The Lower Paleolithic in Eastern Europe and the Caucasus: A Reappraisal of the Data and New Approaches

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ABSTRACT

A reappraisal of the artifacts and chronological evidence for the earliest occupation failed to recognize any location in Eastern Europe with solid evidence for a Lower Paleolithic occupation. Human occupations reported by various researchers at Gerasimovka, Bogatiry, and Kinjal are concluded to be "possibilith" locations rather than unquestionable artifact assemblages. Currently, only Treugol'naya Cave has reliably dated evidence for human settlement in Eastern Europe, from the beginning through the middle of the Middle Pleistocene. In Eastern Europe, three assemblages from Khryashchy and Mikhailovskoe, and possibly Pogreby and Dubossary, appear to be the only locations that tentatively can be compared (despite problems with these materials) with Treugol'naya. All these Lower Paleolithic occupations yielded the Pre-Mousterian or Tayacian small tool industries with some pebble tools, but without Acheulian bifaces and Levallois technique. These data suggest that Eastern Europe lies outside the distribution range of the Acheulian techno-complex demarcated by the "Movius Line." Additionally, data now available show that large-scale human colonization of Eastern Europe began with the spread of leaf point assemblages at the end of the Middle Pleistocene. It can be suggested that these lithic assemblages were produced by the first Neanderthal populations to appear in Eastern Europe; and, these assemblages may have developed from the Upper Acheulian or the earlier Middle Paleolithic leaf point industries in Central Europe.

In the Southern Caucasus, the available chronological data indicate that the Acheulian complex has a later temporal appearance here compared to the Upper Acheulian or Acheulo-Yabrudian in Western Asia. Two main Upper Acheulian industrial variants currently can be recognized in the Southern Caucasus. The first, called the Kudarian by the author (from the caves of Kudaro I, Kudaro III, and Azykh), is characterized by lithics made from mostly siliceous rocks, rare Acheulian bifaces, and non-Levallois flaking technique. The second variant is characterized by lithics made from volcanic rocks, numerous Acheulian bifaces, and often more laminar or Levallois debitage. It can be suggested that there are independent origins for these Southern Caucasus Upper Acheulian industrial variants. Possible roots of the Acheulian assemblages of Kudarian variant might be in the local earlier Lower Paleolithic small tool assemblages (with some pebble tools but without Acheulian bifaces). The other Caucasus variant of the Upper Acheulian appears to be related to the Levantine Upper Acheulian. Conclusions that are more precise require additional analysis and new finds.

INTRODUCTION

During last 15 years, the Lower Paleolithic of Eastern Europe and the Caucasus remained outside of main discussions of Paleolithic archaeology in Russia. These discussions mainly emphasized Micoquian or Upper Paleolithic themes including the Middle to Upper Paleolithic transition. Obviously, the small number of the Lower Paleolithic sites has deterred the majority of researchers from working on issues related to this time period. Only Liubin has recently published three monographs (Liubin 1998a; Liubin and Beliaeva 2004a; Lioubine 2002) on the Lower Paleolithic in the Caucasus. Publications by other authors on the Lower Paleolithic include books by Gladilin and Sitliviy (1990), Kuharchuk and Mesiats (1991), Golovanova (1994), and Doronichev et al. (2007), all in Russian. Additionally, Praslov (1995) published a brief review of the Lower Paleolithic in Eastern Europe, and Lower Paleolithic research also has been supplemented by short sketches in Hoffecker (2002) and Stepanchuk (2006). Separate articles on this subject published within the past 15 years are mostly cited in the bibliography.

The author's special interest in the Lower Paleolithic resulted from a study of Treugol'naya Cave—a Lower Paleolithic site in the Northern Caucasus. Working with Golovanova, the cave was opened and then excavated over several years (Doronichev 2000; 2001; 2004; Doronichev and Golovanova 2003; Doronichev et al. 2004; Doronichev et al. 2007). The data recovered during the complex, interdisciplinary research here has allowed, for the first time, a study of the peculiarities of the Lower Paleolithic in the Northern Caucasus and Eastern Europe as a whole; it is based on precise stratigraphy, reliable dates, and faultless typological classification of the assemblages of stone artifacts.

Before the discovery of Treugol'naya Cave, Lower Paleolithic research in Eastern Europe was based mostly on surface materials and supplemented in some locations by isolated artifacts found in Pleistocene deposits. Unfor-

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tunately, even when it was possible to find stratified sites (Khryashchy, Mikhailovskoe, and probably, Pogreby), detailed excavations were not carried out. Artifacts found in sections or test pits were combined with surface collections (these three sites plus Korolevo 1). An additional disadvantage for Lower Paleolithic research in Eastern Europe has been the fact that many old collections are either entirely (Gerasimovka and the lowest assemblages [VIII and VII] in Korolevo) or partly (assemblage VI of Korolevo, as well as Pogreby, Dubossary, and Khryashchy) composed of stone artifacts that are likely unworked—that is, they have no attributes resulting from human flaking or trimming. Problems associated with these assemblages will be considered in more detail below.

For this study, the author also offers a critical analysis of some finds either that have no dated geological contexts or that do not satisfy the typological criteria that allow unconditional recognition of them as artifacts. Finds of the latter sort have become especially frequent in the last few years and may be a reflection of crisis tendencies in Russian Paleolithic archaeology.

"POSSIBILITH" LOCATIONS AND CRITERIA FOR THE RELIABILITY OF ARCHAEOLOGICAL DATA

Even insignificant deviation from the true leads to infinite mistakes further along (Democritus)

Eastern Europe surpasses in size Western and Central Europe. Nevertheless, despite the efforts of many scientists to find the earliest (Pre-Mousterian) sites within the territory of Eastern Europe, the number of such finds is quite small. Although reviews by Praslov (1984) and Liubin (1984) in the volume *The Paleolithic of the USSR*, issued more than 20 years ago, appeared to have a rather representative list of probable Pre-Mousterian sites in Eastern Europe, including the Northern Caucasus, the quality of these sites left much to be desired. The majority of them were represented by surface, frequently isolated finds, or artifacts found together with later period lithics. Not only could one easily question the antiquity of these artifacts (their geological age), but also the status of the finds as human products was frequently doubtful.

For example, more than 35 years ago Liubin (1969) wrote about the lithic finds in Tcimbal Quarry on the Tamanian Peninsula and Ignatenkov Kutok on the Psekups River in the Kuban River Basin that these artifacts lacked:

> "that degree of scientific reliability, which is necessary for formulation of responsible historical conclusions. They have been selected from mixed multiple-age surface finds through typological analysis and have no sufficient stratigraphical, paleontological and geological substantiation" (p. 154).

Since then no new archaeological research on these sites has been undertaken (Shchelinski 2005). The analysis of the stratigraphic positions of the lithics shows that there is little chance that that these Paleolithic finds are associated with the ancient fauna. This is because, in the Middle Pleistocene pebble terraces of the Psekups River, there are jointly bedded lithics and fauna which come from the Pliocene deposits into which the river valley was cut (Nesmeyanov 1999: 184). A typological analysis indicates that the artifact attribution is to only the end of the Lower Paleolithic or the Upper Acheulian (Nesmeyanov and Golovanova 1988).

Until recently, Gerasimovka (on the coast of the Sea of Azov near Taganrog) was identified as the earliest human occupation in the Russian Plain (Praslov 2001). Praslov recovered the lithics in question in 1960 by selecting them from a pebble level with natural flint and Tiraspolian fauna. "A careful selection among rather abundant flint pebbles and boulders has allowed identification of only 7 pieces with authentic traces of their trimming by primitive people" (Praslov 1968: 19]. Klein (1966: 32), however, was doubtful that these stones were artifacts. Recently, another independent expert, Hoffecker (2002: 44), examined the collection and also noted that none of these pieces were indisputable artifacts.

Attempts to present typologically poorly defined flaked stones—similar in their selection from naturally broken rocks to the Gerasimovka redeposited geological contexts—as Lower Paleolithic artifacts and hence evidence of the earliest human occupation proceed to this day. It is regretful that even authoritative Russian archaeologists, who have produced many serious and scholarly works on the Paleolithic, have begun to succumb to this temptation. In 2003, for example, Liubin and Beliaeva reported discovering the Lower Paleolithic on Kinjal Mountain in the Mineral Water area in the Northern Caucasus as follows:

> "The top rocky part of Kinjal Mountain was completely demolished during extraction of building stone, and the bottom was reworked by quarries, falls and roads constructed to allow heavy trucks to access the mountain. In the lowermost part of one of these roads … 12 lithics of Acheulean appearance, made from slate, were found in 2001–2002. The road is built on artificial ground consisting of levels of sand and slate debris" (Liubin and Beliaeva 2004b: 107).

The collection was discussed at the Paleolithic Department at the Institute for the History of Material Culture in St. Petersburg. Stratigraphic, paleontological, and geological substantiation of the age of these materials was not disputed because the materials were recovered in a surface context. There was some discussion, however, concerning whether or not the artifacts were humanly manufactured.

Another example is from 2003, when Shchelinskiy, Bosinski, and Kulakov reported their discovery on the Tamanian Peninsula of a new Lower Paleolithic site, Bogatiry, located at a known Tamanian fauna paleontological location, Sinyaya Balka (Bosinski et al. 2003). The authors propose probable association of finds of flaked stones with the fauna that is dated to the end of the Lower Pleistocene, about 1.2 to 0.8 mya (Wangengeim et al. 1991; Shchelinskiy and Kulakov 2005). During a study of this site, it was established that the Tamanian fauna bone bed is not preserved in its initial position. Rather, it either resulted from the deposition of an ancient mass flow stream (Wangengeim et al. 1991), or it was moved due to tectonic activity or landslip (Shchelinskiy and Kulakov 2005: 307). Hence, this bone bed may include materials from different time periods. Unfortunately, this does not exhaust the problems of the lithic collection from this location. The first finds from Bogatiry were shown in the Paleolithic Department at the Institute for the History of Material Culture in St. Petersburg. As with the finds from the location at Kinjal Mountain, the primary discussion about the Bogatiry lithics centered on whether they are indeed artifacts.

