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Lithic raw material exploitation and circulation in Préhistory. A comparative perspective in diverse palaeoenvironments
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1.5. Paleolithic of Ukraine: The main diachronic and spatial trends of lithic raw materials exploitation

Résumé
Les matières premières lithiques représentent un des besoins essentiels de la population préhistorique, c'est ainsi que les dynamiques de l'exploitation de la matière première dans le Paléolithique en Ukraine doivent être étudiés dans les contextes des spécifiques du territoire, du paysage, du climat et d'autres particularités environnementales, ainsi que les rythmes de colonisation de cette région.

Les caractéristiques environnementales de la région que nous allons évoquer ici sont déterminées par la permanence des conditions climatiques continentales, la netteté des diminutions au sud et à l'ouest, tant au Pléistocène que de nos jours. Les ressources biologiques et minérales sont d'une importance considérable dans les périodes du Paléolithique inférieur, moyen et supérieur. Mais elles ne sont pas réparties de manière égale sur tout le territoire. Il est possible de considérer que la région disposant de ressources stables en matières premières corresponde à la région ayant des bio-ressources riches et relativement favorables. Dans une telle situation, elle était plutôt isolée et constituait un noyau solide pendant le Paléolithique. L'inégalité géographique des ressources biologiques et minérales additionnée au rythme des changements environnementaux est détermnine la direction, la dynamique, et l'intensité de la colonisation des terres aux Paléolithiques inférieur, moyen et supérieur. D'étroites relations entre les différents modèles de colonisation et les dynamiques de changement stratégiques en matières premières lithiques peuvent être déterminées.

Les tendances diachroniques et spatiales principales de l'exploitation de la matière première lithique au Paléolithique en Ukraine sont très généralement caractérisées de la manière suivante : le Paléolithique inférieur se caractérise par l'utilisation d'une gamme étendue de matières premières lithiques, de préférence non isotropes, de provenance locale. Durant le Paléolithique moyen, les stratégies sont orientées vers des matières isotropiques locales. Ces stratégies sont typiques du Paléolithique supérieur, mais la géographie des territoires d'occupation et la mobilité paraît plus étendue et considérablement en haute altitude grâce à l'invention de technologie plus sophistiquées et moins opportunistes.

Abstract
Lithic raw materials represents the only one, though substantial, vital needs of prehistoric population, therefore, the dynamic of exploitation of raw materials in Paleolithic of Ukraine cannot be investigated out of context of specificity of territory, landscape, climate and further environment peculiarities, followed by the regularities of colonization of the terrain.

Environmental features of the area under discussion are determined by the permanently continental climatic conditions, the sharpness of which is decreases southwards and westwards both during Pleistocene and nowadays.
Biological and mineral resources definitely were of the vital importance during the Lower, Middle and Upper Paleolithic. But they were not universally represented on the territory of the country. Areas with stable primary sources of raw materials and areas with rich and comparatively well predicted bioresources are basically coinciding. Besides, the areas with stable and predictable vital resources during the Paleolithic were not borderless and when coincide, they form obvious core-like pattern.

Geographical unevenness of biological and mineral resources alongside with rhythmic environmental changes is the basic determinant of directions, dynamic, and intensity of colonization of the terrain in Lower, Middle, and Upper Paleolithic. Sometimes essentially different colonization patterns are correlated with the dynamic of changes of lithic raw materials strategies.

The main diachronic and spatial trends of lithic raw materials exploitation in the Paleolithic of Ukraine can be characterized very generally in the following way.

The Lower Paleolithic is characterized by utilization of wide spectrum of preferably not isotropic lithic raw materials of local provenience. The Middle Paleolithic raw materials strategies are characterized by relying on preferably isotropic lithic raw material of mostly local provenience. The same strategy is typical for the Upper Paleolithic; but the geography of colonized areas and mobility appeared to be essentially extended and considerably higher due to invention of more sophisticated and less expendable technologies.

Keywords: Eastern Europe, Ukraine, Lower, Middle, and Upper Paleolithic, colonization patterns, lithic raw materials exploitation

1 – Introduction

Paleolithic studies on the territory of modern Ukraine were started almost one and half century ago at the Upper Paleolithic site of Gontsy. It is quite remarkably that field works at this site are still continued and very recently provide so valuable find, as remains of new dwelling constructed by mammoth bones. This meaningful instance demonstrates both the inexhaustibility of Ukrainian Paleolithic records and also the permanent state of incompleteness of archaeological database. Nevertheless, available archeological records, alongside with data of allied sciences, provide the essential basis for the reconstruction of processes took place on the territory of the country in prehistory.

One of the important problems of the home Paleolithic studies comprised a row of questions related to the reconstruction of processes of lithic raw materials provenience, acquisition and circulation. These questions, should be admitted, are at the very early stage of development. Although there are instances of comprehensive case studies focused at isolated archaeological assemblages or at small series of exotic rocks, these instances are few and isolated. There are also perfect geological database, concerning various aspects of lithic raw materials, sometimes quite detailed. There are also isolated lists of samples determined by the means of various, sometimes highly technological methods. But there is also the obvious lack of information and shortcomings of available data. Till now is quite evident the urgent need in professional works embraced efforts of archaeologists, petrologists, and scholars of other related branches. Probable reason of this situation likely rooted in extreme richness of deposits with potential lithic raw materials, high variability of these latter, followed by the similarity of their main characteristics.
Therefore, the proposed paper forcedly deals with the most general regularities of lithic raw materials exploitation in Paleolithic of Ukraine.

Some preliminary assumptions should be made prior to the further reasoning. These are the following:

1. the ultimate vital and obligatory needs of Paleolithic man were few, these are: needs in water, food, raw materials for tools, and also in shelter; and
2. stability of Paleolithic life was a function of different aspects of environment, namely: climate, landscape, flora, fauna, water sources, availability and predictability of biological and mineral resources, natural shelters, etc.

If above assumptions are correct, then the two consequences should be formulated, namely:

- lithic raw materials represents the only one, though substantial, vital needs of Stone Age tool-makers and
- the dynamic of exploitation of raw materials in Paleolithic of Ukraine cannot be investigated out of the context of specificity of territory, landscape, climate and further environment peculiarities, followed by the regularities of colonization of the terrain.

2 – General outline of evolution of Ukrainian Paleolithic

The lower limit of the Ukrainian Lower Paleolithic is currently determined by the age of the earliest authentic sites localized in Transcarpathia, which age is ranged around 1 Ma ago. Conditional boundary between the Lower and Middle Paleolithic on the territory of Ukraine is proposed to define at ~300 ky ago, between the Alpine Mindel-Riss and Riss. Archaeologically, this boundary is marked by invention and spreading of Levallois technologies. Conditional boundaries between the periods are not considered as the impenetrable thresholds. Transitional periods between the Lower and Middle, Middle and Upper Paleolithic are proposed to distinguish, with uneven chronological frames between 450-300 and 50-30 ky BP, respectively. It cannot be excluded that proper industries and their bearers can survive beyond these boundaries.

Early (~450/300-~130/100 ky) and late (~130/100-~50/30) stages are distinguished within the frameworks of the Ukrainian Middle Paleolithic.

The most early Lower Paleolithic evidence, that is VIII-th cultural-chronological complex of Korolevo in Transcarpathia, is correlated with OIS 22. The latest Middle Paleolithic sites, known in Crimea, and probably also in the West of Ukraine and in Donbas, are correlated with the end of the OIS 3 and the beginning of the second oxygen-isotopic stage. Thereby, in terminology of geostratigraphy, the Lower and Middle Paleolithic of Ukraine occupy the Upper Eopleistocene and the entire Neopleistocene. Marine oxygen-isotopic scale in its relation to the most common schemes of geostratigraphical subdivision of climatic events in out-glacial zone of the Eastern and Western Europe, and the Alps were used as universal correlation mean for the comparison of chronological position of Ukrainian Paleolithic sites (Fig. 1).

3 – Geographical position of the country and the main regularities of environment

A – Geographical Position as a Factor for Permanently Continental Climatic Conditions

Territory of modern Ukraine includes the essential south-western segment of the East European plain. Landscapes of this area are rather variable and embrace mountainous, hilly elevations, and plains. The preponderant landscapes are flat plains, dissected - mainly in longitudinal direction - by the valleys of large rivers and their tributaries. Several great hydrosystems dissect the plain, these are – from west to east – the Dniester, Southern Bug, Dnieper rivers, and the western tributaries of the Lower Don. Crimean and Carpathian mountains are localized in the extreme south and west of the country.

The major portion of Ukraine covers open terrains eastwards from Carpathians: it means domination of basically continental climate with no mild effects of warm ocean streams.

As a result, effects of continental climate were effective in course of the entire period of Pleistocene, in various extents, of course. It is worth to stress that the continental characteristics of climate are decreases southwards and westwards both during Pleistocene and nowadays (Velichko 2009).

B – Hydrological Peculiarities of Terrain

Should be emphasized the practically even distribution of hydrorecources on the territory of the country. The only exception is represented by the zone of steppe on the extreme south, where smaller rivers are few and not stable. The preponderant majority of rivers in the continental Ukraine have meridian orientation, and this important feature of the hydrographic system was principally formed already towards the end of the Eopleistocene.

Even if to exclude so important roles of large and smaller rivers as water sources, as axis of animal and human migration routs, as limitation frontiers, and as seasonally renewing areas of rich bioresources, one more significant role is still remained. It is a role of transportation channels for lithic raw materials.

