RAW MATERIAL PROVENANCE IN THE PALAEOLITHIC OF UKRAINE: STATE OF PROBLEM, CURRENT APPROACHES AND FIRST RESULTS

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Abstract

The territory of Ukraine is fairly rich in siliceous raw materials though their spatial distribution is uneven. Accordingly to geological data, good quality isotropic rocks suitable for knapping are especially abundant in Transcarpathia, the Dniester valley, North and North-Eastern Ukraine, and Crimea. Though areas of the main concentrations of potential outcrops of raw materials and areas intensively occupied by Palaeolithic man generally coincide, Late Middle and Upper Palaeolithic sites demonstrate somewhat different trends in spatial distribution, and form several geographical groups. The problem of raw material provenance and acquisition is still poorly elaborated not only for the Ukrainian Palaeolithic sites, but for Stone and Aeneolithic Ages, in general. The main problem is the lack of a systematic survey of available sources and further comparisons with archaeological lithic series, both macroscopic and analytical. Pioneering and highly valuable works of V. Petrougne reveal several types of flint resources on the Right-bank Ukraine (areas westwards from Dnieper). Considering the experience of a long-year program on the study of raw material base in adjacent countries, a row of specific characteristics is proposed to be involved in course of the systematic description of either natural outcrops or archaeological assemblages. A special attention is paid to several instances of availability and acquisition of flint resources in a regional context, i.e. Kanev and Zaporizhia areas in the Middle Dnieper, Bolshaia Vys' in Southern Bug basin, and the River Biyuk-Karasu area in Eastern Crimea.

KULCSSZAVAK: NYERSANYAG, PALEOLIT, UKRAJNA

KEYWORDS: RAW MATERIALS, PALAEOLITHIC, UKRAINE

Introduction

Availability or absence of high-quality lithic raw materials ultimately resulted in particular adaptive responses of prehistoric communities, which are mirrored in ways and specifics of behaviour practices. These specifics are reflected in the variability of the applied lithic technologies, in the ways of raw material selection, acquisition, and transportation, in the contacts and the interchange between populations, and in the purposeful "raw material expeditions", and even migrations.

There are two main directions of raw materials analysis. The multiaspectual study of lithic series recovered at archaeological sites represents the first of them. The archaeo-mineralogical analysis seems currently to be the most important aspect of studies on raw material variability of the Ukrainian Palaeolithic assemblages. The next direction of analysis of raw materials consists of the evaluation of localisation, quantitative/ qualitative properties, and further features (like temporal or seasonal accessibility) of raw material outcrops within the frames of a given territory exploited by a certain prehistoric community. The two directions of studies are tightly related and interdependent. The necessity of the accumulation of data allowing the reconstruction of the spatial/temporal distribution of lithic raw material resources throughout the territory of Ukraine, as well as accumulation of data concerning the specifics of lithic assemblages of concrete sites make the current studies urgently needed.

Current state of problem

The territory of Ukraine is fairly rich in siliceous raw materials though their spatial distribution is uneven. Accordingly to geological data, good quality isotropic rocks suitable for knapping are especially abundant in Transcarpathia, the Dniester valley, North and North-Eastern Ukraine, and Crimea (**Fig. 1**). In general, territory of Ukraine is characterised by a fairly high number of lithic raw material outcrops. Flint outcrops usually occur in the colluvial-alluvial sediments of the valleys of big rivers, like the Dniester, the Southern Bug, the Dnieper, the Desna and the Seversky Donets. The majority of the rivers in continental Ukraine have a meridional orientation, and this hydrographic pattern generally developed by the end of the Eopleistocene. So in the course of the Pleistocene, repeated water-glacial flows transported and accumulated various lithic materials, including silicites, through vast territories. Time to time, these materials formed concentrations by way of lithics redeposited in long areas, for instance in the Lower Dniester basin (Petrougne 2004).

