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The Carpathian Basin and its Role in the Neolithisation of the Balkan Peninsula

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THE KÖRÖS AND THE EARLY EASTERN LINEAR CULTURE IN THE NORTHERN PART OF THE CARPATHIAN BASIN: A VIEW FROM THE PERSPECTIVE OF LITHIC INDUSTRIES

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Key words: *Mesolithic, early and late Neolithic, lithic industries, Carpathain Basin.*

Abstract: *The presented model of technological development of lithic production in the VIth millenium BC bases on the premise that in a general model of cultural evolution the technological subsystem is determined by other cultural subsystems, first of all by subsistence economy and social relations. The interactions of these subsystems are determined by and part of mutual interrelations with natural environment.*

Introduction

The classical works on the Early Neolithic in the Middle Tisa Basin assumed a sudden breakdown of the expansion of the Körös culture, which only slightly extending to the north-beyond the region of Szolnok. became replaced, further north, by the early Eastern Linear Culture (ELC – Kalicz, Makkay 1977). This boundary was referred to as the „Kunghegyés-Berettyoujfalu" line; the abrupt check of the expansion of the Körös culture on this line was ascribed to the presence of a fairly dense Mesolithic settlement in the northern part of the Carpathian Basin (Kalicz, Makkay 1966). On this basis it was assumed that – on the one hand – the Mesolithic substratum impeded the expansion of the Körös culture, but – on the other hand – when adopting economic and cultural innovations the Mesolithic substratum played a dominant role in the genesis of the ELC (Kalicz, Makkay 1972). Moreover, the fact that the distribution ranges of the Linear Complex and of the Körös culture do not overlap was claimed to be another argument in support of the above understanding of the genesis of the ELC Complex (Kalicz, Koos 2002).

These views were, later, criticized in the light of a number of new facts namely:

1. In the 1980s the discovery by P. Raczky (1983) of the site of Kötelek-Huszársarok on the Tisza, north of Szolnok, where pit 1 provided Körös culture materials, whereas pit 8 yielded materials of the early ELC described as

Szatmar II group. In this way, for the first time, the overlapping range of these two culture complexes on the middle Tisza was demonstrated. At the same time, as P. Raczky noted, the process of emergence of the Early Linear Pottery of Szatmar II type could have been contemporaneous with later phases of the Körös culture in the Hungarian Plain, especially with the materials ascribed by J. Makkay to the Proto-Vinča group (horizon) (Makkay 1982). P. Raczky (1989), too, drew attention to the possibility that the Early Neolithic impulse on the middle and upper Tisza basin arrived from two directions: from the south via the Tisza basin (Alföld variant of the Körös Culture) and from the east, via the Criş culture in north-east Rumania (Partium variant). The two variants differed not only in terms of material culture but also in terms of economy. This aspect in the interpretation of the Körös-Criş influences was also emphasized by A. Sheratt (1982) and J. Korek (1983).

2. The investigations into the reconstruction of the palaeogeography of the Tisza basin conducted by P. Sümegi and R. Kertesz (Kertesz, Sumegi 2001) established that the expansion of the Körös culture in the northern pat of the Carpathian basin was checked not so much by the existence of a hypothetical zone of dense Mesolithic settlement, but by the ecological boundary zone, which was also the northern boundary line of the Körös culture. It is described as the "agroecological" barrier or CEB AEB (the Central European-Balkan Agro-Ecological Barrier). Another important result of Sümegi's palaeogeographical investigations (2006) was establishing the mosaic nature of the environment in the middle Tisza basin in the Atlantic period.
3. The discovery of a complex of Mesolithic sites in the region of Jaszag by R. Kertesz (Kertesz *et al*. 1994) was claimed to confirm the hypothetical presence of dense Mesolithic settlement in the Hungarian Plain beyond the boundaries of the Körös culture. Thus, the models that assumed an essential role of Mesolithic populations in the process of neolithization were to be validated. However, the discoveries in the region of Jaszag cannot be regarded as a proof that Mesolithic settlement persisted until the appearance of the Körös culture: the Mesolithic sites near Jaszag represent only the early, at most the middle phase of the Mesolithic. This leaves a large hiatus between the Mesolithic and the Neolithic in the Tisza/Danube interfluves. Only very few sites in the north-east part of the Carpathian basin can be ascribed to the Late Mesolithic (e.g. Ciumeşti – Păunescu 1970, possibly also the site of Tarnaörs recently investigated by P. Kertesz. These sites do not provide evidence of contacts with the Early Neolithic, on the other hand, the isolation of Mesolithic population from the main routes of raw materials procurement is obvious (Kozłowski 2005). The investigations by P. Sümegi and R. Kertesz (1994) in the Hungarian Plain did not confirm assumptions about the existence of Mesolithic sites deeply buried underneath Holocene alluvia (Chapman 1989, Bartosiewicz 1999). The demographic crisis in the Carpathian Basin in the Late Mesolithic, just as the similar crisis in the eastern Balkans, calls for explanations.

4. Investigations into the economy of the Starčevo-Körös-Criş complex suggest that the population that had reached the Danube and the Carpathian Basin was able to adapt their subsistence economy to local conditions (Lazić 1988). An example are sites in northern Voivodina e.g. Nosa-Biserna Obala (Bökönyi 1974) where as much as 75.4% of faunal remains are wild mammals, birds and fish, while live – stock is only 24.5%. At the Starčevo culture sites in the region of the Iron Gate the faunal composition is similar, for example in phase III of Lepenski Vir (74.5% as compared to 25.5% – Bökönyi 1970), and at Padina B (Clason 1980) this contrast is even greater. At the same time, most Starčevo culture sites are characterized by the domination of domesticated fauna, typical of the FTN (e.g. Divostin: 91.5% of live-stock to 8.4% of wild animals – Bökönyi 1988). The adaptations in the sphere of subsistence economy must have had counterparts in other spheres of material, social and spiritual culture. The process of adaptation can also be seen in the northernmost Körös culture sites in the Tisza basin, but its manifestations are different. At the site of Nagykörü-Cooperative Orchard the fauna retained the Balkan domination of bred and herded stock, mainly goat and sheep (75% NISP), but – simultaneously – wild mammals, birds and fish increase in species variety, indicating *ad hoc* hunting, fowling and fishing (Raczky *et al*. in press).

In recent years sites discovered in the middle Tisza basin north of Szolnok such as Tiszaszölös-Domaháza (Domboroczki 2005) provided a sequence of Körös culture and early ELC (Szatmar II), settlements,. These investigations have confirmed Raczky's previous observations (1983) at Kötelek and documented the continuity between the Körös culture and the ELC.

An increasing number of radiometric dates from sites in the north-east part of the Carpathian Basin confirm that the succession of the Körös and the ELC was chronologically close, and that the spread of the FTN settlement in the Tisza basin (Domboroczki 2003) as well as in Transilvania (Biagi *et al*. 2005, Lazarovici 2006) was relatively fast.

The FTN sites with white-painted ceramics (e.g. Donja Branjevina) considered oldest, are dated at 7080±55 to 6775±60 BP (6100–5500 cal BC), and the south Hungarian sites are dated within a similar time-spars (e.g. Endröd 119 – 6915±45 to 6720±45 BP, Pitvaros – 7060±45 to 6885±50 i.e. in the interval from 6000 to 5700 cal. BC – Whittle *et al*. 2002).

The northernmost sites in the Tisza basin provided, basically, similar dates. The Körös culture features from Tisaszölös-Domaháza were dated at between 7065±40 to 6751±35 BP (i.e. in the interval from 5990 to 5620 cal. BC – Domboroczki 2005). In turn, the dates for Szatmar I group from Mehtelek on the upper Tisza are in the interval from 6835±60 to 6625±60 BP (i, e. 5730–5480 cal. BP), which almost corresponds to the dates for the early Linear Ceramics (Szatmar II) at the northern edge of the Körös culture (Kötelek – 6780±35 and 6630±60 BP i.e. between 5720 to 5530 cal. BC).

