectives of the survey were: (i) to identify ancient sites; (ii) to investigate settlement patterns and their distribution in different periods; (iii) to draw an archaeological map of the settlements; (iv) to study inter and intra-site relations and the interaction with the environment in the region; and finally (v) to clarify the nature of relations with nearby regions.

The survey method

The Abharroud basin, which includes the towns of Abhar and Khoram Dareh, is a vast area of 3400km^2, of which 2993km^2 belongs to the town of Abhar and the remaining 407km^2 to the town Khoram Dareh. The first survey was carried out in an area of 1200km^2, which included the entire town of Khoram Dareh and some parts of Abhar. During the second season, the remaining parts of Abhar were covered, which included the districts of Sa'een Qaleh, Sonbol Abad, Sultanieh, Darsajin, and Dolat Abad (*Aali 2006b.18*). Considering the vastness of the area, existing limitations, preliminary knowledge about the conditions of the settlements in the region and its unique location, the region was intensively surveyed with vehicles and on foot. We carefully explored and studied wherever there was a possibility of occupation, such as caves, rock shelters, river banks, areas around springs and streams, valleys, mountainsides, drained river chambers, and seasonal flood areas. In order to have a better understanding of the region, we used maps with a scale of 1: 50 000 and GPS for geographical coordinates. We also enjoyed the help and guidance of local people to find sites, and we examined all the sites that villagers and shepherds informed us about, so that we could search all the sites with any potential. Having identified the sites, we surveyed them intensively, although surface materials were sampled randomly. To record preliminary data, we devised a form on which we recorded geographical information, the dimensions and area of sites, data on the sites (their position and situation, extent of human disturbance, *etc.*), and the quantity and distribution of cultural materials. We also drew a topographical map of each site to be attached to the corresponding archaeological data.

Background to the archaeological research

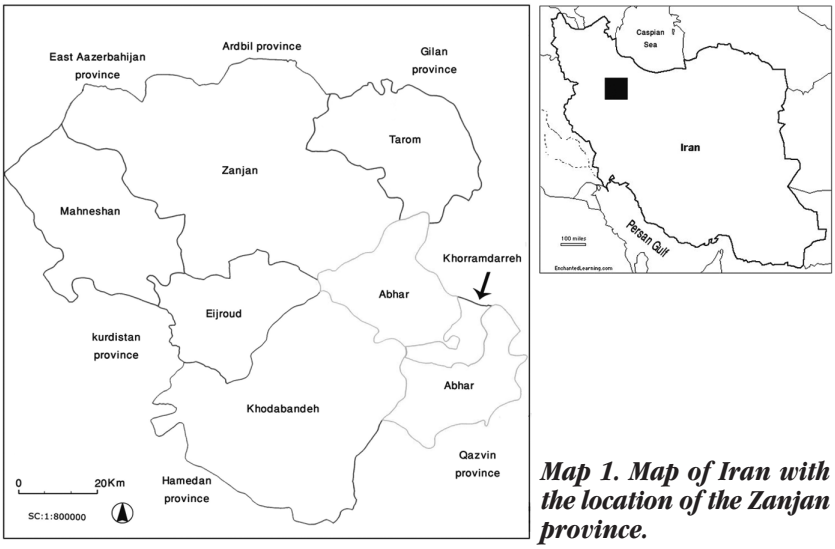
Few surveys have been carried out in this region since the beginnings of archaeology in Iran. Moreover, almost all archaeological surveys were concentrating on the Islamic era and no attention was paid to prehistoric times (for previous field research see: *Aali 2006b*). Archaeological surveys in the Abharroud basin began in the early 1350's, with surveys and excavations in Sultanieh and studies of the remains of the Islamic era (*Ganjavi 1974; 1976a; 1976b*). Although archaeological studies was carried out in the region every now and then, no evidence was obtained on prehistoric cultures until recent years (*Alibaigi, Khosravi 2007; 2009; Alibaigi* et al. *2010; 2011; Alibaigi, Khosravi in press; Khosravi* et al. *2009; 2010; Khosravi, Alibaigi 2008; in press; Masoumi 2008; Aali 2006b*).

Unfortunately, the results of surveys and studies on the prehistory of the region, and even their preliminary reports, have not yet been published. Tapeh Noor, near Sultanieh, is the only prehistoric site, which has been excavated. Prehistoric trenches at the Nour Tapeh were excavated in the summer of 2004 by Parvin Kazempour Esmati, managed by Aliasghar Mirfattah and supervised by the Sultanieh Archaeological Project. There is also little information about the excavations of this important Chalcolithic site. The only information we have is based on personal meetings and a visit to the site during the excavation. In 2009, this site was excavated again by Kazempour Esmati in order to explore the stratigraphy (*Kazempour Esmati 2009*). Tepe Khaleseh, the only Neolithic settlement in the region, was also excavated in the summer of the same year by Hamidreza Valipour (*Valipour* et al. *in press*).

Natural and geographical location

In order to achieve a full understanding of prehistoric occupation conditions in the region, the geographical features must be taken into consideration. Abhar and Khorram Darreh (the Abharroud basin) are among seven towns in the Zanjan province and are located on its eastern border. The Qazvin province bounds Abhar to the east and south, the towns of Khodabande and Ijrud to the west, and the towns of Zanjan and Tarom to the north. The town of Khorram Darreh, with an area of 407km^2, is almost surrounded by the territory of Abhar, it neighbours to Tarom to the north and is surrounded by Abhar on its southern, eastern, and western borders (Map. 1). Khorram Darreh, as the province capital, is located

80km from Zanjan and 95km from Qazvin; it lies 1570m above sea level (*Sazman-e Modiriat va barnamehrizi ostan-e Zanjan 2005.20*).

