

The supply system of siliceous rocks between the Drava, Sava and Danube rivers during the Starčevo culture

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ABSTRACT – This paper analyses the production processes of chipped stone artefacts from ten Starčevo culture sites in the area between the rivers Sava, Drava and Danube. The aim was to compare the results of assemblages analysis from individual settlements to reconstruct the existence and extent of relationships between settlements and their inhabitants. The results showed that in the area between Sava and Drava during the early Neolithic period, a system for acquiring and processing raw materials and the production and exchange of stone tools among the settlements developed. The Starčevo culture population was familiar with the environment and resources, and had developed a system of procurement and distribution of raw material and intermediate goods.

IZVLEČEK – V članku analiziramo produkcijske procese odbitkovnih kamnitih orodij iz desetih najdišč kulture Starčevo na području med rekami Savo, Dravo in Donavo. Namen raziskave je bila primerjava rezultatov analiz skupkov iz posameznih najdišč za rekonstrukcijo obstoja in obsega odnosov med naselbinami in njihovimi prebivalci. Rezultati kažejo, da se je na području med Savo in Dravo v obdobju zgodnjega neolitika razvil sistem za pridobivanje in obdelavo surovega materiala ter produkcijo in izmenjavo kamnitih orodij med naselbinami. Prebivalci kulture Starčevo so poznali okolje in naravne vire, in tako so razvili sistem pridobivanja in distribucije surovin in polizdelkov.

KEY WORDS – Slavonia (Croatia); Starčevo culture; lithics; distribution; sites; raw material

Introduction

In this paper, the organisation of lithic production at Starčevo sites in the area between the rivers Sava, Drava and Danube is analysed. Material originates from the sites Slavonski Brod-Galovo, Zadubravlje, Ivandvor, Tomašanci-Palace, Virovitica, Šagovina Cernička, and several locations in Vinkovci (they all probably belong to the same large settlement). Since material originates from excavations of varying scope and methodology, these factors also influenced the final composition of the assemblage. The range of artefacts per site ranges from 1 to several thousand, as in Slavonski Brod-Galovo and Zadubravlje. For these reasons, it is hard to draw firm and comprehensive conclusions about aspects of the chipped stone industry. Some sites were excavated on very large surfaces, using precise methodology, so information on the quantity of artefacts can be

considered realistic. Although the methodology of excavation and data collection was different, recently investigated sites in each group justify the division of the settlements. This enabled conclusions about the production of chipped stone artefacts between the Sava, Drava and Danube during the Starčevo period. According to the established site typology, each settlement was classified into one group based on the amount of production types in the assemblage. Austro-Hungarian maps were used to approximate walking distances in hours between settlements and mutual 'availability' depending on natural obstacles. Given the highly altered landscape due to Austro-Hungarian and modern land reclamation, the construction of embankments and canals for drainage, for information on wetlands and flood areas were used from 'Croatia on 18th secret Military

Maps', and 19th Century – 'Brod Regiment' and 'Građiška Regiment' Military Maps published by the Croatian Institute for History (*Buczinsky et al. 1999a; 1999b*). Based on the available data, we found that in the Early Neolithic in the area between the Sava, Drava and Danube, there was a choice of raw materials, and a system of raw materials procurement, production and distribution between settlements as in other parts of Europe in this period.

Settlement types according to the production of lithic artefacts

Irrespective of the distance and availability of sources of raw material, it was necessary to insure quantities which would satisfy the needs of the whole community. Also, irrespective of distance, the final stage in the production of tools occurred in the settlement itself. The place of use could also be partially confined to the settlement itself, but some objects moved with their owners. Rejected pieces and some lost pieces could be found again in association with the settlement, because personal property was safer inside the settlement. Storage (utilitarian and symbolic) and graves were special cases, since objects were kept for later use, or in the other world. Artefacts could take a rather simple route from the source of the raw material to the settlement, or to the place of use, which did not necessarily have to be in the same location. Different stages of workshop activity could occur between these locations (*Balcer 1995*). We could recognise specific 'industrial zones' in different periods and for different raw materials, such as regions of exploitation of chert and radiolarite in the Bakony Mountains (*Biró, Regénye 1991*). The reconstruction of the movement of objects presents a significant challenge. Different members of a community would have exploited, produced and used different types of artefact, which potentially reflected the social structure. The position of the artefacts depends on geological and geographical characteristics, as well as the division of labour and their passing through many different hands during their lifespan – from raw material to discarded and worn out artefact, which then became waste to be removed for security reasons. One and the same block of raw material could end up in different ways, in the hands of different people, in different stages of production simultaneously, and during the long period in which the artefact was remodeled and modified several times for various uses. One person could transfer one pre-core to different places and distribute it among various users, without the necessary context of sophisticated forms of