The transformation of the Körös culture into the ELC can, thus, be described by the following hypothesis:

1. This process took place in the northern peripheries of the Körös culture, which overlapped with the European-Balkan agro-ecological boundary zone in the north-east part of the Carpathian basin. For this reason the process involved a greater flexibility on the part of the Körös culture people to enable their adaptation to new environmental conditions.
2. Another important determinant of the Körös-Eastern Linear transformation was the fact that in the territory of the formation of the ELC crossed the influences from the south via the Tisza basin and from the east – from the Partium, territory from the Criş culture province. The best evidence of eastern influences are the sites of Szatmar I group such as Méhtelek on the upper Tisza (Kalicz, Makkay 1972, 1977). Their chronology is earlier than the beginnings of the ELC on the middle Tisza and they show similarities with the sites in north-west Romania such as Homorodul de Sus, Suplacu de Barcau or Zauan (Raczky *et al*. in print). Moreover, the sites such as Tiszabezed (Kalicz, Makkay 1977) or Ibrany (Domboroczki 2005) indicate that Szatmar I population moved along the upper Tisza to the west.
3. The continuity between the Körös and the ELC cultures is manifested in a number of spheres of material culture (e.g. ceramics), also in economy, settlement (location of sites in the Heves district – Domboroczki 1997, 2003), in architecture (Kalicz, Koos 1997, Kalicz, Raczky 1981, Domboroczki 2003), and symbolic culture (Kalicz, Makkay 1976, Kalicz, Raczky 1981, Domboroczki 2003).
4. In contrast to the Körös-ELC continuity we cannot point to any links whatsoever of the Early ELC and the Mesolithic (Kozłowski 2001), even less so to any evidence of hypothetical existence of a Late Mesolithic settlement network in the northern part of the Carpathian basin.
5. The innovations in the various cultural subsystems of the ELC are, therefore, the result of adaptational processes leading to internal transformations.

Balkan tradition in flint industries of the FTN

The most typical feature of lithic industries of the pre-linear painted FTN is the use of extralocal raw materials distributed over a large territory. Of special importance was yellow, spotted flint, described as “Banat” or “Balkan” flint. Artefacts from this flint – whose deposit areas are, probably, located in the pre-Balkan platform – are known at sites with the amplitude of distance between them of up to 700 km, across the territory from the Thrace Plain to the Upper Tisza Basin. Both at sites located closer to deposits and at distant sites “Balkan” flint is present in the form of blades or complete tools. The occurrence of artefacts from “Banat” or “Balkan” flint across such an extensive territory documents the existence of a network of contacts and information exchange between the various taxonomic units.

A separate problem is the presence of single obsidian artefacts at numerous sites of the FTN. This obsidian comes – in all likelihood – exclusively from deposits in the Tokaj-Zemplin Range i.e. from the territories outside the range of settlement of the Early Neolithic cultures with Painted Ware (Starčevo-Criş complex). Obsidian artefacts are found at the sites ascribed to the Early Phase (with white-painted ceramics e.g. Donja Branjevina – Karmanski 2005 and Gura Bacului – Lazarovici 2006) or the Late Phase (e.g. Golokut – Kaczanowska, Kozłowski 1984). Obsidian is recorded at sites up to 400 km to the south of deposits, but no relation has been noticed between its proportion and the distance from its outcrops. The distribution of obsidian south of the deposits, indicating the functioning of a network of contacts and various types of exchange, covers similar distances to those of the distribution range of "Banat" or "Balkan" flint. As far as obsidian procurement system is concerned two hypotheses can be considered:

1. the diffusion of obsidian is claimed to have been the effect of exchange with other groups that inhabited areas in the vicinity of deposits. In this case only alleged local Mesolithic groups can be taken into consideration. As we have shown, so far no traces have been found of the existence of Late Mesolithic groups in the Upper Tisza basin that would exploit obsidian. Thus, this hypothesis should be rejected,
2. Körös culture groups obtained obsidian directly at deposit areas despite the fact that these areas were not occupied by Körös Culture. The small number of obsidian artefacts discovered at sites, also the lack of noticeable correlation between obsidian frequency and the distance to its deposits indicate that procurement of this raw material was sporadic and random, during the penetration of new territories before the main advance of the FTN. The Tokaj Mts obsidian which occurs as small nodules was unsuitable for macroblade production.

Lithic industries of the Early Neolithic cultures with painted ware show characteristic low proportion, or even absence, of cores at settlements, the presence of a small number of flakes, but – on the other hand – a high index of blades and tools. Such an inventory structure is repeated at sites in western Bulgaria (Galabnik, Slatina IV, Gradeshnitza A – Gatsov 1993), Serbia (Golokut, Starčevo) and in the Hungarian Plain. The on-site processing of local raw materials was registered only at the site of Donja Branjevina (cores – 5.7%, flakes – 32.7%), but even at this site blades (34.3) and tools (22.1) dominate (Šarič 2005).

The domination of tools and blades over cores and debitage, established at sites of painted ware cultures (Starčevo-Körös), is the effect of a specific system of raw material procurement namely: prepared cores were brought to the settlement and a series of – at the most – several blades were detached in several episodes when needed. The preliminary working of raw material nodules (decortication, platform preparation, crest formation) was carried out outside the settlement area. Sporadically cores prepared for processing may have been traded, although first of all completed blades were exchanged, which were later reworked into tools on-site. This procurement system imposed "thrifty" raw materials economy where even fine

flakes from core rejuvenation were collected and stored in depots as, for example, in the case of a depot from Endröd 39 with about 100 flakes stored in a vessel (Kaczanowska et al.1981). It seems highly likely that such core reduction was carried out by skilled knappers. This is evidenced by straight edges and interscar ridges of blades, large size and slender proportions. To produce blanks like this required considerable skill. Blades were detached by means of a punch, but it is also possible that pressure technique may have been used. It is difficult to determine the dimensions of blade blanks as specimens are mostly broken or reworked into tools. It seems, however, that as a rule blades measured between 10 to 12 cm, although larger specimens are also known e.g. from the site of Szarvas (Starnini, Szakmany 1998 fig. 30) or Battonya (Bacskay, Siman 1987). Among retouched tools blades with lateral retouch are most common. They were registered both at eastern and central Balkan sites e.g. in the Vardar valley (Anzabegovo II–III 40% of tools – E. Elster 1976), in the Thrace Plain (Karanovo II), and in western Bulgaria (Galabnik, Slatina I, Balgarcevo – from 16 to 71% – Gatsov 1993) and Serbia (Divostin, Golokut, Starčevo).

However, in the Iron Gate region some differences in comparison with the Balkan model can be seen. At the site of Cuina Turcului-Dubova three layers contained a specific industry with distinctly local elements. In the literature this industry is interpreted as a local variant of the Starčevo culture (phase IIB, IIA and IIIB) with a microlithic component, allegedly derived from the local Mesolithic (Paunescu 1970, 1987). But typological analysis of lithics from Cuina Turcului-Dubova has shown that – just as at other Starčevo culture sites – this industry is dominated by blades with lateral retouch. Next in size is the group of trapezes and other geometrical forms but made on broad blades. The high proportion of trapezes could be the effect of the adaptation of Neolithic economy to specific ecological conditions in the Danube Gorge rather than a manifestation of persistence of Mesolithic traditions. Just like at Cuina Turcului the lithic industry from Lepenski Vir III is also specific: with a greater role of on-site working of – mainly – "Balkan" flint. This is confirmed by the presence of cores (including a core depot in a vessel – Srejovic 1969) and a fairly high proportion of flakes (69.7%) in comparison with blades (19.8%). Nevertheless, among retouched tools (9.1%) in the entire inventory almost half are retouched blades (Kozłowski, Kozłowski 1982).

Several sites, investigated in recent years, on the middle Tisza at the northern edge of the Körös culture, yielded small series of chipped stones (Tiszaszölös, Nagykörü). Alongside the continuation of Balkan traditions such as: tools with lateral retouch and artefacts made from "Banat" or "Balkan" flint (waxy, spotted) new traits appear at those sites. This is, for example, an attempt at exploitation of raw materials from the Upper Tisza basin e.g. limnoquartzites. Fissibility of this rock is much worse. The deterioration of the technological standard of blade production may have been caused by the use of poor quality raw materials as well as by decline of specialization in lithic production and transfer of this production to the level of individual household clusters.

The Proto-Linear Phase (Szatmar I)

The developmental tendencies in the lithic industry of the Iron Gate variant of the Starčevo culture and in the northern variant of the Körös culture – that make these units different from the Balkan tradition – intensified as the ELC was gradually shaping.

These were:

1. gradual vanishing of specialization and transfer of production to the level of individual household clusters,
2. exploitation of meso-local and local raw materials of much poorer quality, such as obsidian and limnoquartzites which occurred as smaller concretions,
3. general deterioration in the technological standards and transfer from macroblade (also pressure) to "mediolithic" technique, and moreover, relinquishment of careful preparation of core flaking surfaces from postero-lateral crests,
4. less economic core exploitation which is carried out in a single production episode, and replaced exploitation in several reduction episodes,
5. less intensive tool curation replaced by the use of expedient tools.