The dominating orientation of the major water streams essentially contributes to the systematic North to South transportation of flints from the primary outcrops (Dniester basin, Upper flow of Southern Bug, tributes of Seversky Donets River, a row of left tributaries of Middle Dnieper) and also of flints of moraine origin (mainly Dnieper basin). Large amounts of various kinds of lithics were transported by water-ice streams and accumulated across large areas in course of Pleistocene. For instance, the area of so-called Northern moraine flints (Petrougne 1995) generally coincides with boundaries of continental Pleistocene glaciations.

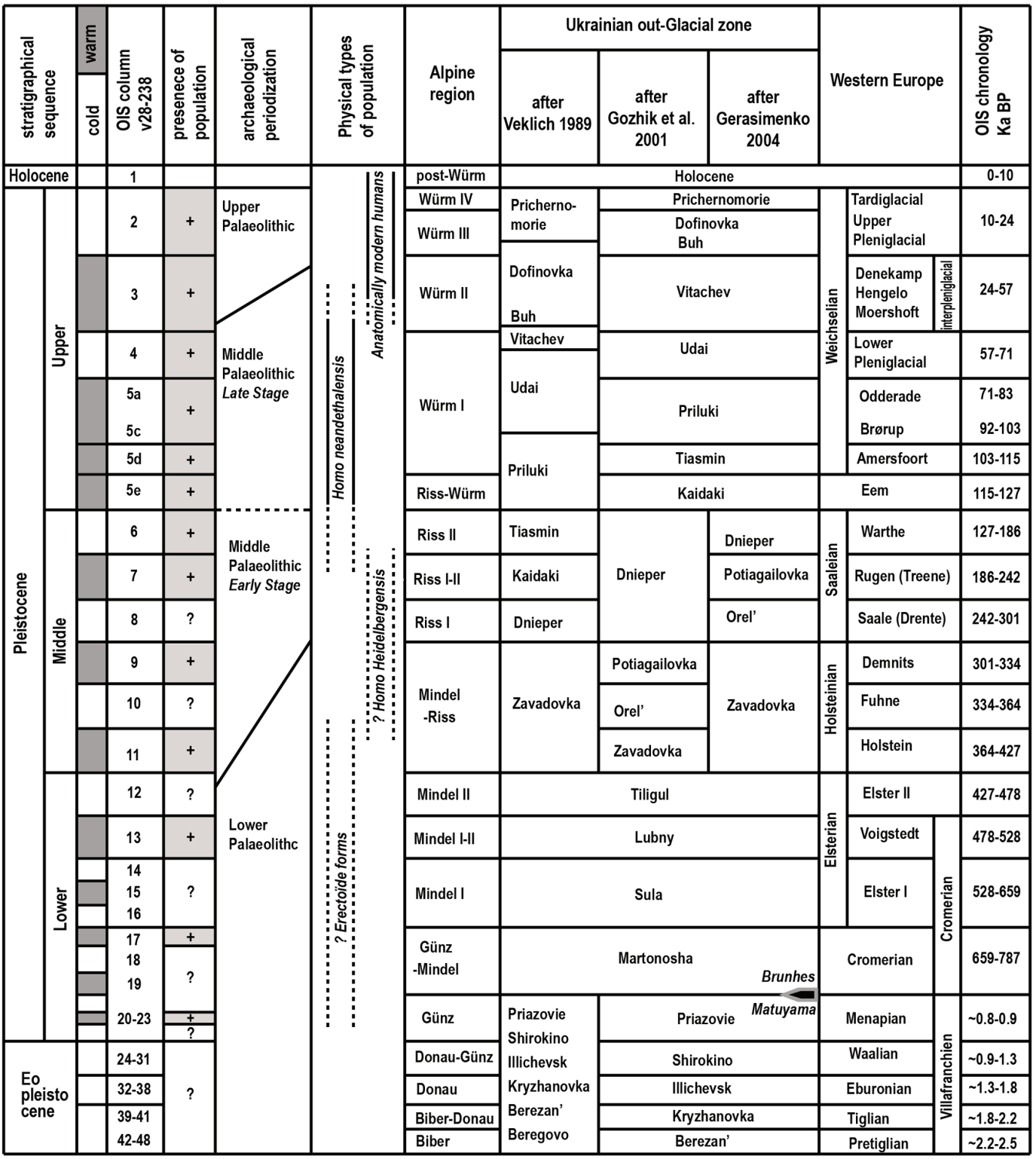


Figure 1
Correlation of stratigraphical horizons, climatic events, and cultural dynamic of the Ukrainian Paleolithic

Thereby, the role of rivers in the creation of secondary deposits of lithic raw materials would hardly be overestimated. But by the other hand, the significance of these secondary deposits for Paleolithic tool-makers should not be overestimated. The intensity of the destruction of primary deposits of flint, as well as quantities and distances of transportation of fragments of siliceous rocks were not constant during the Pleistocene, being the function of global climatic shifts. Therefore, the exposed outcrops of siliceous rocks in landscapes of Middle Dniestr, Podholian upland, Donetsk Ridge and Crimean foothills appeared to be the most reliable and the most easily accessible sources of lithic raw materials during the Paleolithic.

C – Availability of Bioresources: The Most Important Environmental Factors

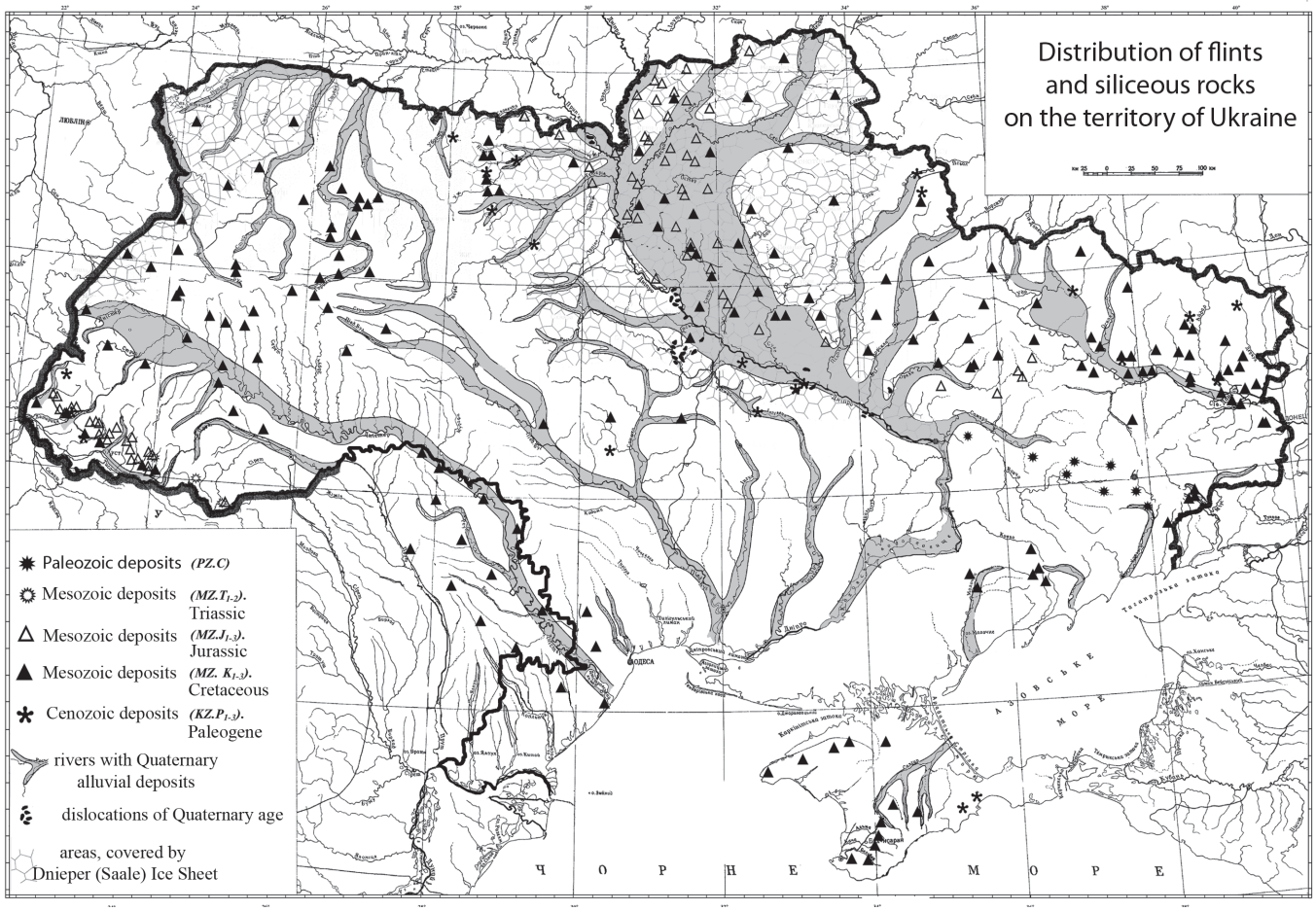
Climatic conditions on the territory of modern Ukraine were not constant during the Paleolithic time, of course (Matviishina 2010). Global climatic changes had resulted in repeated changes of paleolandscapes and compositions of flora and fauna. Environmental shifts and consequent landscape changes directly affect the basic aspects of life activity of the ancient population.

In particular, global and seasonal climatic changes strongly conditioned the availability of bioresources. Three environmental factors are of especial importance in this respect, these are: landscape, continental climate, and snow cover.

