RAW MATERIALS AS A SOURCE FOR TRACING MIGRATION: THE CASE OF UP ASSEMBLAGES OF MIRA IN MIDDLE DNIEPER AREA

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Abstract

The report presents the first results of the investigation of the composition of rocks used at the new EUP open-air site of Mira in the Middle Dnieper area, Eastern Europe, Ukraine. The petrographic study of ca. 300 samples of flint and stone artifacts coming from layers I and II/2 was made with a polarizing microscope.

The quantitatively predominant flints (subunits Ia^{1-3} and, probably, Ia^{4}) of the uppermost archaic UP layer of the site (Mira: I) had Eastern Carpathian origins and were seemingly collected somewhere on the territory of modern Romania. Lithics of subunits Ia-b and Ib are quantitatively less significant, but their peculiarities allow to define their exact origins in the area of modern Kosteshti town in the Prut valley (subunit Ia-b(A)); area of modern Soroki town in the Dniester valley (subunit Ia-b(B)); area of River Bakshala mouth in the Southern Bug valley (subunit Ia-b(V)); the Ingulets valley (subunit Ia-b(G-1)); area of modern towns of Nikopol and Marganets in the Lower Dnieper valley (unit Ib). The paragenetic association of zeolitised tuffs (subunit IIIa), actinolitites (subunit VIIa), amphibolites (subunit VIIb), and effusives (unit IV) from Mira: I assemblage points to Carpathian origins of certain exotic varieties of non-siliceous rocks. The sandstone of subunit IIa, the quartz milonite-ultramilonite of subunit VIa, migmatite or gneiss (unit VIII), and probably quartz-diabase (unit V) have local origins. The flint raw material of the lower occupation Mira: II/2 (subunit Ia^{5}) provides grounds to regard it as western, at least Volhynian type.

The typomorphic peculiarities of flints and non-siliceous rocks allow a rather precise tracing of a West-to-East movement of the occupants of Mira: I. The migration started somewhere on the territory of modern Romania and passed almost in a longitudinal direction through the valleys of Rivers Prut, Dniester, South Bug, Ingulets, and, finally, stopped at the Dnieper. The quantitative prevalence of the most remote raw materials points to the notion of a comparatively rapid movement from the Carpathians to the Dnieper.

KULCSSZAVAK: NYERSANYAG, KORAI FELSŐ PALEOLIT, UKRAJNA MIRA, VÁNDORLÁS

KEYWORDS: RAW MATERIALS, EARLY UPPER PALAEOLITHIC, UKRAINE, MIRA, DISTANT MIGRATION

Introductory remarks

The new Early Upper Palaeolithic open-air site of Mira is located in the valley of River Dnieper, Ukraine, Eastern Europe, about 15 km south of Zaporozhiye, 47°40' of N latitude and 34°50' of E longitude (**Fig. 1**) (Stepanchuk et al. 1998). The site has yielded two distinct Palaeolithic occupations, i.e. II/2 and I, separated by a natural conflagration layer II/1. The examination of the essential aspects of geological and archaeological taphonomy (Stepanchuk 2004) allows to conclude that Mira layers I and II/2 represent separate and homogeneous short-term occupations, in which a good example of well-preserved living floors could be observed. The assemblage of Mira: I demonstrates a fusion of MP and UP features, while the underlying Mira: II/2 appears to be true UP and has a Gravettian-like appearance (Stepanchuk et al. 2004). Lithologic, geomorphologic, palynologic, anthracotomic, micro- and megafaunistic analyses and radiometric (AMS and conventional 14C) data precisely correlate the culture-bearing sediments with the Denekamp / late Vitachiv /Bryansk interstadial of the Middle Pleniglacial and put both Palaeolithic occupations between 27-28 ky BP (Stepanchuk et al. 2004). The lithic series of the uppermost occupation (layer I) is highly diversified in respect of raw materials (Petrougne 2003; **Table 1; 2**). The overwhelming majority of the rock varieties belong to the Mira: I occupation, while Mira: II/2 has yielded less flint artefacts. The petrographic study of the rock composition of the lithic series from the excavation of the site of Mira in 2000 was conducted by Dr. V.F. Petrougne by means of studying samples under a polarising microscope. A series of ca. 300 samples of flint and stone artefacts was subjected to analysis. This paper mainly focuses on the problem of the composition of lithic raw materials used by the occupants of Mira, their supposed origins, and the interpretation of the data.

