On the Raw Materials of Stone Tools from the Paleolithic Sites Near Andriivka (Kharkiv Region, Ukraine)

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Abstract. The article is devoted to solving the question of the origin of the raw materials of stone artifacts discovered during the study of the surface of the Lower Paleolithic localities near the settlement of Andriivka in the Kharkiv Region (Ukraine). The material of a significant part of artifacts was represented not by flint but by other rocks that are not typical for the area where the sites are located. Thus, an assumption was made about the likely mass use of remote stone raw materials in the Early Paleolithic, which is not typical for the territory of Ukraine. To confirm this fact, a petrographic study of the raw material of the artifacts was conducted based on 12 selected samples. Transparent thin sections had been produced from all the items, and the study using a polarizing microscope was performed. Research on the raw materials in the studied collection determined that it includes limestone, chalcedony rock (silicified limestone), sandstone, and two samples showing the contact between quartzites and schists. The studied limestones are represented by oolitic, coral, and chemogenic cryptocrystalline species. Also, the raw material of some of the products was identified as silicified limestone. All the mentioned rocks are characteristic of the occurrences of the Oxford stage of the Upper Jurassic, common in the Izium and Lozova Raions of the Kharkiv Region. The raw material of one item was identified as quartz sandstone with rock fragments and relict argillaceous-siliceous cement. Such rocks are typical for the deposits of the Carboniferous system of the Donets Coal Basin, they are found southeast of Andriivka, downstream of the Siverskyi Donets River, and also within the Open Donbas. Since in ancient times, only rocks exposed to the day surface could be mined, most likely, the sandstone got to the place of discovery from the territory of the modern Donetsk Region. Two of the studied products were made from contact rocks: one sample is identified as a contact of micaceous quartzite and sericite-quartz schist, and the other as a contact of microquartzite and quartz-biotite schist. The first rock, most likely, was formed as a result of recrystallization of siltstone, and the second – owing to quartzization of argillaceous limestone and carbonate-biotite schist. Siltstones are characteristic of Paleozoic deposits and may have the same origin as sandstone. The second sample may have the same provenance as the investigated limestones. Based on the results of the research, it was determined that all the samples from the locations near Andriivka come from the territories located mainly downstream of the Siverskyi Donets River, or in the southwestern direction in the territory of the modern Lozova Raion of the Kharkiv Region. The data provided by the sites in the Andriivka area testify to the relatively high mobility of the ancient population, as the identified rocks include samples from occurrences located at a distance of more than 60 km and some – more than 100 km. Thus, the distance between the deposits and the sites is greater than is usually recorded for the Lower Paleolithic archaeological sites of Ukraine. The obtained data indicate the origin of the purposeful collecting and supply of remote stone raw materials by man on the territory of Ukraine no later than 300 thousand years ago.

Keywords: petroarchaeology, stone tools, Lower Paleolithic, Ukraine

Про сировину кам’яних знарядь з палеолітичних місцезнаходжень поблизу Андріївки (Харківська область, Україна)

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Анотація. Стаття присвячена вирішенню питання походження сировини кам’яних артефактів, виявлених при дослідженні поверхневих нижньопалеолітичних місцезнаходжень поблизу селища Андріївка у Харківській області (Україна). Матеріал значної частини виробів був представлений не кременем, а іншими гірськими породами, які не є характерними для
району розташування стоянок. Таким чином, було зроблено припущення про ймовірне існування масового використання віддаленої кам’яної сировини в ранньопалеолітичний час, що не є типовим для території України. З метою підтвердження цього факту було проведено петрографічне дослідження сировини артефактів за вибіркою, яка склаля 12 предметів. З усіх них було виготовлено прозорі шліфи та досліджені за допомогою поляризаційного мікроскопу. У результаті виявлення сировини артефактів дослідження колекції було визначено, що вона представлена вапняками, халідонованою породою (скрім’яним вапняком), пісковиком, також два зразки являли собою контакт кварців зі сланцями. Досліджені вапняки представлені оолітовою, коралову та хемогенною прихванокристалічною відмінами. Також сировина частини виробів була ідентифікована як скрім’яний вапняк. Усі зазначені породи є характерними для проявів оксфордського вруса верхньої юри, поширених у Ізюмському та Лозівському районах Харківської області. Сировину одного виробу було визначено як кварцовий пісковик з уламками порід та реліктовим глинисто-кременистим цементом. Такі породи характерні для відкладів кам’яновугільних системи Донецького кам’яновугільного басейну, вони зустрічаються на південному схилі від Андріївки, ніжче за течією р. Сіверський Донець, а також у межах Відкритого Донбасу. Оскільки у давнині могли розроблятися лише породи, що виходять на земну поверхню, найвірогідніше, пісковик потрапив до місця знахідки з території сучасної Донецької області.