In Western and Central Europe, on the other hand, scholars are generally rather cautious and more often skeptical about such lithic finds. For example, in 1993 in Tautavel (France), at the international colloquium, "The Earliest Occupation of Europe"—the proceedings of which were issued under the same name two years later as a large volume—a joint article by Roebroeks and Kolfschoten (1995), entitled "The earliest occupation of Europe: a reappraisal of artifactural and chronological evidence," resonates to this issue. These authors concluded that, in Europe, it is erroneous to say that there is not indisputable evidence of human occupation before 500kyr (ibid.: 307). In fact, such evidence is available, but one must bring a critical eye to its assessment. Roebroeks and Kolfschoten offer a new definition—"incertofacts" or "possibiliths"—for those lithics that experts cannot diagnose confidently as human products. Unlike eoliths, "possibiliths" occur in geological strata from which, in other locations, finds of indisputable artifacts are known. The authors especially stress that "possibiliths" "cannot be used as solid basis for archaeological theories" (ibid.:304), although different scientists vary in their assessment of possibiliths.

The "possibiliths" problem is not new. It arose at the dawn of Paleolithic archaeology in the middle of 19th century and was actively debated for the next 50 years as a discussion about eoliths and Tertiary man in Europe. In 1913, Obermaier published the fullest review of this topic in his well-known book, *Prehistoric Man*. No other so comprehensive review of the eolith problem has ever been done in the history of Paleolithic research. In the chapter, "The Man of the Tertiary period and a question about eoliths," Obermaier gave an exhaustive scientific diagnosis of eoliths and other artifact-like stones and formulated basic criteria allowing one to ascertain the validity of such finds. By the early years of the 20th century, three basic, complementary diagnostic methods that facilitated establishing whether randomly found flaked stones were artifacts, i.e., human-made products, or natural stones had been developed:

The first is a typological method, primary the analysis of the compatibility of stone knapping attributes on a flake (Obermaier 1913: Figure 236; Debénath and Dibble 1994: Figure 2.3). These attributes are well known to Paleolithic archaeologists. However, Obermaier (1913: 450–451) emphasized that these attributes in themselves "are not quite faultless criteria of deliberate processing," and "only critical analysis of a combination of the attributes is capable of enabling us to reach a correct decision." The triad of attributes necessary for diagnosing humanly-produced stone knapping includes: a) striking platform attributes (negatives or facets of preparation, and point of percussion), b) ventral surface attributes (bulb of percussion and ripples), and, c) dorsal surface attributes (negatives of previous flake scars). With respect to the Lower Paleolithic, typical for this period is a Clactonian flake with an oblique plain flaking platform, convex bulb of percussion, frequently well expressed semi-cone point of impact, and negatives of previous flakes often with deep pits of percussion on the dorsal surface—such flakes are produced by a hammer stone and have similar morphology irrespective of kinds of raw material. Even an individual flake, combining all these attributes (especially a Clactonian flake), can serve as "a litmus test," which allows for a high probability that the piece was flaked by a hominin. However, only repeatability of a combination of these attributes on many flakes makes this probability almost 100 percent. Certainly, in any archaeological assemblage, the specified feature set is not necessarily found on every flake. Nevertheless, it is also true that in any archaeological assemblage there are at least one and, rather more likely, several or many flakes on which all these attributes are present.

Among the seven possibiliths from Gerasimovka, there is only one flake (Praslov 1968: Figure 2.2). It has a wide bulb of percussion on the ventral face and three flake scars on the dorsal face, which mainly is covered with natural cortex. But its striking platform is "without preparation and represents a natural surface of a pebble" (ibid.: 20). In the collection from Bogatiry there are several flakes (Figure 1: 2–7; Bosinski et al. 2003: abb. 7) which have some of the flaking attributes—for example, flake scars on dorsal surfaces and feebly marked ripples on ventral surfaces—but either the striking platforms are natural or the bulbs of percussion and points of percussion are absent and no typical Clactonian flake is present among them. Likewise, among the finds from Kinjal Mountain, shown by Liubin and Beliaeva in 2005, the author noted only two flakes—one with a feebly marked bulb of percussion and two negatives on a dorsal face but a natural striking platform, and the second with a natural dorsal surface.

Thus, ***in all three collections, there is no flake with the complete diagnostic set (triad) of attributes of human flaking such as a typical Clactonian flake. It therefore is not possible to attribute repeatability of a combination of these attributes to even a minimal series of flakes***. Hence, there is no obvious typological basis for assigning deliberate (human) activity to the production of the scars which are present on these stones. It is possible only to say that these stones have been subject to mechanical influence—impact or pressure. The absence of undeniable typological attributes of humanly produced flaking on these possibiliths allows one to conclude that the same mechanical influences likely explain the retouching or flake scars visible on the edges of these stones. Illustrations of these natural process-

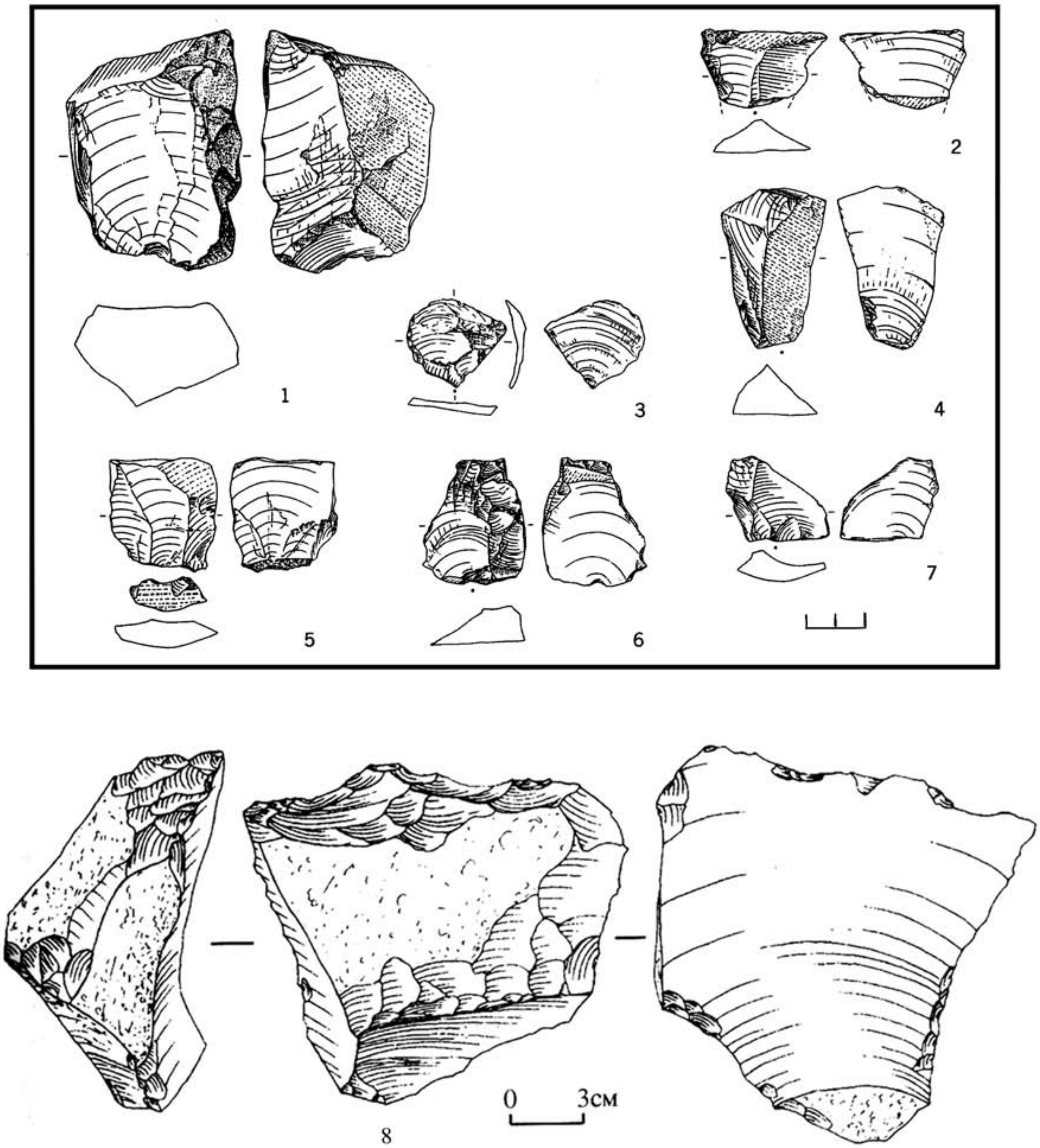


Figure 1. Bogatiry location: 1: core; 2–7: flakes; 8: tool. Sources of data: Bosinski et al. 2003: abb.7; Kulakov et al. 2005).

es and their results can be found in Obermaier (1913: Figure 240, Table XXVI). To wit, the absence of a definite human signature in the production process means that there cannot be a precise lithic typology at these three sites (Bogatiry, Gerasimovka, and Kinjal Mountain). Consequently, typological definitions for the materials from these three sites are based frequently on an analog principle, meaning that they are described based on similarity to certain types but with the addition of the ending "-like." For example, at Bogatiry, the bulk of the collection is composed of "chopper-like scrapers" or "scraper-like choppers" on marl pieces and fragments (Figure 1.8 ; Kulakov et al. 2005: 307).

The second method that can be used is the analysis of the geological contexts of the lithic finds. Previous experience in studying eolith locations in Europe has allowed determination of the typical conditions in which these artifact-like stones are formed, whether these are flints, marls, limestones, or other isotropic rocks.

1. "it is possible to predict definitively that eoliths have been found when these occur in the same context as flint in natural conditions and, at the same time, in contexts that, after deposition … underwent displacement" (Obermaier 1913: 467);
2. "in particular both in more ancient, and in newer river deposits" (ibid.);
3. "a source of eolith formation … is the sea surf " (ibid.: 471);

4. "eoliths are formed also by pressure of the earth" in loams in plateaus (ibid.);
5. "are found in the area of glaciers, first of all among fragments of rubble of moraines" (ibid.: 472); and,
6. "similar to eoliths, stones with trimmed-like 'retouched' edges can be attributed … to boots of peasants, iron of ploughs … actions of wheels of vehicles and horseshoes" (ibid.), i.e., to modern, mainly technogenic, factors.

It is not difficult to see from this list that the ***sites of Gerasimovka, Bogatiry, and Kinjal Mountain correspond to typical location conditions for the formation of eoliths.*** This is either pebble alluvium (Gerasimovka), or displaced mass flow or sea-bank deposits (Bogatiry), or a recently functioning rock quarry (Kinjal Mountain).