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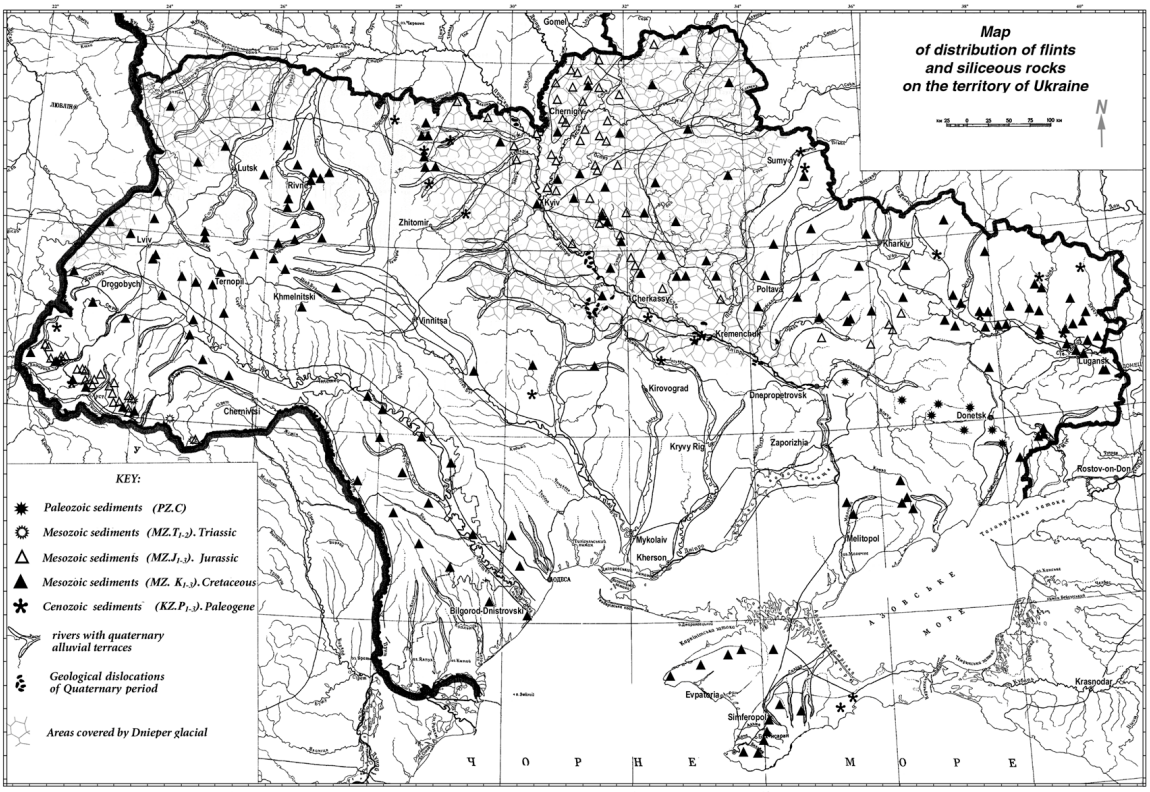

Fig. 1. Map of distribution of flints and siliceous rocks on the territory of Ukraine.

The accessibility of such so called secondary outcrops depended on the changes of the Black and the Azov Sea level conditioned by the climatic fluctuations during the Pleistocene. There are numerous representatives of these secondary outcrops on the territory of Ukraine but they are very difficult to determine.

Although the areas of the main concentrations of potential outcrops of raw materials and the areas intensively occupied by Palaeolithic man generally coincide, Late Middle and Upper Palaeolithic sites demonstrate somewhat different trends in spatial distribution, and form several geographical groups, namely: Transcarpathia, Middle and Upper Dniester, Middle Dnieper, Eastern Ukraine, and Crimea (**Fig. 2**). Flint resources (silicites) were first of all exploited by Prehistoric man on the territory of Ukraine, as elsewhere in Europe. The only exception can be found in Transcarpathia where volcanic rocks, like andesite and obsidian, prevail in the Palaeolithic assemblages.

In general, the distribution of Palaeolithic sites on the territory of Ukraine coincides with the two large natural-climatic zones, the plain-hilly and the mountain ones. The plain-hilly territory of Ukraine provides the majority of open-air Palaeolithic sites, and practically all of them are associated with the drainage system of large rivers. The western part of Ukraine has yielded numerous Palaeolithic sites and localities dated to the Middle and the Upper Palaeolithic. There is a special concentration of sites in the Dniester basin where Velyky Glybochok, Ezupil, Korman, Stinka, Molodova I-V, Bolshaya Akkarzha and many others are known. The Basin of the Southern Bug has yielded Anetovka I and II, Ivashkovo VI, Tsarinka etc.

The central part of Ukraine is represented by sites connected with the Dnieper its main water artery and its tributaries. Mezin, Pushkari, Mezhirichi, Dobranichevka, Gontsy, Osokorovka, Mira etc. are known here.

The eastern part of Ukraine, the area of Donets ridge and the basin of Severskij Donets, is known for such sites as Minevskij Yar, Govorukha, Amvrosievka, Antonovka I-III, Muralovka, Rogalik and many others.

Numerous Palaeolithic sites are known in the mountain areas of Crimea (e.g. Zaskalnaya I-IX, Prolom I and II, Kiik-Koba, Kabazi I-V, Siuren' I and II etc.) and the Carpathians (Korolevo, Maly Rakovets, Rokosovo, Sokyrnytsia, Molochny Kamen').