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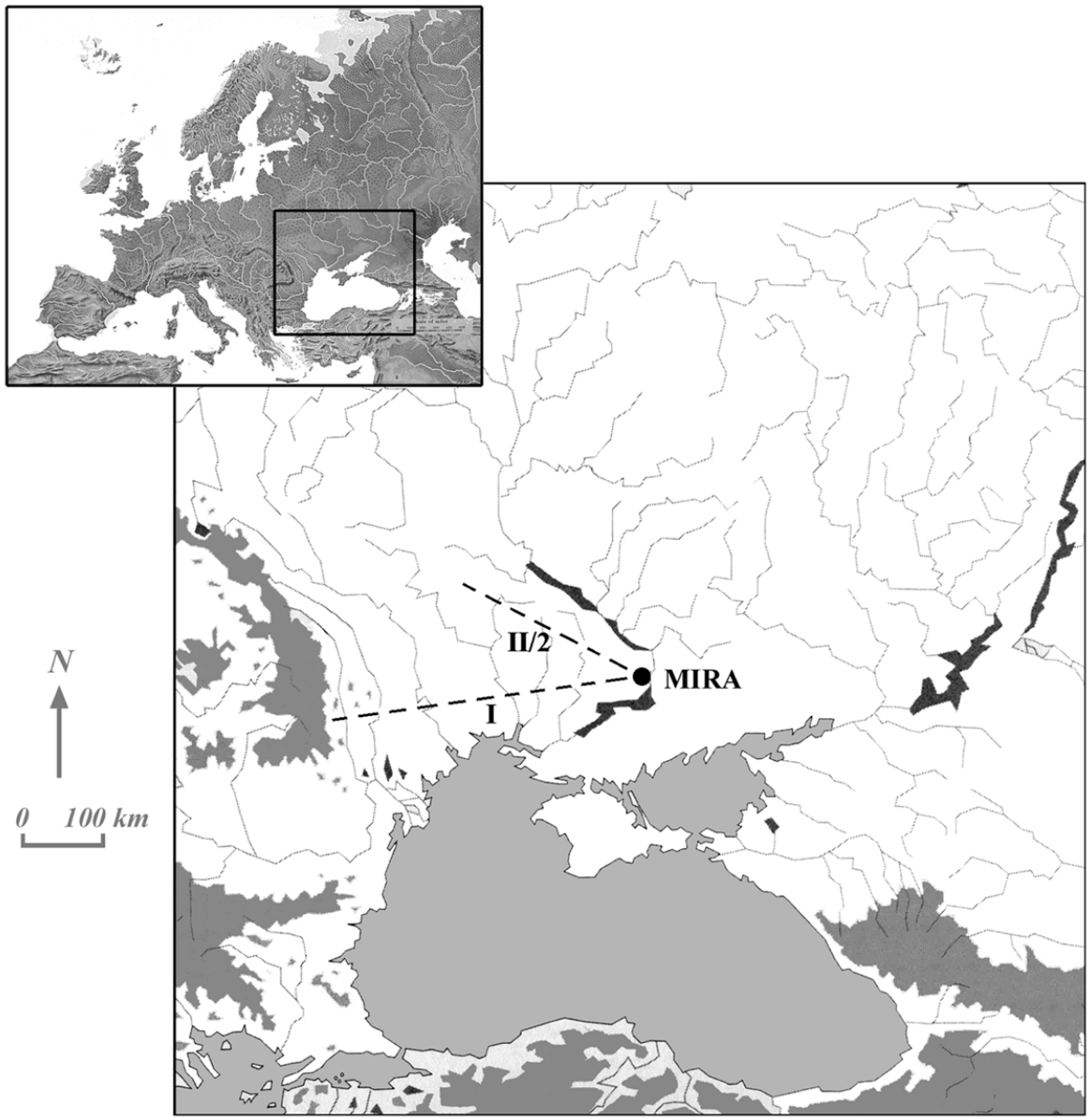

Fig. 1. The location of the site of Mira. Dash lines show remoteness of sources of raw materials mainly used in Mira layer I and II/2.