The third method uses raw material analysis to examine the relationship between the location of flaked stones and the sources of raw material from which these finds were made. This method has the potential to be the most exact, even compared to typological analysis. This is because raw analysis allows identification of even those stones that have no attributes of flaking as manuports, if it is established that the sources for these stones are far enough away from where they are found, and that there are no taphonomic explanations for the presence of these stones in the locales where they are found. Raw material analysis was used successfully by Obermaier in identifying eolith locations: "eoliths represent objects selected from many thousands of flints, which form every possible morphology from possible flakes to nothing to speak of fragments" (ibid.: 466).

This method (raw material analysis) also provides a negative answer to the question of whether the "possibiliths" from the three sites are, in fact, real artifacts. This is because, ***at all three locations, collections of flaked stones were generated by the selection by researchers of fragments of the same rock that is present naturally in some abundance at these locales***—flint pebbles at Gerasimovka, slate fragments at Kinjal Mountain, and fragments of silicified marl or limestone at Bogatiry. ***No pieces of nonlocal raw materials were found at any of these sites.*** Moreover, the excavations at both Kinjal and Bogatiry did not yield any other traces of human activity, such as fireplaces, burnt or cut-marked bones, remains of dwellings, etc.

Besides the three methods discussed above, there is one more way that can be used for assessment—a search for similar flaked stones in the same or similar geological contexts in other locales. In some cases, this method can provide important additional arguments, pro or contra. As more such find locales are documented, the less probable will be the attribution of these types of "possibiliths" to human activity. In fact, ultimately, the eoliths problem was put to rest by European science when the numerous similar finds in different places in Western Europe—in deposits of various genesis and geological age—exceeded the quality of the finds. To begin with, their possible artifactual status was not supported because of a lack of other traces of human occupation, such as fire-places, burnt or cut-marked bones, remains of dwellings, as well as no fossil remains of hominids. Second, these collections of flaked stones did not exhibit clear lithic typology, but, on the contrary, everywhere were a more or less similar set of pieces in which stone fragments of highly variable forms, with sharp or sometimes roughly retouched edges, prevailed. In fact, for the flaked stones from Bogatiry, results of this fourth method are already available. Recently it was reported (Kulakov et al. 2005) that marl-based assemblages close to Bogatiry are found in two other locales along the Azov Sea coast of the Tamanian Peninsula, but without any association with ancient fauna. Thus, ***archaeological surveys have found new assemblages like Bogatiry where natural outcrops of silicified marl pieces are available.***

All told, it is necessary to add that the sensational nature of such "Lower Paleolithic" finds is usually rather fleeting. Nevertheless, their influence on the quality of the Paleolithic archaeology database and archaeological theories created on its basis may have considerable longevity. Like surface finds of "Lower Paleolithic forms," "possibilith" locations create convenient ground for long, but unproductive discussions about their geological age or scientific importance. A low level of typological criteria applied to the finds or not checking the geological age of the artifacts using modern diagnostic methods result in such materials being used to design sometimes absurd archaeological hypotheses. Below are several examples.

One such instance is the discussion that was centered on the so-called "Kuruchai pebble culture" from Azykh Cave, Azerbaijan. This archaeological hypothesis was formulated on the basis of the materials from the lower strata VII-X in this cave (Guseinov 1985), but was received skeptically by many Russian and foreign scholars (Liubin 1998a: 26). Only recently, however, has it been specifically declared that these stones do not have the attributes associated with cultural manufacture (Liubin and Beliaeva 2004a: 250). Some artifacts in this collection, apparently, were found in collapsed sediments under sections and are intrusions from the upper strata of this cave site (Doronichev 2004: 257).

Another example is the recent reiteration by Liubin (1998a) that the artifacts from Ignatenkov Kutok are proof of hominid occupation and existence of Acheulian industries in the Northern Caucasus in the Early Pleistocene. This fact "is proved" by two handaxes recovered from the Psekups River bed and a handaxe in the top pebble level that also has fossil fauna (Liubin 1998a: 165). Liubin does, however, accept the fact that the two handaxes are from nonstratified context and that the other handaxe has been redposited in a pebble level containing fauna of Psekups Complex. This faunal complex is dated from 2.5 to 1.97Ma (Wangengeim et al. 1990), a range of time that far exceeds the age of the oldest indisputable Paleolithic finds in Europe and Asia.

In the case of the Bogatiry finds, Shchelinsky and Kulakov (2005) originally proposed the possibility of a "Tamanian variant" of the Lower Acheulian, but, more recently, Shchelinsky (2007: 7) has described the assemblage as "a quite typical Oldowan industry." Another "original Acheulian variant" is claimed for the finds at Kinjal Mountain

(Liubin and Beliaeva 2006: 44). In both cases, the distinctive nature of the lithic assemblages is supported only by the types of various raw materials; no true handaxes were found to support their Acheulian attribution. Moreover, some scholars hypothesize that the lithic assemblages from Bogatiry and Kinjal Mountain are significant for understanding typological variability of the Lower Paleolithic in Eastern Europe, because this variability is caused by the use of unusual raw materials. Additionally, the finds at Kinjal Mountain are said to document the fact that hominid occupation of Eastern Europe occurred mainly along the Great African Rift, which has its northern termination in the volcanic mountains in the Central Northern Caucasus. Thus, a penetration of the "creators of the most ancient Acheulian industries in the adjacent central part of Northern Caucasus" occurred through the passes of the Central Caucasus (Liubin and Beliaeva 2004a: 105).

Contrary to these views, the author believes that before engaging in discussion about the variability of lithic industries and hypotheses about the age and routes of human migrations in the Lower Paleolithic, one has to critically and impartially evaluate the finds. Namely, one needs to argue and prove that the lithic collections are represented not by naturally broken stones, but by assemblages of stone artifacts. As discussed above, all four objective methods (typology, geological context, raw material analysis, and identification of additional locales with similar stones but no record of archaeology) for assessing the "possibiliths" from the three sites (Bogatiry, Gerasimovka, and Kinjal Mountain) have yielded negative answers regarding these finds as human products.

THE PRE-MOUSTERIAN OR TAYACIAN COMPLEX IN EASTERN EUROPE (600,000–200,000YA)

Evidence of the oldest human occupation satisfying the requirements of scientific reliability discussed above currently is known only in the southern and western mountain regions of Eastern Europe. These are Korolevo I in the Western Carpathian Mountains and Treugol'naya Cave in the Northern Caucasus. Detailed studies carried out on these sites are published with sufficient completeness (Gladilin and Sitliviy 1990; Doronichev et al. 2004, 2007). Other sites (Pogreby, Dubossary, Chryashchy, and Mikhailovskoe) have yielded mostly surface finds with just a few artifacts in Middle Pleistocene strata. In the Northern Caucasus, materials from the lower strata at Weasel Cave also are identified as Lower Paleolithic, but they are not numerous and only preliminarily published (Hidjrati et al. 2003). Among these sites, only the multidisciplinary investigated stratified materials from Treugol'naya Cave allow assessment of the earliest stages of the Paleolithic actually in the territory of Eastern Europe.

TREUGOL'NAYA CAVE

Treugol'naya Cave is located in the Northern Caucasus. The author undertook excavations of the cave from 1986 to 2000. There are 11 Middle Pleistocene strata, seven of which contain stone artifacts. On the basis of several lines of evidence—study of the geomorphological position and stratigraphy of the site (Nesmeyanov 1999); paleomagnetic, magnetic, and palynological analyses of sediments (Pospelova et al. 1996; Doronichev et al 2004, 2007); the study of a rich fauna including more than 20 mammal species (Baryshnikov 1993) and more than 20 bird species (Potapova and Baryshnikov 1993; Baryshnikov and Potapova 1995); zooarchaeological research of animal bones (Hoffecker et al. 2003); and, more than 40 absolute dates using the ESR method on mollusk shells (Molodkov 2001) and mammal teeth (Blackwell et al. 2005; Doronichev et al. 2004)—the Lower Paleolithic industries at Treugol'naya Cave are dated to the first half of Middle Pleistocene, or from Oxygen Isotope Stage (OIS) 15 to 11 (Table 1). This corresponds to a time interval from 600,000 to 350,000 years ago. From stratigraphic positions of the lithics, four Lower Paleolithic cultural-chronological assemblages were identified in Treugol'naya Cave (Doronichev 2000, 2001, 2004; Doronichev et al. 2004, 2007).

The oldest, Assemblage IV, contains 18 artifacts (Doronichev et al, 2004: Figure 11–14). They are made from flint, and also quartz, limestone, and other rocks, the majority of which are not found near the cave. Among the 10 tools are side-scrapers, end-scrapers, a denticulate, and composite tools (Figure 2: 1–5). Despite the small number of artifacts, these lithics are currently the only authentic evidence of human occupation in the southern part of Eastern Europe by about 600kyr (see Table 1). This period corresponds to the warm OIS 15, which appears to be correlated with the Cromer III interstadial in Western Europe (Roebroeks and Kolfschoten 1995: Figure 2) or the Muchkapsk (Belovejsk) interglacial in Eastern Europe (Bolikhovskaya and Molodkov 2002: Table 1). According to pollen data, most of Eastern Europe was characterized by mixed coniferous and broad-leaf forests with Neogene exotics dominant in the optimum of this interglacial. In the Northern Caucasus, broad-leaf forests with a prevalence of hornbeam, beech, wing-nut, walnut, chestnut, and other warm and moisture-loving species existed at that time (ibid.: 12). This interglaciation followed one of the most extensive (probably) glacial periods during entire Pleistocene—the Don Glaciation of the Russian Plain. Ice sheets during this glaciation spread much further to the south in the Don River Basin than recorded for any subsequent glaciation (Roebroeks and Kolfschoten 1995:298). During the Don Glaciation (OIS 16), conditions of cold periglacial forest-steppes, steppes, and coniferous or birch dominated light forests prevailed even in the southern areas of Eastern Europe (Bolikhovskaya and Molodkov 2002: 11).

All later assemblages (III, II, and I) at Treugol'naya Cave are dated to one chronological period (OIS 11), a period that ranges from 430/455 to 360/365kyr. This stage OIS 11 corresponds to the Likhvin Interglaciation in Eastern Europe (ibid.: Table 1). It was the warmest interglacial period during entire Middle Pleistocene in Europe as a whole. The climatic optimum during the Likhvin Interglaciation was

TABLE 1. CHRONOLOGY OFTHE TREUGOL'NAYA CAVE DEPOSITS BASED ON ESR DATES, AND STRATIGRAPHIC, MAGNETIC, FLORAL, AND FAUNAL DATA.

