BLANK SELECTION STRATEGIES IN THE MESOLITHIC OF SOUTHWESTERN UKRAINE

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Abstract

The Author presents a new variety of blank selection analysis based on the function of the flint implements according to the results obtained from the traceological analysis. The study of the assemblages from two Mesolithic sites of Southern Bessarabia, Myrne and Bilolisja, allows to hypothesize a shift in the model of knapping organisation. The explanation of this change is to be searched in the mobile economy of the Mesolithic hunter-gatherers.

Introduction

Optimisation models are widely employed in the study of the subsistence strategies by the supporters of the "optimal foraging theory" (Winterhalder and Smith, 1981; Broughton, 2002; Bird and O'Connell 2006). They can be equally applied to other aspects of prehistoric people's behaviour. Their use in the lithic technology investigations is of particular interest.

Flint-knapping has its own "economic" meaning (Geneste, 1991; Kuhn, 1995; Blades, 2001). Palaeolithic man tried to obtain the tools he needed by optimising some critical parameters. We can speculate that amongst these parameters there were time, effort and the quantity of raw material. Their importance, together with other, not so universal characteristics, varied according to the different societies, communities and, first of all, situations. The process of stone tool production can be described as an optimisation interpretative framework.

The knowledge about the mechanical properties of the raw material and technological components of its transformation is essential for the reconstruction of the ancient "*chaine operatoire*". Nevertheless the utilization pattern of the knapping results predefines the process of flaking.

The functional analyses of the assemblages from some Ukrainian Mesolithic sites made by G. F. Korobkova (1989), enables us to fulfill this comparison. After the definition of the function of all the retouched and unretouched artefacts, one may discuss the reasons why a particular blank was selected and (non-) modified by a secondary treatment (retouch or burin spall or trimming).

The tools production and use differed, although the preferential responses of the knappers to the demands of the working operations were similar and systematically related to each other.

The method we argue is a variety of the blank selection analysis. It is different from the most common type of the latter, because of its dependence from the results on the functional analysis of the entire site collection. V. N. Stanko (1982) developed this method and applied it to the Myrne assemblage in 1982. In his study he also extensively used the optimisation explanatory framework.

In this paper, this method is applied to the study of the Bilolisja chipped stone assemblage. Its results are compared with those obtained from the analysis made by V. N. Stanko on the industry from Myrne.

The sites

Both Myrne and Bilolisja are located in the southern part of the Danube-Dniester interfluvial.

Bilolisja lies on the right bank of the Sarata, a small, meandering river that flows into the Sasyk (Kunduk) Lyman (salt lake) (*fig.* 1). A. Kremer discovered it in 1958 (Kraskovsky and Kremer, 1959) and V. N. Stanko (1971; 1976; 1977; 1980; 1985) ex-