The problem of raw material provenance and acquisition is still poorly elaborated not only for Ukrainian Palaeolithic sites, but for the Stone and Aeneolithic Ages in general. Indeed, the problem in question has been discussed from various aspects in many publications concerning given sites or micro-regions. But the main problem is the lack of a systematic survey of available sources and further comparison with archaeological lithic series, both macroscopic and analytical.

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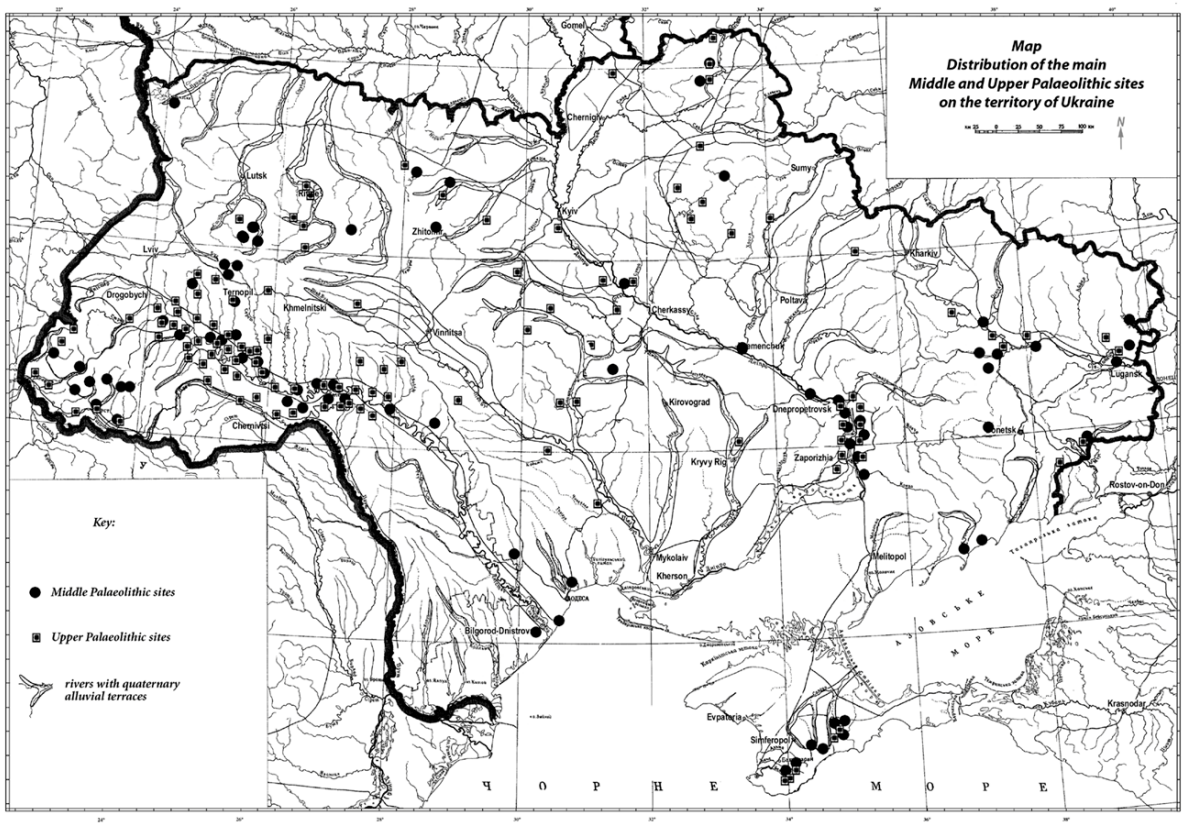

Fig. 2. Map of distribution of the main Middle and Upper Palaeolithic sites on the territory of Ukraine.

In the course of the last four decades, the only scholar working on various aspects of the problem in discussion was V. Petrougne the well-known Ukrainian archaeo-mineralogist. He, in particular, conducted the petrographic examination of many Palaeolithic assemblages and raw material outcrops of Ukraine. According to V. Petrougne, Ukrainian flints can litho-petrographically be subdivided into three main groups, namely: silicates (opal-crystobalites), chalcedonolites, and microquartzes. There are primary (sedimentary-diagenetic) and secondary (residual-infiltrated) silicates (Petrougne 2004). A special and very important work was conducted by him concerning the mapping of the available flint outcrops. Unfortunately, this work was not finished (Bruiako et al. 2005).