On the basis of ceramics we can assume that the crucial moment in the transition from Starčevo-Körös-Criş to Eastern Linear complex Szatmar I phase in the Upper Tisza and Samos basin. Its most important site so far is Méhtelek-Nadas (Kalicz, Makkay 1977). The lithic industry from this site displays, well expressed, all the features we have enumerated (Starnini 1994, Kozłowski 2001):

1. On-site lithic production is of considerable importance, documented by the large number of artefacts (1710), many times higher than the frequency of artefacts at the sites of the Starčevo-Körös complex. Among artefacts cores are relatively numerous (6.1%), but flakes are most frequent (59%).
2. At Méhtelek-Nadas there are occasional specimens (0.5%) made from „Balkan" flint, but the most important raw materials are obsidian (60%) and limnoquartzites.
3. Besides ocassional macrolithic blades (and one blade core), mainly from „Balkan" flint, „mediolithic" blades are most frequent, about 4 cm long, split off by direct percussion, possibly with a soft hammer.
4. The dominant group in the structure of retouched tools continue to be bilaterally retouched blades – just like at Balkan sites – although their frequency is smaller than in Körös – ca 26–30%; retouched blades are replaced by retouched truncations (18.6%), retouched flakes (24.1%) and by microliths (16.6%).

In the past the sites such as Michalovce and Lučky used to be assigned to the Proto-Linear phase (Lichardus 1972); today we know that they represent the early phase of the ELC (Šiška 1989). The position of the site of Košice-Červeny Rak (Šiška 1989) is still controversial: it may represent either the northernmost outpost

of the Körös culture or a transitional phase between the Körös culture and the ELC. Lithis artefacts from this site have not been described as yet.

The Early Phase of the Eastern Slovakian Linear Ceramics Complex

At settlements of the Early Phase of the ELC the basic raw material for tool production was obsidian. At sites situated in the Eastern Slovakian Plain it usually accounts for more than 80% of raw materials (Moravany – 88.8% and 95.4%; Slavkovce – 95.4%, Zalužice – 81.5% and 89.5%; Zbudza – 90.6% and 91.9% – Kozłowski ed. 1997). These sites are fairly close to obsidian deposits, no more than 20 km away. Unworked obsidian concretions were brought to settlements. In all likelihood they were collected from the ground surface as there are no traces of mining. A depot of 34 such concretions, weighing from 2.9 kg to 0.10 kg, was discovered in pit E/88 at Slavkovce. The total weight of stored raw materials was 13.5 kg (Kozłowski ed. 1997). Assuming that the calculations done by A. Dzieduszycka-Machnikowa and J.Lech (1976) of potential ability of groups that penetrated deposit areas to carry raw materials are correct, we could estimate that this quantity of obsidian was brought by only 1–2 people. Unworked obsidian nodules were also found at other settlements e.g. at Moravany.

The inhabitants of settlements in the Košice Basin, from the early phase of ELC situated at a distance of 40 to 50 km from obsidian deposits (Čečejovice, Barca III, possibly Košice-Červeny Rak – Kozłowski 1989) favoured limnoquartzites and hornstones for tool production. These materials were brought to settlements as cores in early phases of reduction.

Generally, obsidian transport in the ELC followed certain rules: to settlements situated in the East Slovakian Plain obsidian was supplied from a distance of a little more than 20 km. To the east and north-east of deposits parties in search of raw materials set off from a zone further away (i.e. a procurement zone acc. to the classical definition by C. Renfrew et al.1968). To the south of deposit areas obsidian was the basic raw material at settlements about 80 km from deposits (Füzesabony-Biro 2002). Analysis of obsidian diffusion shows the vital importance of communication routes along rivers, notably along the Tisza basin where some settlements are situated at a distance of 150 km from deposits and where the proportion of obsidian is more than 90% (Szárvas – Starnini, Szakmany 1998).

The nodules of raw material brought to settlements were exploited near dwellings for the needs of a single household. The inventory structure is characterized by a fairly high proportion of cores (less than 10%), the domination of flakes, chips and waste (as much as more than 60%). These specimens were not an intended outcome of processing but are the side-products from core preparation and rejuvenation. Blades are about 20% and tools up to 20%. Local processing is also evidenced by a high proportion of cortical and partially cortical flakes accounting for up to 30% of all flakes (e.g. at Moravany). In early phases (decortication, platform shaping) cores were exploited with a hard hammer, and blades were detached by means of a soft hammer or a punch. Sometimes detachment of blades was undertaken without prior flaking surface preparation – fully cortical blades was

detached starting blade reduction of the core, then, the flaking surface was extended by detaching blades with lateral cortex (Moravany – about 12% of all blades).

Blade blanks are "mediolithic" measuring up to 4.0 cm. Specimens longer than 4.5 cm account at Moravany for only 12%. Although raw material was worked, basically, near each household, yet there were areas within a settlement where core preparation was carried out on a larger scale. These are features (pits) with a large concentration of artefacts, mainly from initial phases of processing. Blade production proper was done elsewhere – possibly in the immediate vicinity of dwellings, probably in the same areas where also hafts of combined tools with obsidian inserts were made (Zbudza, feature 1/85 and 2/92 – Kaczanowska, Kozłowski 1997, Moravany feature 2/99). The appearance of features related, to a greater degree, to the preliminary phase of processing indicate a two-episode cycle of blank production. This could have initiated the process of setting up specialized workshops for the needs of the entire settlement. Workshops like this are known in the youngest phases of the ELP.

Retouched tools account for up to 20% of all artefacts. In the assemblages that are associated with the formation phase of the ELC, tool groups frequently contain retouched flakes (Slavkovce – Kaczanowska, Kozłowski 1997), whereas at somewhat later sites blades with lateral retouch predominate. A higher proportion of end-scrapers than retouched blades and the occurrence of a fairly numerous groups of denticulated tools were recorded only in the Košice Basin (e.g. Čečejovce – Kozłowski 1989). At all sites occur trapezes which in the older literature used to be associated with the influence of local Mesolithic substratum. At present there are no doubts that these are forms that are found in the whole Neolithic: from the Starčevo-Körös complex to the Early Eneolithic, they can hardly function as diagnostic for Mesolithic tradition.

The Late Phase of the evolution of the Linear Complex

In the northern part of the Great Hungarian Plain, in the Košice Basin, in the Eastern Slovakian Plain and in the Prešov Basin the Bükk Culture developed, which N. Kalicz and J. Makkay (1977) believe to have been a local group of the ELP. The exploitation and trade in obsidian used to be linked with the Bükk Culture. Analysis of chipped stone industries of the Bükk Culture has shown that obsidian played a major role at settlements at the distance of as far as 55 km north of obsidian deposits i.e. in comparison with the early phase of the ELP trips to obtain obsidian were undertaken from more distant areas. This was caused by the gradual expansion of the Bükk culture to the north. Moreover, the isolation of the Košice Basin where a greater influx of obsidian is registered had ended. To the south the route along the Bodrog and the Tisza continues to play an important role in obsidian diffusion. However, deposits of local raw materials began to gain in importance, especially those located in the immediate vicinity of settlements such as e.g. limnoquartzites at Boldogkováralja or Arka, or Carpathian radiolarites at the sites in the Prešov Basin. On the one hand, the presence of obsidian at all Bükk culture sites confirms inter-site contacts and a network of exchange within this culture, on the other hand,

advancing process of adaptation to local conditions and natural resources can be seen.

Preliminary working and partially also blade blanks exploitation took place in specialized on-site workshops. At Kašov a long pit (probably associated with a posthouse) yielded remains of at least 4 workshops producing blades (Banesz 1991). Similar features are known as well from Mala Trna and Humenne (Kaczanowska, Kozłowski 2002). Cores from these workshops are conical or cylindrical, with a carefully prepared platform and a flaking surface round the entire circumference. Prior to exploitation crests were shaped. Blades were detached using punch technique, in some cases pressure technique. The size of obtained specimens and regular, straight edges allow assuming that blank production in workshops was carried out by specialized knappers. The longest blades, more than 10 cm long, were taken away from workshops. Majority of specimens that remained was broken pieces. Possibly, they were damaged accidentally in the course of production process, but it is also likely that blade breaking was used to achieve straight profiles when as a rule the thickest, proximal part was broken off.