Lithic raw material composition of Mira, layer I assemblage: brief systematic description

Unit Ia

Siliceous, mainly diagenetic and partially infiltratic rocks of basically chalcedoneous content

***subunit Ia*[1]**

A mainly tabular, laminated light grey to almost black flint with a thin grey grainy mono-mineral chalcedony coarse cortex. The sub-cortex layer is represented by transparent smoky chalcedony with a thin laminated microstructure followed by a grey-coloured central layer. Instead of micro-lamination, this latter one often demonstrates a dotty micro-spot structure, varied in tonality and dimensions.

The lithologic peculiarities consist of the rarity of grains of aleurolite clastic quartz and micro-globules; there also are pseudomorphs on iron disulfides, sometimes limonitised and even hematitised. This subunit finds no analogy among silicilites known in the Right-bank Ukraine, Sub- and Transcarpathia and might be regarded as a new distinct type of micro-detritus-foraminifer-(radiolarian)-prism-inoceramic flints.

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The tabular chalcedony raw materials of subunit Ia[1] might be regarded to have come from somewhere the territory of modern Romania.

Name of rock	Conditional code	Presence in layer I	Presence in layer II/2
Flint	Ia[1], Ia[2], Ia[3], Ia[4], Ia[5], Ia-b(A), Ia-b(B), Ia-b(V), Ia-b(G-1), Ia-b(G-2),	all save for Ia[5]	Ia[5]
Fossilized wood	Ib	+	-
Local sandstone	IIa	+	-
Quartzite sandstone	IIb	+	-
Zeolitised tuff	III	+	-
Effusive rock	IV	+	-
Quartz-diabase	V	+	-
Quartz milonite-ultramilonite	VIa	+	-
Quartzite	VIb	+	-
Actinolitite	VIIa	+	-
Amphibolite	VIIb	+	-
Migmatite or gneiss	VIII	+	-
Tektite-Moldavite (?)	IX	+	-

Table 1. Mira. List of rocks, represented in materials of layer I and II/2

subunit Ia[2]

This subunit of flints is similar to previous type in its structure and microfauna, but it is red-coloured to a different extent. The central layer between two grey areas is weakly transparent and bright red. The pigmented area consists of quartz grains overfilled with flakes of clayey-microhematite; where hematite is secondary. The chalcedony substrate of the smoky covering layers has a thin/fine/medium grained (0,001-0,01 mm) structure with single silicified prisms of inocerames and spherical contours of elementary shells.

There are no data on primary outcrops of such a kind of a raw material on the territory of Ukraine. Judged from a series of characteristics, first of all the microfaunal content, the flints of this subunit can also be originated from a currently not precisely localised Romanian geo-locale.

subunit Ia[3]

Mainly grey with slight greenish tincture, with grey-smoky spots, little transparent flints of alternately clayey-chalcedony content. Close to subunit Ia[1] by mineral content and peculiarities of silification of microfauna. This latter is represented mainly by foraminifers; there are sometimes phantom remains of spicules; but there are almost no detritus, inoceramic prisms, and relics of nodular cortex. Texture is typical for its small light spots on grey background, and also for specific macroenamelity of surface of certain artefacts. Structure varied between 0,01 and 0,08 mm.

Primary outcrops of this kind of flints is unknown on the territory of Right Bank Ukraine, Sub- and Transcarpathia.

subunit Ia[4]

It is the subunit of glauconised and partly patinated raw materials. This mineral was most likely formed under the terms of marine basin where fragments of flint rocks were primarily connected with Upper Cretaceous (?) deposits of Carpathian region.

The exact area of origin of this kind of raw materials is not known but it might at least partly be paragenetically connected with the area of the primary outcrops of the tabular smoky flints of the first subunit.

subunit Ia[5]

They are transparent smoky chalcedony thin-grained raw materials, which are macro-structurally uniform and characterised by a fine-grained structure with rare areas of re-crystallisation, including here radial radiant spherolitic forms. They are similar to the flints of the so-called Volhynian (Podolian) type in their smoky variety. A further study of several petrographic sections is desirable with the aim to discover silicified remains of fish whitebait. If so, the preliminary assumption about a Turonian age and a Volhynian-Podolian origin of this raw material should be regarded as proved.

subunit Ia-b

This subunit is rather provisional and includes a quantitatively subordinate series of samples of unusual mineral raw materials.