V. Petrougne's pioneering and highly valuable works revealed several types of flint resources on the Right-bank Ukraine (areas westwards from Dnieper). Several main types of flints and the areas of their distribution were identified. These are moraine flints of a northern origin, Desna type, Volhynian, Dnieper-Kanev, Ukrainian crystal shield, Middle Dniester and Prut, Middle Dniester, and Bakshala type flints (**Fig. 3**) (Petrougne 1995; 2004). Besides, there are no less than five varieties of Lower Dniester alluvial flints (Petrougne 1971), distinguished by their different colouring and position in the stratigraphical sequences (Petrougne 1967). The Bakshala type flints appeared to be similarly varied, where six to seven subtypes were recognised (Stanko et al. 1981). V. Petrougne's works clearly outline the importance, and, what is especially noteworthy, the high potentials of Ukrainian data for many aspects of prehistoric studies in the country.

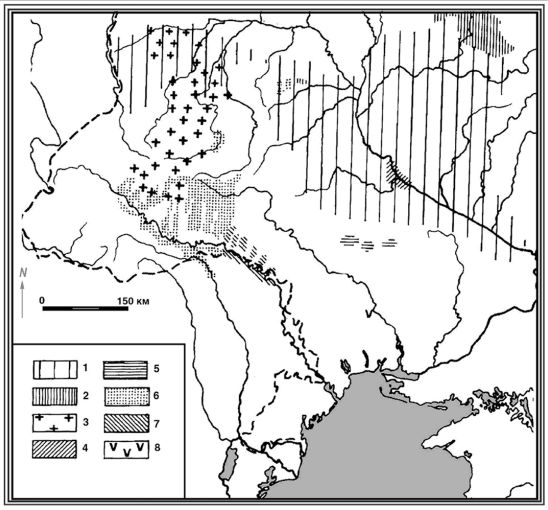

Fig. 3.

Variability of siliceous rocks of Right-bank Ukraine (after V. Petrougne). Key: 1 - Moraine flints; 2 - Desna type flints; 3 - Volhynian flints; 4 - Dnieper flints; 5 - Crystal shield flints; 6 - Middle Dniester and Prut cherts; 7 - Middle Dniester flints; 8 - Bakshala flints.

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It must be admitted, nevertheless, that special studies on the problematics of raw materials in Ukraine are still in the initial phase. This state of matter invokes urgent need in the elaboration of some basic methodological grounds and approaches to the systematic survey of the available sources of raw materials and archaeological sources.

Methodological approaches

Considering the experiences of a long-term program on the study or the raw material base in adjacent countries, especially in Hungary (Biró & Dobosi 1991), the following characteristics are proposed to be involved in the systematic description of either natural outcrops or archaeological assemblages.

I. Geographical / Topographic localisation

1 – Coordinates GPS

2 – Nearest inhabited locality

3 – Reference to hydrographic system

3 – River (terrace)

4 – Ravine

5 – Quarry

6 – Nearest Palaeolithic site/ raw material outcrops

7 – Code of locality

II. Lithological / Stratigraphic features

1 – Genetical group (sedimentary-diagenetic/ residual-infiltrated/ volcanic etc)

2 – Geological period

3 – Position (Primary/ Secondary/ Anthropogenous)

4 – Distribution (local, regional, exotic)

5 – Stratified/ exposed

6 – Features of the raw material bearing layer (thickness, depth, spread)

7 – Stratigraphic sequence

III. Individual features of the sample

1 – petrographic/ common name

1 – sample code (+ other individual code if any)

2 – Provenance (name/ code of locality)

3 – Position (Primary/ Secondary/ Anthropogenous)

4 – Stratigraphic position (if any)

5 – Exterior morphology

a) shape (block / nodule / pebble / … / core / flake etc)

b) features of the cortex or the naturally fractured surface

6 – Interior morphology

a) colour

b) texture (homogeneous/ fine grained/ grained etc)

c) pattern (striped/ zonal/ mottled etc)

d) transparency (non-transparent/ slightly translucent/ translucent/ transparent)

8 – collector

9 – date of sampling

10- reference to analyses

Availability and acquisition of flint resources: some regional examples

Several areas were recently investigated in the Crimea, in the basin of the Middle Dnieper and the Lower Dniester with the aim to examine the interrelations between the available raw material resources and the Palaeolithic sites. These areas provide examples to short and medium distance, and remote raw material provenance and acquisition.

Middle Dnieper, Kanev region (Short distance raw material acquisition)

It was held for a long time that no flint outcrops of the first generation existed. Recent studies have revealed two microregions with good quality flint outcrops: these are the Buchak and the Kanev microregions (Ryzhov 2004).

Buchak type Cenomanian flints included in cemented sandstones can be recovered directly in the Dnieper valley in the vicinity of Buchak town. These are fine grained nodular flints of a light grey colouring with white spots; there are inclusions of the micro-fauna.