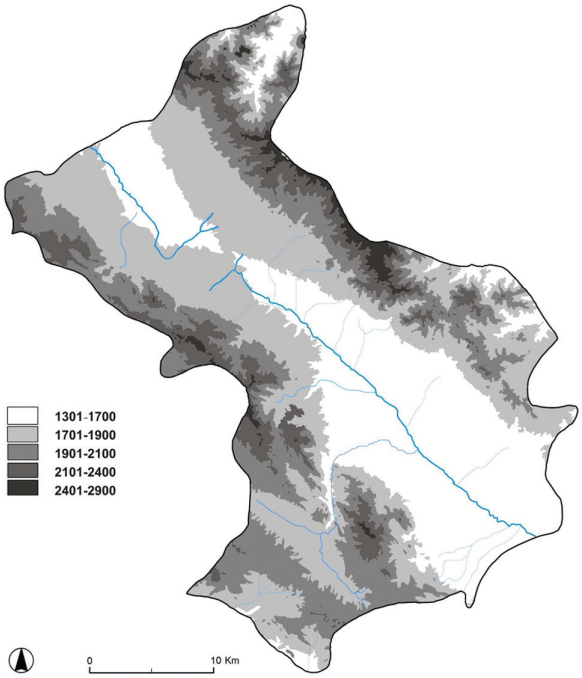


Map 1. Map of Iran with the location of the Zanjan province.

The Abharroud basin is one of the inlets of a salt lake and also a main sub-basin in the centre of the Iranian plateau, which is comprised of two large tributaries, one permanent and the other seasonal. The Abharroud basin, including the plains and valleys of the towns of Abhar and Khorram Darreh, extends from eastern longitude of 48°48' to 49°30' and from the northern latitude of 35°57' to 36°36', in eastern Zanjan. This basin borders the Qezel Ozan basin to the north, the Kharrud river to the south and the Zanjanrud river to the east. The basin includes a highland region on the western part of the Alborz mountain range and on its southern mountainside between two high mountain ranges running east to west (Map 2). The basin covers the area of *c.* 2300km², with 900km² belonging to plains. The mountains in the Abharroud basin are formed in two parallel mountain ranges extending northwest-southeast as a continuation of the Zanjan Mountains from the Mt. Qaflankouh to the plain of Qazvin (Takestan). These mountains are connected to the Alborz mountain ranges to the north and to the Zagros mountain ranges to the south and southwest. The rain and snow, which falls in these mountains, form the various tributaries of the Abharroud, which leave large deposits in the valley and create fertile land for farming. The vegetation in the highlands and mountains makes pastoral activities possible, which in turn led to the development of human societies and economic centres such as Sultanieh, Saeen Qaleh, Heidaj, Khorram Darreh, Abhar, and numerous villages (*Sazman-e Amozesh va Parvaresh ostan-e Zanjan 1996. 16*). The highest point in the basin is the Sendandagh peak, which is 2975m above sea level, while the lowest point is the confluence of the Abharroud and Kharrud rivers at a height of 1250m above sea level. The width of the plain between the two mountain ranges is 17km at its widest; it is covered with quaternary deposits.

The rivers in this basin mostly rise in the western and central mountains of the Alborz. The Abharroud has two tributaries, one of which is seasonal and the other permanent. One of these tributaries runs from Chaman Sultanieh and the other from the mountains south of Kinehvars. The Abharroud is 60km long and the total length of its branches is *c.* 400km.

The climate is semi-arid with very cold winters. The area we studied does not enjoy good vegetation due to the environmental features. The region has steppe vegetation in the form of shrubs. Low areas of the region are almost entirely devoid of vegetation and the vegetation in higher areas includes shrubs and grasses. The average annual temperature is 11.5°C and average yearly rainfall is 412.7mm (*Baghche Kord Mahale 1999.a*).



Map 2. The Abharroud valley.

Archaeological remains

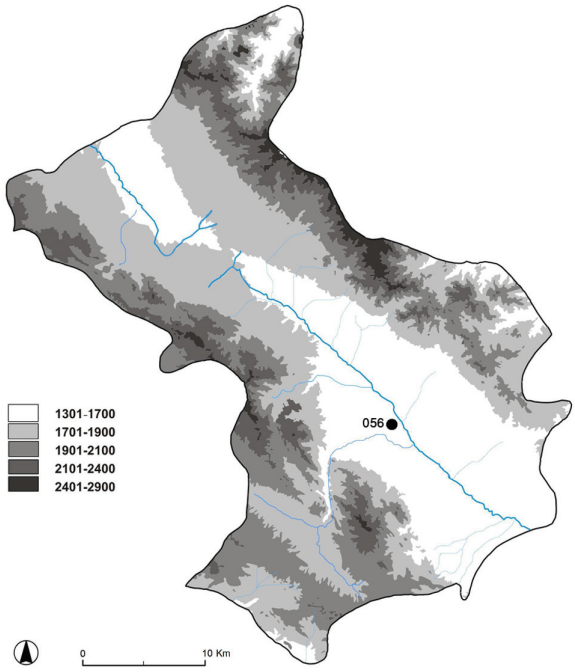
The two survey seasons led to the identification of 257 sites, which are very variable and remarkable in terms of type, appearance, temporal and spatial distribution. These include: Tapeh or tells, open sites, castles, towns, caves, baths, aqueducts, shrines and other religious sites. During the two seasons, 34 prehistoric sites were discovered in an area of 3400km^2. These include one Lower Palaeolithic site, one Neolithic site, 25 Chalcolithic sites, and 7 possible Bronze Age sites. The prehistoric sites were identified in tell sites and plains (Figs. 1–2), but studies of several caves and rock shelters did not produce any evidence of prehistoric settlement.

The Palaeolithic period

The earliest evidence of human settlement in the Abharroud basin goes back to the Lower Palaeolithic period. The only site identified (Tapeh Khaleseh) is located near the town of Khoram Dareh (Map 3). Tapeh Khalese includes the remains of a small settlement located within the gardens south of Khoram Darreh and on the terrace of an old drained river. Most surface remains in Tapeh Khaleseh date back to the Neolithic period. During the first season of the survey, and also as a result of several visits to the site between 2003 and 2007, a collection of chipped stones was discovered from the disturbed layers of the site and at a depth of about 2.5m lower than the surrounding lands. This collection, which is probably Lower Palaeolithic, includes axes, cores, core-choppers, hammer-stones, flakes, one heavy-duty scraper and one cleaver-like tool (Fig. 3; Pl. 1) (*Alibaigi 2009; Alibaigi, Khosravi 2009; Alibaigi* et al. *2010*).