social contact and exchange systems. The finished tool did not have to remain in the community whose member made it. It was common for products to be transported to other communities of the same cultural group. Distance from the source can be tracked from the level of use of almost all artefacts, as well as re-modeled tools, while at production sites there was some profusion, since even larger and still useable segments of cores were used as tools. The distribution of regional raw material sometimes corresponded with the borders determined by other elements of material culture. The rules of access to the raw material still remain unclear. We can only draw conclusions on the basis of the relationship between the amount of waste and number of tools at specific locations. Obviously, the pattern changed, depending on the raw material and chronological period. This relationship between the amount of raw material, waste and tools at specific sites has enabled the differentiation of several types of Early Neolithic settlement: (1) extraction/exploitation, (2) production, (3) distribution, (4) consumption, (5) self-sustained, (6) no procurement, but production present, (7) tool production and use.

The linear path of raw material in systematised groups of settlement is 1–4. The path can, of course, be shorter or different, depending on the type of raw material and the usual means of transportation. Of course, we frequently find in one settlement an overlap between certain groups. In addition to the *chaîne opératoire* for determining the type of settlement, we have found very useful the scheme of the 'life-cycle' of the object from extraction from the rock to discarding, created by M. de Grooth (*1997*). The scheme was originally devised for chipped stone material, but is applicable to almost all artefacts. According to this scheme, we can determine respectively for every site which activities linked to production occurred there, and whether the settlement had contacts (and of what kind) with other settlements. It is very difficult to determine the origin of some objects – exchanges sometimes leave a very limited number of traces, which is obvious from ethnographic analogies (food, spices, textile, cattle), and we can detect only those objects that are not prone to deterioration. The cooperation which had to exist between the first allochthonous agriculturalists and the autochthonous settlers of the Trans-Danube region was also conducted through patterns of exchange. Indigenous settlers were familiar with sources of Szentgal radiolarite, raw material crucial for farmers, and hence they exchanged it for skills such as house building and plant cultivation, or for provi-

sions, such as meat and salt (*Banffy 2004*). Settlement typology was adapted to the area between Sava, Drava and Danube rivers according to Lech (*1981; 1983; 1989*) and Matetiucova (*2008.99–102*).

- The first group includes settlements or system of settlements the activity of which was exclusively or mostly linked to raw material extraction from a quarry. These settlements were situated in the close vicinity of the quarry and contained numerous traces of processing of raw material into cores and other products, and little or no trace of occupation or dwelling.

- The second group refers to production settlements with large amounts of waste material, blanks, discarded and worn out cores, core rejuvenation flakes, overshot blades, and unfinished tools. These were large settlements the basic function of which was handling and processing raw material.

- The third group is the hardest to detect and was probably the rarest. In regions situated far from primary sources of raw material, some settlements were detected which served as secondary distribution centres of raw material.

- The fourth group comprises settlements which exclusively used final products obtained through exchange for other products such as wheat, pottery, or meat. On occasion, in times of shortage or disrupted supply, the settlers produced certain ad-hoc tools themselves from locally obtainable material. Due to the developed system of exchange in the Early Neolithic, there was a large number of such sites, such as Vörs, Devavanya, Golokut (*Kalicz et al. 2002, Kaczanowska, Kozłowski 1985*).

- The fifth group consists of settlements which produced enough for their own needs, and neither obtained raw materials and cores and/or blanks from others, nor distributed their own products. Such settlements appear in the Late Neolithic (for example, the Sopot Culture). In some cases, we can demonstrate an independent supply in certain communities, whose members undertook acquisition expeditions to quarries or mines for the raw material they required. Individuals came here from distant settlements situated in regions suitable for early agricultural communities, and returned home with the necessary amounts of raw material, without processing the raw material at its source (except perhaps the basic separation of material of evidently poor quality).

- The sixth group includes settlements which obtained raw material from someone else, while performing the ensuing stages of production themselves – these were settlements which participated in a specific system of exchange (such as Byłany in eastern Czech, Skroszowice, Niemcza, Stráchow – all three in southern Silesia). These sites confirmed the group specialisation of certain settlements for exploitation, preparation, and distribution as early as the second half of the 5th millennium BC.

- The seventh group procured raw material already processed into blanks, and, if necessary, additionally processed these into tools. The existence of the sixth and seventh groups was frequently determined by the type of raw material used, and equally by the skill of specific settlers. In regular settlements, some stages of tool processing were also present, but the concentration of waste material was much smaller. The difference between a settlement and a workshop was observable in the inversely proportional relationship between the number of tools and the amount of waste.