The presence of workshops that focused on blank production is related to the problem of blade depots at Bükk culture settlements. The literature of the subject connects them with exchange with remote areas and the exceptional role of this culture in obsidian trade. In view of the above we would like to draw attention to several facts, namely:

1. To assign all the obsidian depots to the Bükk culture can be regarded as – to say the least – questionable.
2. At Bükk culture settlements depots of blades made of raw materials other than obsidian were also discovered (Boldogkováralja – limnoquartzites, Sarišskie Michalany – radiolarites – Kaczanowska *et al*. 1993).
3. Use-wear analysis of these depots has established that these were depots of tools which were used for specific functions e.g. wood working. Thus, we can define them as craftsmen's kits.

The Bükk culture inventories exhibit high variability of frequencies of the various retouched tool types. For example, at Humenne blades with lateral retouches dominate and the burin index is high (Kaczanowska, Kozłowski 1998); at the settlement at Šarišskie Michalany the majority are truncations followed by end-scrapers (Kaczanowska *et al*. 1993); at Boldogkováralja truncations and end-scrapers dominate, whereas at Čierne Pole end-scrapers are most frequent. Thus, the tool inventory depends on functional specificity or differing stylistic traditions. At other settlements, wherever larger areas were explored, the increasing role of end-scrapers and truncations, in comparison to older phases, is noticeable. The growing importance of tools with lateral retouch could have been the effect of influence from two centers: the unifying influence of the Vinča culture on the Linear complex (Kaczanowska 1982) or contacts between the western and the eastern Linear units.

It is also possible that changes in tool structure were caused by the changes in subsistence economy.

Conclusions

The presented model of technological development of lithic production in the VIth millenium BC bases on the premise that in a general model of cultural evolution the technological subsystem is determined by other cultural subsystems, first of all by subsistence economy and social relations; the interactions of these subsystems are determined by and part of mutual interrelations with natural environment. The proposed model of technological evolution differs from the linear model characteristic for the neo-evolutionistic and neo-Marxist orientations. In place of the linear evolution, both of social structures and the technology that determined them, we propose an oscillatory model where the initial phase of the FTN – in the first half of the VIth millennium – continues to maintain the high level of technology adopted from the Pre-ceramic Neolithic of the Near East, the corresponding social structure based on specialization and a more advanced task assignment, and possibly – incipients of hierarchical society. About the middle of the VIth millenium BC – when Linear complexes emerged – the inter-group specialization and long-distance exchange vanish, and – in the consequence – the standard of technology deteriorates. It is only at the end of the VIth millenium BC, in the late phase of the ELC, that a revival of elements of specialization can be seen. However, specialization does not occur between regional groups, but only at the level of particular settlements. Nevertheless the revival of specialization is apparent in development of technologies which reach a standard similar to the initial phase of the FTN.

This new leap in the evolution of social structures and technologies in the Bükk culture took place only in the north-east part of the Carpathian Basin. This evolutional leap was not registered in the later phases of the LBK in Central Europe. The Bükk culture, notably its northern variant in the territory of eastern Slovakia, in turn, vanishes suddenly at the turn of the VIth and Vth millennia. S. Šiška (1995) related this phenomenon to hypothetical immigration of Bükk population to the north of the Carpathians – but there is no evidence in support of this hypothesis. It is more likely that the northern variant of the Bükk culture disappeared as a result of a demographic crisis. Consequently, the latest Bükk culture sites on the middle Tisza exhibit isolation which is seen in the use of local raw materials and the gradual deterioration and disappearance of specialization (e.g. Polgar 31).

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Figures

Fig. 1. Mesolithic and alleged Mesolithic sites in North-Eastern part of the Carpathian Basin: 1 – Ciumeşti (Romania); 2 – Kamenitsa 2 (Ukraina); 3 – Kamenitsa 1 (Ukraina); 4 – Uzhgorod 1 ((Ukraina), 5 – Tiszaőrs (Hungary); 6 – Hugyaj (Hungary); 7 – Tarpa (Hungary); 8 – Jásztelek (?) (Hungary), 9 – Barca (Slovakia), 10 – Streda nad Bodrogom (Slovakia).

Fig. 2. North-Eastern part of the Carpathian Basin and adjacent territories in the Early Neolithic.

Fig. 3. Animal bone structure in selected Starčevo-Körös sites.

Fig. 4. Radiometric chronology (calibrated BC) of the main Starčevo-Körös Culture, Szátmar Group and Early and Middle Phase of the Eastern Linear Culture sites.

Fig. 5. FTN sites in the Northern Balkans and in the Carpathian Basin with blades made from "Balkan" (yellow, white spotted) flint.

Fig. 6. FTN sites in the Carpathian Basin with artefacts made from the obsidian of Tokaj-Prešov Upland.

Fig. 7. Ratouched blades from Karanovo-Kremikovci Culture (1, 3 – Galabnik 1 , 2 – Galabnik 3: Bulgaria), and Starčevo Culture (4-6 – Velesnitsa, Serbia; 7, 8 – Golokut, Serbia) (acc.to I. Gatsov and J. Šarič).

Fig. 8. Cuina Turcului, Romania.1 – Burin, 2 – retouched blade, 3 – end-scraper, 4 – perforator, 5-10 – trapezes (wg A. Păunescu).

Fig. 9. 1-3 – cores from Nagykőrű, Hungary; 4-7 – Tiszaszőlős-Domahaza, Hungary (4-6 – cores, 7 – retouched blade from „Balkan" flint).

Fig. 10. Mehtélek 1, 4-5 – cores, 2 – blade from Balkan flint, 3 – perforator, 6-12 – trapezes, 13-16 – blades with traces of use, 17 – retouched truncation (acc.to E. Starnini).

Fig. 11. Obsidian nodules from the early Eastern Linear Culture site of Moravany (Eastern Slovakia).

Fig. 12. Number of artefacts in lithic assemblages of the FTN sites in the Northern Balkans and in the Carpathian Basin.

Fig. 13. Slavkovce (Eastern Slovakia). 1-9 – cores from Early Eastern Linear Culture assemblage.

Fig. 14. Obsidian and limnoquartzite tools from Eastern Linear Culture: Slavkovce (Eastern Slovakia): 1-6 – retouched blades, 7-12 – trapezes, 13 – fragment of trapeze or truncation; Zalužice (Eastern Slovakia): 14-19 – retouched blades, 20 – end-scraper.

Fig. 15. Raw material structure of selected Western Linear (LBK) and Bűkk Culture sites: 1 – obsidian, 2 – limnoquartzites, 3 – radiolarites, 4 – Jurassic flint, 5 – Cretaceous flint from Dnester basin, 8 – others.

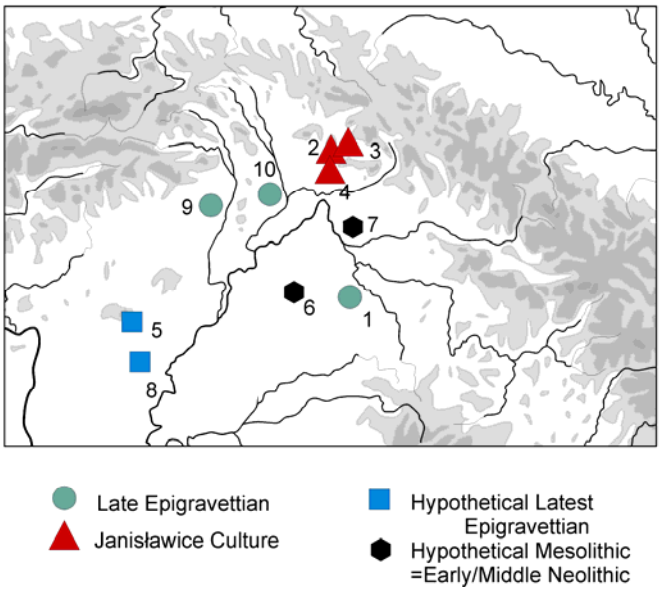
Fig. 16. Obsidian cores from the Bűkk Culture workshop in Kašov (Eastern Slovakia) (acc.to L. Banesz).

Fig. 17. Radiolarite blade depot of Bűkk Culture from Šarišske Michal'any (Eastern Slovakia).

Fig. 18. Radiolarite blade depot of Bűkk Culture from Šarišske Michal'any (Eastern Slovakia).

Fig. 19. Raw material procurement systems, technology, tool morphology and the relation between lithic production and social structures in the Early and Middle Neolithic in the Northern Balkans and the Eastern part of the Carpathian Basin.