Layer	Archaeological Industry	Flora	Fauna	Climate	Mean ESR Dates (ka)	Magnetic Subzones	Correlation with OIS Curve [1]	Ages for OIS Stage [2]
Deep erosion								
4A	"Pre-Mousterian" flake-tool industry	Wooded steppe	Singilian Faunal Complex: *Canis mosbachensis, Vulpes vulpes, Ursus (Spelaearctos) deningeri, Stephanorhinus hundsheimensis, Capreolus cf. C. sussenbornensis, Cervus elaphus (cf. acoronatus), Bison ex gr. priscus-schoetensacki, Capra ex gr. Caucasica*	moderate, dry		I	Stage 10 ?	334–364
4B		Subalpine meadows		cool, dry	364 ± 11; enamel (LU)	IIa	Stage 11 probably Stage 11.1a	364–427
Deep erosion - lenses R & β								
4C	"Pre-Mousterian" flake-tool industry	Low altitude deciduous woods		warm, humid	376 ± 9; enamel (LU)		probably Stage 11.1b	
		Subalpine meadows		cold, dry (stadial extremum)		IIb (or IIc)		
4D	Core-chopper industry						probably Stage 11.2	
5A	"Pre-Mousterian" flake-tool industry	Subalpine meadows		cold, dry (stadial extremum)	418 ± 10; enamel (LU)	IIc		
				cool, humid		IIIa		
5B		Wooded steppe		very warm, humid (interglacial optimum)	393 ± 27; molluscs 406 ± 15; enamel (LU)	IIIb	probably Stage 11.3	
5C	"Pre-Mousterian" flake-tool industry	Subalpine meadows		cold, dry (stadial extremum)		IIIc	Stage 12 ?	427–474
				cool, humid		IIId		
Erosion								
6		Dry subtropical woods		warm, dry (subtropical)	504 ± 24; enamel (LU)		Stage 13	474–528
Erosion								
7A	"Pre-Mousterian" flake-tool industry	High altitude woods & subalpine meadows		cool, humid	583 ± 25; molluscs	IVa	Stage 15	568– 621
7B		Wooded steppe		warm, dry		IVb		
						IVc	Stage 16 ?	621–659
Deep erosion								
8								

[1]Based on all data and comparison with OIS curves for MD900963.
[2]Age comparisons from Aitken and Stokes (1997: Table 1.2).

Figure 2. Treugol'naya Cave. Assemblage IV: 1, 2, 4: composite tools; 3: unretouched flake; 5: transverse side-scraper. Assemblage III: 6: massive end-scraper; 7: composite tool; 8: unretouched flake; 9: flat limace; 10: endscraper; 11: double end-scraper.

characterized by a wide expansion of warm and moisture-loving tree species in the central areas of Eastern Europe and the formation of extensive forests in the southeast forest-steppe palezones (ibid.: 13).

Assemblage III in Treugol'naya Cave contains 27 artifacts, including eight tools (Doronichev et al. 2004: Figures 15–18). Like Assemblage IV, the lithics are made of various rocks that are not local in origin. Most lithics are from alevrolite. Along with small flake tools (see Figure 2: 6–11), among which end-scrapers and composite tools dominate, there also are pebble macro-tools (a chopper and a proto-biface on a flat limestone pebble) (Doronichev et al. 2004: Figure 16,17). As a whole, Assemblages IV and III at Treugol'naya Cave document that, in the interval from 600 to 400kyr, the Lower Paleolithic in southern Eastern Europe is represented by an industry of small flake tools and pebble macro-tools, without Acheulian bifaces. On this basis, these finds were assigned to the Tayacian (Doronichev 2001; 2004a). It is necessary to note that there was obvious selectivity of archaeological material by the groups responsible—in both assemblages, cores are absent and in Assemblage IV, there are no macro-tools. Selectivity is also characteristic of the upper Assemblages II and I at Treugol'naya Cave. Generally, as the publications show, such selectivity appears to be an integral feature of the Lower Paleolithic industries; that is, it is characteristic to find a combination of two common typological groups—small tools made on flakes or angular fragments and large tools made on pebbles or rock fragments.

Assemblage II has 70 lithics including 37 tools (Doronichev et al. 2004: Figures 19–37). It has been identified as a chopper industry (Doronichev 2001) because choppers made on limestone pebbles and slabs comprise about 65% of all tools (Figures 3 and 4). More than 70% of these are side- or end-, convex unifacial choppers. The other pebble macro-tools include three double choppers, four chopping-tools, two pebble side-scrapers, two massive pick-like unifaces, four small short proto-bifaces, a tool of *rabot* type, and an atypical or core-like biface. Flake tools are few—a side-scraper, an end-scraper, and four retouched flakes. Numerous small cortical or semi-cortical flakes and split pebble fragments, as well as few pebble cores, including two single-platform, two triple-platform, two polyhedrons, a double-platform, and a subspheroid core characterize the debitage. Despite obvious typological differences between Assemblage II and the other assemblages in Treugol'naya Cave, it is possible to assume a selective character in this industry. Hence, one can interpret it as only one part of typologically more complex and variable industrial complex in the Lower Paleolithic. This new interpretation is based on the following data: a) a recent series of ESR dates for the top Middle Pleistocene layers in Treugol'naya Cave document the chronological placement of Assemblages III, II and I within the framework of OIS 11, i.e., in a rather narrow time interval about 100kyr; b) several pebble implements are found in assemblages III and I; and, c) pebble macro-tools are the integral component, along with small flake tools, in the Lower Paleolithic.

The uppermost Lower Paleolithic assemblage (I) at Treugol'naya Cave consists of 280 stone artifacts (Figures 5 and 6; ibid.: Figures 38–46). An industry of small non-Levallois flake tools, made from nonlocal flint, is present in the assemblage. Few pebbles with scars are found. A distinctive feature of the assemblage is the prevalence of side-scrapers, which comprise about 50% of all tools; these are mostly simple types. There are individual double, abrupt, convergent, and thinned back side-scrapers. End-scrapers comprise the second most frequent tool category. There are two *Quinson* points. Denticulates, notches, combined tools, and awls are rare. Levallois or Mousterian points, as well as Acheulian bifaces and Levallois technique, are completely absent. Assemblage I has been identified (Doronichev 2001; Doronichev et al. 2004) as Proto-Charentian, due to its common similarity in debitage and flake tools with the Lower Paleolithic industries from the caves of Kudaro I and Azykh in the Southern Caucasus. Earlier, Liubin (1984) defined these as the "Acheulean of Proto-Charentian type." Now the time has come to reconsider this industrial definition for Assemblage I for the following reasons:

1. Recently Liubin no longer notes a Proto-Charentian aspect for the Lower Paleolithic industries in the Southern Caucasus, but instead defines them as "Acheulean industries with bifaces" (Liubin, 1998a: 17; Liubin and Beliaeva 2004a). The term "Proto-Charentian" also is not used to define the Lower Paleolithic assemblages in either Western Asia or Central Europe. Moreover, this term is no longer used in France where de Lumley (de Lumley-Woodyear 1971: 308) had introduced it to designate complexes with rare bifaces from Arago Cave. More recently, the Lower Paleolithic assemblages from Arago Cave, the most ancient of which are dated to about 600kyr and contain rare typical Acheulian bifaces and cleavers, have been redefined as the Mediterranean Acheulian (de Lumley and Barsky 2004).
2. A series of absolute dates for Assemblage I (Doronichev et al. 2004) indicates its strong chronological association with Assemblage II (the chopper industry) and Assemblage III, which was earlier determined to be Tayacian.
3. The original uniqueness of the industries represented by the numerically largest assemblages—I and II, representing a flake tool industry and a chopper industry, respectively—is now not so obvious. Comparison with the Lower Paleolithic in Central Europe (Gladilin and Sitliviy 1990), the Southern Caucasus (Liubin 1998a) and Western Asia (Bar-Yosef 1998) shows that the combination of both tool groups is characteristic of lithic assemblages that contain numerous artifacts.

Based on these reasons, the author believes that the most justified position is now to consider all the assemblages at Treugol'naya Cave within the framework of a uniform industrial tradition, which can be defined as the Pre-Mousterian Complex or Tayacian in a broad sense. It is necessary to note that this conclusion is an archaeological hypothesis, which is based not only on the analysis of the lithic industries at Treugol'naya Cave, but also a synthesis of the data from other Lower Paleolithic sites in Eastern Europe. Unfortunately, the archaeological assemblages from Treugol'naya contain only small quantities of artifacts. In identifying the artifacts, the author was guided by rigid typological criteria that are, as it is stressed above, either