Два досліджені вироби було виготовлено з контактних порід: один зразок визначено як контакт кварциту та алевроліту, а другу – при окварцуванні глинистого вапняку та карбонат-біотитового сланцю. Алевроліти характерні для відкладів палеозою і можуть мати те ж саме походження, що й пісковик. Другий зразок може мати одне походження з дослідженими вапняками. За результатами проведенного дослідження було визначено, що усі зразки з місцезнаходжень поблизу Андріївки походять з територій, розташованих, переважно, більш ніж за течією р. Сіверський Донець, а також у межах Відкритого Донбасу. Оскільки у давнині могли розроблятися лише породи, що виходять на земну поверхню, найвірогідніше, пісковик потрапив до місця знахідки з території сучасної Донецької області. Дані місцезнаходжень району Андріївки свідчать про відносно високу мобільність стародавнього населення, оскільки визначені породи включають зразки з проявів, розташованих на відстані понад 60 км, а деякі – понад 100 км. Таким чином, відстань між родовищами та району розташування стоянок. Таким чином, було зроблено припущення про ймовірне існування масового використання віддаленої кам’яної сировини у ранньопалеолітичний час.

Determining the provenance of stone raw materials of ancient artifacts is especially important when studying the monuments of the Paleolithic Period sites because they can reveal the facts of data on the origin of the systematic use and transportation of certain types of rocks over considerable distances, which received significant development in subsequent historical epochs. One of the areas of active use of raw materials throughout history was the northwestern outskirts of Donbas. In addition to flint, there are known occurrences of other rocks that served as raw materials for the manufacture of various tools. This article is devoted to the study of non-flint stone products found during the observations of the sites near the settlement of Andriivka in the Kharkiv Region, which can contribute to a better understanding of the transition processes of to systematic human use of stone raw materials in this region. At the beginning of the 2010s a local historian, M. Torianyk discovered several surface localities yielding stone artifacts. Geographically, they are situated in the valleys of minor left tributaries of the Siverskyi Donets River in the Kharkiv Region and confined to high watershed areas. In 2018, V. Stepanchuk, M. Torianyk and Yu. Veklych observed three sites in the vicinity of Andriivka and Babaky settlements. During the works, several hundred lithic items were collected, among which cores, choppers, chippings, pikes, proto-handaxes, sidescrapers, retouched flakes, etc. (Fig. 1). Thus, the main array of finds consists of distinct Lower Paleolithic types of tools. Numerous signs point to the dominance of the bipolar-on-anvil knapping technique, which is characteristic of the archaic materials of the Paleolithic of Ukraine (Stepanchuk, 2022), and therefore indicates the Lower Paleolithic age of the assemblages. This is consistent with the previous geological and geomorphological observations of Yu. Veklych, according to which the probable lower chronological limit of the age of stone artifacts is about 620 – 530 thousand years (Lubny stage, MIS 15-13). The upper limit is not determined, but judging by the technical and typological signs, it cannot be much younger than 300 thousand years. This is due to the raw materials for the production of tools, according to field determinations, silicified limestone fragments, sandstone pebbles, fragments of limestone, and other rocks were used. All these rocks are not characteristic of this area. Thus, a probable case of mass use of remote stone raw materials in the Early Paleolithic was recorded. This case is not typical for the territory of Ukraine, since mainly locally available raw materials were used at the Lower Paleolithic sites (Stepanchuk, 2013). Thus, the determination of the raw materials that were used to produce the artifacts found near Andriivka, as well as the exact places of their probable provenance, has significant cognitive potential in the matter of researching the level of mobility and the forms of adaptation of the ancient population when exploiting ter-
ritories devoid of widely available deposits of lithic raw materials.