Flat landscapes are the most common in Ukraine, and these landscapes are characterized by the worst parameters of predictability and availability of bioresources in comparison with landscape of elevations and foothills. These latter were potentially more productive due to the peculiarities of mosaic landscapes. Hereupon, areas of elevations and foothills were more attractive both for animals and prehistoric population. The factor of continental climate was resulted in sharp difference of daily and annual cycles of temperatures, duration and severity of winters. Degree of continental features was progressively decreased westward and southward. Essential role was also played by the factor of snow cover varying by such characteristics as thickness, duration of conservation, and tightness (Formozov 1990). Spatial pattern of animal habitats and fauna composition was to a great extent corrected by these three environmental factors.

The extreme south and the west of the territory of modern Ukraine were comparatively the most comfort in respect of climate during the Quaternary period. The same areas represents the most biodiversificated zones of crossed foothills and elevation landscapes and, hence, were the most attractive for animals, and, consequently, for humans.

Figure 2
Distribution of flint and siliceous rocks on the territory of Ukraine



Lower Paleolithic																	
	ands	anbs	obsd	qrtz	qtz	slt	snst	crss	qzss	flss	flnt	jspr	radl	argl	rtsn	lmsn	chrt
Korolevo VIII clc	⊕		+	+	+												
Korolevo VII clc	⊕		+														
Korolevo VI clc	⊕		+	+	+	+					+						
Maly Rakovets		+	⊕	+													
Medzhibozh				+	+	+	+			+	⊕						
Luka Vrubleveckaya											⊕						
Neporotovo VI				+							⊕						
Kodak					+		+				⊕						
Gaspra				⊕													

Early stage of Middle Paleolithic																	
	ands	anbs	obsd	qrtz	qtz	slt	snst	crss	qzss	flss	flnt	jspr	radl	argl	rtsn	lmsn	chrt
Korolevo V-б clc	⊕																
Korolevo V-a clc	⊕		+	+		+					+						
Korolevo V clc	⊕		+	+		+					+						
Korolevo IV-a clc	⊕			+	+	+											
Zhitomirskaya											⊕						
Bugliv V: I					+						⊕						
V. Glybochok: III											⊕						
V. Glybochok: III-B											⊕						

Late stage of Middle Paleolithic																	
	ands	anbs	obsd	qrtz	qtz	slt	snst	crss	qzss	flss	flnt	jspr	radl	argl	rtsn	lmsn	chrt
Korolevo IV clc	⊕																
Korolevo III clc	⊕		+	+	+	+	+				+		+	+			
Korolevo II-a clc	⊕		+	+	+	+	+				+						
Korolevo II clc	⊕		+	+	+	+	+				+		+	+			
Korolevo I clc	⊕		+	+	+	+	+				+						
Malyj Rakovec	+		⊕	+	+		+				+						
Cherna X	⊕			+							+						
Pryjma I		+							+		+						
Zhitomirskaya											⊕						
Rikhta											⊕						
Zhornov											⊕						
Tochil'nica											⊕						
Molodova I: 5							(+)				⊕						
Molodova I: 4							(+)				⊕	+					
Molodova V: 12							(+)			+	⊕	+		+			
Molodova V: 11							(+)				⊕	+			+	(+)	(+)
Korman' IV: 12							(+)				⊕						
Stinka 1: lower l.							(+)		+		⊕						
Кетросы: lower l.							(+)				⊕						
Pronyatin											⊕						
Ezupil': III								+			⊕						
Ezupil': II											⊕						
Orel											⊕						
Skubova Balka							+				+						
Nenasytec I				□													
Antonovka											⊕						
Kurdyumovka											⊕						
Belokuz'minovka											⊕						
Kiik-Koba: IV							(+)				⊕						
Zaskal'naya V: II						(+)	(+)				⊕	+					+
Kolosovskaya: II					(+)	(+)	(+)				⊕	+				(+)	+
Kolosovskaya: III					(+)	(+)	(+)				⊕	+				(+)	+
GABO: I											⊕	+					
Prolom I						(+)	(+)				⊕						+
Prolom II: II					(+)	(+)	(+)				⊕					(+)	+

Table 1 – Variability of raw materials used for knapping and tool manufacture at the main Lower and Middle Paleolithic sites of Ukraine.
Key: ⊕ prevailed, + available, (+) not used for regular knapping; cave sites and sites located in foothill areas are shown in gray; ands – andesite, anbs – andesite-basalt, obsd – obsidian, qrtz – quartzite, qtz – quartz, slt – slate, snst – sandstone, crss – "Carpathian sandstone", qzss – quartz sandstones, flss – siliceous sandstone, flnt – flint, jspr – jasper, radl – radiolarite, argl – argillite, rtsn – rottenstone, lmsn – limestone, chrt – flint limestone.

Of course, this regularity has its exceptions and limitations. Nevertheless, it seems to be consistent during the whole Paleolithic, regardless of the nature of global climatic episode, features of floristic cover, type of faunal complex, physical type of man, and development degree of its culture.

D – Availability of Mineral Resources

Peculiarities of geological construction of the country result in proliferation of Cretaceous deposits including siliceous rocks, highly variable in respect of physical properties and quality (Rudenko 2007). Cretaceous siliceous rocks include various combinations of chalcedony, quartz, and opal and characterized by good isotropic properties (Kovnurko 1979). Just these, widespread siliceous rocks, commonly known as flints, were served as the main source of raw materials for manufacture of lithic artifacts during the Stone Age and later periods.

The major part of Paleolithic sites of Ukraine is dated to the Middle Paleolithic and later periods. Flints are crucially predominated in tool kits of the overwhelming majority of Ukrainian Paleolithic sites and localities (Table 1). There are isolated artifacts or series of artifacts made of other kinds of raw materials in assemblages of many sites, indeed. But their content and frequency heavily depend on quantitative and qualitative availability of preferable isotropic rock, which is flint. There are only few exceptions, one of which is denoted as "phenomenon of quartzite industries" on the east of Ukraine. Another, also spatially limited, exception is reported for the mountainous area of Transcarpathia, where the spectrum of used raw materials was wider through the whole period of Paleolithic, and volcanic rocks like andesite and obsidian stably dominate in assemblages.

The territory of Ukraine is rich in lithic raw materials, though their spatial distribution is far from the evenness (Ryzhov *et al.,* 2005). According to geological data (Fig. 2), the potentially important for the Paleolithic man resources of rocks of higher isotropic qualities are especially numerous in Transcarpathia, in River Dniester valley, in the North and North-East of continental Ukraine and in the Crimea.

Outcrops of lithic raw materials are differentiated by their genesis. Extensive areas with exposed primary outcrops of flints variable in respect of age of formation are known in Transcarpathia, in the valley of Upper Dniester, in Podholian upland, in Donetsk Ridge, and in mountainous Crimea. Constant and easy access to these outcrops is ensured by the specificity of mosaic landscapes.

Worthy to emphasize that virtually all exposed flint bearing deposits are bound either to the areas of foothills, or to uplands, or to canyon-like river valleys. To the contrary, accessible outcrops of lithic raw materials are very rare in areas with flat and smooth landscape, where flint-bearing strata often exist but covered by thick pack of subaerial sediments. The only exceptions might be some landscape anomalies, like Kanev glacio-dislocation, or powerful erosions in valleys of larger rivers, cutting the sediments of tertiary age (Ryzhov *et al.,* 2005). Should be specially emphasized that primary outcrops of flint raw materials are almost not known in the Middle and Lower flows of such rivers as the Dnieper and the Southern Bug, save for so-called flints of crystalline shield in river Bolshaya Vys valley, tributary of the Southern Bug (Petrougne 2004).

Secondary occurrences of flints are characterized by wider spatial distribution. Secondary outcrops of gravitation and proluvial-deluvial genesis has obvious local importance, particularly in the context of broken landscapes (Muratov 1973). Secondary outcrops in form of accumulations of siliceous rocks often associate with colluvial and alluvial deposits in the valleys of such great rivers of the East European plain as the Dniester, Southern Bug, Dnieper, Desna, and Seversky Donets. Sometimes these concentrations are especially rich, for instance in area of the Lower Dniester (Petrougne 2004). Origin of secondary outcrops of this type relate to the destructive activities of powerful water flows, that broke up the matrix geological deposits containing siliceous rocks and then move their fragments on quite significant distances.

Quartzite represents a further kind of potential raw materials for Paleolithic toolmakers. It is characterized by similar regularities of spatial distribution. There are areas of high concentration of such material in form of primary deposits, and also areas of secondary outcrops. On the territory of Ukraine quartzite is widely represented, but the largest, and easily accessible deposits are located in the North-Western part of Ukrainian crystalline shield (Semenchenko *et al.,* 1974).

Therefore, predictable primary sources of qualitative lithic raw materials also gravitate toward the South, West, and, partly, the East of Ukraine. This spatial regularity is explained in terms of geological history and landscape peculiarities of terrain: raw materials are far more rich and easily accessible in broken landscapes nowadays as millennia ago.

E – Availability and Predictability of Biological and Mineral Resources: The Most Essential Features

Definitely, the biological and mineral resources were of vital importance in Lower, Middle and Upper Paleolithic. But these resources were not universally represented on the territory of the country. It is worthy to emphasize, that areas with stable primary sources of raw materials and areas with rich and comparatively well predicted bioresources are principally coincide. Besides, the areas with stable and predictable vital resources during the Paleolithic were not borderless and when coincide, they form obvious core-like pattern (Fig. 3).