The Neolithic period

Most of the material indicating the Neolithic period consists of several types of pottery from Tapeh Khaleseh, which includes red or buff potsherds with thick clay slips in orange, cream, brown and buff colours. Most of the potsherds are coarse, soft and chaff-tempered. All the pottery is hand-made, but fired at different temperatures. Both basket and slab techniques were used to make the vessels. Although some of the ceramics have been fired sufficiently, their surface tends to be multicoloured as the result of using open kilns. Most of the ceramics are open vessels, but closed rims are also visible. There are some interesting samples with rectangular rims; of these we can mention small bowls and small jars. Some pottery is painted with red, black or dark brown coloured geometric and plant motifs such as zigzags, hatched triangles, ladder-like patterns and



Map 3. The Khaleseh (AB. 056) in Abharroud valley. Location of the Paleolithic and Neolithic sites.

assemblages of wheat or flowers. Both the exterior and interior surfaces are painted, but the paints are applied mainly to the shoulder and base parts of the pottery. Most vessels have carination in the upper part and their forms often include small and large bowls, jars, crocks and large vessels with inverted rims (Fig. 4; Pl. 2). Some of them also have basket handles. The close similarity can be seen between the pottery of this site and other Neolithic sites like Haji Firuz in northwestern and Charboneh and Maay Tepe in Iranian central plateau (*Rezaei Kalaj* et al. *2010; Voigt 1983; Fazeli Nashli 2007*). The investigation of several prehistoric settlements in the Abharroud basin suggests that Tapeh Khaleseh is probably the earliest permanent settlement in the region (*Alibaigi, Khosravi 2007*).

The Chalcolithic period

The lack of scientific excavations of the prehistoric sites in the Abharroud basin and the lack of stratigraphic information make it difficult to sub-divide the Chalcolithic period in the region. However, excavations at sites such as Tapeh Ghabrestan (*Majidzadeh 1977; Madjidzadeh 2008; Fazeli Nashli 2006*), Ozbaki (*Majidzadeh n.d.; 2004; 2010*), Esmail Abad (*Fazeli Nashli, Ajorlou 2006*), Tapeh Shizar (*Valipour 2006*) and Soha Chai Tapeh (*Aali 2008*) have provided valuable information about the Chalcolithic and Bronze Age cultures on the northwestern outskirts of the central plateau of Iran and Zanjan province.

As result of the survey, 25 Chalcolithic sites were identified. Other than settlement sites, another Chalcolithic site, Chakhmagh Dasheh, was discovered that had different occupational features. The surface material such as various cores and flakes and other unused tools indicate that the site, located on a mountainside, was probably a workshop producing chipped stones.

The Chalcolithic pottery from the region consists of sherds with red, orange, grey and smoked paste. The exterior surfaces are covered with dark red (early Chalcolithic phase), red or grey (middle Chalcolithic phase), and reddish orange or light grey (late Chalcolithic phase) slips. This pottery is all hand-made and fired at low temperatures; therefore the cores are smoked. Some potsherds are decorated with rather plain geometric patterns, and in a few cases with motifs of animals painted in dark colours. The vessels are rather plain in form and include small and large bowls, vessels with vertical bodies and plain rims, crocks and storage jars (Figs. 5–16; Pls. 3–8). Furthermore, during the survey of other sites such as Kharabeh I, Guy Sadeh, Falj, Chakhmaghlukh, Qieh, Karvansara, Shahrbanoo and many others, potsherds from the middle and late Chalcolithic periods were discovered, which are contemporary with settlements in the central Zagros like Godin Tepe (*Cuyler Young, Levine 1974; Henrickson 1983*), Dalma Tepe and Tepe Sivan in northwestern Iran (*Hamlin 1975; Soleki, Soleki 1975*) and Tepe Ghabristan and Tepe Ozbaki in Iranian central plateau (*Madjidzadeh 2008; 2010*).

The number of sites relating to this period indicates remarkable growth in population and settlements compared to previous periods. The sites in this period were scattered both on the plains and in the highlands. The southern heights and mountainsides of the basin host 10 sites; 8 sites are located in the northern heights and mountainsides and 7 are located on the plain, close to the Abhar river. The highest site lies 2150m above sea level, while the lowest is 1490m above sea level (Map. 4). The Chalcolithic settlements are usually located less than 200m from the nearest water sources.

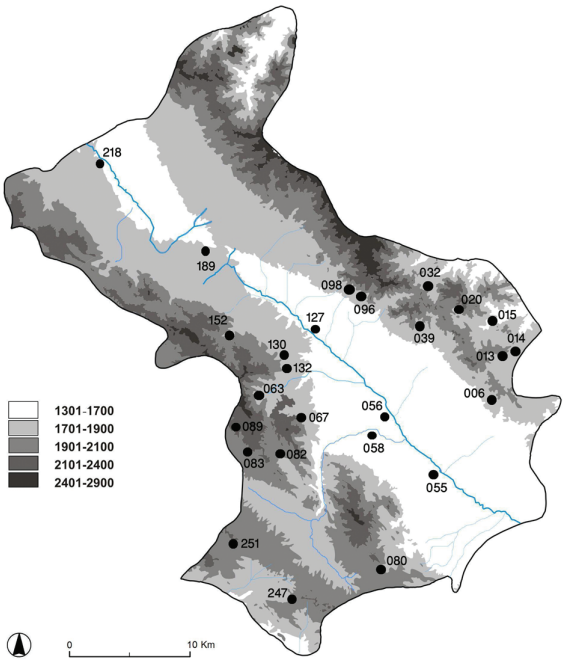
The Bronze Age

A total of 7 Bronze Age sites were identified. Of these, two (AB. 055 and 189) had been occupied during the Chalcolithic period and continued into the Bronze Age; the remainder were new sites. Such a change in the number of sites indicates a relative shift in settlement patterns in the Bronze Age compared to the preceding periods. The cultural material from tell and open-air sites generally consists of grey-black and red-coloured potsherds that are typical for the Bronze Age in the west and northwest and for the late Bronze Age in the centre of the Iranian plateau.