The analysis of the production process has proven the existence of intensive production in all the stages at the sites of Zadubravlje and Slavonski Brod–Galovo. The production of blades and flakes from already prepared cores has been confirmed at Virovitica–Brekinja, Ivandvor, Vinkovci–Zvijezda, Vinkovci–Nama and Vinkovci–Hotel. Traces of production were not found on the sites at Tomašanci–Palača and Šagovina Cernička.

Table I shows the quantity of finds per m² on the sites. These figures, although quite significant, might in some cases not reflect the real situation due to the large gaps between objects on certain sites, as well as the lack of data for an accurate estimate of the settlement size. However, they do point to functional differences between the settlements.

On the basis of the structure of the lithic assemblage in the settlements, we can make two different settlement divisions. The assemblages can be divided into groups based on several factors. Firstly, we could determine the type of settlement depending on the structure of the assemblage, *i.e.* the proportion of categories of the '*chaîne opératoire*'. These data have enabled the reconstruction of production stages in certain settlements. Taking them into account, we could assume that the settlements communicated among themselves and supplied each other. Thus we have confirmed that all production phases were

present on certain sites, only some on other sites, and that on some sites stone tools were not produced, but only used.

Types of settlement depending on phases of production between the Sava, Drava and Danube rivers. Production and distribution settlements

Zadubravlje and Galovo

To the sites of Zadubravlje and Slavonski Brod-Galovo, the raw material was transported, and then processed into cores in the settlement. Blades and numerous corticated flakes, even up to 100%, proved that un-manufactured raw material was shaped into cores in the settlements. Pre-cores were not found at Zadubravlje, but the completely corticated debitage indirectly confirmed their presence. Some prepared cores were used for the production of blades and flakes, and some were most probably distributed to other settlements. The assemblage displayed a small quantity of chunk which testified to (i) the skill of the producers and (ii) the quality of the raw material. The two settlements functioned as distribution centres for the raw material, more precisely the silicified limestone that settlers collected in Northern Bosnia, material that comprises 70% of the assemblage. These settlements undoubtedly had numerous other functions, but one of the most important was the production of cores, primarily, blade cores, which were (most probably) collected during periodic expeditions to Northern Bosnia. The settlers were very selective in their choice of raw material. Even though the Sava river-bed was rich in siliceous rocks pebbles and the Ophiolite, and Sava-Vardar zones (Hrvatović 2006) were abundant in radiolarite, the primary choice for these people was silicified limestone of excellent chipping quality. The factors for the selection could be various – knowledge of the source, tradition, good chipping quality, distinctive and attractive appearance, suitable size, the

Percentage of tools in total assemblage on analysed sites	
Sites	Percentage of tools
Zadubravlje	7.9%
Virovitica-Brekinja	15.6%
Ivandvor	16.2%
Tomašanci-Palača	29.0%
Šagovina Cernička	38.0%
Slavonski Brod – Galovo	7.3%

Tab. 2. Percentage of tools in total assemblage on analysed sites.

Sites	Excavated area/m ²	Number of finds	Distribution of finds/m ²
Galovo	200	2746	13.7
Zadubravlje	6200	4276	0.68
Vinkovci Hotel	2100	77	0.03
Vinkovci Nama	2680	37	0.01
Vinkovci Zvijezda	332	60	0.18
Vinkovci Duga Ulica 23	76	2	0.02
Vinkovci Varteks	360	1	0.002
Vinkovci Jugobanka	3660	35	0.009
Cernička Šagovina	50	41	0.82
Ivandvor	8000	896	0.11
Tomašanci Palača	4000	58	0.01
Virovitica Brekinja	5400	255	0.04

Tab. 1. Excavated area and number of chipped stone artefacts per m².

possibility of easy exploitation. Besides, they were not tectonised like some other radiolarites in the Ophiolite zone. The River Sava flooded several times a year, and hence the river-bed could not be approached nor the river crossed (Rubić 1953). It was assumed that during those periods, between two expeditions, the settlers used raw material they could collect locally, in the river-beds of smaller rivers and brooks, as well as on the surface. The alluvial drifts of the River Sava carried chert and radiolarite pebbles which could be collected on the surface. So far, it has been difficult to establish whether the cores and other products made of river pebbles were also distributed to other settlements, since the raw material appeared very similar and was available from different sites. In the settlements, silicified limestones were manufactured into cores and blades and distributed to the north, west, and east. The range of distribution has yet to be established. So far, we could have established that there was a system of supply, but not the details. What the exact tradable currency was can also not be determined, but, based on analogies, we could suppose that it was wheat, clothes, meat, or other produce. In Hungary, salt was exchanged for stone material (Bánffy 2004). Here, it is difficult to make such an assumption, since salt deposits were present in the same regions as the raw material, *i.e.* close at hand. According to the range of their movements, the same people had access to salt and stone material. Control over the sources of these raw materials meant a significant strategic advantage for the communities in the valleys of the rivers Sava and Bosna. Hence the small number of sites discovered in this area is rather surprising. According to the above data and the absolute dating

for the region of the Northern Balkans, we could assume that the sites in the valley of the River Sava and what is today Bosnia and Herzegovina were contemporary, and henceforward perhaps even question the direction of Neolithisation of the valley of the River Bosna.