The petrographic analysis allows accurate determination of the material of ancient artifacts and outlines the probable places of their provenance. The use of petrographic methods in the studies of archaeological artifacts today covers all historical periods, including the Paleolithic one. Recently, several Paleolithic assemblages in different countries have been investigated using petrographic methods. The research on the raw materials of flint and quartzite tools of Southern Europe in thin sections was performed by Diego E. Angelucci, which allowed to determine the origin of their raw materials (Angelucci, 2010). Petrographic studies were used as supplementary ones in studying the features of the supply of raw materials to the Middle Pleistocene Lower Paleolithic site Qesem Cave (Agam, 2020). A. Ciornei studied petrographic features of the cherts from the Upper Paleolithic site of the Giurgiu-Călărași area (southern Romania) and determined their belonging to the so-called «Kriva Reka type» of Ludogorie chert (Ciornei, 2015). Petrographic studies of stone artifacts allow the reconstruction of Paleolithic strategies of population mobility, an example of which is presented in the work of A. Wiśniewski with co-authors (Wiśniewski et al., 2012). T. Aubry with co-authors also considered the adaptation of the population of Atlantic Europe during the last glacial maximum in meeting their needs for stone raw materials (Aubry et al., 2015). In the article by M. Brandl with co-authors, there are considered South Moravian silicites (Czech Republic) that were discovered during the study of the raw materials of the Aurignacian site Stratzing-Galgenberg in Austria, and their provenance from the mentioned region is proved (Brandl et al., 2015). In their research, E. Erahm and T. Hauck designate the origin of an obsidian scraper at Yabroud Rockshelter II (Syria), which, according to their conclusions, was delivered 700 km from the territory of modern Turkey. Also, these authors conclude the existence of social communications between the populations of different regions during the Early Upper Paleolithic Era (Erahm et al., 2017). In the scientific work of C. Calle, the material of Upper Paleolithic stone implements from the archeological site of El Pirulejo (Spain) is studied. The researchers determined the local origin of silicites, the source of which is located at about 20 km from the site (Calle et al., 2016). Archeometric methods of research, in particular, microscopic, are widely used in the study of secondary changes in the raw materials of Paleolithic flint products (Caux et al., 2018). In addition, valuable data are provided by the article of X. Shen with co-authors. In Eastern Eurasia, high-quality flints and obsidians are much less common. The local population mainly used vein quartz, quartzite, and low-quality flint. The authors of the article note that if during the Lower and Middle Paleolithic there prevailed the rocks exposed near the place of discovery, then during the Upper Paleolithic the role of quartz decreased. The use of high-quality raw materials brought from more distant territories, such as flint, chalcedony, and silicite, increases; besides, volcanic tuff and obsidian appear for the first time. During this period, the emergence of specialized centers for the extraction of raw materials and the manufacture of stone products is mentioned. The changes, according to the researchers, were the result of increased mobility of the ancient population, the development of technologies for the production of stone tools and climate changes (Shen et al., 2023). The authors of this article were engaged in the petrographic study of raw materials of non-flint stone products of the Upper Paleolithic Period. In particular, the local origin of most types of non-flint artifacts from the Mira site near Zaporizhzhia was proven (Ni- kitenko et al., 2022; Hoffecker et al., 2014).

The purpose of the study is to determine the specifics of the application of stone raw materials by the Paleolithic population of the sites located near the settlement of Andrivka, as well as to find out the probable provenance of the rocks used.

Materials and methods

To conduct the research, a collection of ancient artifacts made from various rocks was selected, consisting of 12 items, mostly represented by fragments with processing traces (Table 1). Transparent thin sections were made from all of them and examined in transmitted light using a POLAM P-312 polarizing microscope. As a result, the mineral composition and textural-structural features of rocks were determined. It also made it possible to determine the primary rocks, the alteration of which led to the formation of the mentioned rock types.