The early Bronze Age material is marked by grey-coloured pottery (the so-called Yanik style). These vessels are all hand-made, mineral-tempered and fired at low temperatures. The pottery occurs in the form of small and large bowls and straight-walled vessels. In addition to these, several potsherds with orange slip were found at these sites (Fig. 17; Pl. 9). These vessels are also hand-made and rather coarse.

During the survey of Qaleh Tapeh in Abhar, in addition to the early Bronze Age potsherds (Yanik style), some late Bronze Age (the so-called Sagz Abad style) potsherds were found which are consistent with the pottery tradition of the late Bronze Age in the central plateau (Sagz Abad, Qoli Darvish). This handmade and coarse pottery is characterized by sand inclusions, is coloured from buff to red paint, and the vessel surface was decorated by irregular black and red bands (*Masoumi 2008*).

Chalcolithic and Bronze Age potsherds were found together at two sites. Generally speaking, the Bronze Age sites of the area are related to the Yanik culture known in northwestern and western Iran. For example, Yanik pottery was found on two sites: Qaleh Ta-



Map 4. The Abharroud basin; the distribution of Chalcolithic settlements.

peh and Aliyord Tapehsi (*Khosravi 2009; Asgarian 2001*). All Bronze Age sites are located in the southern areas of the basin while there are absent in the northern part. Like in the Chalcolithic period, the sites are scattered in both the plain and the highlands (1497 to 1972m above sea level) (Map 5). There is a drastic reduction in the number of settlements compared to previous periods (only Qaleh Tapeh was settled continuously from the Chalcolithic to the Bronze Age).

Conclusions

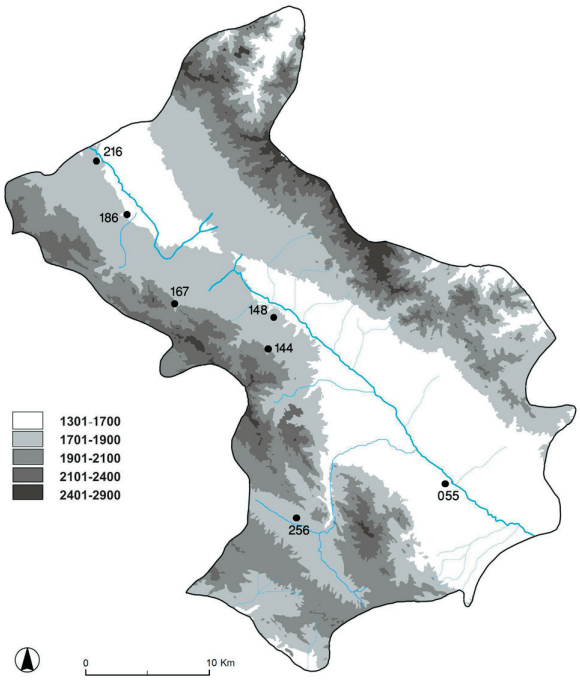
The two seasons of archaeological surveys in the Abharroud basin produced valuable information on the cultures of various periods in the region, especially in prehistory. The survey results provided significant evidence on relations between the prehistoric cultures of the region and contemporaneous cultures in the central plateau and western and northwestern Iran. Lack of sufficient information and scientific excavations in the basin compels us to date the sites on the basis of a typological comparison between the finds of this region and those of contemporary cultures in neighbouring areas. According to our studies, the data obtained from surveying the prehistoric sites reveal evidence of a period of occupation between the Palaeolithic and the end of the Bronze Age (Map 6).

The settlement distribution shows that the only Neolithic site in the region, Khaleseh, is located in the centre of the plain and on the bank of the Abhar river. As the areas around the river have been ploughed, it is possible that small Neolithic sites have been destroyed. Furthermore, it is also probable that the remains of this period are buried under natural sediment or under the remains of the Chalcolithic or more recent periods.

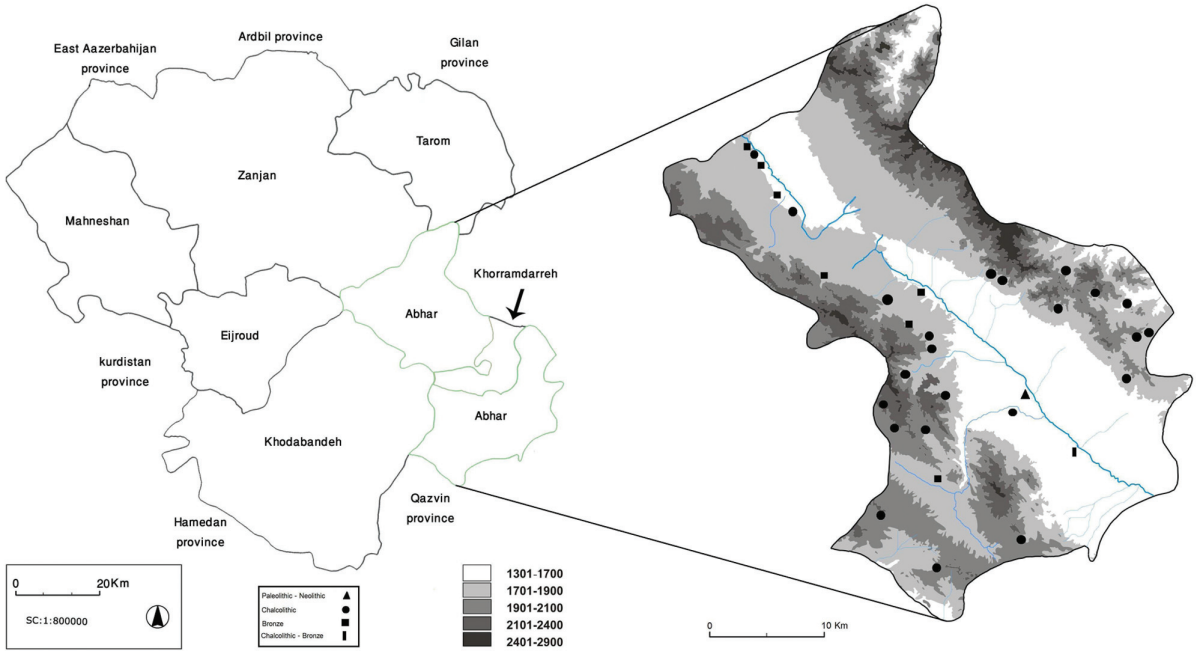
All of the Neolithic and later sites, except for the single Chalcolithic site (Chakhmagh Dasheh AB. 132) were probably settlement sites and villages of varying sizes, scattered over a vast area of the region. In general, prehistoric settlements can be found in many areas of the basin. Early settlements are relatively rare in the high mountains and the areas between the Abharroud river and northern mountains. Cold weather, rocky terrain and the absence of permanent water sources seem to be the main reasons for this rarity. Prehistoric settlements, especially those of the Chalcolithic period, are usually located on mountainsides. Permanent springs played a significant role in the development of these settlements in the northern mountains.