According to current analyses, we could establish that people returned to the Zadubravlje and Galovo sites several times and hence that these were occupied for prolonged periods. Returning to the same place, especially if it was in a good position, near a river or major communication route, was quite frequent among Early Neolithic populations, which also displayed a certain respect for ancestors, *i.e.* avoidance of their potential remains during the erection of new settlements. Locations of settlements, even though they became invisible after being abandoned, (unlike settlements of the tell type), could still be preserved in oral history (*Chapman 1989.39*).

On a number of objects in Galovo, the assemblages could be characterised as workshops. Besides Galovo, this type of assemblage was documented only in Zadubravlje. A workshop assemblage is a term used for assemblages containing more than 500 artefacts in one object (*Balcer 1995.75*), and could refer to material directly linked to the workshop, as well as to material which originated in the workshop, with the pit being its secondary location. The material from the workshop was frequently swept into a pit, which left no evidence of the existence of the workshop on the surface (*Balcer 1995.78*). It seems logical to assume that it was much more practical to place workshops outside and not inside pits. Chips remaining after production in workshops presented a danger both to humans and livestock, because of their sharp edges, and hence were probably removed from the walking surface and deposited in abandoned objects, partially buried objects, or objects dug especially for that purpose. Workshop residue was probably transferred on clothes or animal skins which were spread around during the work (*Balcer 1995.78*). Due to the distribution of the finds inside the object, as well as the structure of the assemblage, it appears more likely that the pits were not locations where production was undertaken, but that the residue from the near-by workshop, which was probably situated on the surface, was swept into it. The sites at Zadubravlje and Slavonski Brod had all the typical characteristics of sites of extensive production. The number of tools in the total assemblage was relatively small (7% and 7.9%, see Table II). Raw material was transferred to the site as extracted from

the bedrock, was there manufactured into cores, and then the blades and flakes were chipped off the cores. Some of the prepared cores were stored for later use and prepared for transportation to settlements which were participating in the exchange scheme. The blocks of raw material were of greater size than the commonly found river pebbles, which is visible in the dimensions of the flakes and blade-like flakes, some of which were up to 15cm long. In that first phase of removing corticated debitage, there was a large number of blade-like flakes with cortication which marked the phase in the preparation of cores for chipping off blades. The dimensions of the blades followed the reduction of the cores; hence there were blades of different dimensions. This did not point to irregularities in production, but to the efficient exploitation of the raw material. In the stages when the cores were larger, larger blades were chipped off; as the size of the cores grew smaller, so the size of the blades also diminished. The dimensions of the blades followed the reduction of the cores, but the length-width ratio remained the same. The quantity of cores was also important, with the most numerous being blade cores. Some of the cores were 'exhausted', while some could still be chipped. The latter were probably used as preserved stock by the inhabitants of Galovo and Zadubravlje, or were perhaps cores which, for various reasons, never made it to their end-users. Especially significant were finds of flakes left after the repair of the platform, *i.e.*, rejuvenation of the core, which proves there was extensive production and not only chipping of flakes according to demand. In confirmation of this, there were cores with changed orientation, *i.e.* changed platform, or, in other words, cores on which a new platform was formed after the old one could no longer be used. The cores were carefully prepared, and if they were used for the production of blades, were mostly conical or wedge-shaped. As a local feature, being a result of the raw material used, we could single out 'laminar' cores. Laminar cores were found in Zadubravlje, Galovo and Ivandvor. These were of significantly greater width than thickness, covered with cortication on two sides, with chipping marks visible on lateral sides. Cores of all types were frequently found in the completely exhausted stage, without cortication, especially at sites which we considered not to be production sites, but places where the cores were used several times.