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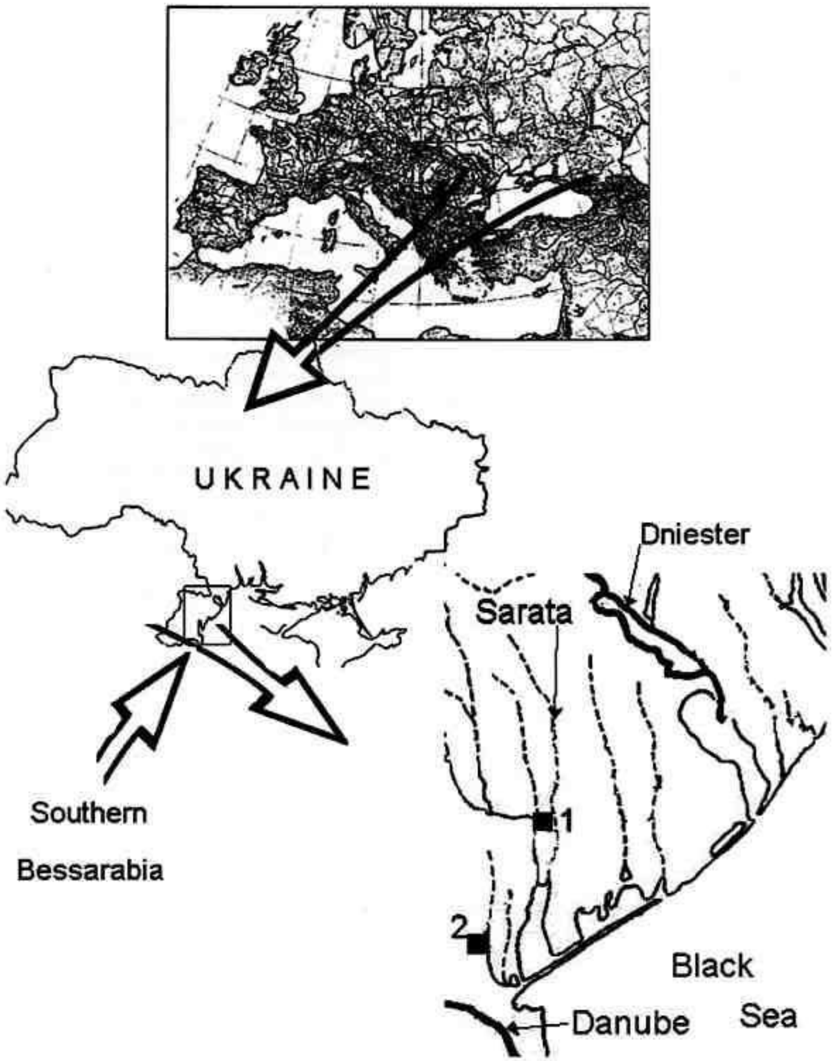

fig. 1 - The study area with the location of Bilolisja (1) and Myrne (2).

cavated it in 1965-66 and 1977. The excavations covered 180 sq. m. The archaeological layer was discovered in the clayey deposit beneath the recent subsoil (chernozem B). Two hearths and four or five distinct scatters of finds represent the structural units of the site. Its chronological position is still disputed (KOROBKOVA, 1989; JANEVICH, 1990; GRIGOR'EVA, 1992; ZALIZNJAK, 1995: 18; 1998; 2005). The geoarchaeologist V. P. Petrougne attributes the sediments containing the first hearth to the end of the Glacial period because of their stratigraphic position and morphological characteristics (PETROUGNE, 1971). The pollen analysis by G. PASHKEVICH (1961) would assign the cultural layer to the Preboreal; in contrast, the only radiocarbon date so far available falls into the Boreal period (Ki-10886; 8900±160 uncal BP).

The lithic assemblage is characterised by the predominance of segments amongst the microliths, together with trapezoidal geometrics and arched points. The knapping technology resembles that of the Palaeolithic. The cores are sub-prismatic, for the production of both short blades and flakes. The blades have irregular contours and dorsal ridges. According to these data, some authors attribute the site to the end of the Palaeolithic, although its excavator assigns it to the Early Mesolithic. This latter interpretation is the most widely accepted and it is the one adopted in this paper.

Myrne was discovered on the western bank of the Drakulja River, in the lowlands adjacent to the wide Danube Valley (*fig.* 1). The settlement, which covers a surface of 2500 sq. m., was excavated by V. N. Stanko in 1968-1976. The pollen and geoarchaeological analyses and one radiocarbon date (Le-1647: 7200±80 uncal BP) (STANKO, 1982) attribute the site to the Atlantic period. The flint assemblage is represented by materials attributable to two different traditions. The Kukrek one is characterised by conical and bullet cores and a well developed pressure flaking technique. The particular tool types of this tradition are the Kukrek inserts (medium wide blade fragments with trimming facets on their ventral surface and a partial, dorsal retouch removing the corners of the blank) and the Abuzova Balka points (points on a narrow bladelet composed by a backed side adjacent to an oblique truncation). The Grebenyky industry is characterised by flat prismatic cores with regular blade and bladelet detachments. The commonest microlithic, geometric tool of this aspect is a small, symmetrical trapeze (*fig.* 2).

According to V. N. STANKO (1982), bearers of both the above-mentioned traditions settled Myrne more or less contemporaneously.