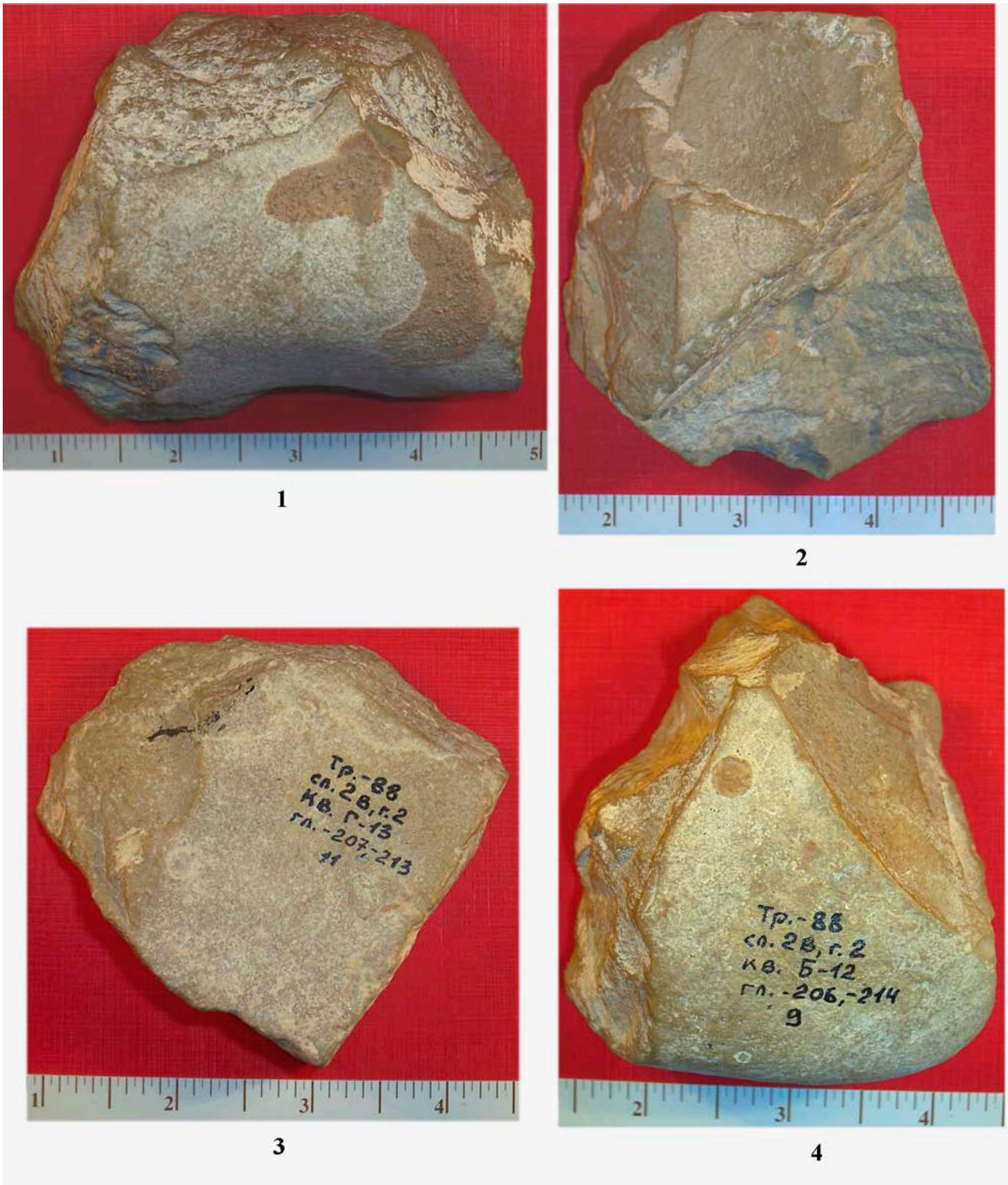


Figure 3. Treugol'naya Cave. Assemblage II: 1, 3: choppers; 2: three-platform core; 4: proto-biface.

the quality of the lithics themselves (the flaking attribute triad) and the typological standardization of their forms, or the nonlocal raw materials on which the lithics are made. Certainly, with somewhat less rigorous standards, the number of lithic finds at the site could be increased because there are numerous fragments of local limestone which frequently have edges with rough, irregular retouch or flaking. Nevertheless, as noted earlier and in Doronichev (2001: 10), such "possibiliths" were removed from consideration when their number sharply increased in the excavation of the cave entrance area outside the modern drip line. It became clear that these artifact-like pieces of limestone originate from slope sediments above the cave, and are not, in fact, artifacts.

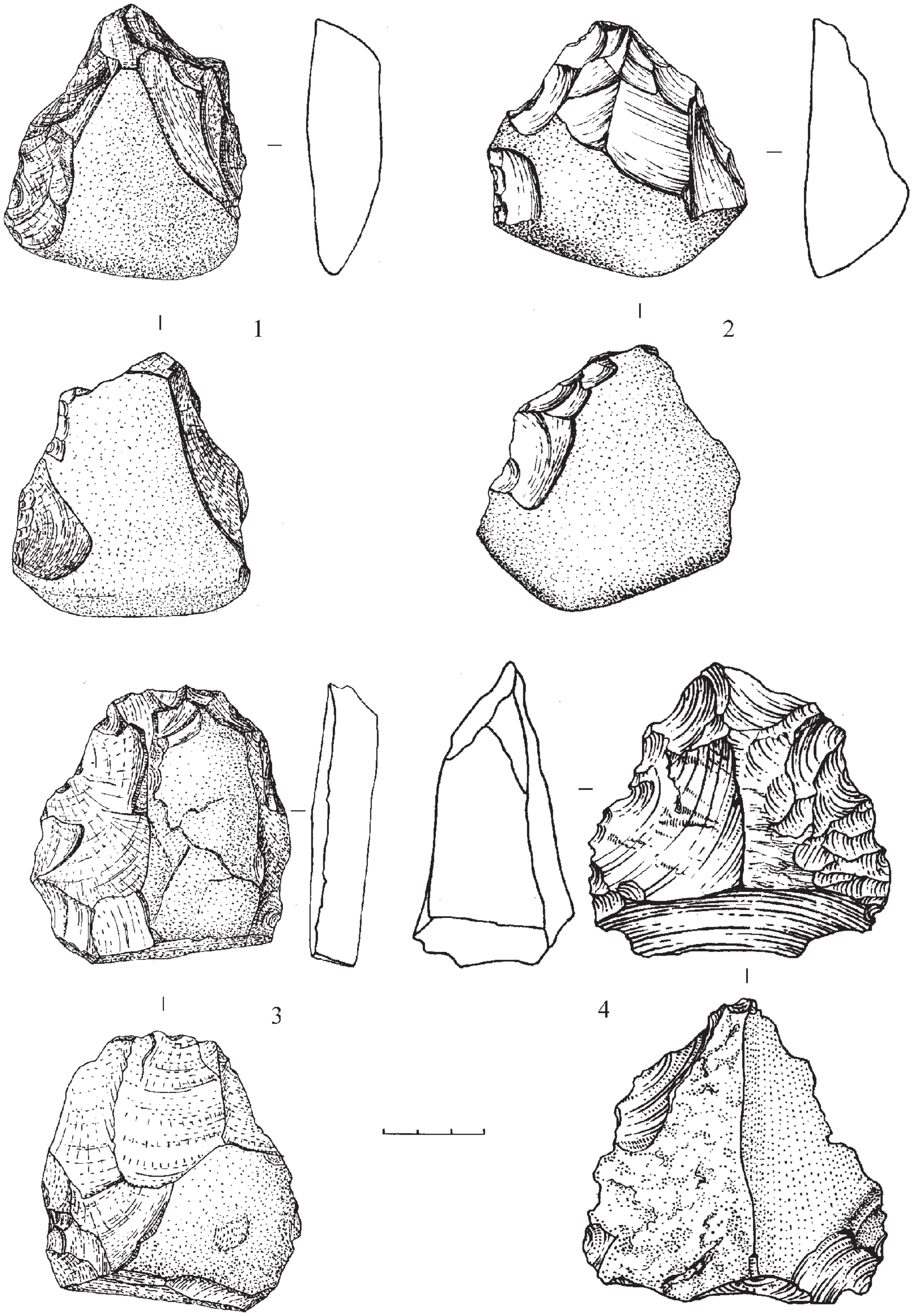


Figure 4. Treugol'naya Cave. Assemblage II: 1, 2, 4: proto-bifaces; 3: atypical biface.

DEFINITION OF THE PRE-MOUSTERIAN (TAYACIAN) COMPLEX

In mid-1960s, Bordes (1968: 140) suggested replacing Breuil's early 1930s term "Tayacian" with the term "Pre-Mousterian." The term "Tayacian," however, still is often used for designating assemblages that are synchronic with the Acheulian, but that do not contain typical (i.e., symmetric and well-made) Acheulian handaxes in the Lower Paleolithic industries in Europe and Western Asia. Other terms have been applied within restricted regions (Clactonian, Bohemian, Taubachian, Buda-industry, etc.); the use of descriptive labels (nonbiface assemblages, small tool assemblages, flake tool assemblages, core-chopper industries, etc.) also has occurred. Eponymic and descriptive terms

Figure 5. Treugol'naya Cave. Assemblage I: 1: end-scraper; 2–4, 10: simple side-scrapers; 5: denticulate tool; 6: exhausted core; 7, 8: transverse side-scrapers; 9: retouched flake.