To determine the provenance of raw materials of stone artifacts, there were used data from geological literature, reference information on the geology of deposits of building materials, as well as materials from field surveys conducted in the fall of 2019. All this made it possible to understand the specifics of the use of raw materials and draw historical conclusions, associated with the mobility of the Paleolithic population and the development of stone working.
Fig. 1. A handaxe (1) and a cleaver on a massive bipolar flake (2)

Table 1. Studied samples

<table>
<thead>
<tr>
<th>No.</th>
<th>Sample number</th>
<th>Name of the implement</th>
<th>Raw material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A1</td>
<td>Fragment of a rock with signs of working, greenish-gray</td>
<td>Chalcedony rock (silicified limestone)</td>
</tr>
<tr>
<td>2</td>
<td>A2</td>
<td>Fragment of a rock with signs of working, yellowish brown</td>
<td>Chalcedony rock (silicified limestone)</td>
</tr>
<tr>
<td>3</td>
<td>A3</td>
<td>Fragment of a rock with signs of working, dark grey</td>
<td>Organogenic-hemogenic limestone, cryptocrystalline</td>
</tr>
<tr>
<td>4</td>
<td>A4</td>
<td>Fragment of a rock with signs of working, rufous</td>
<td>Contact of microquartzite and quartz-biotite schist</td>
</tr>
<tr>
<td>5</td>
<td>A5</td>
<td>Fragment of a rock with signs of working, greenish-gray</td>
<td>Chalcedony rock (silicified limestone)</td>
</tr>
<tr>
<td>6</td>
<td>101</td>
<td>Artifact with secondary working. The opposite narrow edges are chipped</td>
<td>Contact of a micaceous quartzite and sericite-quartz schist</td>
</tr>
<tr>
<td>7</td>
<td>102</td>
<td>Probable artifact (flake) with secondary working (the edges are trimmed)</td>
<td>Quartz arenite with fragments of rocks and argillaceous-siliceous cement</td>
</tr>
<tr>
<td>8</td>
<td>104</td>
<td>Artifact (flake) without secondary working</td>
<td>Organogenic-hemogenic limestone</td>
</tr>
<tr>
<td>9</td>
<td>105</td>
<td>Fragment of a rock without signs of working</td>
<td>Coral limestone, breccia-like</td>
</tr>
<tr>
<td>10</td>
<td>108</td>
<td>Fragment of rock with signs of bipolar-on-anvil knapping</td>
<td>Organogenic-hemogenic limestone in contact with limestone breccia</td>
</tr>
<tr>
<td>11</td>
<td>110</td>
<td>Fragment of an artifact with secondary working (the edges are trimmed)</td>
<td>Oolitic limestone</td>
</tr>
<tr>
<td>12</td>
<td>111</td>
<td>Fragment of a rock without signs of working</td>
<td>Cryptocrystalline limestone</td>
</tr>
</tbody>
</table>

Results

As a result of researching the raw materials of the studied artifacts collection, it was determined that they are represented by limestones (A3, 104, 105, 108, 110, 111), chalcedony rocks (A1, A2, A5), sandstone (102); also, two samples were the contacts of quartzites with schists (101, A4).

Limestones. The largest number of samples in the collection belongs to limestones (A3, 104, 105, 108, 110, 111). Sample A3 was identified as organogenic-chemogenic limestone. The rock is composed of a cryptocrystalline calcite aggregate. Against the background of the aphanitic groundmass, the imprints of the remains of marine organisms, composed of coarser crystalline calcite, stand out (Fig. 2). Among
the identifiable remains the skeletons of foraminifera, ostracods, and fragments of large shells are present. There are aggregates of carbonaceous substance.

Sample 104 is more coarse-grained and has a light gray color. An imprint of a brachiopod shell is also identified on its surface. The rock is composed of big crystals and micro-grained calcite aggregates, which have an isometric and irregular shape. Imprints of fragments of mollusk shells are identified. Coarser-grained calcite forms crystals of isometric shape with boundaries characteristic of this mineral, it has a manifested cleavage and sometimes – polysynthetic twins. The size of the crystals is 0.1 – 0.5 mm.

Sample 105 was identified as a breccia-like coral limestone. The rock is composed of fine-grained calcite and contains imprints of corals. In the thin section of sample 108, the contact of organogenic-hemogenic limestone and the brecciated same rock is observed. The calcite groundmass contains imprints of foraminifera (mostly multi-chambered), shell fragments of large mollusks, and fragments of bryozoans (?) and algae (?). The brecciated area consists of fragments of cryptocrystalline limestone in crystalline calcite. Seldom, the imprints of organic remains are met: foraminifera, fragments of shells.