Fig. 20. Oscillating changes in lithic production techniques (red) and their relation to social organization (green) in the Early and Middle Neolithic in the northern Balkans and eastern part of the Carpathian basin.



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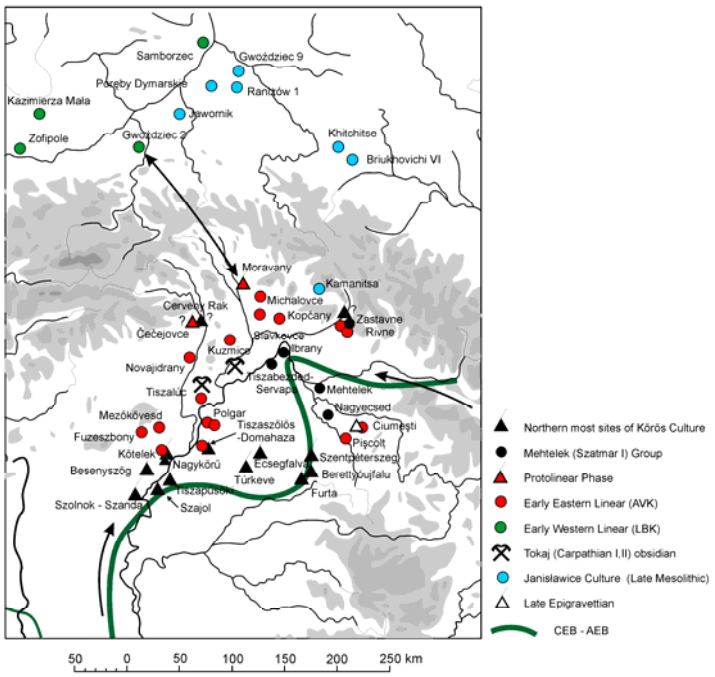

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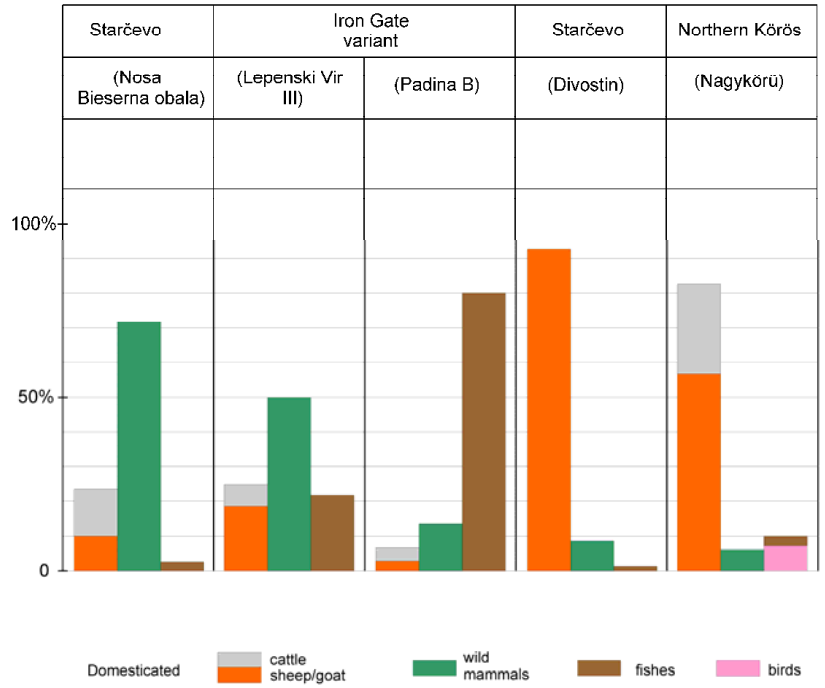

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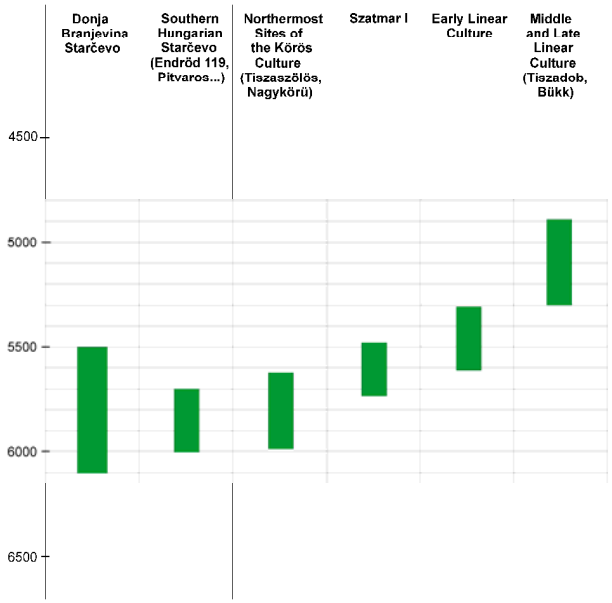

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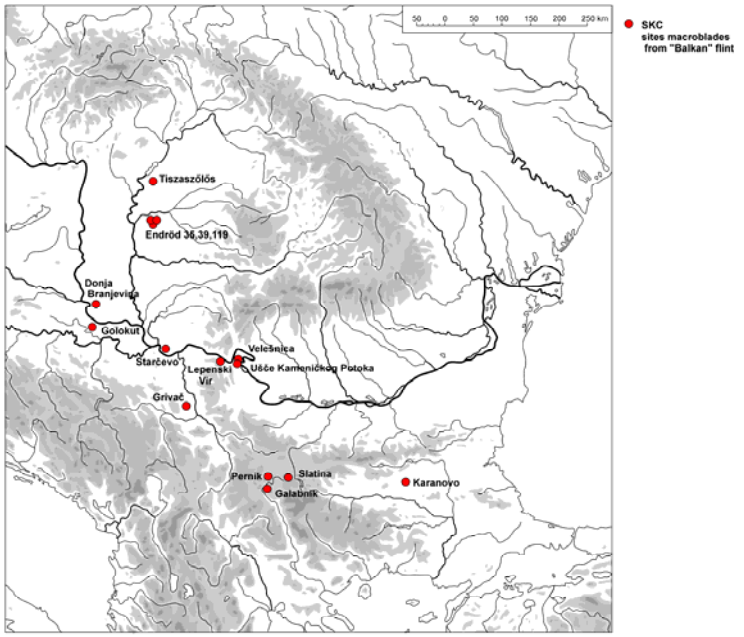

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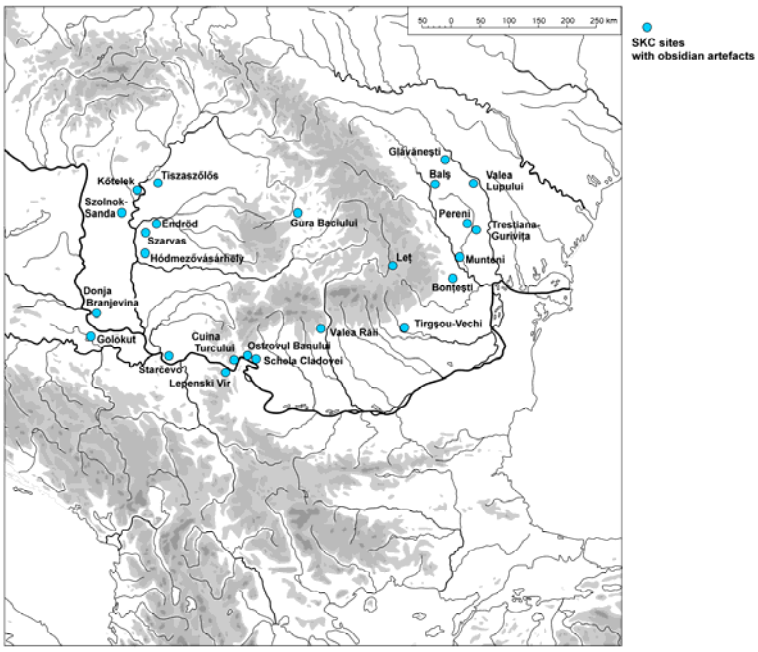