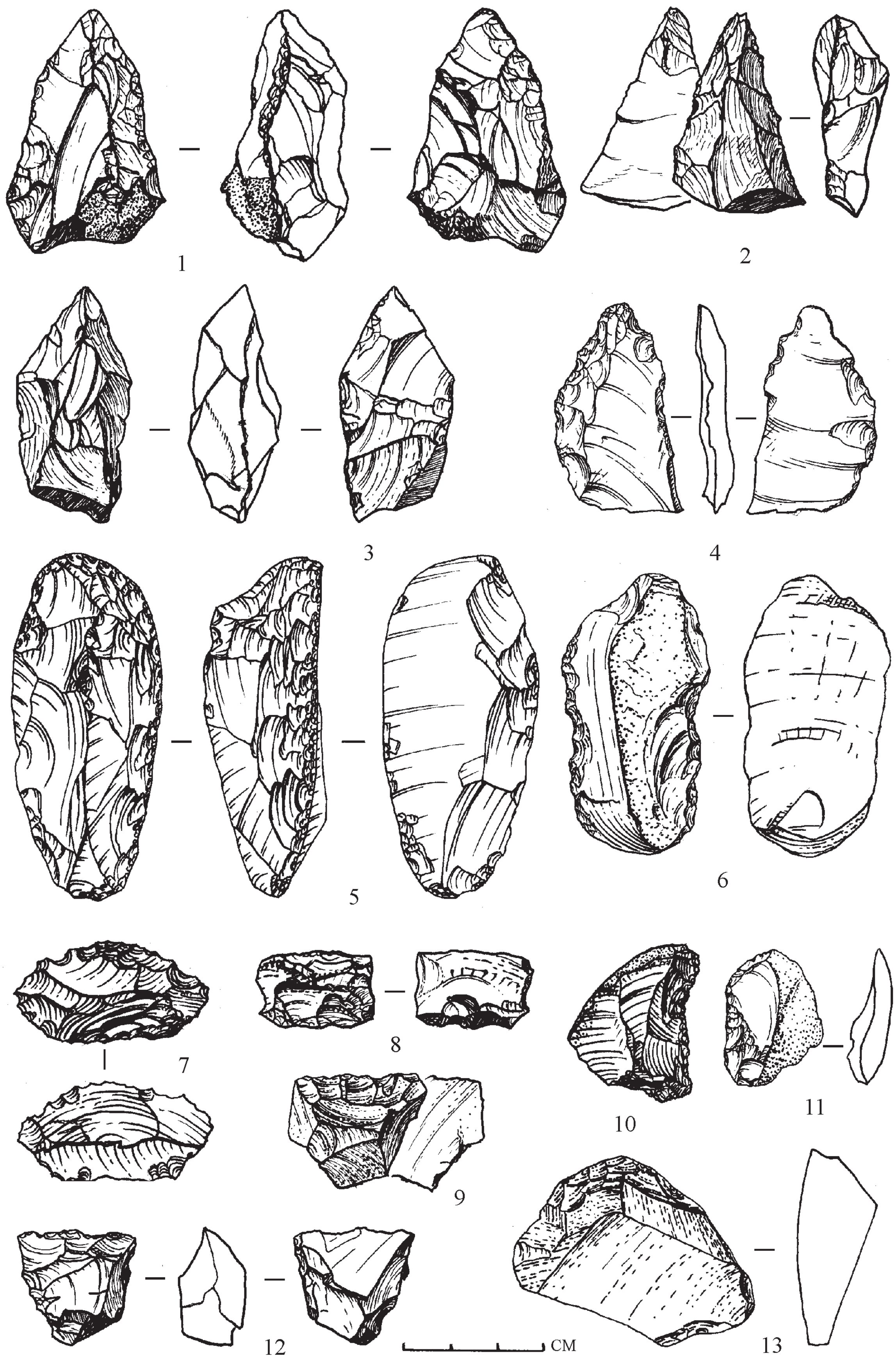


Figure 6. Treugol'naya Cave. Assemblage I: 1, 3: Quinson points; 2: reverse convergent side-scraper; 4: composite tool combining a simple side-scraper with a nosed end-scraper; 5: Quina side-scraper with a back thinned with flat ventral retouch; 6: denticulate tool; 7, 8: transverse side-scrapers; 9, 12, 13: end-scrapers; 10, 11: simple side-scrapers.

both are valid and whether researchers choose to use one or another is somewhat subjective.

In France, where Lower Paleolithic nonbiface assemblages first were identified:

> "the term Tayacian (or proto-Mousterian) has been used to cover a variety of assemblages that are clearly contemporaneous with Acheulean ones but that lack bifaces and are dominated instead by flake tools, often retouched to form sidescrapers. In addition, these assemblages often contain flaked pebbles (choppers)…limaces, denticulates, notches, and Tayac (or Tayacian) points…" (Klein 1989: 254–255).

It also is pertinent to remember that Bordes, following Breuil, considered the Clactonian to be earlier than the Tayacian industrial complex without Acheulian bifaces. Bordes (1968: 95) defined the Clactonian as an industry without handaxes, containing various choppers and chopping-tools, flakes (a "Clactonian flake" is only one of types; some flakes have almost a Levallois shape, although their platforms are usually plain), and flake tools. Flake tools include various, sometimes well retouched, side-scrapers, end-scrapers, denticulates and notched tools, etc.

All told, the definitions of the "Tayacian" or "Pre-Mousterian" are quite similar. This can be seen in the following example, where these assemblages have been repeatedly renamed, depending on the researcher involved. At La Micoque, Breuil (1932) identified Layer 3 as Clactonian, and the overlying Layer 4 as Tayacian. Subsequently, Bordes (1956) classified them, respectively, as primitive Mousterian and Mousterian. Finally, both layers were again renamed as Pre-Mousterian (Laville et al. 1980). All these different names thus are generally attributable as the Pre-Mousterian (Tayacian) techno-complex of Lower Paleolithic industries, which existed synchronously with the Acheulian techno-complex, but differed from it in the absence of Acheulian handaxes, and Levallois technologies. Other basic characteristics of the Pre-Mousterian Complex are: a) a combination of macro-tools such as choppers, which are made on pebbles or boulders, with small tools made on non-Levallois flakes; and, b) a prevalence of side-scrapers among the flake-tools, and usually significant numbers of end-scrapers, denticulates, and notched tools.

It is necessary to note that the main diagnostic feature of this complex of industries is the absence of Acheulian bifaces (or handaxes), i.e., symmetrical, continuous or partially bifacially trimmed, bifacial tools of standardized morphology, or so-called classical types (for definitions see Debénath and Dibble [1994: 132–149]). On the other hand, bifaces falling into the category of "miscellaneous" (including small, square, biface-awls and so on) occur in the Lower Paleolithic not only in the Acheulian, but also in the Tayacian assemblages (Bordes 1961: 68; Debénath and Dibble 1994: 169). This is true also of other types of bifaces, such as "Abbevillian," core-like, proto-bifaces, etc. Other categories of bifaces (backed biface-knifes of Central European types) characterize the Middle Paleolithic—Micoquian in Central and Eastern Europe—as distinct from the Acheulian industrial complex. Likewise, bifacial foliate points or leaf points are present at the end of Lower to the beginning of the Middle Paleolithic in Central and Eastern Europe and are rare in Western Europe (Debénath and Dibble 1994: 119).

Accepting the terms "Pre-Mousterian" and "Tayacian" as synonymous, the author argues that, like the Acheulian, these terms do not have a strict cultural designation. They are applied only as common identifiers of techno-complex rank that is synchronous with the Acheulian techno-complex in the Lower Paleolithic, and for which symmetrical, flat or massive Acheulian bifaces and Levallois technique (excepting sometimes a few Levallois flakes) are absent. Use of the term "Pre-Acheulian," that sometimes is used to designate archaic, mostly pebble, industries that preceded the Acheulian techno-complex in different regions of Western Europe, to the context of Eastern Europe seems less appropriate. Here it is necessary to take into account the absence of a long-term Acheulian tradition in Eastern Europe (contrary to Western Europe or Western Asia), and a precedence for Eastern Europe of the term "Pre-Mousterian," as offered by Obermaier (1925) in the 1920s.

In addition to Treugol'naya Cave, industries of the Pre-Mousterian (Tayacian) Complex have been identified at all other Lower Paleolithic sites in Eastern Europe—Khryashchy and Mikhailovskoe in Lower Don River Valley and Pogreby and Dubossary in Moldova (Table 2). However, both the age and industrial uniformity of these archaeological collections are problematic, as they mainly consist of surface finds. Nevertheless, one attraction of the materials from these sites is that they help overcome the numerical deficiency in the archaeological assemblages from Treugol'naya Cave—the comparatively small quantities to use for reliable industrial attributions. At the same time, it is necessary to note that only future discoveries of stratified Lower Paleolithic occupations with many thousands of lithics from these industries will finally document the appearance of the earliest human populations in Eastern Europe.

POGREBY AND DUBOSSARY LOCATIONS

At the Pogreby and Dubossary locations, which are situated several kilometers from each other in the Lower Dnestr River Valley, stone artifacts have been collected on eroded surfaces of loesses and in buried soil on high terraces along the Dnestr River. The age of these collections is not determined precisely. Earlier Anisiutkin (1987: 13) assumed a Rissian age for the Pogreby industry, but later re-dated it to the Mindel and Mindel-Riss (Anisiutkin 1992: 36). The artifacts were found on the surface or in deposits that have been correlated with the Dnepr loess and Zavadovsk soil, after Veklich's scheme (ibid.). Both these are now correlated, respectively, to OIS 8 and OIS 9–11 (Bolikhovskaya and Molodkov 2002: Table 1). The soil correlation to OIS 11 is supported only by pollen of arboreal exotics (*Pterocarya, Zelkova*) and a reworked elephant tooth (*Archidickodon trogontherii)* typical of the Tiraspolian fauna (Pospelova and Levkovskaya 1994: 224). Thus, while the age determination

TABLE 2. PROPOSED CHRONOLOGY OF THE LOWER PALEOLITHIC STRATIFIED ASSEMBLAGES IN EASTERN EUROPE (AGE OF OIS STAGES AFTER AITKEN AND STOKES 1997).

European Glacial & Interglacial Complexes	Oxygen Isotope Stages (OIS)	Ages for OIS (ka)	Lower Paleolithic Assemblages in Eastern Europe		
Saalian	6	130–190	**Upper Acheulian or Early Middle Paleolithic Leaf Point Industries**		
				Khryashchy, later assemblage	
	7	190–244		?	
				Mikhailovskoe ?	**Pre-Mousterian**
				Khryashchy, early assemblage	
	8	244–301	Pogreby ? Dubossary ?	?	
Holsteinian	9	301–334			
	10	334–364	Treugol'naya, Layer 4a ?		Korolevo, Layer VI ?
			Treugol'naya, Layers 4a-c	Assemblage I	**Pre-Mousterian**
	11	364–427	Treugol'naya, Layer 4d	Assemblage II	**Core-chopper Industry**
			Treugol'naya, Layers 5a, 5b	Assemblage III	**Pre-Mousterian**
Elsterian	12	427–474	Treugol'naya, Layer 5c ?		
Cromerian	13	474–528			
	14	528–568			
	15	568–621	Treugol'naya, Layer 7a	Assemblage IV	**Pre-Mousterian**

between OIS 11 and OIS 8 for the materials from Pogreby and Dubossary seems quite probable, the reliability of this dating remains problematic.

At Pogreby there are 259 lithics and at Dubossary there are 415 lithics. About 95% of the finds from both sites occur on the surface, and among them many naturally broken stones have been noted (Hoffecker 2002: 47). Moreover, at Pogreby, an admixture with Upper Paleolithic artifacts was recognized (Anisiutkin 1987). From the techno-typological point of view, Anisiutkin considered both collections to be similar and attributed them to a "Dubossary industry." At Pogreby, Anisiutkin defined 28 cores, a series of pebble macro-tools, including choppers, three rough backed bifaces (?), small and massive Clactonian flakes, and 41 flake tools (side-scrapers, notches, denticulates and beak-like tools, atypical burins, awls, a proto-limace, and a Tayacian point). The Dubossary collection includes 77 cores, 12 lithics made on pebbles and 99 tools made on flakes and fragments. Analogies for the "Dubossary industry" are said to be with Pre-Mousterian assemblages in Western and Central Europe, for which the common feature "is not only the absence of typical hand axes, but also a constant combination of large pebble tools with small flake tools" (Anisiutkin 1992: 34). In addition, he noted a similarity of these materials to "Tayacoid industries" in Central Europe (Anisiutkin 1987: 13–14).