Ia-b (A)

These lithics with an apospiculae structure are analogous to flints associated with Lower Cenomanian deposits known in middle flow of the Dniester and the Prut.

The isolated brownish-grey flints with light grey spots are also known in the alluvium of the Prut river.

Ia-b (B)

A black smoky flint with a white softy cortex and a fine-grained structure of the main chalcedony substrate. It includes fairly numerous spicules alongside with inoceramic prisms and fine-grained detritus of valves of other lamellibranchia molluscs. The raw material is originated from the primary deposits of an Upper Cenomanian age exposed along the Dniester valley between mouth of River Kalus and Resina town.

Ia-b (V)

A multicoloured chalcedoneous base, slightly glaukonized, with a white cortex composed of fine-grained kaolin with isolated grains of quartz. It is almost not transparent, with a bold lustre, it includes fairly numerous grains of clastic quartz and no remains of microfauna. This rock of a clearly residual-infiltrated origin has a direct analogy among the Sarmatian clayey-chalcedony flints of Bakshala type, e.g. known on the cortex of erosion of Ukrainian crystal shield in the mouth of River Bakshala in the basin of Lower Bug.

Ia-b (G-1)

The residual-infiltrated origin is also specific for light grey not transparent almost dim flints, which are characterised by the absence of microfauna in the substratum and a seemingly pelitomorphic clayey component of metagalluasite-kaolin content in its cortex. Similar flints are known in the cortex of erosion of Proterozoic rocks of upper suite of Krivoj Rog series on the territory of Krivoj Rog town.

Ib(G-2)

It is an infiltrated chalcedony rock, three-coloured, well transparent, mainly muddy-smoky, bold lustred and of a fine-grained structure with dispersed micro-spots of accumulating re-crystallisation and no microfaunal inclusions. This kind of raw materials is known in the cortex of erosion of Ukrainian crystal shield in Middle Dnieper area and elsewhere in Right-bank Ukraine, e.g. in the Cherkassy region.

Unit Ib

Siliceous rock of infiltratic-metasomatic origin

Siliceous rocks of an infiltratic-metasomatic origin is represented by swamp cypress which is by all parameters identical to chalcedonised fossilised wood reported from the area of the modern town of Marganets and essentially differs from specimens known in the Donbass, and in the alluvium of both Left- and Right-bank Ukrainian rivers including Subcarpathia and Transcarpathia in the Tisza basin.

Unit II

Clastic (detrital) sedimentary rocks

subunit IIa

It is predominantly a grey sandstone with a massive texture, silt-psammitic, coarse, and uneven-granular textures with clay-quartz contact (and, partly, regenerated) cement. The clastic component is represented both by sharp and rolled (up to 2 mm) grains of vein or plutonic quartz, plagioclase, fresh or kaolinised potassium feldspar, rare ore material (magnetite), isolated flakes of mica-muscovite.

The rock is basically analogous to Tertiary sandstones (from Buchak to Upper Pliocene), which were formed due to the destruction of crystalline formations of the Ukrainian shield. This sandstone has most likely a regionally local genesis.

subunit IIa

It is light grey quartzite-like sandstone with glass lustre, translucent up to 2 mm, with a silt-psammitic structure, sometimes with whitish spots. The contact cement is a clay-chalcedony-quartz without microfauna and other diagnostic signs.

The exact origin of this chalcedoneous quartzite-like rock is not known. There are, for instance, outcrops of quartzite-like sandstone in the Southern Bug valley, on the right bank of Mertvovod River, eastward of Voznesenka town.

Unit III

Sedimentary-volcanogenic, pyroclastic rocks

subunit IIIa

Tuffs, to some extent metasomatically altered. The thickest fragments are bicolour; brownish-green bold-lustred in the core zone and turquoise-bluish on the periphery. The structure of both zones is matted fibrous, lepide or nematoblastic. The central zone is specific for the availability of extra rare flakes of biotite and quartz grains, and the fine admixture of ferric oxides and clay turbidity. Some features allow supposing, at least theoretically, some anthropogeneous (high temperature) effects on the properties of structure.

By the sum of signs, the rock under discussion represents a practically completely zeolitised originally vitroclastic cemented (welded?) ashen tuff of a silt structure and dacite (?) content.