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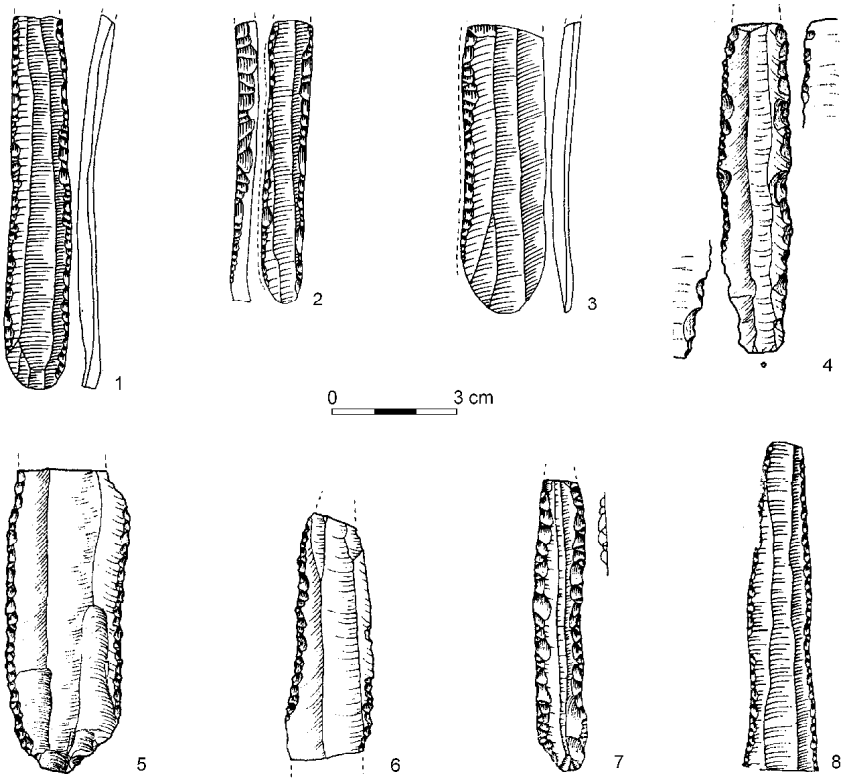

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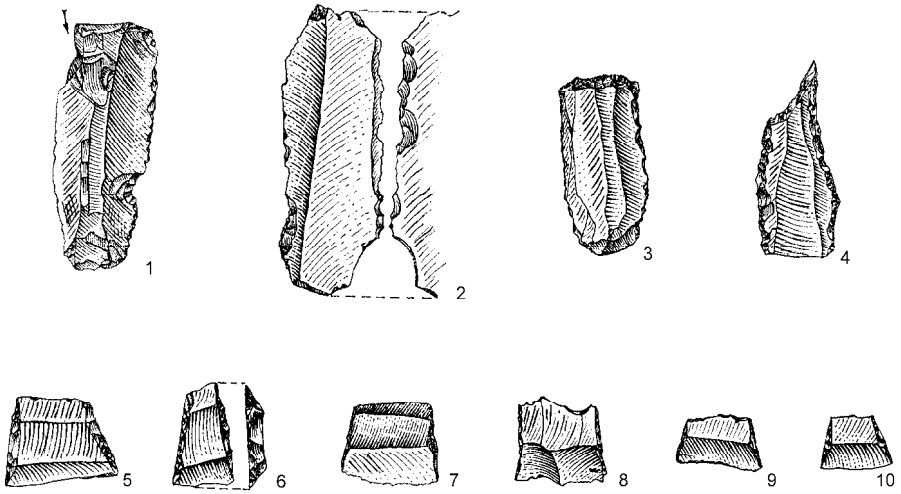

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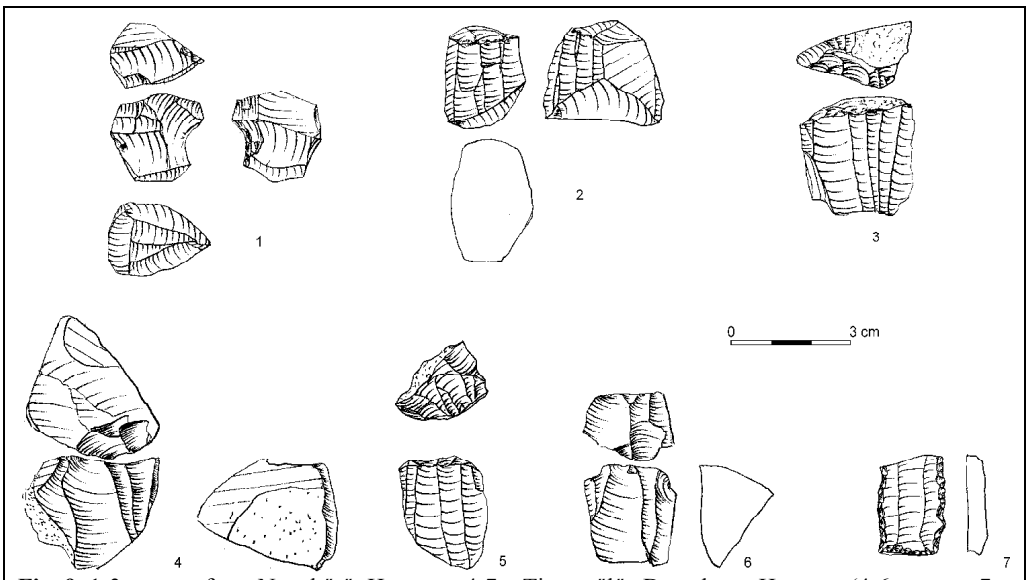

Fig. 9. 1-3 – cores from Nagykőrű, Hungary; 4-7 – Tiszaszőlős-Domahaza, Hungary (4-6 – cores, 7 – retouched blade from „Balkan" flint).

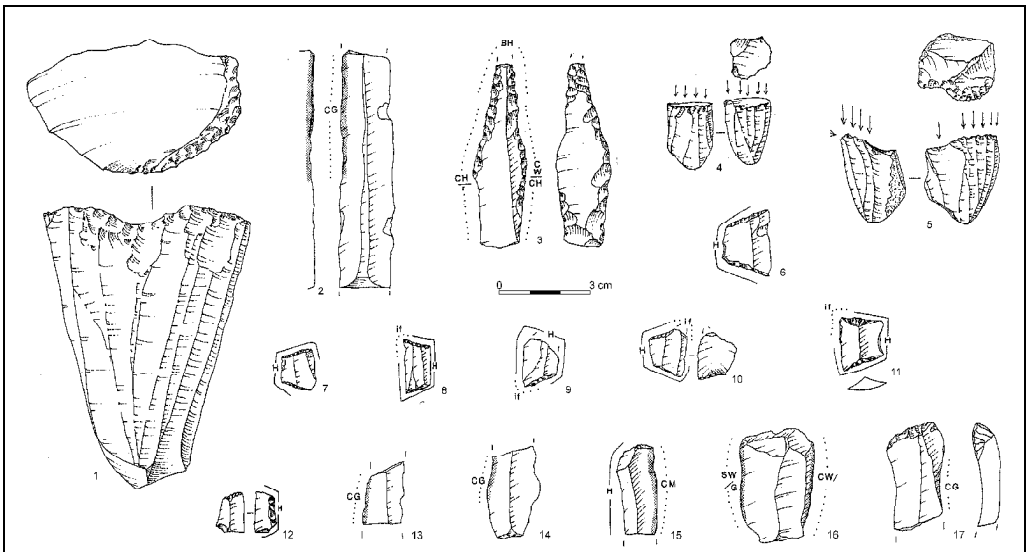

Fig. 10. Mehtélek 1, 4-5 – cores, 2 – blade from Balkan flint, 3 – perforator, 6-12 – trapezes, 13-16 – blades with traces of use, 17 – retouched truncation (acc.to E. Starnini).

Fig. 11. Obsidian nodules from the early Eastern Linear Culture site of Moravany (Eastern Slovakia).