KHRYASHCHY AND MIKHAILOVSKOE LOCATIONS

At the Khryashchy and Mikhailovskoe locations, which are 2 km from each other in the Severskiy Donets River Valley, three Lower Paleolithic assemblages were identified—the most ancient alluvial assemblage (60 pieces) is at Khryashchy; a middle assemblage from the lower soil (220 pieces) is found at Mikhailovskoe; and, the top assemblage from the middle soil (20 pieces) is at Khryashchy (Praslov 2001). Based on stratigraphic position and a cold pollen spectrum identified for the alluvial assemblage at Khryashchy, this location has been dated to the time of the Dnepr Glaciation. The lower and middle buried soils at both sites were attributed to the Odintsovo Interglaciation (Praslov 1968, 1984, 1995). It is not clear why the alluvial assemblage at Khryashchy recently was re-dated to the Don Glaciation, while the buried soils were reassigned to the Likhvin Interglaciation (Praslov 2001: 21). The reasons for this new chronology are not clear, as no new supporting data have been presented. In the alluvium at Khryashchy, as in the buried soils, no diagnostic species of Tiraspolian fauna have been found. To the contrary, correlation of the alluvial assemblage at Khryashchy with OIS 8 (244–301kyr) is demonstrated by a trans-Don climate-stratigraphic correlation (Zubakov et al. 1985). The archaeological assemblages from the buried soils at Khryashchy and Mikhailovskoe thus can be dated no earlier than OIS 7.

Although Khryashchy and Mikhailovskoe are considered to be the only stratified Lower Paleolithic sites in the Russian Plain (Praslov 2001), like Pogreby and Dubossary, the overwhelming majority of the finds here are not associated with a stratified context. Only five lithics were found during cleaning of the surface of the alluvial pebble level that was exposed in the riverbank at Khryashchy (Praslov 1968: 24, Figure 4). Hoffecker (2002: 48) noted that the lithics are strongly abraded, and many naturally fractured stones occur in the alluvial assemblage at Khryashchy. Only one flake was found during section cleaning in the top of the middle buried soil at Khryashchy and seven lithics in the lower soil at Mikhailovskoe (Praslov 1968: 24, 34, 44, Figure 13). Khryashchy and Mikhailovskoe contain flake tool industries with some pebble macro-tools (Figures 7 and 8), but without Acheulian bifaces and Levallois technique. Thus, these materials correspond to the definition of the Tayacian complex, a technological similarity which Praslov (ibid.: 55) noted for Mikhailovskoe. Also, Anisiutkin (1987: 13) assumed that Khryashchy "belongs to the group of industries with choppers, Clactonian flakes, but without real Acheulean bifaces and Levallois technique."

LOWER PALEOLITHIC LOCATIONS IN THE NORTHERN CAUCASUS

In the Northern Caucasus, except for Treugol'naya Cave, Middle Pleistocene strata have been investigated at Weasel Cave (Mishtulagti Lagat) in Northern Ossetia. The Lower Paleolithic materials found here are published only preliminary (Hidjrati et al. 2003). In this cave, located at an elevation of 1125masl, at the bottom of a 26m section is a lower bed of sediments (Layers 22–36), which are dated, based on pollen and fauna, presumably to the interval from 250–400kyr. For Layer 24, an argon date greater than 500kyr was obtained, but the excavator is not certain that the date is accurate (Hidjrati, pers. comm., 2005). In these layers, only a few artifacts were found—a chopper and flake tools in Layer 29 and a core in Layer 32. A small number of artifacts presumably dating to the end of the Middle Pleistocene (130–250kyr) were found in the lower levels (15, 17, and 19–21) of the middle bed in the cave. An archaeologically sterile layer (18) is a volcanic ash horizon; it has an argon date greater than 200kyr. Despite the small number of artifacts in Levels 15–21, a similarity of these lithics to a laminar Middle Paleolithic industry with a greater quantity of artifacts from the overlying Levels 12–14 was identified. Layers 12–14 are dated to the beginning of the Upper Pleistocene (70–128kyr) based on faunal and pollen data.

A recent Lower Paleolithic discovery has been the site of Darvagchai I near Derbent in Dagestan (Amirkhanov and Derevianko 2004; Derevianko 2006). Lithic finds are mostly small (less than 5cm) flint pieces originating from two levels within marine sediments of a sea terrace of the Caspian Sea. The lithics are embedded in conglomerates composed of marine shell-bearing sands, cobbles, and pebbles. The age of these finds was identified as the early Middle Pleistocene (800–600kyr) on the basis of marine faunal remains of the Baku transgression of the Caspian Sea. The assemblage numbers 261 lithics from two excavation areas of $12m^2$ and $4m^2$ and seems to include a number of typo-

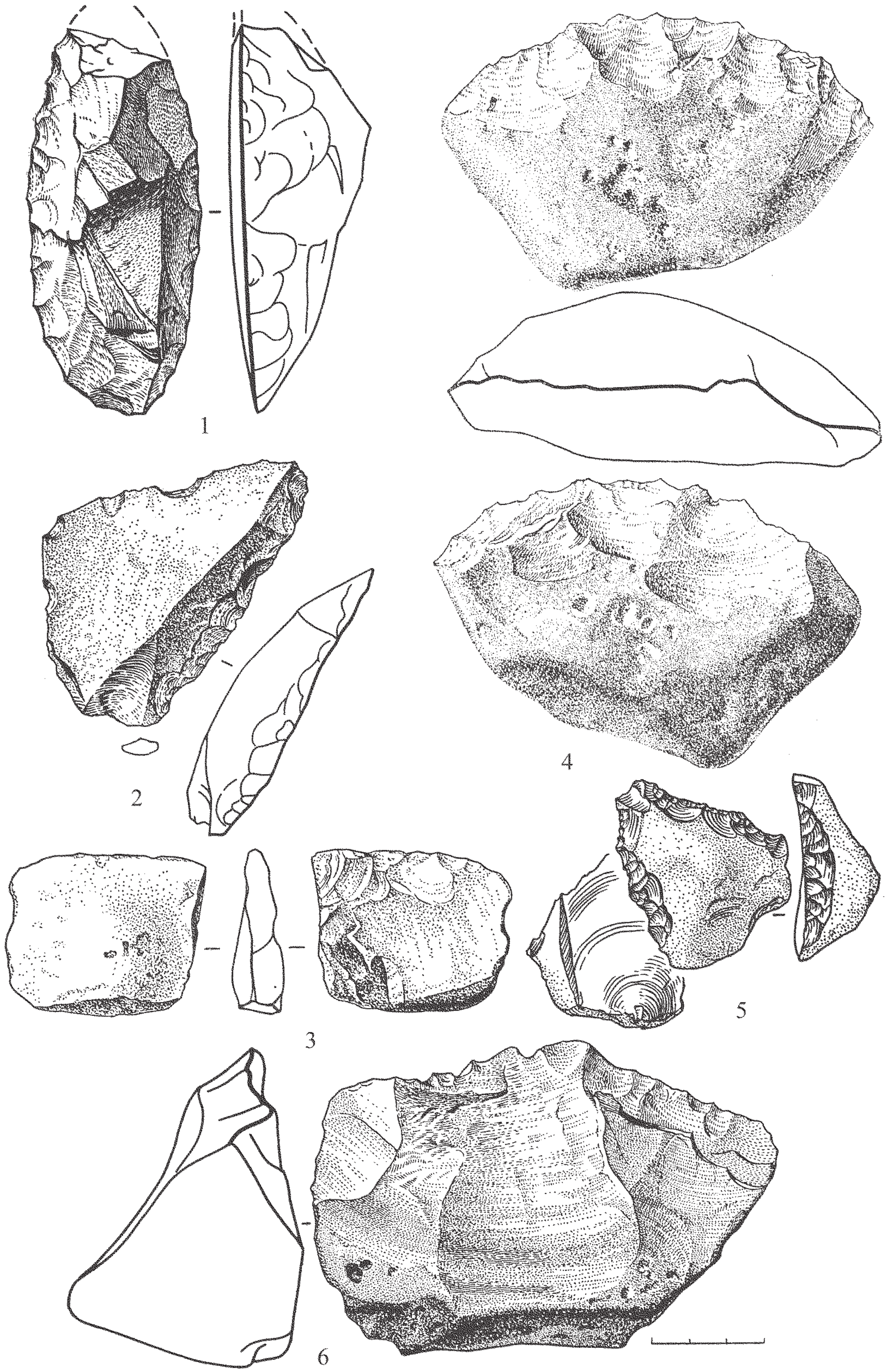


Figure 7. Khryashchy location, alluvium assemblage: 1: Quina side-scraper; 2: simple side-scraper; 3: transverse side-scraper; 4: chopping-tool; 5: angled side-scraper; 6: one-platform core. Modified after Praslov (1968).