Settlements of partial production

The assemblages of chipped lithic material at the settlements of Ivandvor, Virovitica Brekinja, Vinkovci

Na-Ma, Zvijezda and Hotel displayed different characteristics. There were no pre-cores, and the quantity of corticated flakes and blades was very small. Cores were present, as well as some unworked flakes and blades, and a small number of platform renewal flakes. Already prepared blade cores were arriving from the area around the River Sava or some other areas, depending on the position of the settlement, and the settlers were chipping them off according to need. There was a very small number of corticated flakes and blades, as well as crested blades and blade-like flakes, which meant that the preparation stage was minimally present. From the analogies with Starčevo culture, we could conclude that the cores were not exhausted in one chipping session, but that the settlers chipped off as many blades as needed at a given moment, and stored the core for later use. This means that blades were not 'goods' stored and saved for future use, but cores. Such a practice was made possible by the good quality of the raw material, which was easily chipped off. Virovitica-Brekinja, even though it belonged to this group according to the structure of the assemblage, was not in the system of exchange. The raw material from Virovitica, even though macroscopically similar, was completely different from the raw material found at other sites, and hence Virovitica-Brekinja had to belong to some other system of exchange. The settlers of Virovitica, just like the settlers of other settlements from this group, sometimes prepared cores themselves from locally available raw material. The assumption is that their production was based on regionally available pebbles, but in minimal quantities, according to need. Traces of such production were found in all the settlements from this group. It is important to mention that, even though core preparation was not the primary activity of the inhabitants of these settlements, all the cores, those obtained from exchange and those they made themselves, were very carefully processed and effectively used. The conclusion on the effectiveness of core use was confirmed by the platform renewal flakes.

Consummation settlements

The percentage of tools in the assemblage was highest at settlements from which cores, as well as material linked with the different stages of shaping and knapping cores were almost completely absent. These settlements include the sites at Tomašanci-Palača and Šagovina Cernička. At the Šagovina Cernička not a single core was found, while three were found in Tomašinci. In the assemblages of both settlements, the dominant products were blades. The

blades were also the most numerous among tools. The types of tool and the raw material used indicate that these two settlements were typical Starčevo sites situated between the rivers Sava, Danube and Drava.

Communication between settlements

The distances between sites were such that they suggest their mutual accessibility. In some regions, communication could be difficult due to the marshy land, but the settlers were probably familiar with routes by which they could surmount these obstacles. For calculating distances in kilometres (air distance), we used Goggle Earth, which is commonly used for the purpose. The presumed travel time on foot between two sites was calculated from Austro-Hungarian maps outlining the distance in hours between two separate sites, and the passability of specific routes during dry or rainy weather. The sites of Slavonski Brod-Galovo and Zadubravlje were very close to each other, only 15km apart. Ivandvor by Đakovo and Tomašanci-Palača are 7.5km apart, and Ivandvor is 25km away from Slavonski Brod. Šagovina Cernička is situated 55km to the west of Slavonski Brod. The distance between Slavonski Brod and Stari Perkovci is 26km, and from Stari Perkovci to Ivandvor 11.2. Ivandvor and Vinkovci are 30km apart. The easternmost site analysed in this paper was Vinkovci, and the westernmost were Virovitica-Brekinja (NW) and Šagovina Cernička (SW). The distance between any two sites of Starčevo culture was never greater than one day's walk. The settlements in Posavina were 30 to 50km distant from a region with raw material (silicified limestone), which is between a one and two-day walk in one direction. Of course, between these sites there are also sites not addressed here, or possibly not yet discovered, and they can make the maximum distance between the two sites. In some regions the terrain was certainly more difficult for walking, or even impassable, and hence in some areas, despite the relatively small distances, communication was somewhat difficult due to swamps and flooded areas, especially at certain times of the year.

The distances between sites suggest simple and relatively rapid communication. The route from Vinkovci to Mikanovci was dry and passable, but the route through the woods from Mikanovci to Vrpolje was passable only in very dry weather, and the maps did not even specify the distance in hours. It was much easier to travel from Đakovo to Vinkovci than from Vinkovci to Vrpolje. The optimal communication route would thus be: Vinkovci-Ivankovo (2h 45min); Ivankovo-Vodinci (1h 45min); Vodinci-Novi Mika-

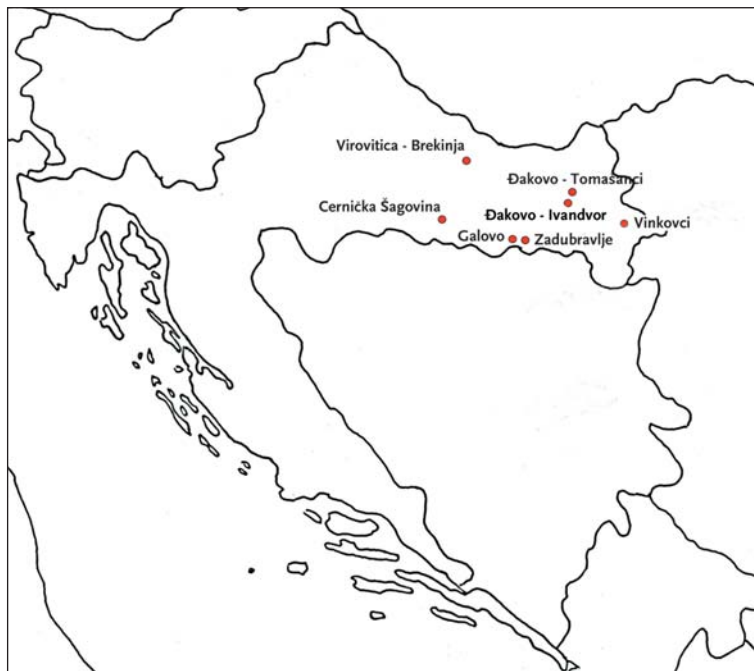


Fig. 1. Map with sites analysed in the paper.