The ideal, most appropriate for prehistoric population, area should combine a row of characteristics, such as richness and predictability of biological resources, developed hydrographic network, availability of primary outcrops of lithic raw materials. Only a few regions of Ukraine were characterized by such a combination, these are: Crimean foothills, Carpathians foothills, River Dniester valley, and Donetsk Upland.

Core areas with rich and predictable biological and mineral resources were limited not only in space, but also in time. This statement can be illustrated by the relationship between the accessibility to the outcrops of lithic raw materials and the climatic changes. During the warmer periods, especially during its humid phases, the access to secondary (i.e. re-deposited) raw material outcrops was essentially decreased. It depends on the differences of potamic accumulations under the terms of different climatic regimes. The same periods coincides with considerable seasonal (snowy period) difficulties in procurement of raw materials. Flint raw materials became more accessible during the cold periods, both in primary (Crimean and Carpathian foothills, Volhyno-Podolian and Donetsk elevations), and in redeposited outcrops (river alluvium).

In what way the features of colonization of the terrain were defined by the aforementioned regularities, including the availability and abundance of qualitative lithic raw materials?

4 – Patterns of colonization of terrain in diachronic perspective

The earliest evidence of human presence on the territory of country is dated back to the OIS 19-17 and discovered in Ukrainian Transcarpathia, west of Carpathian mountains (Gladilin & Sitlivy 1990). Since that time humans sporadically appeared in the same area and also penetrate east of Carpathians arc, as it witnessed by localities aged to practically each warm stage between OIS 14 and 7. Starting from the OIS 7, the initially lacunar pattern of peopling became more stable in chronological sense, since humans still remain in the area not only during warm episodes, but during cold phases, as well. Period between oxygen-isotopic stages 6 and 3 is characterized by virtually the same fluctuate pattern of peopling, common features of which is the persistent presence of people in some core areas, significant expansion of colonized areas during the more comfort periods, and following reduction of peopled territories during the periods of climatic deterioration.

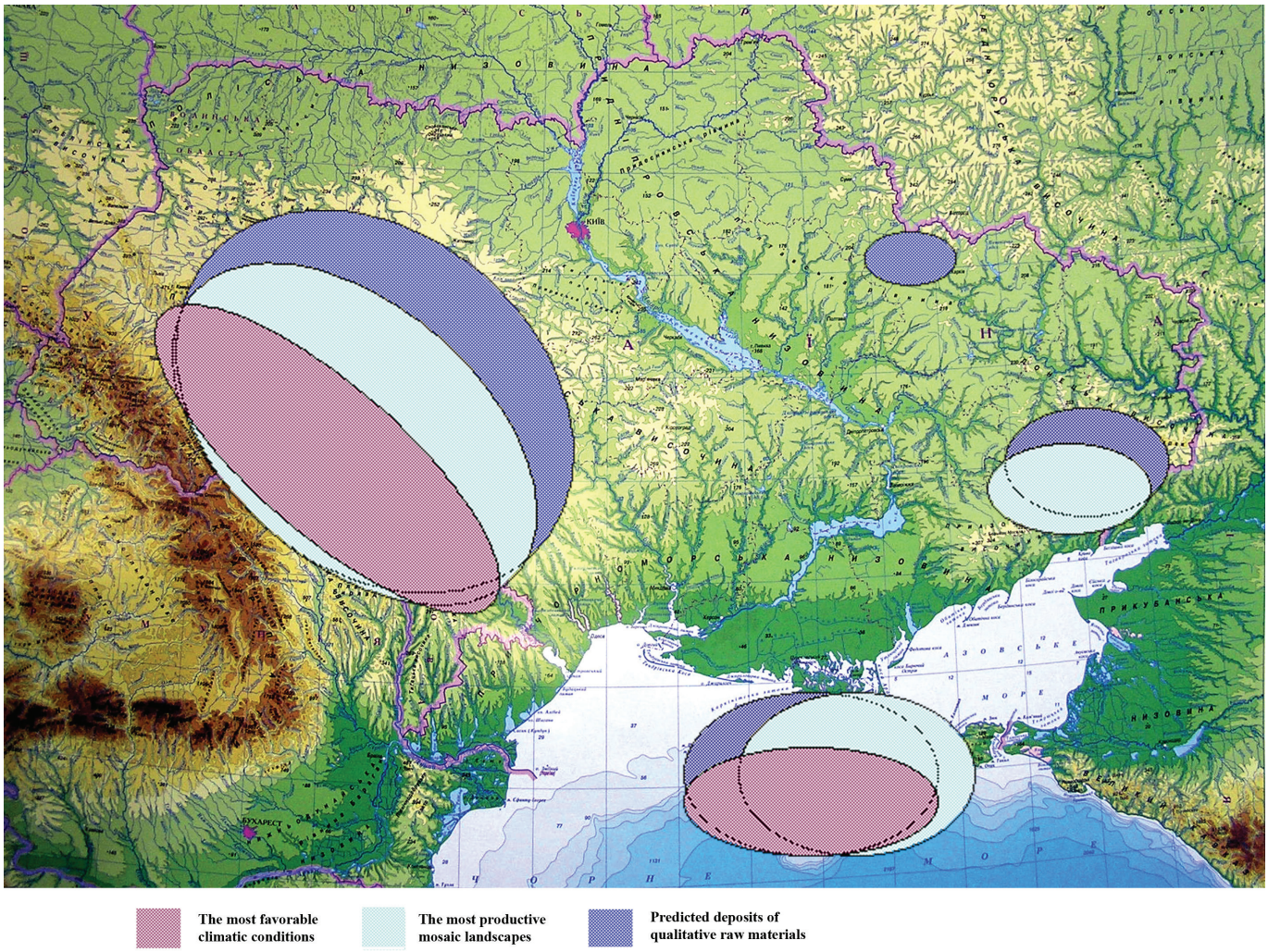


Figure 3 – Core-like pattern of geographical coincidence of the most favorable climatic conditions, the most productive mosaic landscapes, and predicted deposits of qualitative raw materials

The following very general geo-social peculiarities of colonization of the territory of modern Ukraine should be emphasized, namely: gravitation of Lower Paleolithic localities toward the fringe areas of open landscapes of the East European plain, concentration of Middle Paleolithic localities within the frameworks of core-like areas rich in biological and mineral resources, and gradual overcoming of natural restrictions during the Upper Paleolithic.

A – The Lower Paleolithic Pattern

The known Ukrainian Lower Paleolithic localities gravitate mainly towards the sea-shores and mountainous areas in extreme west and south of the country and to gravitate toward the western and southern fringe areas of the East European plain. Till now the only few indisputable Lower Paleolithic localities are recovered on the territory of Ukraine (Fig. 4), though recent discoveries in adjacent areas (Anisiutkin *et al.,* 2012; Shchelinskij *et al.,* 2010) clearly points to the high probability of discovery of new localities in the near future.

It is remarkably that Lower Paleolithic assemblages, though very few in number, are reported as coming from locations separated by hundreds of kilometers and localized in Transcarpathia, in the valleys of the Dniester, Southern Bug, Dnieper, Severski Donets rivers, and in the Crimea (Stepanchuk *et al.,* 2010).

The Lower Paleolithic peopling pattern might be summarized as a multiple pioneering colonization of fringe areas of the East European plain during warm periods and depopulation during cold periods.

B – The Middle Paleolithic Pattern

The Middle Paleolithic localities demonstrate the land colonization pattern obviously differing from the Lower Paleolithic. Middle Paleolithic sites form concentrations and evidently gravitate towards rich in bio- and mineral resources areas of broken landscapes in the South, East, and West of the country (Fig. 4).

The only exception from the rule is represented by the area of the Dnieper basin localized within the Sub-Ridge zone. This area was frequently visited and regularly populated in the Middle Paleolithic, as it revealed by the comparatively numerous localities, but it provides no primary outcrops of lithic raw materials and only flints redeposited by river flow might be collected here. As in the case of more recent periods, the presence of population during the Middle Paleolithic one can explain in terms of extreme density and richness of bioresources in this area.

Available records at hands unanimously witnesses that territories once colonized were not settled permanently during the entire period of the Middle Paleolithic. One can state, that there is significant general tendency of association of human occupations primarily and almost exclusively with more warm periods, and this pattern is specific both for the Lower Paleolithic and for the early stage of Middle Paleolithic of Ukraine.

During the later phase of Middle Paleolithic the situation is somewhat changed. As the data on spatial and chronological position of the late Middle Paleolithic sites of Ukraine reveal, the colonized areas reduce notably and repeatedly during the more dry and cold climatic episodes and, to the contrary, became larger and more densely settled during the periods of amelioration of climate. That is, the number of sites and extents of colonized areas become larger in warmer periods and *vice versa* (Fig. 5), but it is quite new feature that the colonized areas are still survived during the cold climatic phases.

In sum, the Middle Paleolithic peopling pattern might be summarized as a model of permanently settled core areas which are fluctuated responding to environmental changes.

C – The Upper Paleolithic Pattern

The dependence of the pattern of land colonization on the general paleoclimatic situation seems to be determinative on the late stage of the Ukrainian Middle Paleolithic, and also in course of practically entire duration of the Upper Paleolithic. This dependence had resulted in such function as population density, and, hence, the frequency of sites. Number of sites and colonized areas varied in fluctuating way.