Geographical features undoubtedly had a decisive influence on the development and distribution of settlements. All the identified sites, except for Chakhmagh Dasheh (AB. 132), were probably villages and/or seasonal camps of various sizes, which developed near permanent water sources such as springs and rivers, many of which still have water and are being exploited today. A few sites are located near streams and drained channels. Like today, rocky terrain and areas without permanent water sources were rather neglected.

As mentioned above, Chalcolithic sites are more frequent in the southern areas of the basin than in the northern parts. This may be due to the difference between the environmental conditions of the two areas. The land between the Abharroud river and its northern mountain has a pebbly soil and lack of permanent rivers. In contrary, the southern part of the Abharroud basin has a more fertile land accompanied by permanent rivers and springs. Most of these sites are small settlements whose dwellers seem to have lived on cultivation, hunting and animal husbandry. Considering that some of these settlements are located at elevations above over 1700m and taking into account the fact that the region is very cold in autumn and winter, it is very probable that the highland settlements belonged to nomadic people.



Map 5. The Abharroud basin; the distribution of the Bronze Age settlements.



Map 6. The Abharroud basin; the distribution of prehistoric sites.

The finds generally suggest the influence of cultures known in neighbouring areas and cultural contact with contemporary prehistoric cultures in the northwest, west and centre of the Iranian plateau.

We should restate that, due to the fact that most of the areas around the Abharroud are now farms and gardens, it is probable that early settlement sites – which usually developed in lowlands and over small areas – have disappeared. Unfortunately, as in many other regions in Iran, most of the ancient sites in the basin have been destroyed by human activity and illegal excavations. Neglecting such damage may give rise to unwelcome errors when presenting settlement patterns. Therefore, these problems must be taken into consideration when establishing regional chronologies, settlement patterns, and rank-size graphs of different periods.

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Fig. 1. A view of Nour Tapeh (AB.189); a large Dalma settlement near Sultanieh.

Fig. 2. A view of Burokh Tapeh (AB.218); a Dalma settlement near Sultanieh.

Fig. 3. The Khaleseh site; a possible Lower Palaeolithic stone tool assemblage.

Fig. 4. The Khaleseh Tepeh (AB. 056); the Neolithic painted pottery.

Fig. 5. A Dalma painted pottery found at Nour Tape, Sultanieh in 2002 (courtesy of the Archaeological Museum of Zanjan).

Fig. 6. The Karvansara site (AB. 014); the Dalma painted pottery.

Fig. 7. The Algezir Chay site (AB. 152); the Chalcolithic painted pottery.

Fig. 9. The Shahrbanou site (AB. 013); Dalma painted pottery with the representation of goats with long horns.

Fig. 8. The Shahrbanou site (AB. 013); the Chalcolithic painted pottery.

Fig. 10. The Khorasanlo site (AB. 096); the Middle Chalcolithic grey carved pottery.

Fig. 11. The Guy Sadeh site (AB. 251); the Chalcolithic painted pottery.

Fig. 12. The Chakhmaqloukh site (AB. 082); the Late Chalcolithic pottery.

Fig. 13. The Kohneh Ghabrestan Baghdareh site (AB.063); the Late Chalcolithic pottery.

Fig. 14. The Chakhmaqloukh site (AB. 082); the Chalcolithic pottery with stamp seal impression.

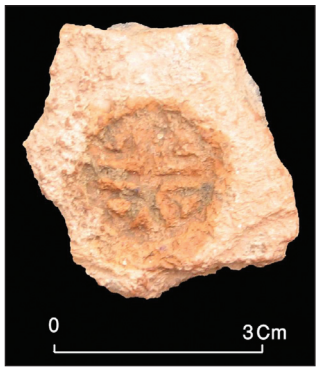
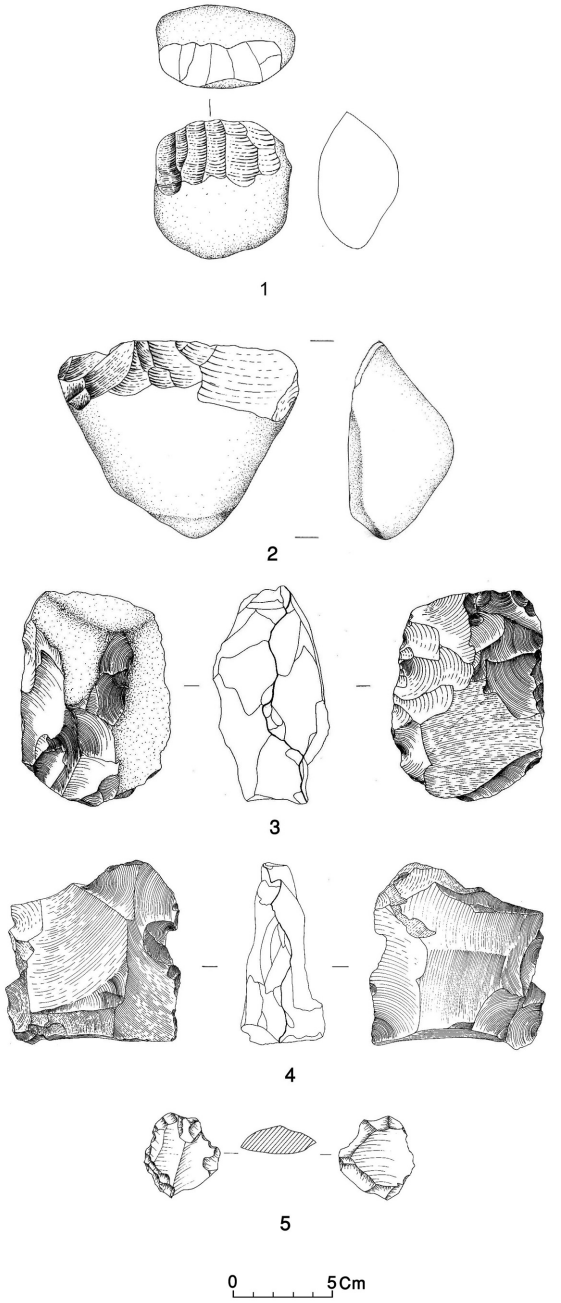