novci (30min); Novi Mikanovci-Đakovo (2h 45min). The walking time from Vinkovci to Đakovo could thus be calculated to 8h 30min, and from Stari Perkovci it would take approximately 9 hours. Half an hour's walk would cover the distance between Stari Perkovci and Čajkovci. From Čajkovci, the two possible routes were to Slavonski Brod or Zadubravlje.

The trip from Brod to Đakovo could have followed one of the following routes: Brod-Bukovlje (1h 45min); Bukovlje-Vranovci (15min); Vranovci-Trnjani (1h); Trnjani-Selna (15min); Selna-Garčin (15min); Garčin-Andrijevc (1h 30min); Andrijevc-Čajkovci (2h). From Brod to Čajkovci was a seven-hour walk, and to Vrpolje an additional 45 minutes. The strategic position of Vrpolje is already evident in this period. On this route, the journey from Vinkovci to Brod could be completed in 16 hours, which is definitely too much for one day, so travelers probably stayed overnight in one of the villages along the route. Andrijevc, Čajkovci, Vrpolje, Perkovci or other settlements in the vicinity of Đakovo could have been ideal travel stops, and were easily accessible both from Galovo and from Zadubravlje. From Čajkovci to Sredanci was a two-hour walk. A half-hour walk would cover the distance between Zadubravlje and Trnjani, and hence the journey from Zadubravlje to Đakovo was significantly shorter than to Brod, while Stari Perkovci could be reached in 5 hours. The sites in Perkovci were situated immediately on the border of the swamp region, at somewhat higher elevations (Makrović, Botić 2008), and

they could also have belonged to the system of settlements due to their very convenient strategic positions. The absence of sites between Vrpolje and Vinkovci was also the result of thick forests and swamps, and probably due to difficult passability, this area was not even used as a communication route. The transportation of cattle and goods through Posavina, and further towards Banat, was optimal by waterways because of the numerous swamps (Šić 1975).

Šagovina Cernička was situated between the highland and lowland regions of Slavonska Posavina. The route from Šagovina to Galovo could be crossed in 15 hours. Other settlements of Starčevo culture were situated along the way, so we could sa-

fely assume that it was not necessary to make the journey in one leg, unless absolutely necessary, but in stages with rest stops in between.

After Starčevo culture

During the Late Neolithic in the broader region of Central and Southeastern Europe, the dominant practice was the use of exclusively local resources, while a system of exchange has not been documented (Kaczanowska, Kozłowski 1997.31). The transition from good quality raw materials to that of bad quality, and from global to local, can also be followed on Croatian sites. During the period of Starčevo culture, in the regions between the Sava, Drava and Danube the selection of raw material was rather varied, but red silicified limestone was absolutely dominant. There was a well-established exchange system and so-called production settlements, as well as settlements engaged in processing, modifying and using the raw material. The dominant raw material originated from the Ophiolite zone, 30 to 50km to the south of the settlement. Neogenic post-volcanic siliceous sediments have been documented for the whole period of Starčevo culture, but in very small quantities. Only after the disappearance of Starčevo culture from the Balkan Peninsula did this raw material become dominant (together with radiolarites from secondary sources). We could logically presuppose loss of control over sources of raw material. This loss need not have been the consequence of conflicts between populations, but only of changed 'political circumstances'. The assumption is that the

occupants of Starčevo settlements to the north and south of the River Sava were acquainted and considered themselves 'the same'. Vinča and Sopot culture people were undoubtedly 'others' to each other. If there was no immediate demand for the raw materials, and there was none, since enough could be collected in the nearby area, and there was no demand for the selection of raw material as in earlier periods, there was no need for the establishment of an exchange system which would have additional consequences. The Sopot culture people kept away from the mountainous regions, were restricted to the narrow lowland region next to the right bank of the Sava, and perhaps were completely unfamiliar with the existence of that raw material. Sopot culture underwent significant changes. The number of blades decreased, *i.e.* the percentage of blade tools, while the number of end-scrapers increased. Significant changes also occurred regarding the raw material (even though the beginning of these changes was detectable already at the end of Starčevo culture). The red silicified limestones disappear from general use. Instead, river pebbles and neogenic post-volcanic siliceous sediments were used. A break in communication was possible; Sopot culture was present only on the northernmost regions of the right bank of the Sava, and so far there is no evidence of its having spread to southern regions. Thus far, analyses have been conducted only for a small number of the sites, but a significant change is still noticeable in comparison to earlier periods.