Kanev type Jurassic/ Cretaceous fine grained flint pebbles, which are dim black or grey with white spots, are especially characteristic for Pekarska Kosa and its environs, and it come, in particular, from sediments exposed in the large ravines that segment the elevation of the Kanev dislocation.

The macro-morphological comparison of flints from natural outcrops and the available archaeological materials allows supposing different raw material bases for the local MP and UP sites. Thus, the MP assemblage of Kanev (Pislarij et al. 1999) shows affinities to the Buchak type of flint, while the UP artefacts from Mezhirichi (Pidoplichko 1976; Korniets et al. 1984; series stored in National Kiev University) seem to be closer to the flints of Kanev type (**Fig. 4**).

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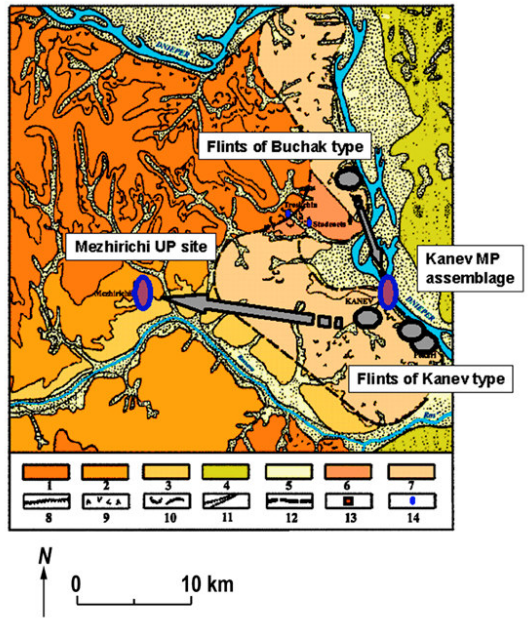

Fig. 4. Kanev area: outcrops, Palaeolithic localities, and probable connections between the two. Key: 1 – plateau, 2 – moraine terraces, 3 – loess terrace, 4 – I terrace (sand), 5 - fluvial terrace, 6 – dislocated plateau, 7 – dislocated moraine terrace, 8 – bank incuts, 9 – working ravines, 10 – displacements, 11 – passing valleys, 12 - borders of Kanev dislocations, 13 – stratigraphic sections with Kanev flints, 14 – Palaeolithic localities.

River Bolshaya Vys', Southern Bug basin (Medium distance raw material acquisition)

Outcrops of the "crystal shield" type apoinoceramic fine grained nodular flints with microfaunal inclusions and numerous Palaeolithic localities were investigated in the basin of the Bolshaya Vys' River the tributary of the Southern Bug (Stepanchuk et al. 2005) (**Fig. 5**).

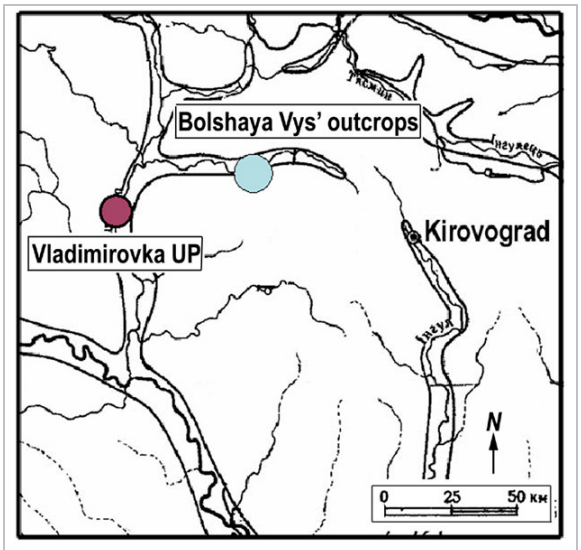

Fig. 5. Bolshaya Vys' area: raw material outcrops and the UP site of Vladimirovka.

The particular features of the raw materials afford the recognition of the origins of the main portion of the knapped lithics in the lowermost layers of the UP site of Vladimirovka (Chernysh 1953), situated ca. 60-70 km westward of the Bolshaya Vys' outcrops.

Middle Dnieper area, early UP site of Mira (Extra distant raw material acquisition)

Palaeolithic occupations of the EUP site of Mira near Zaporizhia in the Middle Dnieper area provide numerous and variable sets of lithic artefacts (Stepanchuk et al. 2004). The inspection of the flint and other stone series of Mira, layer I reveals long distance delivery of the main portion of knapped flints and some other rocks, such as zeolitised tuff, amphybolites e.a. from the area of the Eastern Carpathians. The lithic material of Mira, layer II/2 also points to a remote source, though in this case it seems to be a West Ukrainian one (Volhynian) (Stepanchuk & Petrougne, this volume). (**Fig. 6**).