These, in many respects caused by nature, fluctuations of the process of peopling of the territory are characteristic both for the Middle and Upper Paleolithic periods, and demonstrate no dependence neither on physical type of population nor on level of development of applied technologies. Permanently peopled zones or core areas were played a role of centers for repeated colonization during climatic amelioration and, per contra, of refugia in periods of population decline resulting from reduction of predictable biological and mineral resources. These core areas gravitate toward the south and the west of modern Ukraine and coincide with the most climatically comfortable and rich in various resources zones.

An Upper Paleolithic pattern of peopling demonstrates no difference with Middle Paleolithic pattern, at least for the period between the first penetrations of AMH in the area till the maximum of the last glacial. A similar picture of climatically caused influxes and effluxes of population is restored for this period (Stepanchuk *et al.,* 2009). Situation was decisively changed only after the LGM time when people appeared to

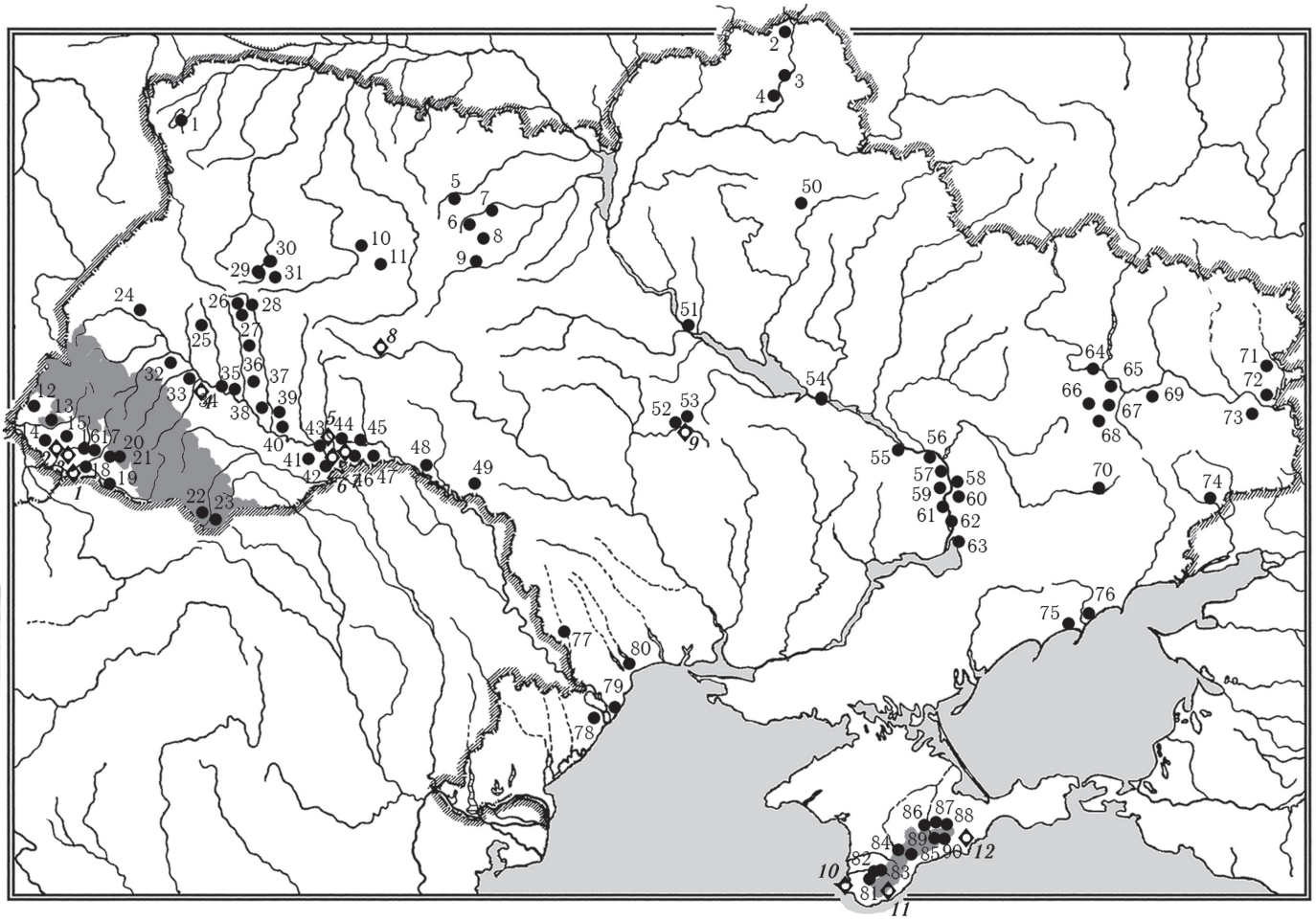


Figure 4 – The most important Lower and Middle Palaeolithic sites and localities of Ukraine

Lower Paleolithic: 1 Koroleve; 2 Malyj Rakovec'; 3 Rokosove; 4 Bukivna IV; 5 Luka Vrublivec'ka (?); 6 Babyn I; 7 Neporotove VI; 8 Medzhybizh; 9 Maslove (?); 10 Mayachnyj: 11 Gaspra; 12 Echki-Dag.
Middle Paleolithic: 1 Verhiv'ya Pryp'yati; 2 Gorihovyj Log, Yazvi, Pidbolottya; 3 Dovgyj Riv; 4 Chulatove III, Komarnya, Arapovychy; 5 Tochyl'nycya; 6 Emylivka I; 7 Ryhta; 8 Gorodysche II, Gorodenka; 9 Zhytomyrs'ka; 10 Spivak, Bilotyn; 11 Zhorniv; 12 Onokivci, Radvanka I, II, Zamkova gora; 13 Mukacheve, Chernets'ka Gora, Tupcha I-III; 14 Zastavne II, Beregove III; 15 Il'nycya; 16 Malyj Rakovets'; 17 Rokosove; 18 Koroleve I, II; Pleshka I, II; Cherna I, II, IV, VIII-X; 19 Shayan II; 20 Hust; 21 Stanovci; 22 Dibrova, Solotvyn I, II; 23 Bila Cerkva; 24 Pryjma I; 25 Berezhany V; 26 Velykyj Glybochok I-III, V; 27 Igrovycya I, Malashivci, Glyadky; 28 Pronyatyn, Ternopil' I, II; 29 Staryj Vyshnevets'; 30 Vanzhuliv I-III; 31 Bugliv V-VIII; 32 Kolodiiv; 33 Ezupil'; 34 Kasperivci VII, Lysychnyky II, Pecherna; 35 Kasperivci I, VI; 36 Dolyna, Pidgajchyky; 37 Bil'che-Zolote; 38 Myhalkiv I, II; 39 Pylypche VII, XIV, Hudykivci I; 40 Pylypche XI, Ustya III; 41 Ketrosy, Stinka 1, 3, 4, Kalynivka, Osypka, Ataky I; 42 Kyshlyans'kyj Yar; 43 Sokil I; 44 Luka Vrublivets'ka; 45 Stara Ushycya; 46 Molodova I, V, Babyn I, III, VII; 47 Korman' IV, Oselivka; 48 Subotivka; 49 Zholubets'; 50 Muhovets'; 51 Kaniv; 52 Maslove, Troyanove, Korobchyne; 53 Andriivka 1, 3, 4, 8; 54 Kremenchuk; 55 Romankove; 56 Gyrlo Samary; 57 Locmans'ka Kam'yanka, Kodak I, II; 58 Nenasytets' I, IV, Remenovo; 59 Skubova Balka, Majorka IV, Tyagynka I-III, Mykil'ske I-III, Vijs'kove, Vovnigy; 60 Orel; 61 Kruglyk, Fedorivka, Ostriv Tavolzhanyj; 62 Vil'nyanka I, IV-VI; 63 Balky I-VII, Uzviz; 64 Izyum; 65 Korniiv Yar; 66 Druzhkivka; 67 Bilokuz'mynivka; 68 Kurdyumivka, Ozeryanivka; 69 Zvanivka; 70 Antonivka; 71 Chugynka; 72 Derkul; 73 Chervonyj Yar; 74 Amvrosiivka; 75 Samsonove, Novoazovs'k, Obryv; 76 Sedove; 77 Bilyaivka; 78 Bilgorod-Dnistrovs'kyj; 79 Baraboj III; 80 Illinka; 81 Starosillya, Holodna Balka, Ulakly; 82 Shajtan-Koba I, IV, stoyanka im. G. A. Bonch-Osmolovs'kogo, Tav-Bodrak I, II; 83 Kabazi I-V, Va; 84 Chokurcha I, II; 85 Kiik-Koba, Vovchyj Grot; 86 Sary-Kaya I-IV, Karabaj; 87 Zaskel'na I-IX, Ak-Kaya I-V; 88 Al'oshyn Grot, Chervona Balka; 89 Prolom I-III; 90 Buran-Kaya III.

be successful in invention of new subsistence strategies which allow them to adapt successfully to virtually all variations of landscapes and resources. Since the LGM time practically the whole territory of modern Ukraine was colonized by hunter-gatherers stably and without lacunas (Zalizniak 2010).

5 – Lithic raw materials strategies in diachronic perspective

A – Lower Paleolithic Raw Material strategies

The predominantly local lithic raw materials were almost exclusively used for tool-making activity, as it revealed by the data provided by the Lower Paleolithic localities recovered in Ukraine. There are no indisputable instances of exploitation of in any extent remote raw materials. The range of variations of rocks which were used at different localities and in geographically diverse areas, is rather high, although these variations always remain within the frameworks of variability of local rocks (Table 1).