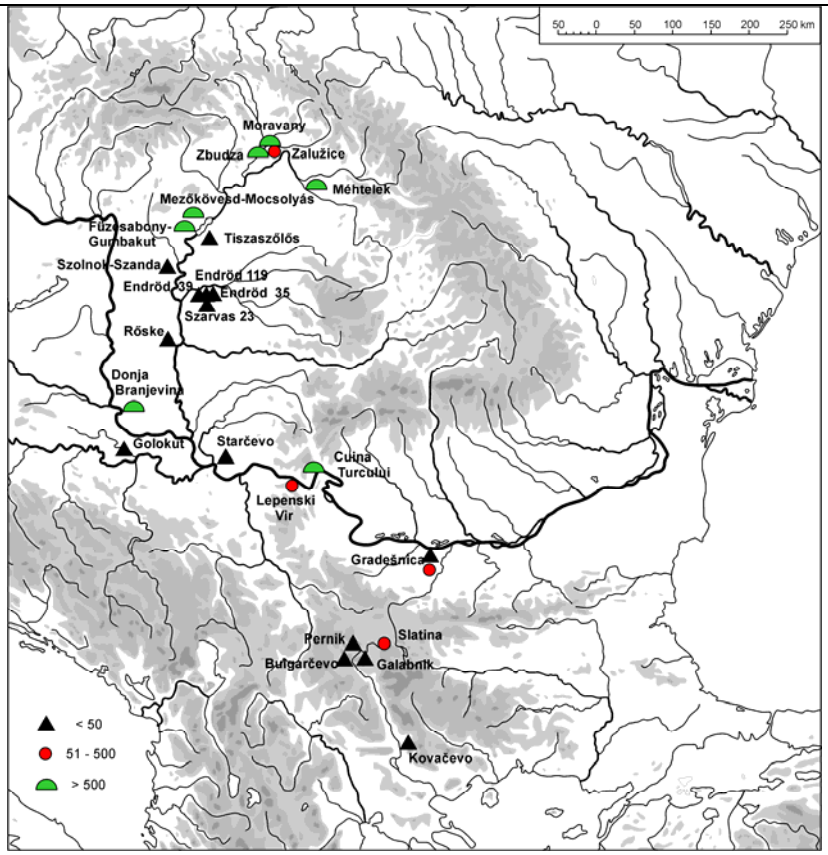

Fig. 12. Number of artefacts in lithic assemblages of the FTN sites in the Northern Balkans and in the Carpathian Basin.

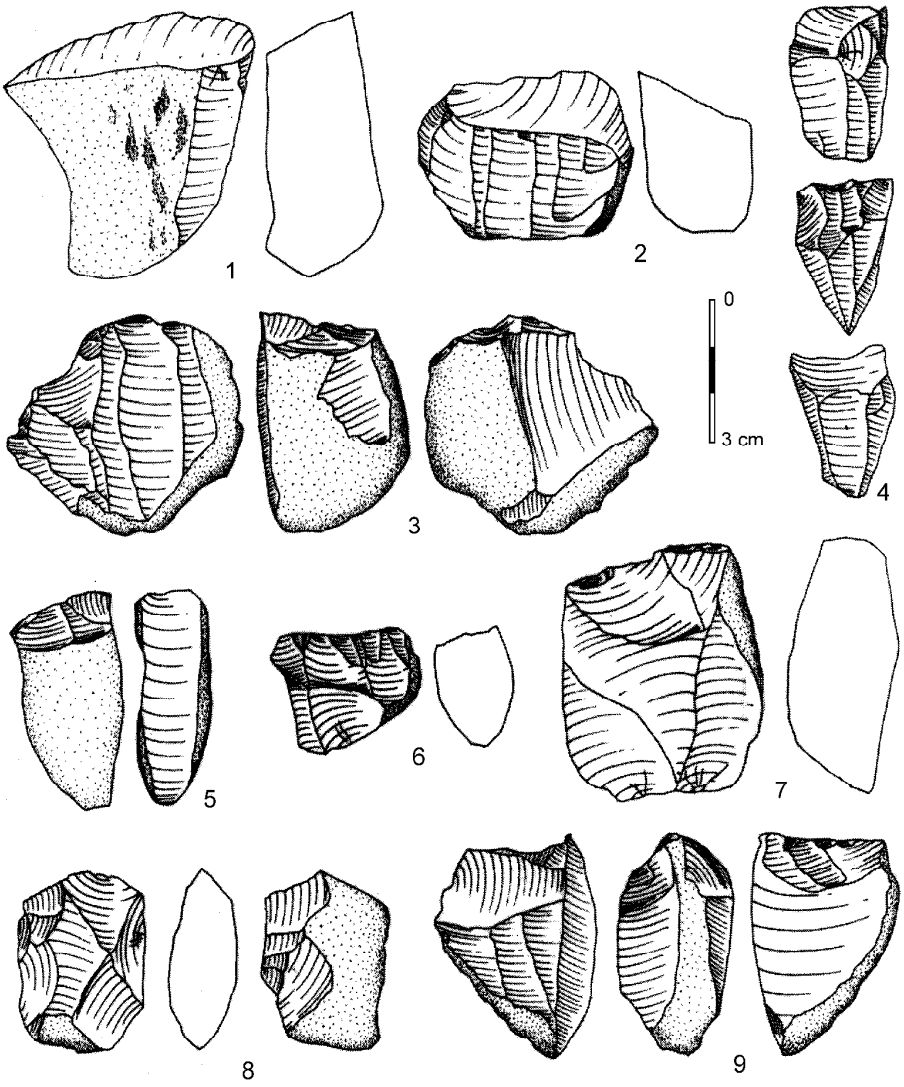

Fig. 13. Slavkovce (Eastern Slovakia). 1-9 – cores from Early Eastern Linear Culture assemblage.

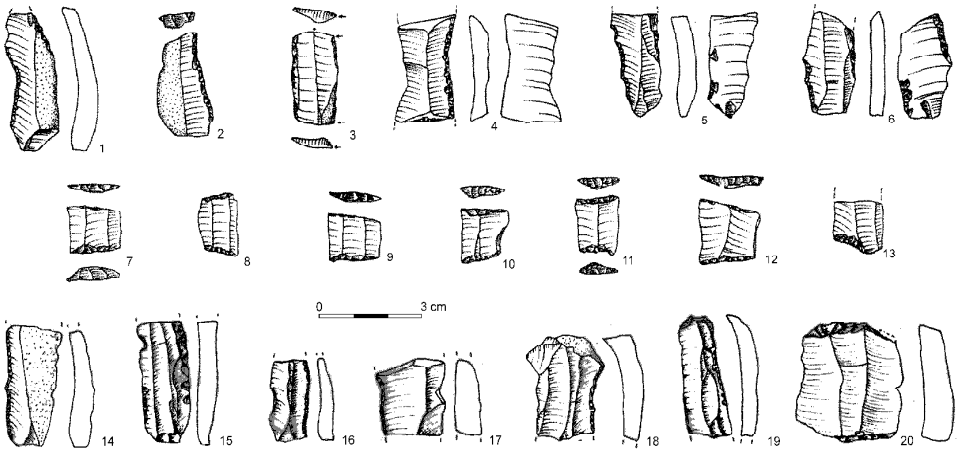

Fig. 14. Obsidian and limnoquartzite tools from Eastern Linear Culture: Slavkovce (Eastern Slovakia): 1-6 – retouched blades, 7-12 – trapezes, 13 – fragment of trapeze or truncation; Zalužice (Eastern Slovakia): 14-19 – retouched blades, 20 – end-scraper.

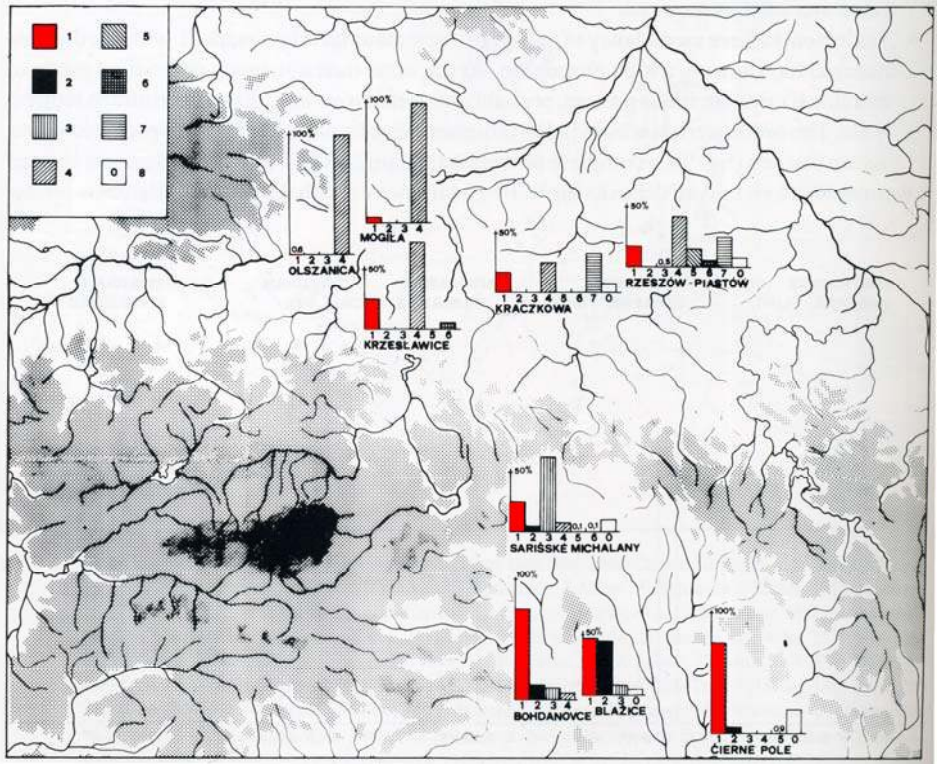

Fig. 15. Raw material structure of selected Western Linear (LBK) and Bűkk Culture sites: 1 – obsidian, 2 – limnoquartzites, 3 – radiolarites, 4 – Jurassic flint, 5 – Cretaceous flint from Dnester basin, 8 – others.