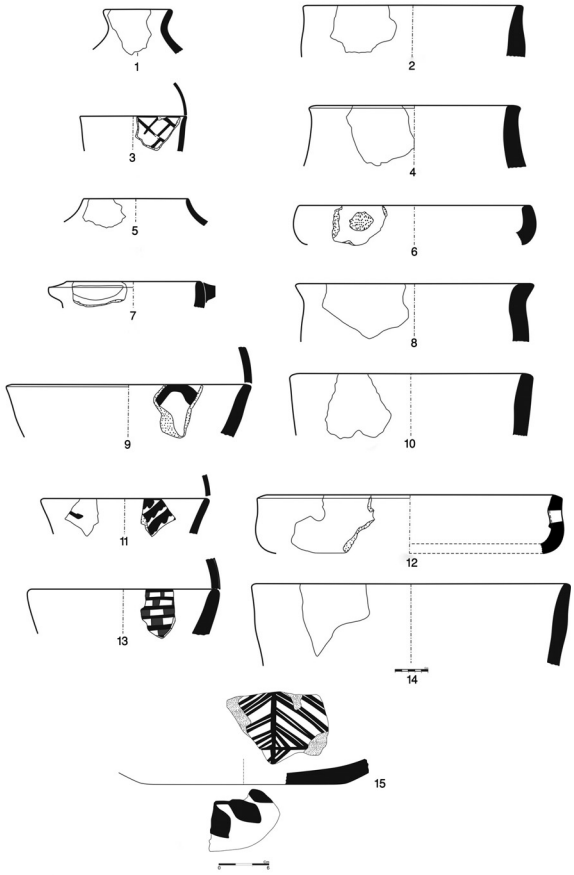
Fig. 16. The Shahrbanou site (AB. 013); the Chalcolithic stone tools.

Fig. 15. The Falj site (AB. 067); the Chalcolithic decorative object.

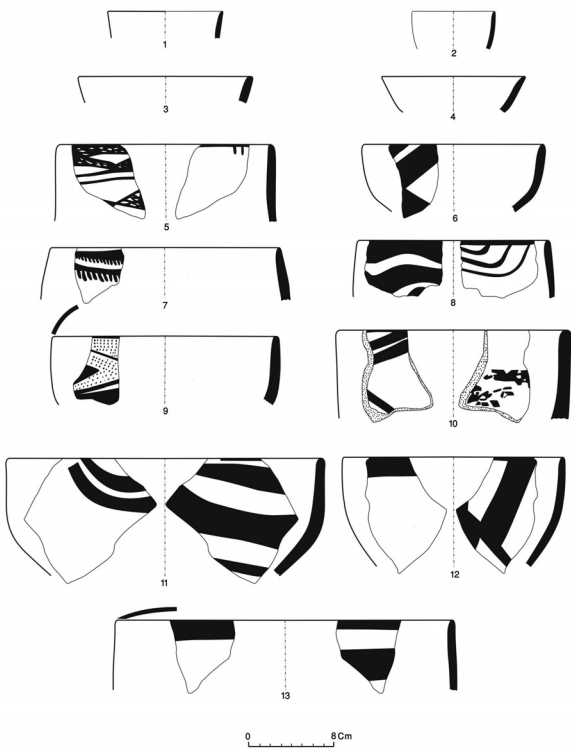
Fig. 17. The Aliyord Tapesi site (AB. 146); the Early Bronze Age pottery.



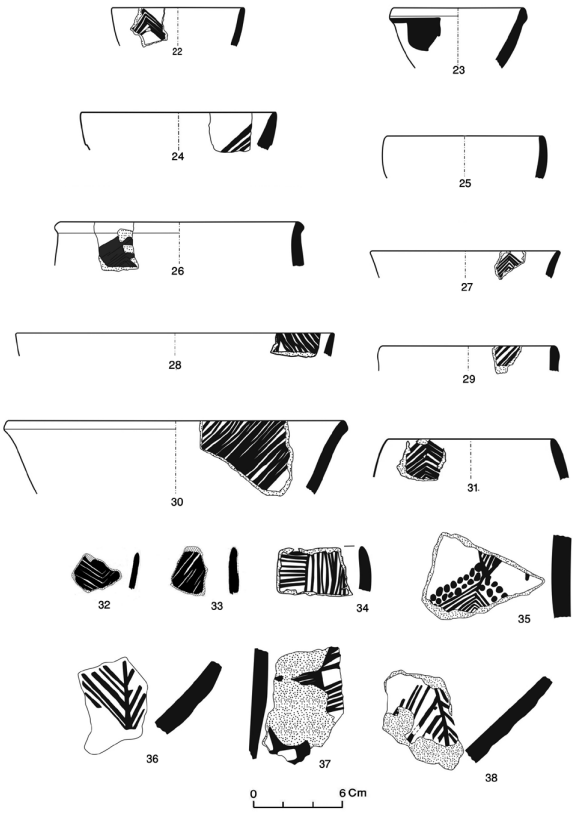
Pl. 1 . The Khaleseh site. 1– 2 choopers, 3 core, 4 large core fragment, 5 retouched flake.