Eastern Crimea, Late MP sites of Sary-Kaya, Zaskalnaya V, VI e.a. (Short distance raw material acquisition)

The inspection of the series of flint outcrops in the vicinity of the Middle Palaeolithic sites concentrated in Krasnaya Balka (=Red Valley), the valley of River Biyuk-Karasu, the 2nd Ridge of the Crimean Mts., Eastern Crimea (Kolosov et al. 1993) has revealed short distance delivery of knapped flints. Field survey has revealed an abundance of either regionally distributed or strictly localised primary and secondary outcrops. Judged by the composition of flint varieties in Palaeolithic assemblages, practically all kinds of flints were used, but in crucially different ratios. The overwhelming majority of knapped artefacts are made of grey fine-grained homogeneous platy flints, which are the most numerous in the alluvium of terraces I-III and in the primary outcrops of Sary-Kaya (**Fig. 7**).

Analytical data: some instances

The macro-morphological comparisons of flints coming from natural outcrops and Palaeolithic assemblages are in some cases complemented with analytical geo-chemical data. The series of Kanev and Buchak flints from the Kanev area of the Middle Dnieper were analysed in the mineralogical X-ray Laboratory in National T. Shevchenko University, Kiev (**Table 1**). The investigation of the Palaeolithic site of Maly Rakovets in Ukrainian Transcarpathia (Ryzhov 2000) and its environs has revealed the presence of various volcanic rocks, including obsidian and andesite. The geo-chemical analysis of the artefacts of the Mousterian layer of the site has revealed materials of a probably non-local provenance (**Table 2**).

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Table 1. Series of Kanev and Buchak flints

Nr.	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Br	Rb	Sr	Ba	La	Ce	Pb
1	<50	<50	<20	<20	<3	<3	<3	<3	<2	<1	<1	1.1	<20	<15	<15	<2
2	<50	380	<20	<20	6	<3	4.3	4	<2	<1	<1	13	183	<15	<15	4.3
3	<50	498	<20	<20	<3	11	<3	<3	<2	<1	<1	6.6	46	29	25	<2
4	<50	687	<20	<20	<3	10	3.3	<3	<2	<1	<1	8.1	<20	<15	<15	5.9
5	895	25200	<20	<20	3	66	<3	<3	2	<1	2.5	11	148	<15	<15	2
6	<50	8300	<20	<20	<3	22	<3	4	13	<1	1.4	72	2100	<15	<15	<2
7	<50	377	<20	<20	3	15	<3	<3	<2	<1	2	3.9	27	<15	<15	5.8
8	<50	68	<20	<20	3	5	<3	<3	<2	<1	<1	4.3	<20	<15	<15	<2
9	<50	15500	<20	<20	5	8	<3	4	4	1	3.6	100	113	87	104	<2
10	<50	213	<20	<20	<3	<3	<3	<3	<2	<1	<1	2.8	81	<15	<15	<2
11	<50	126	<20	<20	<3	<3	<3	<3	<2	<1	<1	27	<20	<15	<15	<2
12	<50	98	<20	<20	<3	<3	<3	<3	<2	<1	<1	5.3	48	<15	<15	<2
13	<50	1220	<20	33	<3	<3	<3	<3	<2	<1	<1	4.9	43	<15	<15	<2
14	<50	221	<20	<20	<3	<3	<3	<3	<2	<1	1	5.9	408	<15	<15	<2
15	<50	711	<20	<20	3	21	<3	<3	<2	<1	<1	2.8	<20	<15	<15	<2
16	<50	1030	<20	<20	<3	10	<3	<3	<2	<1	1.8	11	<20	<15	<15	<2
17	<50	149	<20	<20	13	10	<3	<3	<2	<1	<1	1.7	58	<15	<15	<2
18	124	250	105	<20	6	4	<3	<3	<2	<1	1.3	11	75	<15	<15	4.1
19	<50	202	<20	<20	<3	<3	<3	<3	<2	<1	<1	1.2	<20	<15	<15	<2
20	<50	496	22	<20	5	<3	<3	<3	<2	<1	<1	5	134	<15	<15	<2
21	<50	1130	<20	<20	<3	<3	<3	<3	<2	<1	1.5	1.9	45	<15	<15	3.9
22	<50	167	<20	<20	3	5	<3	<3	<2	<1	<1	1.1	60	<15	<15	<2
23	312	2420	<20	<20	<3	6	<3	6	5	7.5	13	11	84	<15	<15	<2
24	<50	915	<20	<20	<3	10	<3	<3	<2	1.6	<1	10	<20	<15	<15	4.7
25	<50	372	<20	<20	4	6	<3	<3	<2	<1	<1	4.3	34	<15	<15	<2
26	<50	270	<20	<20	9	<3	<3	<3	<2	<1	<1	2	<20	<15	<15	<2
27	<50	475	<20	<20	<3	5	<3	<3	<2	1	<1	1.5	<20	<15	<15	2
28	<50	78	<20	<20	<3	9	3	<3	2	<1	<1	1.9	51	<15	<15	<2
29	<50	3780	<20	29	4	11	<3	<3	<2	1.2	1	1.7	<20	<15	<15	3.8
30	86	1650	<20	<20	<3	<3	<3	<3	<2	1.1	1.2	20	37	<15	<15	<2
31	170	463	<20	<20	<3	<3	<3	<3	<2	1.3	1.4	1.6	79	<15	<15	<2
32	<50	666	<20	<20	4	9	<3	<3	<2	1	<1	4.7	<20	<15	<15	<2
33	<50	4970	<20	<20	6	13	<3	<3	5	<1	<1	5.8	<20	<15	<15	2.6
34	579	46400	<20	<20	11	89	16	7	<2	<1	42	355	426	22	22	19