Sample 110 is an oolitic limestone, in which foraminifera skeletons very often serve as the center of oolite formation. Poorly preserved imprints of hexacorallias are also recorded. The pores between the oolites are filled with calcite crystals.

Sample 111 is represented by gray cryptocrystalline limestone containing single inclusions, mostly rounded, made of calcite crystals – filled pores or skeletons of foraminifera. Some imprints resemble the shape of the ostracod shell. The rock contains an aggregate of dispersed goethite.

**Chalcedony rocks.** This group comprises three studied specimens, which are very similar to each other (A1, A2, A5). Chalcedony makes up to 77 %, fossilized organic remains – up to 20 %, and chemogenic calcite – up to 3 % of the rock volume. Chalcedony is represented by scaly and radial aggregates, calcite forms tabular crystals, and fine-grained aggregates. Organic remains are composed of carbonate minerals and tinted by iron hydroxides and carbonaceous substances. Fossils are represented by foraminifera skeletons, fragments of spicules of sponges, belemnites, brachiopods, fragments of large mollusk shells (Fig. 3), in sample A2 there is a fragment of crinoid, and in sample A5 – a large fragment of a mollusk shell. In terms of petrographic features, the rocks resemble the limestone of sample 108, with the difference that the carbonate in the limestone was not silicified.

**Sandstone.** One of the studied samples (102) belongs to this group. The rock was identified as quartz arenite with rock fragments and argillaceous-siliceous cement (Fig. 4). The ratio of fragments to cement is 95 to 5. The size of fragments is 0.3 – 1.2 mm, mainly 0.5 – 0.7 mm. The texture of the rock is psammitic, medium-grained. 90 % of the clastic material is represented by quartz; the rest is represented by rock fragments (flint, microquartzite, sericite schist). Quartz grains are tightly compressed, most often connected without cement. Porous argillaceous-siliceous (illite-chalcedony) cement is present, which also contains kaolinite in certain pores. Aggregates of sider-

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**Fig. 2.** Organogenic-chemogenic limestone (sample A3). Against the background of the main cryptocrystalline aggregate, the imprints of the remains of marine organisms, composed of coarser crystalline calcite, are distinguished. *Transmitted light, nicols (–), zoom 47x*
Silicified limestone (sample A1).

The rock mainly consists of chalcedony flakes that were formed as a result of carbonate minerals alteration. Against their background, the imprints of shells and skeletons of marine organisms are visible. Transmitted light, nicols (+), zoom 47x

Quartz sandstone with fragments of rocks and argillaceous-siliceous cement (sample 102).

Quartz grains have a conformal shape and color from white to black. Isometric grains with a scaly internal structure are the rock fragments. Small areas with a scaly microstructure are the relict cement. Transmitted light, nicols (+), zoom 47x

ite and goethite are found in the cement, the latter of which could have formed from another decomposed ore mineral.

Quartzites and schists. As mentioned above, these samples are represented by contact specimens, which comprise two rock types.

In the rock determined as a contact of micaceous quartzite and sericite-quartz schist, the mineral composition of the quartzite is as follows: quartz – 80 – 85 %, sericite – 10 – 15 %, calcite – 3 – 5 %, opaque mineral (pyrite?) – 1 – 2 %. Mineral composition of the schist: quartz – 65 – 70 %, sericite – 20 – 25 %, calcite – 3 – 5 %, opaque mineral (pyrite?) – 1 – 2 %.

The microstructure of the rock is lepidogranoblastic.

Contact of a microquartzite and quartz-biotite schist (A4). Quartzite is composed of granular quartz grains with the size of 0.03 – 0.1 mm. There are relict calcite crystals and their aggregates between the quartz grains. The microstructure of the rock is granoblastic, and cryptocrystalline. Calcite contains small aggregates of an opaque mineral. Quartz-biotite schist has the following mineral composition: biotite – 87 %, quartz – 10 %, opaque mineral – 3 %. Biotite is represented by scales of brown-green color with parallel extinction and eminent cleavage. Quartz forms isometric grains with wavy extinction. The opaque
mineral is represented by aggregates of irregular shape with unclear boundaries, as well as clusters of cryptogrannular aggregates. It is probably represented by goethite with an admixture of carbonaceous substance. The microstructure of the rock is granolepidoblastic, and micro-grained (Fig. 5).