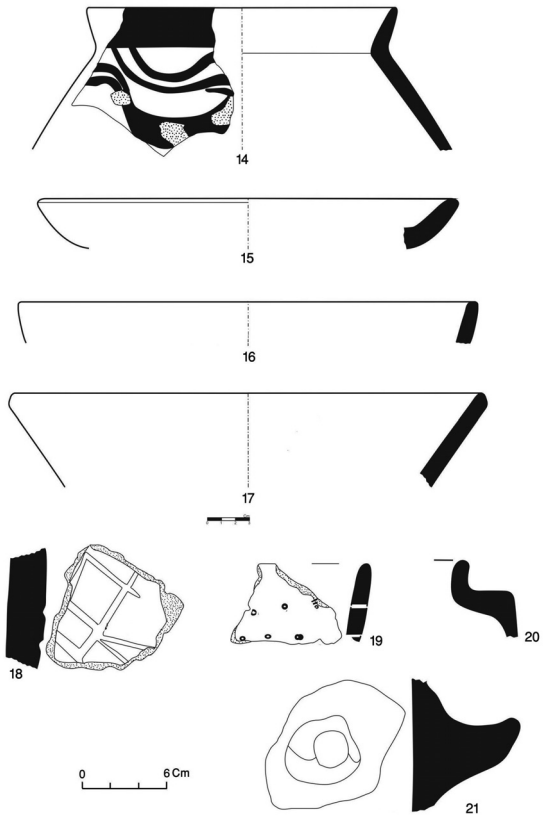
Pl. 2. The Tepeh Khaleseh; the Late Neolithic pottery assemblage.



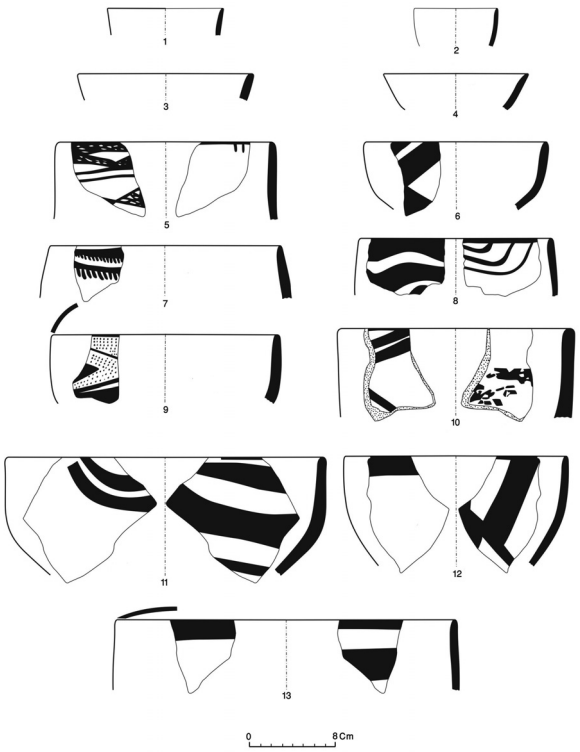
Pl. 3. The Abharroud basin; the Chalcolithic pottery assemblage.



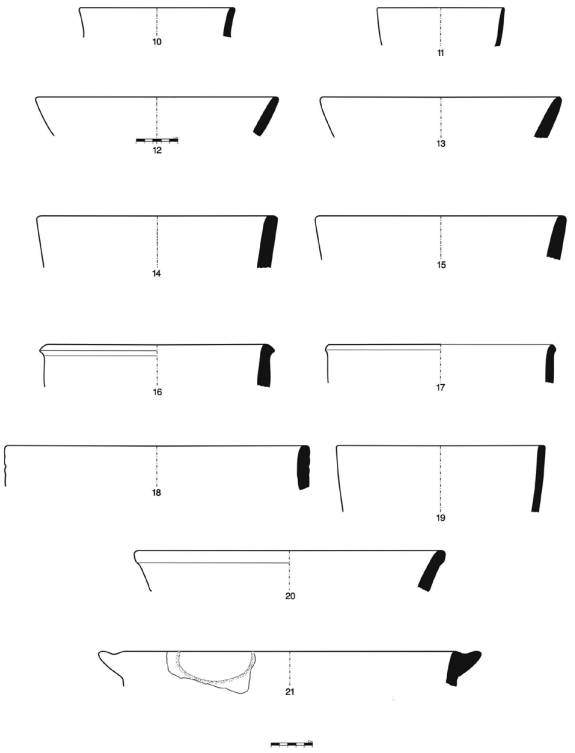
Pl. 4. The Abharroud basin; the Chalcolithic pottery assemblage.



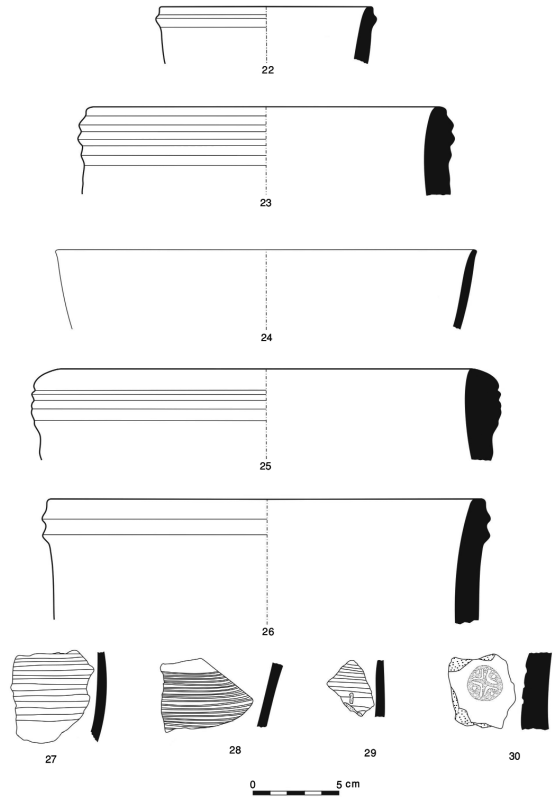
Pl. 5. The Abharroud basin; the Chalcolithic pottery assemblage.