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Table 2. Series of Transcarpathian Rocks

Nr.	??	Rock name	Cr	Mn	Fe	Ni	Cu	Zn	Ga	Ge	Rb	Sr	Ba	La	Ce	Pb
1	not readable	flint	<10	<10	0.06	26	5	16	2	<1	1	2	10	<15	<15	1
2	not readable	flint	14	19	0.06	<10	6	20	1	<1	2	3	10	<15	<15	2
3	not readable	flint	<10	23	0.13	<10	12	7	2	1	5	38	563	<15	<15	2
4	not readable	flint	<10	<10	0.22	<10	4	8	2	<1	8	32	634	<15	<15	3
5	not readable	flint	<10	50	1.25	10	8	17	1	1	13	22	175	14	17	4
6	not readable	obsidian	<10	244	1.39	<10	3	47	9	<1	126	186	852	41	62	16
7	not readable	obsidian	<10	474	2.09	24	18	60	14	2	147	176	826	38	58	19
8	not readable	obsidian	13	206	0.50	<10	7	34	10	4	176	50	470	26	46	15
9	not readable	obsidian	<10	186	0.48	<10	2	23	10	<1	176	42	460	23	41	15
10	not readable	ungvarite	<10	<10	0.13	<10	9	5	<1	13	1	2	7	<15	<15	3
11	not readable	ungvarite	<10	<10	0.04	<10	6	6	2	16	2	2	18	<15	<15	1
12	not readable	ungvarite	<10	17	0.02	<10	2	7	<1	5	1	<1	8	<15	<15	<1
13	not readable	andesite-basalt	<10	425	2.21	<10	11	65	16	3	114	16	760	33	59	14
14	not readable	andesite-basalt	<10	472	2.29	10	5	64	<15	<1	108	<15	692	42	59	13
15	not readable	rhyolite	<10	34	0.40	<10	2	9	<15	1	7	<15	1032	<15	<15	1
16	not readable	rhyolite	<10	49	1.12	24	15	15	<15	3	9	<15	357	<15	<15	7
17	not readable	effuzive rock	<10	18.7	1.15	26	22	41	<15	4	12	<15	88	<15	<15	7
18	not readable	effuzive rock	27	79	1.1	<10	11	33	17	1	17	17	188	22	19	22
19	not readable	effuzive rock	23	48	0.32	<10	5	16	62	4	8	62	1475	<15	<15	2

Concluding remarks

The territory of Ukraine is rich in primary and secondary flint outcrops but their spatial distribution is rather uneven.

The concentrations of Late MP and UP sites and areas especially rich in potential lithic resources generally coincide though exhibit no rigid relationship.

Several geographically limited areas characterised by the prevalence of flint varieties different in macro/micro features can be recognised.

Regional examples of lithic raw material provenance and acquisition demonstrate short, medium, and long distance transportation of flint.

The composition of the used rocks allow the tracing of the directions of migrations.

The remoteness of the exploited outcrops, the composition and the ratios of the involved rock varieties depend on “cultural/stylistic”, “economic” and “behavioural” factors (e.g. MP vs. UP; type of site; type of tool; model of terrain exploitation; mobility of group; complexity of the social network etc).

The study of the primary outcrops and further macro-morphological comparisons with the available Palaeolithic assemblages seem to be the most important at the current stage of the research into the raw material resources. The stratigraphic and petrographic examination of the available raw material base in the local areas of Ukraine will essentially be complemented by accumulation of geo-chemical analytical data.