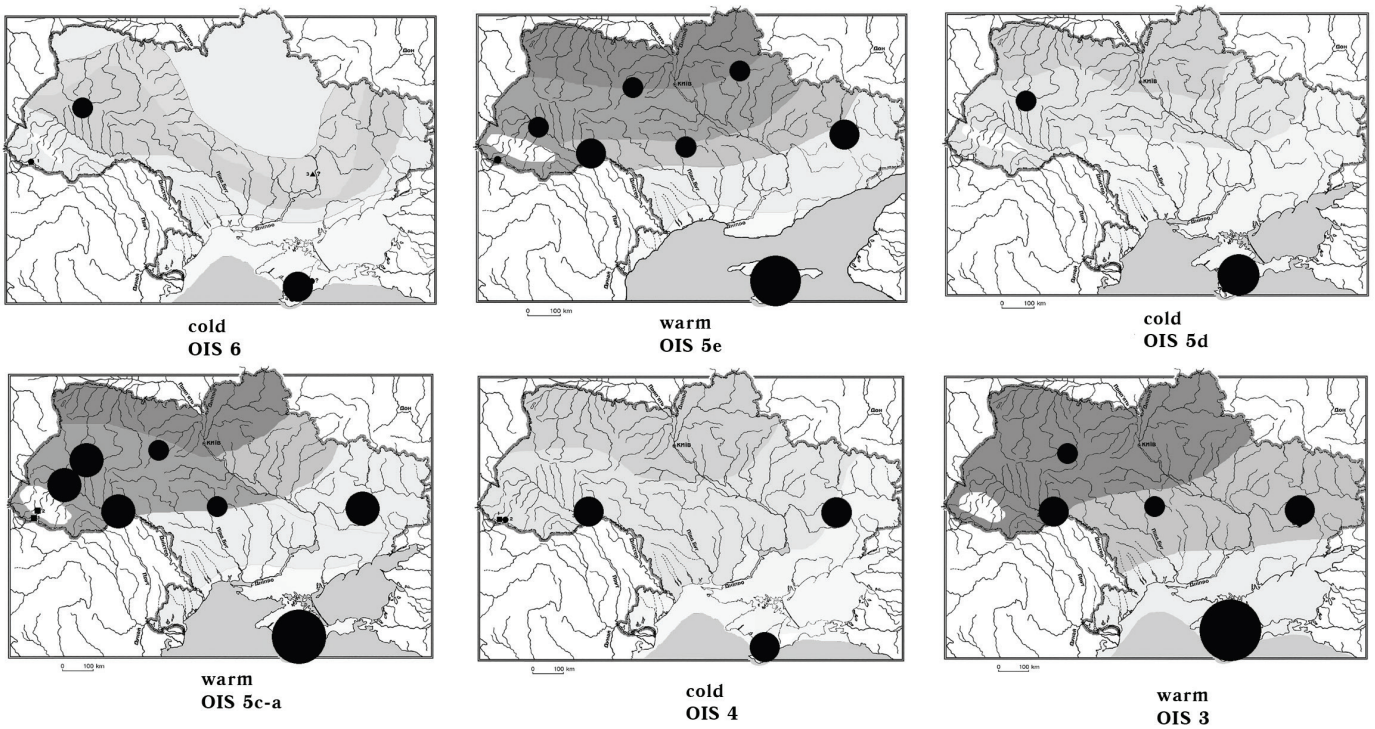


Figure 5 – Correlation of climatic, environmental, and population dynamic at the late stages of Ukrainian Middle Paleolithic. Position and size of black circles correspond to the location of populated areas and intensity of colonization

Regularities of lithic raw materials variability of Lower Paleolithic assemblages equally concern the heavy and light tools.

Worthy to stress that there is likely intentional and well recognizable tendency to avoid more isotropic rocks as raw materials for knapping. It is hard to explain this tendency in unambiguous way. Maybe these rocks, which are more easily to knap but at the same time more easily destruct when working under poor power and coordination control, were rejected because they were taken as dangerous? Anyway, more tight and tough rocks were more preferable. But under the terms of shortage or small choice of raw material such isotropic rocks as obsidians, andesites, or flints were also welcome.

The most ancient sites gravitate toward the mountain areas in the west and the south of the country and known in Transcarpathia, Southern Bug valley, and probably in Crimea. Presence of Lower Paleolithic assemblages in the far east of Ukraine that is nearby the Lugansk city was reported recently (Vetrov Skorikov 2010). Andesite and obsidian were exploited in Transcarpathia, limestone marble, quartzite and quartz in Crimea, quartzite, granite, and flint in the Southern Bug valley, quartzite and sandstones in area of the Severski Donets river in the East of Ukraine. Characteristic feature of the majority of known localities is a location directly on or nearby the areas with easily accessible lithic raw material.

Therefore, the main features of the Lower Paleolithic raw materials strategies should be defined as utilization of wide spectrum of lithic raw material of local provenience and preferably not isotropic.

B – Middle Paleolithic Raw Material Strategies

Middle Paleolithic records of Ukraine allow to recognize two or three very important and interdependent basic changes or tendencies in raw material strategies. These are: a) re-orientation on rocks with perfect isotropic properties, mainly flints; b) sufficient decrease of variability of raw materials used for knapping; c) evidence of multi-staged or multi-aspectual intentional selection of raw materials, including here the so called initial practice of mining.

Should also be emphasized, that the evidence of exploitation of remote and exotic raw materials are also for the first time reported for the Middle Paleolithic period. But,

at the same time, such a feature of the previous period as *the local* origins of *the main* portion of used raw materials is still survives.

Whereas andesite and obsidian remain the dominant type of raw materials in Ukrainian Transcarpathia, other territories demonstrate the crucial shift toward the flint working. It does not mean, of course, the complete absence of assemblages which include a certain number of artifacts made on other lithic raw materials. But in virtually all cases these admixtures can be plausibly explained in terms of quantitave or qualitative insufficiency of available flints.

Middle Paleolithic sites of Ukraine demonstrate rather uneven pattern of spatial distribution, with isolated concentrations and blind spots (Fig. 4). It is of great interest, that geographical position of the majority of concentrations of Middle Paleolithic sites practically coincides with localization of the most reliable and stable sources of raw materials (Stepanchuk 2006). This coincidence is hardly coincidental.

So far the only exception is the Dnieper group of the Middle Paleolithic sites which are not directly related to the known primary raw material deposits. These latter are remote southward and northwestward on a distance of 100 to 150 km. Middle Paleolithic sites of the basin of the Middle Dnieper are localized in area which is exceptionally rich in bioresources though remote from the sources of lithic raw materials. Therefore, this instance is a good illustration of quite high flexibility of Neanderthal technologies and subsistence strategies. However, the major portion of sites described to the Middle Paleolithic period is still tightly bound to the sources of raw material, preferably to the primary deposits.

The Middle Paleolithic industries of Ukraine are not monotonous, as elsewhere in Middle Paleolithic, and are far from the uniformity. The reason of this variability is a subject of continuing discussion in the home literature, as elsewhere. Whatever was this reason, either the entirely environment-determined adaptation or basically cultural response on challenges of nature, there is a number of different variations of MP industries, classified in various ways.

One of the variants of classification of the Ukrainian Middle Paleolithic variations is displayed at (Fig. 6). One can regard the presented technological variations - which are also characterized by clear spatial pattern - as consequences of natural variations of environment and landscape. But special examination of possible interrelations allow to conclude that neither climatic circumstances nor factors of behavioral activity did essentially influenced on the habitus of Middle Paleolithic industries (Stepanchuk 2006). There is no meaningful dependence between the type of industry, and landscape types, composition of hunter game, peculiarities of economy, season of habitation, and types of principally available raw materials.

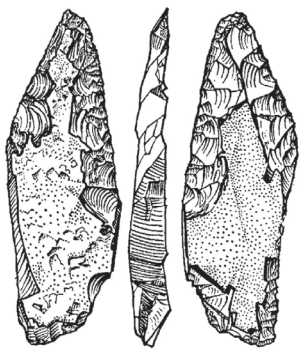
It is worthy to stress - in the context of this paper - that different industrial traditions are characterized by the distinct technological strategies. This distinction is mirrored in applied technologies, final products, and also in specific requirements on lithic raw materials. Few instances would be illustrative in this respect. These are the instance of oriented on utilization of tabular raw materials and used flat knapping Crimean assemblages with bifacial technology (Kolosov 1986), or the instance of oriented on utilization of nodule raw materials and used semi-volumetric knapping Volhynian or Donbass assemblages with blade Levallois technology (Sytnyk 2000; Kolesnik 2003). Worth to stress that *various* shapes of flints are available in the Crimea, Volhynia or Donbass region, as well as *other* kinds of industries are also reported for these areas.

The focusing on a specific form of primary raw materials already represents the stage of intentional selection. As it witnessed by the Middle Paleolithic records, the preliminary selection of raw materials for further knapping and shaping of tools was carried out on a number of parameters, such as dimensions, physical properties, and shape. Physical state of surfaces of pieces of raw materials which were unearthed either intact or knapped in the context of Middle Paleolithic occupations is fairly individual and variable.