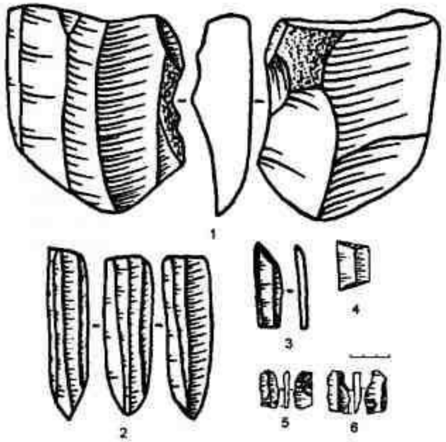

fig. 2 - Most characteristic artefacts of the Kukrek and Grebenyky cultural entities. 1 - flat core, 2 - conical core, 3 - Abuzova Balka point, 4 - symmetrical trapeze, 5, 6 - Kukrek inserts. 1, 4 - Grebenyky. 2, 3, 5, 6 - Kukrek.

THE ANALYSES

The techno-typological method

The functional analysis opened new perspectives to the study of Stone Age archaeology (SEMENOV, 1957; 1968) According to it, a "tool" is a stone artefact, which was utilised to work on some material. The first traceological studies (most clearly it was expressed by SEMENOV, 1968; SEMENOV, KOROBKOVA, 1983; STANKO 1982; MOSS, 1983) showed that typologically-defined tools are not the only used specimens, and that secondary retouch is facultative in the stone tool production process.

The traditional blank selection analysis studies the relationships between blanks and tools according to their typological definition. In this paper, I tried to compare both groups of implements: 1) modified by retouch and 2) with traces of wear. These groups are significantly different. Quite a high portion of unretouched pieces bear traces of wear. I compared the parameters of the blanks with the "functional tools" and tried to answer the question why some particular classes of instruments are retouched, while others do not need to be retouched to be functional.

The Bilolisja lithic assemblage was described according to the techno-typological scheme proposed by V. N. Stanko (*et al.*, 1999): 1) the flint artefacts were measured, 2) the function of the tools and their typological classes were defined, and 3) the correlation between both size and utilization marks, and function and type were considered.

The fundamental precondition of this blank selection analysis is the traceological study of the whole collection, which, in the case of Bilolisja, was carried out by G. F. Korobkova (Stanko, 1985; Korobkova, 1989). Her analysis was made in the 1980s; this is why nowadays it might seem to be too simplified. The mechanical operation of the implement and the material exploited are the only definitions provided by this analysis. They are not enough to understand the real function of each tool within the behavioural pattern of the prehistoric populations. Nevertheless the detailed analysis of each piece was not possible given the large amount of tools to be studied, which include thousand of specimens. We have to point out that only the passionate work of G. F. Korobkova and her collaborators enabled us to complete this paper.

Patterns of blank selection

The blades and elongated flakes were often fragmented before their use. We have selected the width as main criteria for the definition of the metrical groups, because it is characteristic for both the blades and their related fragments.

The microblades (width up to 8 mm) were employed as projectile inserts (0.28%), knive inserts (cutting-edged) (0.14%) and other tools (0.15%), while 0.43% were not utilised. The medium width blades (width between 8 and 15 mm) were used as knives in 41% of the cases, adzes (10%), scrapers (5%) and other tools (20%), while only in 24% of the cases they were discarded before their use. The wide (more than 15 mm) blades functioned as scrapers and knife inserts with an almost identical frequency (0.25% and 0.26% respectively), other tools (0.33%), while in 16% of the cases they were not utilised. Most tools were obtained from blades 8-15 mm wide, although the bigger blades show a higher pattern of use-wear (*fig.* 3).

The Bilolisja flint industry is mainly from blades. 80.73% of the tools were made from blades and microblades. Moreover one can suggest that mainly blades were removed from the site by the prehistoric people, both final knapping products and composite hunting weapons.

Measures (mm)	<10	from 10 to 30	>30	Total
Flakes	130	530	50	710
%	18.31	74.65	7.04	100.00
Tools	5	55	6	66
% of the total amount of items per type of blank	0.70	7.75	0.85	9.30
% of the number of items per metric group	3.85	10.38	12.00	9.30
Measures (mm)	**<8**	**from 8 to 15**	**>15**	**Total**
Blades	109	199	85	393
%	27.74	50.64	21.63	100.00
Tools	62	152	71	285
% of the total amount of items per type of blank	15.78	38.68	18.07	72.52
% of the number of items per metric group	56.88	76.38	83.53	72.52

Table 1 - Utilisation patterns of blanks of different sizes.