Discussion

The conducted research made it possible to determine the probable provenance of the raw materials of the studied stone artifacts, as well as to verify the previous conclusions regarding the specifics of the residents of the sites in the vicinity of Andriivka meeting their own needs in stone raw materials.

**Provenance of raw materials of stone implements.** Deposits of limestones in the Kharkiv Region are most common in its southeastern and southern parts, namely in the Izium and Lozova Raions. They belong to the deposits of the Carboniferous, Permian, and Jurassic systems, which participate in the formation of folded structures of the northwestern periphery of the Donets Coal Basin. The largest natural outcrops are formed by limestones of the Oxfordian stage of the Upper Jurassic. The thickness of the stratum is up to 40 m. It is not homogeneous in composition and consists of oolitic, coral, and algal limestones, as well as sandy and silicified types. The closest natural outcrops of Mesozoic limestones to the settlement of Andriivka are noted in the vicinity of Lozova. Among the prospected limestone deposits, silicified types were pointed out at the Smyrnivsko deposit (Lozova Raion) (Fig. 6) and at the Second site of Donetske-II deposit (Izium Raion), where Jurassic limestones form two layers, the lower of which is represented by the oolitic type, and the upper one – by the cryptocrystalline silicified type (Barskaya et al., 1965; Manyuk, 2016).

On the territory of the Kharkiv Region, sandstones date back from the Paleogene to the Neogene. Mostly, they have siliceous, siliceous-ferruginous, ferruginous, argillaceous, and carbonate cement. Hard sandstones similar to the studied sample, containing rock fragments and having polymineral pore cement, are characteristic of the sediments of the Carboniferous system of the Donets Basin. These rocks are found southeast of Andriivka in the Siverskyi Donets basin, as well as within the Open Donbas (Tkachuk, 1981). The largest deposit of such sandstones in the Kharkiv Region is located near the village of Velyka Komyshuvakha of the Izium Raion. The mentioned sandstones have a quartz and feldspar-quartz composition of fragments and belong to the Araucarian suite, but the rocks of this deposit are overlain by a thick layer of overburdened sediments (Barskaya et
Fig. 6. Smyrnivskyi quarry in the valley of the Brytai River. An outcrop of platy silicified limestones

al., 1965). Most likely, the sandstone got to the place of discovery from the territory of the modern Donetsk Region from manifestations located downstream of the Siverskyi Donets River. These sandstones were actively mined here during subsequent historical eras, in particular, in the Middle Ages they served as the main material for the production of Polovtsian stone babas (Nikitenko et al., 2018).

Regarding sample 101, judging by the petrographic features of the rock, it was formed as a result of the recrystallization of siltstone. Calcite aggregates could have appeared as a result of organic inclusions recrystallization. Siltstones in the area, where the implement was discovered, are found among Carboniferous and Permian deposits (Barskaya et al., 1965). In particular, micaceous inclusions with carbonate and secondary amorphous silica, in which it is difficult to distinguish alloigenic grains from cement, are noted among the deposits of the Carboniferous system. In addition, the cement is often absent in siltstones, and the grains are directly adjacent to each other (Tkachuk, 1981). Paleozoic rocks are exposed downstream of the Siverskyi Donets River from the place where the sample was found.

Concerning sample A4, based on the petrographic features, the rock was most likely formed as a result of quartzization of argillaceous limestone and carbonate-biotite schist. Argillaceous limestones are fairly common rocks both among the Paleozoic and Mesozoic deposits of the east of Ukraine. Carbonate-biotite schist is a rare rock that is not noted in geological sections of the area. It should be noted that among the rocks of the Paleozoic Erathema, argillaceous limestones are the most characteristic of Lower Carboniferous deposits, namely the Visean Stage, which are not exposed in the northwest of Donbas. Among the Mesozoic sediments, argillaceous limestones are characteristic of the Oxfordian, Bathian, and Bayosian strata. As mentioned above, silicification in the area where the artifacts were found is characteristic of Jurassic deposits, so these rocks may originate from the territory of the Kharkiv Region. If quartzite and quartz-biotite schist have a different genesis, they may come from the territory of the Ukrainian Shield.