Central and Eastern Europe lithic material in the first Neolithic communities compared to Starčevo lithic material between the Sava, Drava and Danube

Raw material procurement

The LBK complex is very well investigated in terms of lithic material and raw material procurement and behaviour, since there has been quite a long tradition of related research. By observing distances from sources to sites, one notes a significant difference between the Eastern and Western complex. While in the Western part, the average distance was 100km, in the Eastern part this was only 40km. These differences reflect the conservatism and social conservatism of the Eastern LBK, as compared to the more open system of complex social networks of the Western LBK (*Kaczanowska 2003.9*). A very popular raw material in the Western complex was Szentgal radiolarite. At some sites, even up to 230km distant from the source, it comprised 50% of the assemblage (*e.g.*, sites at Rosenberg and Strögen), and the same

situation has been documented for some sites in Moravia (sites Vedrovice and Kladniky) (*Mateiciucová 2001.289; 2002.186; 2008*). In the later periods of LBK, Szentgal radiolarite was used as a raw material only regionally (*Gronenborn 2003.48*). Many LBK settlements used raw materials from very distant sources and procured them through direct or indirect exchange. The network of multi-directional contacts and indirect exchange was not repeated to the same extent in the periods of the Late Neolithic. Thus the highly developed system of exchange among early agriculturalists of the Danube region was linked to the low level of adaptation of LBK settlements to the various conditions of procurement of siliceous rocks in Central Europe. In other words, this would mean that weak adaptation to exploitation resulted in good adaptation to exchange. Unfortunately, we do not have as much data for Starčevo culture as we have for the LBK, but the available data nevertheless point to some general conclusions. Lithic finds from Starčevo culture *senso stricto* have been documented in Serbia and the Transdanubian region. The most common materials in use by the Starčevo culture in the Transdanubian region were Balkan flint, Szentgal radiolarite, Mecsek radiolarite, Tevel flint and obsidian (*Kaczanowska, Kozłowski 2008*). Flake tools were much more common than blade tools, unlike at Transdanubian LBK sites (*Biró 2005.247*). Raw material analysis of Starčevo culture sites in Serbia has shown significant variations in the use of raw material. At Lepenski Vir, for example, in the early Neolithic horizons, Balkan flint predominated, while in earlier periods, this was not the case, since it comprised only around 3% (*Kozłowski, Kozłowski 1983.267*). At some other sites, like Blagotin, only local raw material was used, regardless of its quality (*Šarić 1999*). Even though variations of chert predominated, there were also significant quantities of quartz and quartzite. Šarić claims that the amount of quartzite might have been larger if adequate attention had been paid to the collection of artefacts made from it (*Šarić 1999*). From the presence of obsidian and Balkan flint, we can conclude that Starčevo culture used raw material from distant sources and in different ratios through direct procurement or exchange (*Tripković 2003.171*). Körös culture displayed similar characteristics. The most popular raw material was Carpathian obsidian, siliceous sediments from the Matra Mountains and white opals, while Balkan flint was in use, but in much smaller quantities. It seems that the system was much more elaborate during the Early than in the Middle Neolithic (*Kaczanowska, Kozłowski 1997; 2008*).

Lithic assemblage composition and core reduction

Carefully prepared cores, especially for blades, were characteristic of early LBK and Körös culture (*Kaczanowska, Kozłowski 2008*). In these systems, the prepared cores were brought to the site, where no more than a few blades were chipped from them, according to need, and the cores themselves stored somewhere in the settlement. The preliminary processing of the raw material (preparation of platform, formation of crest, removal of cortication) took place outside the settlement. Blocs of raw material or cores were brought to the site. We can presuppose the existence of workshops near the source, but a very small number have been documented (*Kaczanowska, Kozłowski 2008; Starnini, Szakmány 1998*). The system presupposed very economical management of the raw material, where hardly anything was discarded and even chips were stored for later use. Blade production was probably done by skilled and specialised workers. This is observable from the straight blade edges, ridges and proportionality. The usage of 'external' raw material undoubtedly influenced the economical use and preservation of cores, artefacts and tools (*Kaczanowska, Kozłowski 2007. 243*). Both in Starčevo and in Körös culture, complete reduction was not done during one episode, but in a process that extended through time and space. Various episodes were interrupted by repairs and renewals, not only of the platform, but also of the bottom and of lateral sides. Cores were discarded only in the final stage of production, when they were completely used up (*Kaczanowska, Kozłowski 2007.243*). On Serbian Starčevo culture sites, such regularities in the preparation and use of cores did not occur. Even though in majority of cases the cores were well prepared, at some sites such as Banja, a lack of precision was noted together with signs of non-economic use (*Odell 1988.257*).