Although flakes predominate, they consist of debitage wastes. Less than 1/10 of the flakes show traces of wear. Their choice was opportunistic and mainly dependent from the particular working necessities.

A large quantity of flakes was discarded without being employed in any way (*fig.* 4). The microblades, consist mainly of scale-like flakelets deriving from retouch, which are too fragile to be utilised. The very thick long flakes were never utilised (crested blades, elongated rejuvenation flakes, primary core reduction flakes). The discarded pieces included also bulbed blade fragments.

They represent about a half of all the unused laminar products. They are due to technological necessities. In effect they might have been utilised for work, although the percentage of used pieces is well below that of the thin (2-5 mm) regular blade fragments, which were suitable for making inserts. Hafting traces have been recorded on 43% of the laminar products. Also a few relatively regular, thin fragments of blades were not utilised, although they represent a minority amongst the discarded laminar products.

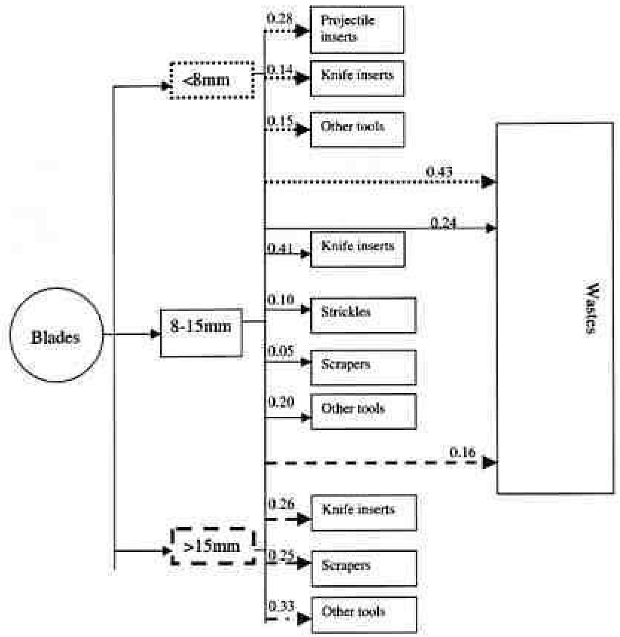

fig. 3 - Percentage of blades according to their function and discharge.

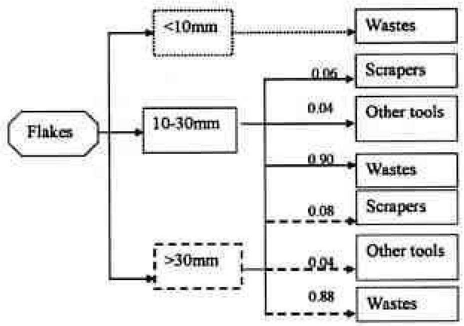

fig. 4 - Percentage of flakes according to their function and discharge.

The secondary treatment (retouch and burin blow) is not correlated directly with any of the tool functions defined by the traceological analysis. This fact, which was demonstrated by V. N. STANKO (1982) for the Late Mesolithic, seems to recur also in the Bilolisja industry. Most pieces were used in working operations without any secondary treatment (66.57%) (*Table* 2). Furthermore the partial and very fine retouch, according to the typological description, does not derive from a deliberate modification of the blank but from the occurrence of macrotraces. A secondary treatment was facultative and even unnecessary for some tool types. Only the scrapers were systematically retouched. They constitute some 20% of the entire complex of tools with wear-traces, and more than 50% of the tools with a secondary treatment.