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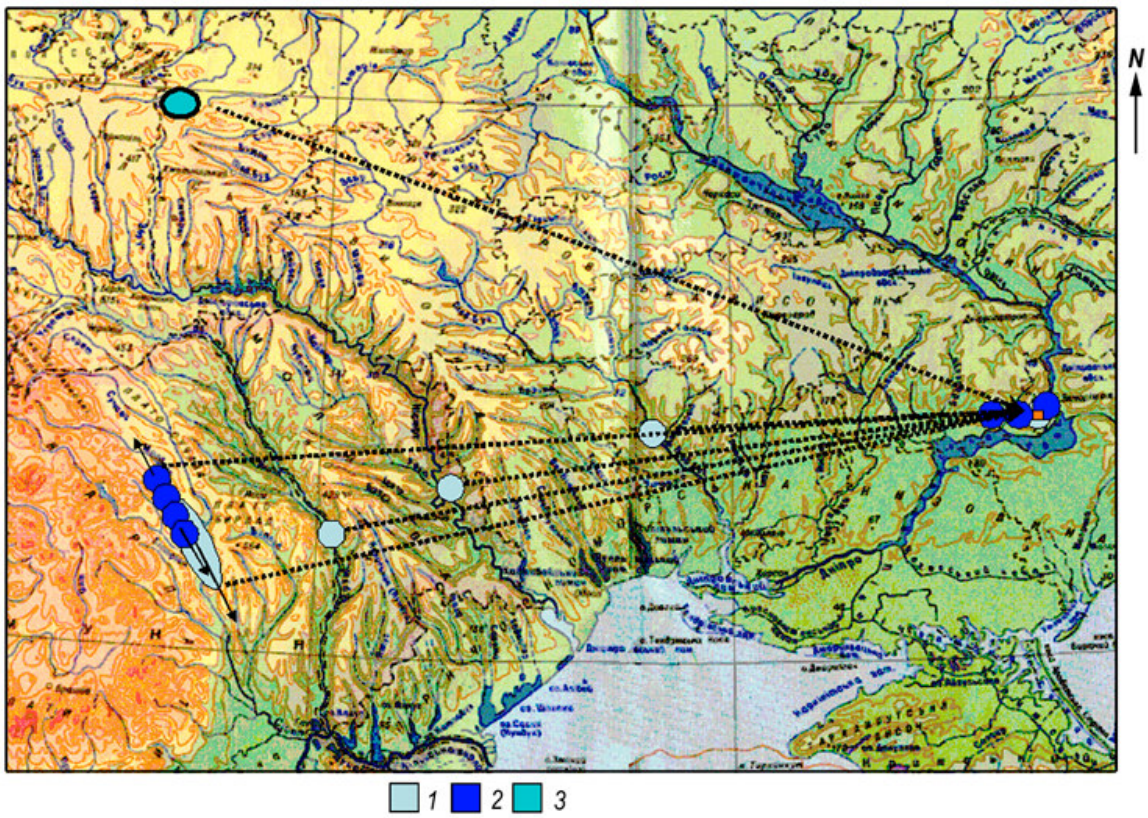

Fig. 6. Mira: example of extra distant raw material acquisition. Key: 1- likely provenance of siliceous rocks used in Mira: I, 2 - likely provenance of non-siliceous rocks used in Mira: I, 3 - likely provenance of siliceous rocks used in Mira: II/2.

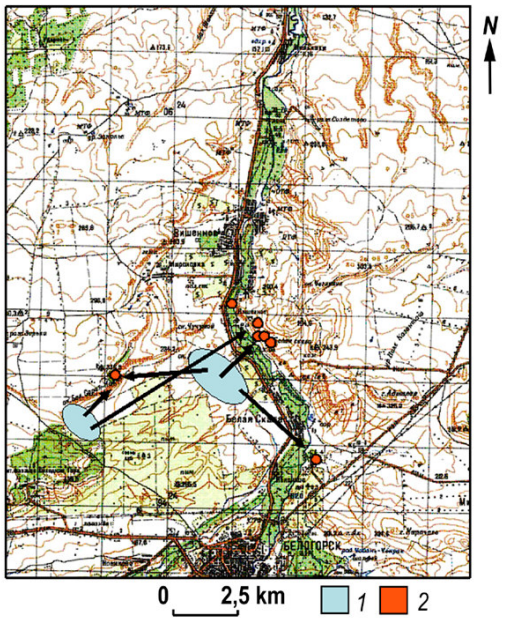

Fig. 7. Eastern Crimea: raw material outcrops and Late MP sites of Sary-Kaya, Zaskalnaya V, VI e.a. Key: 1- zones with peculiar flint raw materials, 2 – Palaeolithic sites. Arrows exhibit the main likely connections between outcrops and occupations.

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