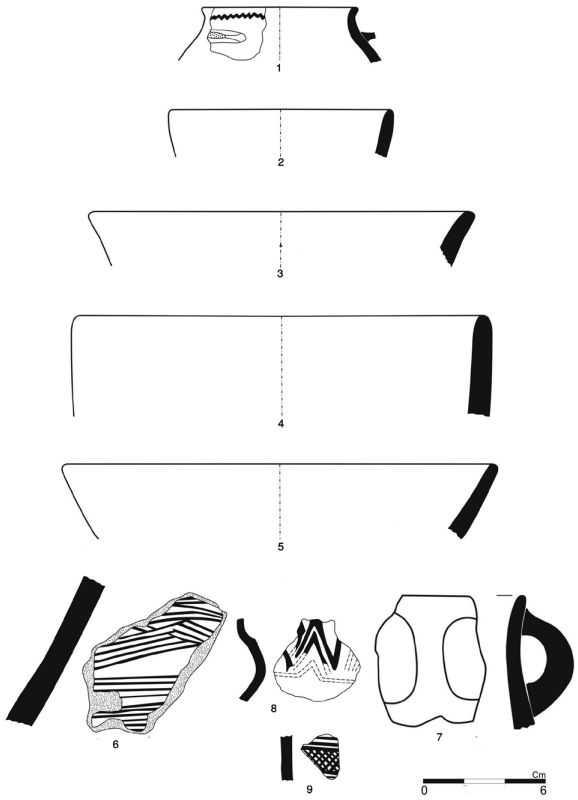
Pl. 6. The Abharroud basin; the Chalcolithic pottery assemblage.



Pl. 7. The Abharroud basin; the Chalcolithic pottery assemblage.



Pl. 8. The Abharroud basin; the Chalcolithic pottery assemblage.



Pl. 9. The Abharroud basin; the Bronze Age pottery assemblage.

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Book review

Francesco Menotti

Wetland Archaeology and Beyond. Theory and practice. Oxford, Oxford University Press, hardback, 568 pages, 116 figures, 26 maps, 6 tables, 234x156 mm, ISBN 978–0–19–957101–7

'Wetland archaeology' is a sub-discipline of mainstream archaeology which deals with waterlogged archaeological remains. In this book, Prof. Francesco Menotti presents the potential of wetland archaeology, its methods and the research questions it addresses to a wider public, archaeologists and non-specialists alike.

The book is divided into nine chapters. In the first, 'Wetland Archaeology Inside Out', the author describes the history of wetland archaeological research (*e.g.*, the discovery of Swiss lake-dwellings) and its contribution to mainstream archaeological thought. This is followed by a global outline of wetland archaeological sites, with descriptions of settlements, their geographical location (with 26 maps covering Europe, Africa, Asia, Oceania and America), chronology, economy, environment and culture. It has been demonstrated that interactions between people and wetlands is a worldwide phenomenon (some areas that are now dry were formerly wetlands), and these communities did not live in hostile, isolated areas. Chapter three explores the relationship between people and their habitats, explaining how and why people choose specific types of wetland and how these choices varied through space and time. At Lake Zurich, for example, an increase in red deer hunting at the beginning of the 37th century BC, coincided with an abrupt deterioration of the climate (colder and wetter), which caused crop failure. These environmental changes affected not only the economy of the community (more hunting and gathering), but also influenced artefact technology (the production of stone blades attached directly to a wooden handle without antler sleeve). Climatic changes also caused fluctuations in lake water levels, and in many cases, archaeological settlement patterns changed. At wetland sites (in contrast to 'dryland' archaeological sites), the preservation of organic materials is excellent, and the fourth chapter deals with the rich archaeological evidence of house construction throughout the world, the organisation of settlements, transport and trade, material culture and sacred ritual practices. The fifth chapter presents various methods of archaeological survey, excavation, preservation and conservation measures. Due to the specific natural conditions of wetlands, discovering a site is difficult, while methods of excavation vary according to the type of wetland and hydrological conditions. Preservation depends on waterlogging, pH and the redox potential of a site. Bones, for example, are better preserved within well-drained or waterlogged neutral to calcareous environments, whereas the skin and internal organs of 'bog' bodies are better preserved in peat bogs. Surprisingly, wetland environments are not very favourable for the preservation of ancient DNA. Wood, although usually well preserved in waterlogged conditions, needs specific conservation treatment after excavation before it is displayed in the museum. Due to the complex nature of the evidence, multidisciplinary research is essential, and the sixth chapter outlines the contribution of most common disciplines: dendrochronology, archaeobotany, archaeozoology and geoarchaeology. Prof. Menotti draws attention to the importance of planning and the standardisation of sampling strategy well before the beginning of the archaeological excavations. A case study from Arbon Bleiche 3 (Lake Constance), for example, is used to demonstrate how multidisciplinary research and the thoughtful planning of excavation and sampling can improve the interpretative possibilities of the research. In this Neolithic village, which was occupied for only a short period (3384–3370 calBC), distribution analyses, archaeobotanical and archaeozoological research suggest a division of labour between food and artefact production in individual houses. The histories of individual houses were also reconstructed by means of soil micromorphology. In order to better understand past societies, and the technologies and tools they used, experimental archaeology is very important, and some successful examples of these efforts (*e.g.*, construction of a house, driving wooden piles into the ground, building track-ways, water transport, basketry, tools and experimental crop cultivation) are presented in chapter seven. Chapter eight puts wetland archaeology into a wider context, stressing that

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these sites were not 'oases' and that more emphasis should be put on the wider cultural, chronological and geographical contexts, as well as people's identity and their social world. In conclusion, the author also addresses the problem of wetland preservation. Human activities (*e.g.*, desiccation, erosion, exploitation of water for agricultural and hydro-electric purposes) and climatic fluctuations significantly endanger cultural heritage. Wetlands are disappearing. Since 1700 AD, more than half of the wetlands in USA have been destroyed; therefore, monitoring projects and measures to protect archaeological sites are essential. It is important to raise awareness of the need to protect world wetland cultural heritage.

This book is very clearly written and a real pleasure to read. It includes a useful glossary and several very interesting case studies – I wish there were more of them. As mentioned in the 'Preface and Acknowledgements', the book attempts to cover the whole world, which is a very ambitious goal, so some areas are, understandably, presented in more details than others. However, the book is a very valuable overview of this very wide topic, and includes a long bibliography which is a good-starting point for further investigations. It is essential reading.

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