I
Middle Palaeolithic
with bifacial & flakey blank technologies

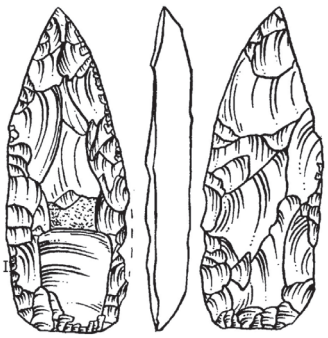
I-1
technocomplex
of bifacial backed tools
(Micoquain industries)

Korolevo II-a industry
Korolevo assemblage II-a
Ezupol' industry
Ezupol' layer II, ?Kolodiev
Zhitomirskaya industry
Zhitomirskaya, early assemblage
? Kanev industry
Kanev locality
? Zaskal'naya IX industry
Zaskal'naya IX, lower layer
? Bodrak industry
Shary I-III
Ak-Kaya group of industries
Zaskal'naya V,
Zaskal'naya VI (Kolosovskaya),
Prolom II, Cary-Kaya, Chokurcha,
Volchij Grot, Krasnaya Balka



I-2
technocomplex
of bifacial leafpoints
(para-Micoquain industries)

Korolevo V-a group of industries
Korolevo V-a, ?Korolevo V-b, V
Velykyj Glybochok industry
Velykyj Glybochok, layer III
Stinka group of industries
Stinka I, II, Shipot 1, Osypka
Antonovka group of industries
Antonovka I, Antonovka II, Cherkasskoye,
Ozeryanovka 1, 3, Druzhkovka, Krasnyj Yar
Rikhta group of industries
Rikhta, Zhitomirskaya, late assemblage,
Spivak, Bilotyn
Orel group of industries
Orel, Balki, Uzvoz
Starosel'ye group of industries
Starosel'ye, Kabazi II, layer III, Kabazi V,
GABO, layer I, Bakhchisaraiskaya, Chokurcha I
Kiik-Koba group of industries
Kiik-Koba, layer IV, Buran-Kaya III, layer B1,
Prolom I, ?Volchij Grot, middle layer



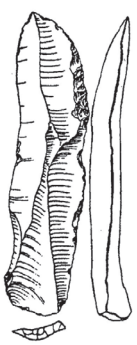
II
Middle Palaeolithic
with flakey blank technologies

II-1
technocomplex
of flake-oriented Levallois-Mousterian
(flake idustries)

Korolevo III group of industries
Korolevo III, IVa, Malyj Rakovets IV
Korolevo II industry
(Korolevo II)
Buglov V layer group of industries
Buglov V, layer I
Molodovo group of industries
Molodovo I, layers I-IV, Molodovo V, layer 12, 11,
Ketrosy, Proniatyn, Zhornov
Shaitan-Koba group of industries
Shaitan-Koba I, Shaitan-Koba IV, Alioshin Grot, layer 2

II-2
technocomplex
of blade-oriented Levallois-Mousterian
(blade idustries)

Buglov V, layer II industry
Buglov V, layer II
Ezupol' III industry
Ezupol', layer III
Nenasytets industry
Nenasytets, Skubova Balka
Kurdyumovka industry
Kurdyumovka, Udai assemblage
Kabazi II layer II group of industries
Kabazi II, layer II



? III
denticulate Middle Palaeolithic

?Kruglik industry
Kruglik
?Maslovo 5 industry
Maslovo 5
Kiik-Koba lower layer group of industries
Kiik-Koba, layer VI, Krasny Mak, Kabazi II, layer IV

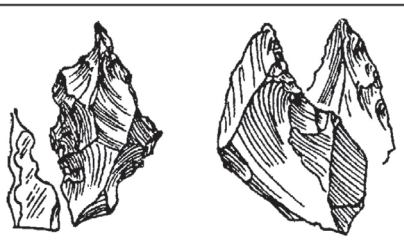


Figure 6 – Industrial variability of the Ukrainian Middle Paleolithic

Among these there are artifacts with practically not weathered fresh carbonate crust. If statistically too frequent, such finds, I believe, suggest the special search for raw materials accumulated in primary deposits. Just intentional activity targeted at collection of pieces of raw materials included in primary deposits might be defined as initial practice of mining.

The main features of the Middle Paleolithic raw materials strategies should be defined as utilization of preferably isotropic lithic raw material of mostly local provenience; there are the first indisputable evidences of exploitation of remote sources of raw materials and isolated pieces of exotic rocks, and also indirect indications of intentional complex activity on selection of lithic raw materials

C – Upper Paleolithic Raw Material Strategies

The tendency of overcoming the dependence on sources of lithic raw materials was started somewhere in the Middle Paleolithic with invention of composite tools and more intensive use of bone and antler in addition to less resistant materials. This tendency becomes more effective and clearly visible during the next phase of cultural development.

Upper Paleolithic period of Ukraine is characterized by the gradual overcoming of dependence on lithic raw materials. Progress in this area was basically ensured by the following innovations, these are: a) intensive involving of bone and antler into tool-making activity; b) invention of far less expendable and more sophisticated knapping techniques; c) invention of insert-technology accompanied by broad applying of composite tools.

Invention of less expendable lithic techniques and technologies contributed greatly to the successful colonization of territories previously inaccessible for stable peopling due to geographical remoteness from zones with predictable lithic resources. Besides, the blade and micro-blade technologies allow to eliminate mostly the restrictions conditioned by the physical properties of raw materials, size restrictions in particular. The allowable distance between sites and raw materials increases up to several tens of kilometers, and, in some exceptional cases, exceeds several hundred kilometers. Nevertheless, the overall trend remains the same as during the previous phase, namely the densely populated areas still coincide with areas of reliably predictable raw material outcrops (Gladkikh & Stanko 1997).

Thus, the main features of the Upper Paleolithic raw materials strategies should be defined as still preponderant utilization of preferably isotropic lithic raw material of local provenience; but the geography of colonized areas become more extended and mobility appeared to be essentially higher due to application of more sophisticated and less expendable technologies. There are the first indisputable evidences of exploitation of very remote sources of raw materials.

6 – Human dispersals at the East European plain

The earliest evidence of human presence in the country is dated to 0,9-1,0 Ma and discovered at Korolevo, west of Carpathian mountains. Korolevo locates in a zone of still actively working quarry and represents conglomeration of numerous sites and localities indirectly on outcrops of andesite raw materials. Of extraordinary importance are assemblages VIII and VII from Korolevo, which, as proved by geostratigraphic, sporo-pollen and geomagnetic data, are associated with sediments occurring below the Brunhes-Matuyama boundary (Gladilin 1985; Levkovskaya *et al.,* 2008). However, geographically Korolevo I is not situated in Eastern, but in Central Europe.

Only a few credible Lower Paleolithic localities have been discovered in the East European part of continental Ukraine and Crimea. Among them, the aged to ~0,4~0,5 Ma Medzhibozh represents the only in Ukraine Lower Paleolithic locality with pebble industry and well preserved fauna demonstrating numerous anthropic modifications.

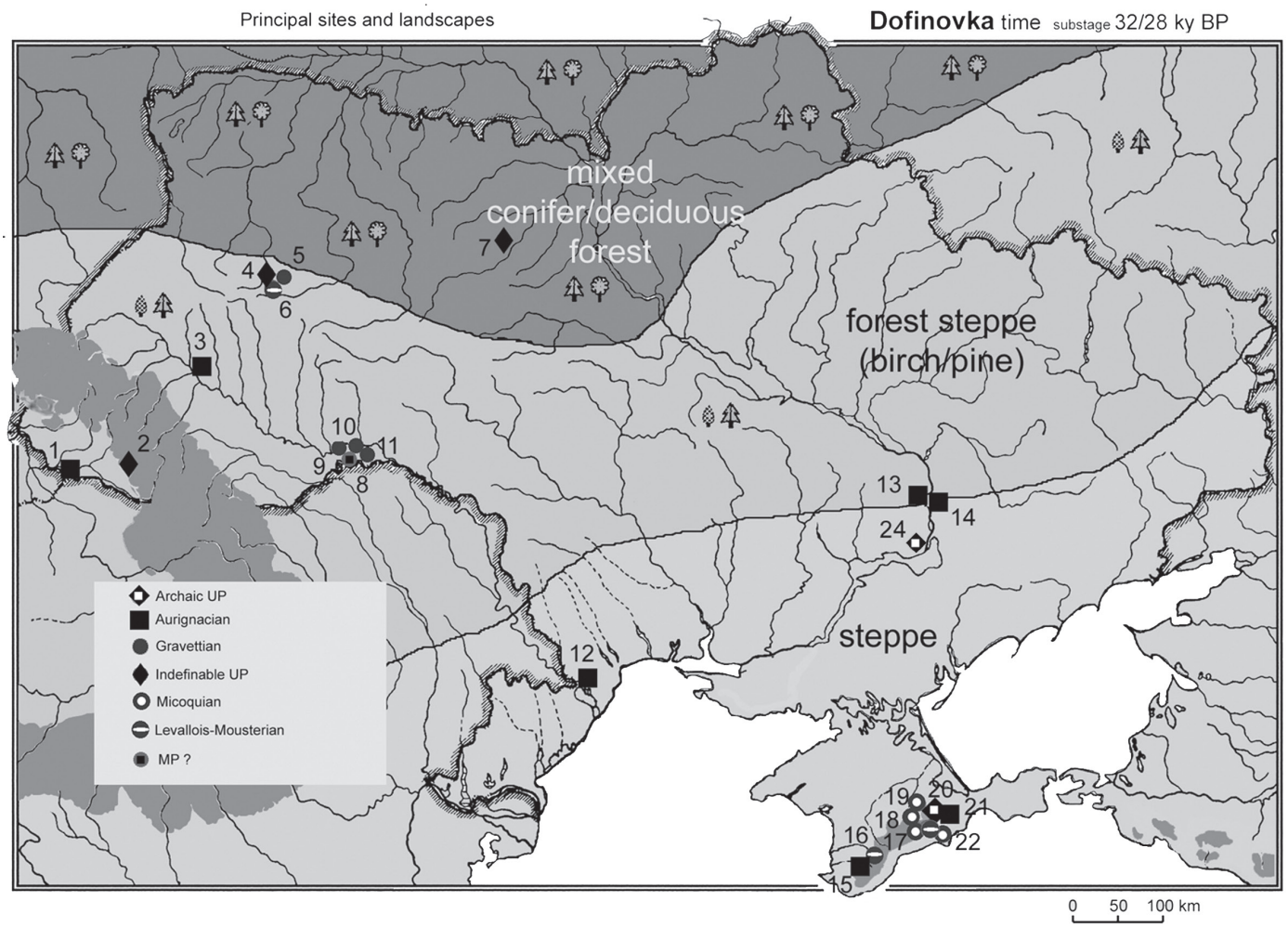


Fig. 7 – Principal sites and landscapes. Dofinovka, early substage, 32/28 uncal ky BP. Environmental reconstruction after Melnichuk 2004.