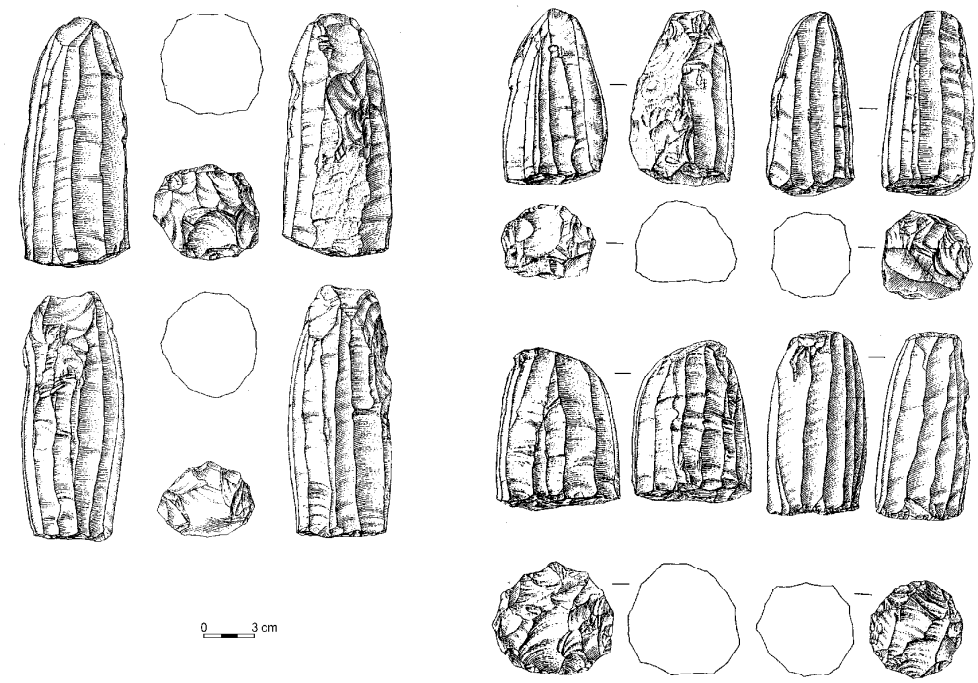

Fig. 16. Obsidian cores from the Bűkk Culture workshop in Kašov (Eastern Slovakia) (acc.to L. Banesz).

Fig. 17. Radiolarite blade depot of Bűkk Culture from Šarišske Michal'any (Eastern Slovakia).

Fig. 18. Radiolarite blade depot of Bűkk Culture from Šarišske Michal'any (Eastern Slovakia).

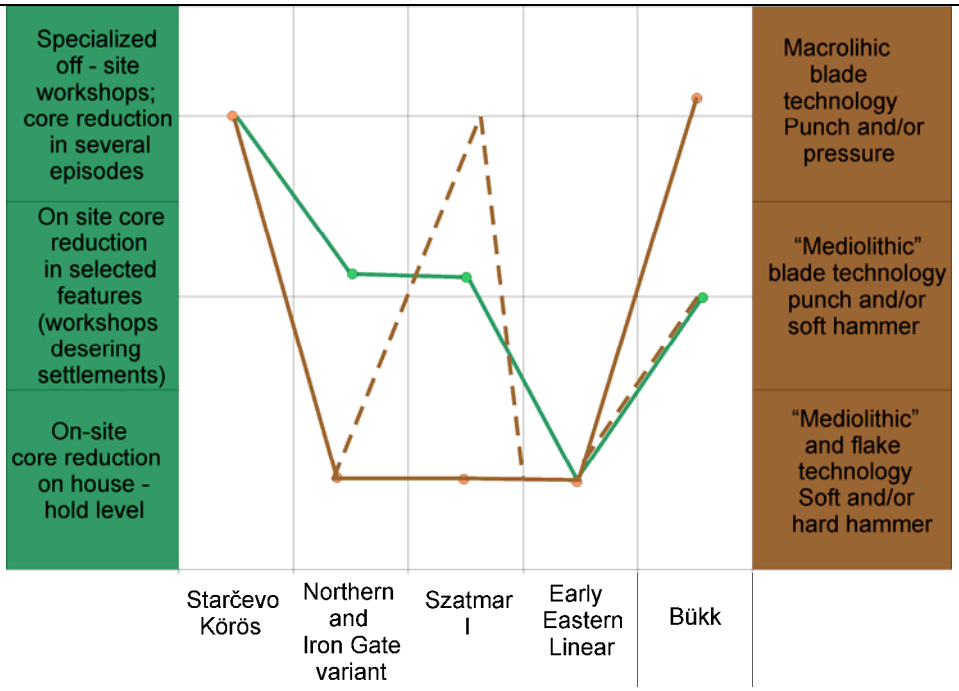

Fig. 20. Oscillating changes in lithic production techniques (red) and their relation to social organization (green) in the Early and Middle Neolithic in the northern Balkans and eastern part of the Carpathian basin.

Fig. 19. Raw material procurement systems, technology, tool morphology and the relation between lithic production and social structures in the Early and Middle Neolithic in the Northern Balkans and the Eastern part of the Carpathian Basin.

		Raw materials	Blanks	Techniq ue	On-site vs off-site reductio n	Raw material supply system	Specialisat ion	Tool structure
5000/ 4900	Bukk Culture	Obsidian or / and limnoquarzites, radiolarites (single raw material dominating or varied raw material structure)	"mediolit hic" blades , single macrobla des	Punch or / and soft hammer (pressure ?)	On-site core preparati on and reductio n	Local/mesol ocal supply system; long distance transcarpath ian exchange	On-site specializat ion: workshops in particular features; Utilised blade depots (equipmen t of specialize d craftmans)	Laterally retouched blades, end-scrapers, burins, truncation s, peduncul ated blades, microliths
5300	Early Eastern Linear	Obsidian,limnoqua rzite, radiolarite, appearance of transcarpathian flint	"mediolit hic" blades; flakes	Direct percussi on, soft/hard hammer	Complet e reductio n cycle on-site	Local/mesol ocal supply system; transcarpath ian contacts with area of the LBK	Full reduction on house-hold level; rare exchange of ready tools and blades	Laterally retouched blades, end-scrapers, truncation s, perforator s, microliths
5400	Szatmar I and Proto-Linear	Obsidian and limnoquarzite. Trace quantities of "balkan" flint.	"mediolit hic" blades few macrobla des flake blanks	Soft hammer	Complet e reductio n cycle on-site	Mesolocal supply system single, long-distance imports	Full reduction on house-hold level	Laterally retouched blades, end-scrapers, truncation s and microliths
5500	Northen and Iron Gate variant of Starcevo-Koros	Obsidian and limnoquarzite/radi olarite. Trace quantities of "balkan" flint	"mediolit hic" blades and macrobla des	Soft hammer and punch	Complet e reductio n cycle on-site	Meso-local supply system. Core depots	Shift to the on-site production	Laterally retouched blades, truncation s and microliths
5700/ 5500 6100	Starcevo-Koros (White painted)	First occurece of obsidian. Extralocal "banat" or "balkan" flint	Macrobla de technolog y.	Advance d core preparati on' punch / pressure techniqu e	Off-side core preparati on. Core reductio n in several episodes . Rare debitage discard	Long-distance exchange network. Prospection of new raw material sources out of settled zone	Specjalisat ion on extra-local level	Laterally retouched blades; few transversa lly retouched tools