To sum up: 1) the flakes were rarely consid-

Tool types	Number	%	Number of tools with s/t	%	% of the group of tools
Knives inserts	119	33.71	9	7.63	7.56
Projectile inserts	31	8.78	2	1.69	6.45
Saws	5	1.42	0	0.00	0.00
Perforators	12	3.40	6	5.08	50.00
Carvers	7	1.98	0	0.00	0.00
Burins	15	4.25	9	7.63	60.00
Borers	10	2.83	6	5.08	60.00
Adzes	39	11.05	11	9.32	28.21
Scrapers	69	19.55	60	50.85	86.96
Scrapers with acute working side	17	4.82	3	2.54	17.65
Planes	12	3.40	2	1.69	16.67
Multifunctional tools	17	4.82	10	8.47	58.82
Total	353	100.00	118	100.00	33.43

Table 2 - Tool types characteristics and secondary treatment (s/t)[2]

ered suitable for any use; 2) the microblades were produced regularly although many consisted of technological wastes; 3) the blades, wider than 8 mm, probably represent final knapping products. The bigger was the blade size, more probable was its utilisation. The raw material constrains (small-sized river pebbles and their not-too-high knapping quality) limited the production of large blanks.

The standardised laminar products, after their detachment from the core, were first snapped and then hafted. Retouch, burin blows and trimming were not necessary for tool making.

DISCUSSION

The analysis I have experimented was conducted for the first time by V. N. STANKO (1982) on the Late Mesolithic assemblage of Myrne, a hunter-gatherers base camp of the Kukrek and Grebenyky Cultures. This site is located some 50 km southwest of Bilolisja. The industries from both these sites were chipped from a similar raw material, the river pebbles from the Prut and Dniester Rivers valleys. The differences observed during their comparative analysis can be explained in the following ways: 1) they derive from different knapping techniques, 2) the assemblages belong to different cultures and ages, 3) the sites locations differ because of the mobile subsistence economic strategies of the prehistoric hunter-gatherers and 4) the size of the samples is not identical. Nevertheless we believe that the differences we have pointed out represent the basic discrepancies observable in the flint-knapping procedures practiced

[2] Secondary treatment (retouch, burin blow negative, trimming).

at the two different sites. Thus they are believed to originate from the chronological differences.

The patterns of flake utilisation are qualitatively different. While the inhabitants of Bilolisja discarded most of the flakes, three quarters of the large flakes from Myrne show traces of wear. The Bilolisja knappers preferred to manufacture wider blades, while Myrne shows an opposite pattern. The medium width microblades and blades indicate a very similar percentage of utilisation (61.96% and 60.82% respectively). The large blades were employed in working activities to a smaller extent, given that 48.59% were used as tools.

For a correct interpretation of these results many more comparative data are needed. Nevertheless, at this initial stage of the analysis, the differences can be explained by chronological reasons. The Bilolisja knappers employed the same manufacturing techniques of their Late Palaeolithic predecessors, while the Myrne industry is a typical example of a Late Mesolithic fine, regular blade technology (*fig*. 4).

These differences are supported by the varying production rates of the groups of blanks. The flake production did not change very much. The flakes distribution in the metric groups becomes flatter during the Late Mesolithic (*fig*. 5). This pattern can be explained by seventeen times larger size of the assemblage from Myrne. The percentages of the blades of different width are very dissimilar. At Myrne the number of microblades is double than that of Bilolisja (*fig*. 6). The production of wide blades, which were less utilised at the second site, was almost four times lower.

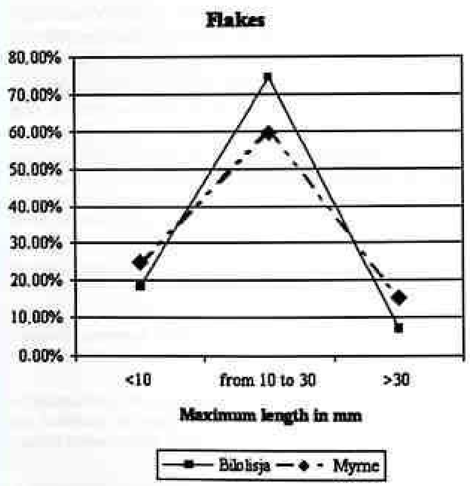

fig. 5 - Distribution diagram of the dimensions and percentages of the flakes.