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The evident paragenetic association of zeolites with volcano-clastic tuffogenic strata affords distinguishing three areas of potential provenance of this rock on the territory of Ukraine. These are Kara-Dag in the Crimea, Azov-Donetsk, and the Carpathians (Petrougne 1965; Lazarenko et al. 1975). The first two areas should be rejected due to the different mineral content, the structural-texture peculiarities, the colouring etc.

Provenance of raw materials		Eastern Carpathians				Eastern Carpathians ?	Prut	Dniester	Southern Bug		Dnieper (Krivoj Rog)	Dnieper (Cherkassy)	Volhyno-Podolian ?
Code of raw materials		Ia[1]	Ia[2]	Ia[3]	Ia[4]	IIb	Ia-b (A)	Ia-b (B)	Ia-b (V)	Ia-b (V) ?	Ia-b (G-1)	Ia-b (G-2)	Ia[5] ?
Category of artefact	flake	1						1					
	blade	1											
	Biface waste-flake	10	1										
	Flake tool edge rejuvenation waste-flake	4											
	Flake tool thinning waste-flake	1											
	Flake tool	49	5	3	1	1	4	1	1	1	1	1	1
	Blade-like flake tool	17		1									
	Blade tool	36	2	4	3	2	1	1	1				
	Bladelet tool	5											
	Biface waste-flake tool	24			1								
	Utilised biface waste-flake	1											
	Tool on waste-flake of rejuvenation of flake tool	14											
	Tool on waste-flake of thinning of flake tool	8											
	Core	2											
	Bifacial tool	3		3									2
	Partially bifacial tool	2											
Total varieties of raw materials		**178**	**8**	**11**	**5**	**3**	**5**	**3**	**2**	**1**	**1**	**1**	**3**
Total areas of origins of raw materials		Eastern Carpathians: 205					Prut: 5	Dniester: 3	Southern Bug: 3		Dnieper: 2		Volhynia ?:3
Total areas of origins of raw materials, % (221=100%)		92.7					2.3	1.4	1.4		0.9		1.4

Table 2. Mira. Raw materials of series of flint artefacts from the uppermost layer I

Zeolitised tuffs of Mira are most reasonably cognate with the ante-Sarmatian formations of the East-Carpathian region. Although zeolitised tuffs and amphibolites are widely represented in Mira: I assemblage, there are grounds to consider their origin from the area in which both formations are known. It is only the exterior zone of the Carpathian arc, ranging between Ukrainian Transcarpathia and the northern part of the Romanian Eastern Carpathians, up to the latitude of Tirgu-Mures town (Onchescu 1960).

Unit IV

Effusive (volcanic, lava) rocks

It is a greenish-grey rock of a microoligofire structure with an extra fine-grained basis. According to the association with zeolitised pyroclastes, it most likely has a regional-Carpathian origin.

Unit V

Intrusive rocks

It is a dark grey quartz-diabase of a massive texture. Similar, usually primarily dyke rocks are known in the Crimea, in the area of the Ukrainian shield, and among the boulders of Dnieper moraine. Under other equal terms, the local origin seems more likely, e.g. from the mouth of the Samara River. Carpathian or North Dobrodgean origins seem less realistic due to the different appearance of more remote rocks.

Unit VI

Rocks of dynamometamorphic genesis

subunit VIa

It is translucent (in the depth of 5 mm), with a dim surface and a massive or fine-laminar texture; the mineral structure is represented by quartz and secondary clay minerals. It is basically a quartz milonite-ultramilonite of most likely a local origin. The tabular shape represents a fragment of a veinlet from the local crust decay of the Ukrainian crystal shield.

subunit VIb

The rock is dim, with a massive texture, of a primarily hydrothermal genesis, formed by quartz grains (0,04/0,4 mm). Local (end moraine of Dnieper glacial), more western (basin of Southern Bug, north to Pervomaisk town), and even Carpathian (alluvium of local rivers) origins might equally be supposed.

Unit VII

Rocks of middle stages of regional metamorphism

subunit VIIa

A rock of a dim surface, it is greyish-green, dark green in colour, not translucent, with a massive texture and a hardness of 5,5. It is almost mono-mineral aggregate composed of sub-prismatic crystals of actinolitite, isolated flakes of chlorite, silt dimensioned grains of quartz and magnetite.