Features of stone raw material supply. One of the co-authors, together with Yu. Veklych, S. Paliienko, and O. Nezdoli, performed geoarchaeological reconnaissance works in the southeastern and southern parts of the Kharkiv Region. In addition to Paleolithic sites, possible sources of raw materials, in particular stone ones, were investigated. In addition to flint, outcrops of sandstones and limestones, in particular silicified types, were examined. Thus, dense fine-grained brown-fawn sandstones discovered at the Nova Vodolaha – Novoselivka site were associated with the occurrence of these rocks among Paleogene sands in the Holube Ozero quarry, located in the area of their discovery. Paleolithic items made of silicified limestone were discovered near the village of Smyrnivka, Lozova Raion. The raw materials of the implements fully corresponded to the rocks exposed in the
Nearby Smyrnivka quarry. Natural outcrops of these rocks were also found at the mouth of Smyrnivska Gully, which flows into the Brytai River. In the article published based on the results of field research, there states and supports the opinion of M. Toryanik that this raw material is similar to the material of silicified limestone implements found at the sites near Andriivka and Babaky, 60 km northeast of Smyrnivka (Stepanchuk et al., 2020).

Based on the results of the petrographic analysis, we can see that all the samples found in the locations near Andriivka come from the surrounding areas, either located mainly downstream of the Siverskyi Donets River or in the southwestern direction in the territory of the modern Lozova Raion of the Kharkiv Region. This does not contradict the previous conclusions of M. Toryanik, although there may be more variants of the provenance of some rocks. Considering that the area’s topography has changed over hundreds of thousands of years, we cannot accurately determine the place of collecting lithic raw materials. What can be said with more certainty is that the population to which the studied products belonged was quite mobile, since among the identified rocks there are samples brought from occurrences located at a distance of more than 60 km (Fig. 7), and perhaps even more than 100 km.

An important circumstance is that it concerned not only such high-quality raw materials as flint, but also other rocks, the products of which had an auxiliary character, and some were also distinguished by less strength and duration of use. The determined distance between deposits and sites is greater than is usually recorded for Lower Paleolithic sites, but this can be explained by the absence of necessary mineral resources in the area at closer distances. At least, even in mountainous areas, certain types of raw materials were consciously transported by Lower Paleolithic humans from different points on a distance up to 33 km (Gregoire et al., 2005). On the territory of Ukraine, the farthest mass transportation of raw materials dating back to roughly the same time was 10 km, as reported for some early sites of the Luhansk Region (Vetrov, 2014). Thus, the distance over which stone raw materials were supplied to the sites around Andriivka far exceeded the distances characteristic of the Lower Paleolithic, which makes these sites unique.

Conclusions

As a result of the performed research, it was determined and petrographically approved that the ancient population of the Lower Paleolithic sites near Andriivka used limestones, chalcedony rocks (silicified limestones), sandstones, as well as quartzites in contact with schists, which formed owing to silicification of sedimentary rocks. All the studied samples may originate from different occurrences in southeast and south of Kharkiv Region, as well as from the north of Donetsk Region. These rocks are of Paleozoic-Mesozoic age. Less probable is the origin of quartzites and schists from the area of the Ukrainian Shield, where Precambrian rocks with similar mineral composition

Fig. 7. The scheme of Andriivka location and probable places of stone raw materials provenance
occur. Even if all the studied specimens are of local origin, the distance to the nearest occurrences of some of them can reach 100 km, which indicates the mobility of the population in the matter of meeting their needs in stone raw materials, and not only high-quality flint but also in other rocks. The artifacts that were discovered at the sites near Andrivka in common bedding had been produced from the rocks, which occurrences have different remoteness and location. The distance between the deposits and the sites is greater than it is usually recorded for Lower Paleolithic monuments, but it can be explained by the absence of required mineral resources in the area at closer distances. Further research of the monuments in the studied area will make it possible to form a more holistic view of the history of the earliest stone use in the northeast of Ukraine.

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References