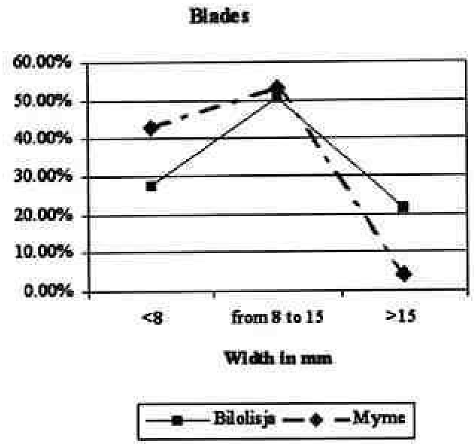

fig. 6 - Distribution diagram of the dimensions and percentages of the blades.

INTERPRETATION

The differences we have observed might derive from the various approaches employed for the production of the scraper blanks. At both sites the main knapping products consist of medium-sized blades. They represent blanks from which were obtained 43-44% of the tools utilised by the inhabitants of Myrne and Bilolisja.

Nevertheless the subsistence activities consisted of various mechanical operations (scraping, drilling, cutting etc.). Each arouses the necessity of a well-defined tool, suitable for this function. The regular, thin blade fragment inserts were indispensable, although they could not be employed as scrapers. The thick edges, which were not so sharp (40-70 degree), were the best choice for scraping activities.

The Bilolisja knappers manufactured large blades (21.63% of the laminar products), one quarter of which was utilised as scrapers. The latter represent the only group of implements where the larger blades (21 items) were preferred to the medium width blades (10 items). 50% of the scrapers were obtained from flakes, whilst the large flakes were rarely employed for this purpose (4 out of 38).

The production of large blades diminished during the Late Mesolithic (4% of blades are wider than 15 mm). At Myrne, 91% of the scrapers are on flakes. Nevertheless the relative production rate of both flakes and laminar products remained unaltered, although they show a low fluctuation rate (4.53% at Bilolisja and 7.85% at Myrne). The variability pattern might be due to the size of the two samples. But the degree of utilisation of the larger flakes increased six times. The wide, irregular flakes systematically make their appearance during the early knapping stages. They can be used for scraping, although their edges needed to be modified by retouch.

Thus, the Late Mesolithic people produced the scrapers they needed without any additional knapping. They utilised one of the groups of the technological waste, the large flakes. This favoured the economic exploitation of the raw material employed. The Bilolisja blank selection strategy implied the discard of a large number of thick, irregular flakes and raw materials. Some quantities of flint were also discarded during the production of large blades. The Myrne inhabitants were able to produce more tools from the same quantity of flint than the Bilolisja knappers. This latter industry is characterised by the growth of efforts towards the retouch of the blanks. If the earlier knappers retouched 87% of the artefacts used as scrapers, 100% of the Myrne scrapers were retouched. The percentage of the secondarily treated blades is almost identical, although at Myrne a higher percentage of flakes is retouched (96% instead of 74.2%). Nevertheless the Late Mesolithic strategy of blank selection might have advantaged the reduction efforts. After a long use, the scrapers were to be re-sharpened. This is why the flakes used as scrapers were always retouched. It is important to point out that the knapping of large blade was a difficult task. The preliminary core preparation was undoubtedly effort-consuming. The number of these processes was reduced four times by increasing the amount of retouched tools 1.14 times. In my opinion, an optimisation pattern is quite possible in this case.

I suggest that the new blank selection strategy resulted from lithic technology revolutionary changes that made their appearance during the Late Mesolithic: 1) the very regular laminar technology (probably obtained by pressure flaking) and 2) the microlithic inserts. These latter lead to the necessary production of microbladelets and bladelets. Most of the large blades became unnecessary and the thinner blades could be utilised for almost every purpose, instead of the large blades, except for scraping. The special core pretreatment for the detachment of thick blades became useless. The wide use of primary flaking products was a solution.

The preliminary review of other sites, whose entire assemblages have been analysed by traceologists (Sapozhnikova *et al.*, 1995), hypothesizes that such a trend arose around the beginning of the end of the Palaeolithic, and that it was connected with the slow change from logistic to residential mobility, following the terminology proposed by L. Binford (1980).

To conclude, the new blank selection strategy accompanied other more evident changes, which took place during the Late Mesolithic. The knappers of this period employed manufacturing methods more efficient than those of their ancestors, not only because they had acquired new techniques, but also because of a more accurate optimisation plan of the raw materials they exploited.

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