Long blades

Most of the Early Neolithic industries in Central and Eastern Europe can be characterised as blade industries. Transdanubia can be regarded as the single exception to that rule. Where long blades are concerned, the situation is somewhat different; although they were characteristic of Early Neolithic, and, according to some, part of the 'Neolithic package' (*Kozłowski, Nowak 2007.107*), long blades were absent from the assemblages of many sites. On the territory of Serbia, both sites with long and average size blades are present. At sites such as Divostin, long blades were completely absent, but Divostin can nevertheless be characterised as a blade industry site (*Tringham et al. 1988.223; Šarić 1999*).

The existence of long blades, unlike at central Balkan sites, was not common in the Transdanubian Neolithic, nor in neighbouring regions which were not inhabited by the Körös culture (*Bacskey, Siman 1988.126*). The absence of long blades is also characteristic of Croatian sites, with the exception of the find of several fragmented blades at Tomašanci-Palača and Ivandvor.

Balkan flint

One of the most characteristic features of the lithic industries of Early Neolithic complexes was the use of non-local raw material distributed over a wide area (*Kaczanowska, Kozłowski 2008.12*). Among these materials, the most important was so-called 'Balkan flint'. Products made from Balkan flint were found in the region from Tračka valley to the upper flow of the River Tisa (*Kaczanowska, Kozłowski 2008.12*). On the territory covered in this paper, Balkan flint occurred rarely, but was present. So far, only three examples have been found at three sites (Vinkovci Na-Ma, Tomašanci Palača I, Kaznica-Rutak (Fig. 2; assemblage not analysed in this paper). It is worth noting that all these are blades.

Conclusions

During the Starčevo culture period there was a certain change in tool typology. Towards the end of Starčevo culture, the number of end-scrapers and flake tools increased. Larger blades appeared in statistically quite irrelevant quantities, and at a limited number of sites. This was the first significant difference in comparison to the assemblages in other areas of Starčevo culture. The appearance of longer blades was a basic characteristic of Starčevo culture and was linked to specific processes in the advancement of agriculture. These blades, in different numbers, appeared at almost all Starčevo sites. What approach should we employ to explain the lack of longer blades in the Croatian Early Neolithic? *Kozłowski and Nowak (2007)* classify the Early Neolithic long blades under the 'Neolithic package'. The lack of long blades pointed either to an incomplete Neolithic package in the settlements between the three rivers, or to another strategy of tool use. At present, we cannot offer a conclusive answer.

Another important difference between the Starčevo lithic material found in the region between the rivers and the material found in the 'central' region of distribution of Starčevo culture is in the use of raw material, such as Balkan flint and obsidian. The raw materials which on the global level were important not only for Starčevo, culture but for the Early

Neolithic complex in general, are almost completely absent from sites in the interfluvian region. The reasons for this are unknown. However, the presence, even though minute, of obsidian and Balkan flint could be evidence of a need to preserve tradition and maintain links with neighbours. However, it is certain that both raw materials, irrespective of their (non)availability, had symbolic as well as practical meanings for their owners. They were of specific and memorable appearance and could serve as signs of affinity or identity, and as memories or bonds with the 'old country' (*Kaczanowska 2003*). In the context of the Early Neolithic, obsidian could have served as one of the symbols of the new way of life, while the ownership and use of obsidian could have expressed an attitude to novelties and other cultures. At the onset of the Neolithic, obsidian was not simply a tool; it also carried within itself a sign of allegiance, allegiance to the 'agricultural way of life' (*Tripković 2003.122*).

Obtaining raw materials for everyday use was in accordance with familiar models of exploiting raw material in the regions populated by cultural groups of the Early Neolithic. The Starčevo culture settlers in the interfluvian region were very familiar with their surroundings and the resources it offered, and had developed systems for the supply and distribution of raw materials and semi-products. Their selection



Fig. 2. *Balkan flint blade from Kaznica-Rutak*

depended on quality and not availability, and possibly on some other factors which could not be presupposed on the basis of the existing data. The settlers of interfluvian settlements undoubtedly communicated with each other. The reasons for this communication could have been multiple, but the procurement of stone artefacts was among them. The inhabitants of certain settlements obtained raw material, produced blades and cores and distributed them to other settlements. In some settlements, blades were distributed which were later used or additionally processed, and in some other settlements, the distribution pattern was centered on cores which were stored and chipped off according to need. What the core and blade distribution centres received in return is still impossible to determine.

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