Judged from the pebble appearance, crystal-optic constants and paragenetic associations differing from actinolitite rocks known in area of Krivoj Rog (Petrougne 1967a), Dnieper area, and in Eastern Asov sea region (Danilevich 1970), actinolitites from Mira might be regarded as ones originating from the Carpathians, even from the Rakhov massive in Transcarpathia.

subunit VIIb

It is black or dark grey, with a massive texture and a heteronematoblastic structure, a hardness of 6. This rock, composed of prismatic crystals of hornblende, often with micro-inclusions of magnetite, rare flakes of biotite, and isolated grains of quartz was determined as amphibolite.

Amphibolites are widely known among the crystalline formations of the southern edge of the Ukrainian shield. Nevertheless, the territorially closer rocks known in various localities in the Dnieper basin are different in a row of macro- and micro-signs.

Until the definition of the absolute age of the Mira samples by K/Ar, it is possible to consider them as belonging to the Carpathian area (Matkovskij 1967) and the area of crystalline shales (Onchescu 1960)).

Unit VIII

Rocks of high stage of regional metamorphism

These rocks are represented by isolated samples and have a local origin.

-- Dark grey, with a massive texture and a heteroblastic structure. The component minerals are plagioclase, quartz, monocline pyroxene in grains up to 1 mm. It might be determined as migmatite or gneiss (?) from the neighbouring areas of the Ukrainian shield.

-- Grey granulated rock with a sub-laminated texture and a heterolepidoblastic structure. The basic mineral content is represented by quartz, plagioclase, biotite and secondary clay matter. It might be determined as gneiss or migmatite.

Unit IX

Rocks of uncertain origin

A fragment of light green glass of a gravel dimension, with a dim but translucent surface. A fraction with glass lustre, without the admixture of

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clastic grains or inclusions. It might be either tektite-moldavite or modern industrial glass rolled in water. The sample is more similar to tektites by structural-texture features but the index of refraction is more typical of modern glass. The chemical analysis of the sample and its gas inclusions would be decisive for a final solution.

Some additional remarks on the archaeological context of Mira: I and II/2

The lithic assemblage of layer II/2 is quantitatively poor, it enumerates only about 200 knapped flints. There are few flakes, flake tools, while micro-wastes of tool rejuvenation and reshaping dominate. Non-siliceous artefacts are completely absent.

The lithic assemblage of Mira layer I is far more numerous and enumerates more than 52 thousands of artefacts, but chips constitute the lion portion (more than 97%). The flint assemblage provides an expressive instance of an extremely transformed industry, the actual appearance of which is the result of intensive utilisation and curation of a limited number of initially thoroughly sorted lithic artefacts. There are practically no ordinary products of core knapping. The assemblage contains extremely few and exhausted cores, few small fragments of raw materials, series of flakes, flake tools, bifacial tools, while chips or micro-wastes of bifacial and flake tools' knapping, sharpening and reshaping dominate. As it was argued elsewhere (Stepanchuk et al. 2004) there are grounds to suppose that the primary appearance of industry was likely composed of: a) massive and wide blades/ blade-like flakes probably struck from parallel single-platform volumetric cores and b) large bifacial pieces. Retouched flake tools and bifacial tools and/or pre-forms, and probably a certain quantity of raw materials by way of blanks and tested pieces were taken to the site. The set of flint artefacts of mainly a remote provenance was complemented with non-siliceous objects, such as am actinolitite pebble, and complete/ fragmented manuports of amphibolite, zeolitised tuffs and effusive.

It is worth noting the presence of compact micro-concentrations of tiny wastes of tool sharpening and modification. The individual peculiarities of raw materials in such micro-concentrations allow suggesting probable discrete episodes of the curation of isolated tools. There are clear differences in the spatial distribution of petrographically different artefacts. For instance, while flints of the dominating unit Ia^1 are represented all over the excavated area of layer I, artefacts of groups Ia-b (A,B,V, and G) are localised only within few distinct areas. Layer I provides numerous small-sized - usually ranged between 30-15 mm - fragments of different rocks. But, the program of the refitting of exotic non-siliceous artefacts from Mira: I (P.A. Levchuk) has clearly demonstrated that there was a very strict primary number of such artefacts, which, as rule, was limited to only one object for each petrographically recognised variety. It may also be stressed that the overall weight of both flint and stone artefacts of presumably East Carpathian origins does not exceed 5 kilograms.