Key: Archaic UP: 2 – Shayan I: II; 4 - Zhornov: 1; 20 - Buran-Kaya: IIIC; 24 – Mira: I; Aurignacian: 1 – Beregovo I; 3 - Mezhigirtsi: lower; 12 – Zeleny Khutor; 13 – Nenasytets III; 14 - Vorona III: lower; 15 – Siuren' I: FA-1-FB2, GA-GB2; 21 - Buran-Kaya III: 6/5-3; Gravettian: 5 - Zhornov: 2a; 9 – Molodova I: 3; 10 - Molodova V: 10, 9; 11 – Oselivka: 3, 2; Indefinable UP: 7 – Radomyshl'; Micoquian 17 – Prolom I: I; 18 – Zaskal'naya V: II, I; 19 - Zaskal'naya VI (site of Kolosov): II; 22 - Buran-Kaya: B1; Levallois-Mousterian: 6 - Zhornov: 2; 16 – Kabazi II: II/1a; 23 – Alyoshin Grot: I; MP ? 8 – ?Korman' IV: 10, 9.

Therefore, essential is the fact that the process of peopling of territories during the Lower Paleolithic was represented by recurring pioneer colonization of areas with abundant and predictable biological and mineral resources by small groups of migrant population with considerable chronological lacunae between individual episodes of colonization. Thus, prolonged uninterrupted colonization and, therefore, continuity of population and traditions are out of the question.

Probable path of colonization from Near East via Caucasus and the South of Eastern Europe to South-Eastern Europe represents only one of the variants of reconstruction of actual events on the stage of the first wave of colonization of Eurasia, to date more plausible due to the available combination of known facts. Other interpretations are also possible. For instance, the prevalence of sites containing 'core-and-flake' inventory on the territory of Anatolia, Balkan peninsula and the South of Eastern Europe seems to suggest also a 'Balkan' version of migration of the bearers of mode 1 technology from the Near East to Europe. In any case, the available information does not contradict the existing notions about a rather intense process of peopling of Eurasian territories via Near East.

Ecological and tightly associated demographic factors were played as guide agenda in the processes of peopling and colonization of new territories. Availability, predictability and richness of bioresources were the primary cause of population growth and concomitant colonization of new areas. Availability of lithic raw materials resources was additional determinant of colonization processes. Rhythmic climatic fluctuations in Pleistocene were accompanied by repeated landscape-climatic alterations and related changes of resource base. Plurality of environmental changes had affected the rhythmic nature of repeated colonization and consequent depopulation of habitats at the early stages of human presence on the territory of modern Ukraine.

There is no room to suppose permanent population of the territory of Ukraine during the Lower and the major portion of Middle Paleolithic, as well. Instead, a picture of numerous affluxes and refluxes of population seems to be more adequate, as it seen from available archaeological records. Constant presence of population, and, consequently, probable continuity within the frameworks of stable colonized areas, might be suggested only for the late stage of the Middle Paleolithic, beginning from the Eem (or the end of Riss) for the Crimea, and, likely, somewhere from the Ammesrfort-Brörup for the Middle Dniester area and Donbas. Should be stressed once again that all these areas provide abundant, easily accessible, and high quality lithic raw materials of excellent isotropic properties. Stable raw material base seems to be one of the components of prosperity of Middle Paleolithic communities in these areas.

Neanderthal technologies and subsistence strategies were quite effective as it witnessed by a thousands years of coexistence with modern humans under the same environmental conditions (Fig. 7). Coexisted UP and MP population share the same biozones (steppe and mosaic foothills) and the same landscapes (highlands and low mountains) in extreme south and west of the country. Accordingly to the recent radiometric data for some Crimean multilayered MP sites, ultimate Neanderthals on the extreme south of Ukraine might survived beyond as late date as 25 ky BP (Stepanchuk 2006).

As it revealed by the Ukrainian records, Neanderthals built dwellings, buried their dead, engraved bones, used colorants, made something from bird bones, collect and utilize exotic rocks, and were skilled and quite prosperous in many other respects.

Neanderthal skills and knowledge allow them to colonize the most rich and comfort areas of the territory of modern Ukraine with a highest level of predictability and abundance of vital resources. But they remained permanently relied on local rich raw materials sources and demonstrate no purposeful technological shifts towards the more mobile style of behavior.

Anatomically modern humans were obviously more mobile, more innovative and less traditional as Neanderthals. Their behavior features are mirrored in many things, in particular in long distance migrations. The case of Mira layer I, dated to ca. 28 ky BP EUP site in the Dnieper valley, is fairly representative in this respect (see this volume). Evidence collected in Mira layer I witnesses for more than 750 km migration and well illustrate the fact that Upper Paleolithic people already overcome some important limitations of dependence on lithic raw materials.

A – Concluding remarks

Diachronic and spatial aspects of the dynamic of exploitation of raw materials in Paleolithic of Ukraine was examined in the context of specificity of territory, landscape, climate and further environment peculiarities, and also in the context of the process of colonization of the terrain. Such approach allowed to elucidate some meaningful interrelations (Table 2).

In diachronic perspective the main trends in exploitation of lithic raw materials can be formulated in following way. The period of Lower Paleolithic is characterized by the utilization of wide spectrum of lithic raw materials, preferably not isotropic. To the contrary, the Middle Paleolithic is characterized by utilization of preferably siliceous isotropic rocks, and the same regularity is inherent to the Upper Paleolithic, when the gradual overcoming of exclusive dependence on lithic raw materials occurs.

In spatial perspective, the Lower Paleolithic is characterized by relying on exclusively local "underfoot" raw materials that probably mirrors a practice of unplanned situational supply and lack of traditional technologies. The Middle Paleolithic is characterized by utilization of mainly local outcrops, localized mostly in the near vicinity of occupation camps. Special and multi-stage selection of lithic raw materials is specific for this period, as well as widespread occurrence of traditional technologies and standardized

Lithic raw materials exploitation in Ukrainian Paleolithic: The main trends				
	Diachronic Perspective	*Spatial Perspective*	*Cultural Perspective*	*dispersals at the East European plain*
Lower Paleolithic	utilization of wide spectrum of raw materials, preferably not isotropic indefinite dependence on "rocks"	exploitation of strictly local "underfoot" outcrops of LRMs unplanned situational supply by raw materials	lack of traditional technologies lack of standardization	Sporadic colonization of areas bordering with plain during the warmer periods
Middle Paleolithic	utilization of preferably siliceous isotropic rocks exclusive dependence on rich and predictable isotropic LRMs	mainly local outcrops, localized mostly in the near vicinity pre-planned multi-stage selection of LRMs	traditional technologies standardization of products	Permanent presence of population in extreme West and South. Increases and decreases of populated areas depending on climatic changes
Upper Paleolithic	utilization of preferably siliceous isotropic rocks gradual overcoming of exclusive dependence on isotropic LRMs	no obligatory dependence on local LRMs pre-planned multi-stage selection of LRMs	traditional technologies standardization and microlithization of products	At the first stages – the same as during the MP. On the latest stage – total colonization of the territory and permanent presence of population

Table 2 – The main trends of Lithic Raw Materials (LRMs) Exploitation in Paleolithic of Ukraine

products. Upper Paleolithic is characterized by the elimination of dependence on local outcrops in particular, and by the overcoming of dependence on lithic raw materials in general, due to highly innovative insert technologies and further standardization and microlithization of lithic products.

Peculiarities of exploitation of lithic raw materials in Paleolithic of Ukraine well coordinate with regularities of peopling and colonization of the terrain. Thus, the sporadic - during warm periods - colonization of seashore and foothill regions and nearest zones bordering with expanses of the East European plain is peculiar for the Lower Paleolithic. The permanent presence of population in extreme west and south of the country is typical for the Middle Paleolithic, as well as the alternate increases and decreases of number and density of populated areas, which dynamic depends on climatic changes. At its first stages the Upper Paleolithic characterized by the same colonization pattern, as prevailed during the MP. The pattern was crucially changed after 18 ky BP. Since that time and till ca. 13 ky BP the territory of Ukraine was peopled everywhere, and Epi-Gravettian UP occupations are known in low mountains, highlands, lowlands, and valleys of large rivers. Therefore, the obligatory dependence on spatial limitations of predictable and rich mineral resources was decisively overcome.

Acknowledgements

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