Conclusion

Examination of Mira lithic assemblage allows to state following:

1. The quantitatively predominant flints (*subunits* Ia^{1-3}) of the uppermost archaic UP layer of the site (Mira: I) are represented by mostly tabular smoky, grey-smoky and grey chalcedonolites which, due to their specific composition of inclusions, have no analogies among the silicilites of the Ukrainian Right-bank area, the Ukrainian Carpathians, and Transcarpathia (Petrougne 1995). These flint raw materials (*subunits* Ia^{1-3} and, probably, Ia^4) have an Eastern Carpathian origin and, as well as a part of the non-siliceous stone rocks discovered at the site, were seemingly collected somewhere on the territory of modern Romania. The state of the physical preservation of the chalcedonolitic artefacts allows to suppose the exploitation of either fresh primary outcrops or eluvially disintegrated flint-bearing rocks, most likely dated to the Upper Cretaceous period. The lithics of *subunits Ia-b* and *Ib* are quantitatively less significant. Nevertheless, their peculiarities allow to define their exact origins. The assemblage of the upper layer of the Mira site includes the following varieties of lithics, i.e.: apospiculae chalcedonolites of Lower Cenomanian age (*subunit Ia-b(A)*) which were picked up in the area of modern Kosteshti town in the Prut valley; spiculae-inoceramic flints of Upper Cenomanian age (*subunit Ia-b(B)*) originating from the area of the modern Soroki town in the Dniester valley; residual-infiltrated Sarmatian flints and opoka-like rocks (*subunit Ia-b(V)*) from the area of the mouth of River Bakshala in the Southern Bug valley; local cherts of Krivoy Rog type (*subunit Ia-b(G-1)*) in the Ingulets valley; fossilised wood (*unit Ib*) from the area of modern towns of Nikopol and Marganets in the Lower Dnieper valley.

There are both local and remote non-siliceous rocks in the Mira: I assemblage. The paragenetic association of zeolitised tuffs (*subunit IIIa*), actinolitites (*subunit VIIa*), amphibolites (*subunit VIIb*), and effusives (*unit IV*) point to the Carpathian origins of certain exotic varieties of non-siliceous rocks. The sandstone of *subunit IIa*, quartz milonite-ultramilonite of *subunit VIa*,

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migmatite or gneiss (*unit VIII*), and probably quartz-diabase (*unit V*) have local origins.

2. The high quality homogeneous, fine-grained chalcedony flint raw material of the lower occupation Mira: II/2 (*subunit Ia*[5]), though also smoky but including only rare elementary microfauna, provide good macro- and microscopic affinities to chalcedonolites of western, at least Volhynian type. A further study is desirable with the aim of discovery of silicificated remains of fish whitebait. If the results are positive, the preliminary assumption about a Turonian age and a Volhynian-Podolian origin of this raw material should be regarded as proven.

3. In the case of the lowermost Mira: II/2 occupation, the outcrops of the lithic raw materials were remote from the site, at least 300 to 350 km, and they can be localised somewhere in Western Ukraine. The typomorphic peculiarities of flints and non-siliceous rocks allow a comparatively precise tracing of the supposed route of a West-to-East movement of the people who left the uppermost Palaeolithic layer of Mira. There are grounds to believe that they started from somewhere on the territory of modern Romania and passed almost in a longitudinal direction across the valleys of Rivers Prut, Dniester, South Bug, Ingulets, and, finally, stopped at the right bank of Dnieper. The initial set of presumably East Carpathian flint and non-siliceous artefacts was added by testing of flint raw materials on the route to the Dnieper and by collecting seemingly local non-siliceous rocks of a Dnieper provenance. The absence of typical flint raw materials known in the upper and middle stretches of the Dniester valley, and the lack of characteristic Lower Danubian flints (Petrougne 1967b: 54) strengthen the justification of this direction of movement, the overall distance of which reaches at least 750-770 km. The quantitative prevalence of the most remote raw materials points to the notion of a comparatively rapid movement from the Carpathians to the Dnieper.

Acknowledgements

The authors are grateful for K. Simán for improving the English of the paper.

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