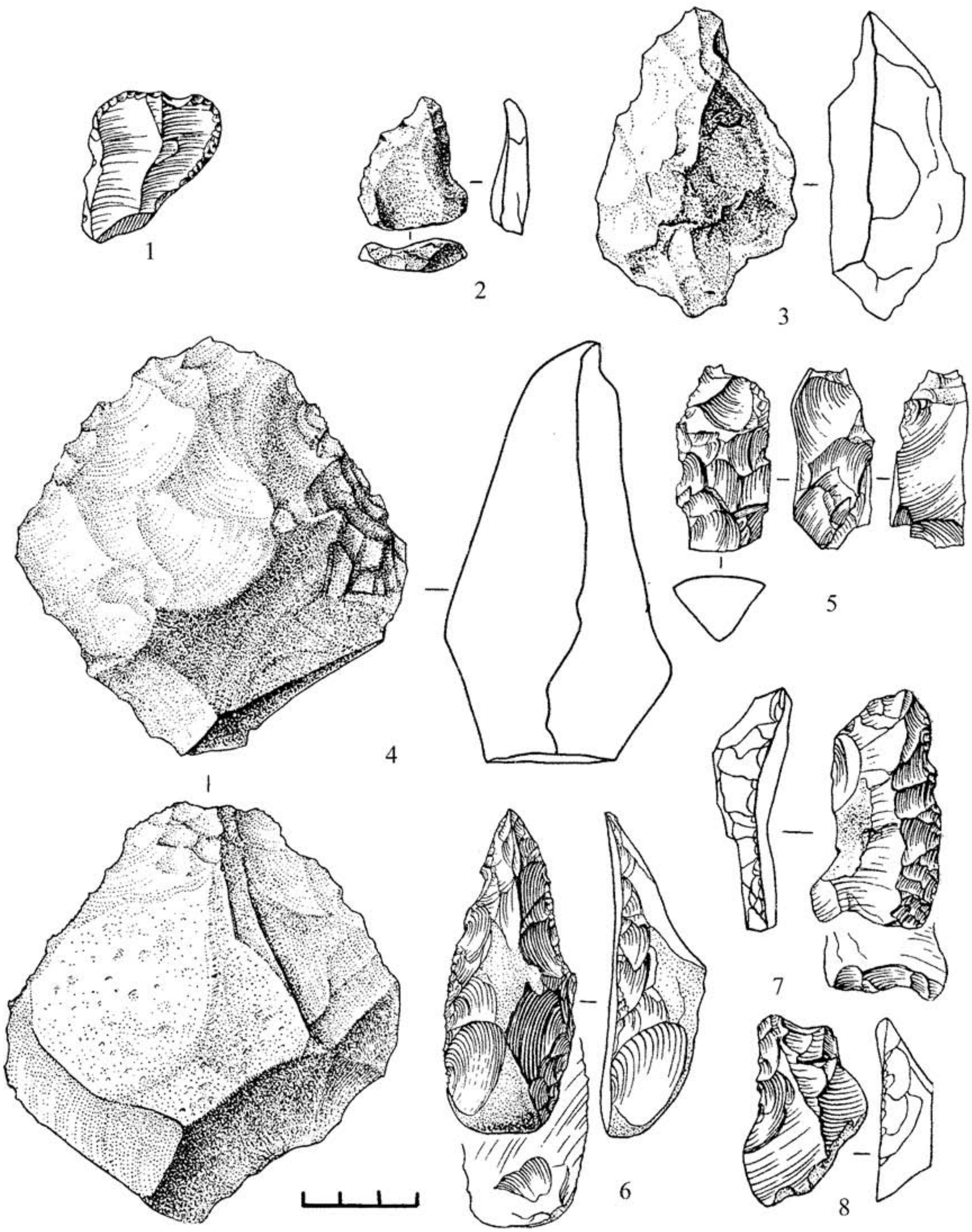


Figure 8. Mikhailovskoe location: 1: end-scraper; 2: angled side-scraper; 3: simple side-scraper with steep retouch; 4: many-platform unifacial core; 5: fragmented Quinson point (?); 6: convergent side-scraper; 7: simple side-scraper with a base thinned with flat ventral retouch; 8: simple side-scraper. Modified after Praslov (1968).

logically defined pieces such as cores, retouched flakes, end-scrapers, and side-scrapers (Derevianko 2006: Figure 13–15; Derevianko et al. 2006: Figures 1–8). All lithics identified as artifacts are more or less heavily abraded (Figure 9), and reworked morphologies for many of them suggest that they may not be human products; moreover, no typical Clactonian flakes are present. Obviously, future research at this site has to clarify the status of this lithic assemblage.

THE LOWER PALEOLITHIC AT KOROLEVO I

Korolevo I is located in the Western Carpathian Mountains. It is situated in the eastern part of Central Europe, but in immediate proximity to the borders of Eastern Europe. Korolevo I was discovered by Gladilin in 1974, and then excavated and meticulously investigated during 16 field seasons. The site is on a high terrace of the Tissa River, on the slope of volcanic ridge which is rich in andesite lava

Figure 9. Flint lithics from Darvagchai I. After Derevianko (2006: Figure 13).

outcrops. Here the Pleistocene sediments have a depth up to 12m and are well stratified due to a series of buried soils. Although fossil fauna was not preserved at the site, geological, soil, paleomagnetic, and palynological research was carried out, and absolute dates were obtained (Gladilin and Sitliviy 1990). The study of the archaeological collections is on-going, with new analyses yielding significant corrections to the initial characteristics of the assemblages (Kulakovskaya 1999, 2003).

Gladilin and his colleagues excavated seven stratified Lower Paleolithic assemblages at Korolevo I—from top to bottom: V, Va, Vb, Vc, VI, VII, and VIII. However, assemblage composition is methodically incorrect, because each assemblage combines the less numerous finds from stratified excavation context with the more numerous artifacts found on the modern surface 300 and more meters away from the excavation units. For example, the earliest assemblages (VIII and VII) include lithics found in the excavation unit at Gostry Verkh Mountain and similar lithics—based on the degree of weathering on the andesite artifacts—that were selected by researchers from mixed surface materials at Beyvar Mountain (Gladilin and Sitliviy 1990: 37, 39, 47). This methodical mistake has resulted in a cautious and often skeptical reaction by other researchers to the Lower Paleolithic industries at this site. More recently, a re-analysis of the assemblages has vastly improved our understanding of these assemblages. Only the lithics found *in situ* are included, while the materials from the surface collections were set aside. As a result, the archaeological stratigraphy of the site has essentially changed. Only Assemblages VI and VII (including the former Assemblage VIII) now are assigned to the Lower Paleolithic (Haesaerts and Koulakovska 2006).

The earliest Assemblage VII (VIII) was found *in situ* only in Excavation Unit XIII at Gostry Verkh, and originates from the paleo-Tissa River alluvial sediments. These lithics are deposited below the Matuyama-Bruhnes boundary and are tentatively dated to about 950kyr. The assemblage now includes only several large flakes (ibid.). Based on published figures of two of these heavily weathered andesite pieces (Kulakovskaya 2003: Figure 1), it is difficult to evaluate the quality of these artifacts with confidence. One can note only that they are not typologically indisputable artifacts. This conclusion is supported by the following example. Gladilin and Sitliviy (1990: 37) mention some artifacts of quartz and quartzite in Assemblage VIII and illustrate a pebble chopper that is made of nonandesite (quartzite?) raw material (ibid.: Table III-1). Unlike andesite lithics, surface finds of this nonvolcanic raw material could not be introduced into the assemblage on the basis of their degree of weathering, as this so-called hydration method was tested only on andesite. Hence, the nonandesite lithics probably were found in the excavation. Because these are not mentioned in later publications, it is possible that new researchers do not consider them to be artifacts. Thus, it is not possible to identify the archaeological nature of Assemblage VII (VIII) at Korolevo I with any confidence. This is especially true because one needs to take into account the conditions of these finds—within alluvial deposits containing large and small pebbles, the local presence of andesite, and generally bad preservation of the lithics. Therefore, from the author's point of view, it is methodically correct to consider these finds only as "possibiliths".

Upper Assemblage VI was found *in situ* in Excavation Unit IX at Beyvar (this hill has been completely destroyed by a modern quarry), in the top horizon of buried soil VII.

The assemblage was originally dated to the Mindel-Riss, but since then it has been re-dated to the inter-Mindel (Gladilin and Sitliviy 1990: 41). Currently, the assemblage is dated to OIS 14 or circa 550kyr (Kulakovskaya 2003; Haesaerts and Koulakovska 2006), but this age can be challenged. In a generalized section of Korolevo I (Haesaerts and Koulakovska 2006: Figure 2), Paleosoil VII corresponds to Strata 17 and 18; it is Stratum 17 that contains Assemblage VI. Paleomagnetic excurse Biwa III is present in the overlaying Stratum 16 and has a TL date of 360±50kyr. According to more recent data (Pospelova 2000: Figure 7), excurse Biwa III is dated to 370kyr, and so it must be correlated with the end of warm OIS 11 (364–427kyr). Pollen data (Gladilin and Sitliviy 1990; Haesaerts and Koulakovska 2006) also help to chronologically position Assemblage VI. A cold oscillation (so-called "cryomer IX" with periglacial birch forest-steppe and later, habitats of the lower part of a sub-alpine zone) has been identified in Strata 16 and 17. These data show that these strata are not only close in the section, but also in environmental conditions, and suggests that these strata have chronological proximity OIS 11. This assumption is supported by two arguments. First, at the bottom of Soil VII (Stratum 18), a warm climatic oscillation (so-called "thermomer VII"—dry forest-steppe with walnut and other broad leaf trees—was identified. Second, similar dynamics of paleovegetation change from forest-steppe with walnut to sub-alpine meadows were recognized during OIS 11 at Treugol'naya Cave (Doronichev et al. 2004). Thus, all these data indicate that Assemblage VI at Korolevo I dates to the end of OIS 11 (probably between 370–390kyr). Based on this correlation, this assemblage can be considered one of the oldest Lower Paleolithic industries in Eastern Europe, along with Treugol'naya Cave (see Table 2).

According to Gladilin and Sitliviy (1990: 41), Assemblage VI totaled 9,367 lithics. However, the methodical mistake of combining *in situ* and surface artifacts—described above—also characterizes this assemblage, with stratified finds from Unit IX at Beyvar incorporated with surface collections from this and the next hill at Gostriy Verkh. Now that these materials have been re-analyzed, neither the exact number of stratified finds nor their true geological age are known. The chronological correlation suggested in this paper is not the only one (for another estimation of the age, see Haesaerts and Koulakovska [2006]).

It thus seems reasonable to draw conclusions about this assemblage based only on those artifacts that meet the following requirements—they are made not from andesite, but from nonvolcanic raw materials, and, are not surface artifacts originally included in the assemblage because of their degree of weathering. Nonvolcanic rocks (quartzite, quartz, flint, and slate) comprise 1.1% of all lithics (9,367 pieces) in the assemblage (Gladilin and Sitliviy 1990: 41), meaning about 100 pieces (Figure 10). The excavators note (ibid.) that 43.3% of 136 tools are made of these nonvolcanic rocks, i.e., about 60% of the total lithics made from nonvolcanic rocks were transformed into tools.

This has analogies with Treugol'naya Cave—in both Assemblage I and Assemblage II, tools comprise more than 50% of all lithics. Moreover, similar to Treugol'naya, Assemblage VI at Korolevo I represents a Lower Paleolithic industry of the Pre-Mousterian (Tayacian) techno-complex. It is indicative, that in the industry at Korolevo I, those components which appear separately within various lithic assemblages at Treugol'naya—namely, macro-tools (mostly choppers) made on pebbles and small tools (mostly side-scrapers) made on flakes—are found in combination. Like Treugol'naya, Assemblage VI at Korolevo I lacks both Acheulian bifaces and Levallois technique, but this statement requires clarification. Earlier, three handaxes were reported in Assemblage VI (ibid.: 44; Tables IX-2, XII-3, XIV-1). However, none of them is a classical Acheulian biface. The best example in Table XIV-1 is a fragment of a bifacial leaf point similar to those found in the upper Assemblages V and Va at Korolevo I. Second, these three bifaces are made from andesite and, thus, can occur in surface collections. As to Levallois technique, the author notes that its use is no longer mentioned in Assemblage VI despite earlier reports (ibid.: 47). To the contrary, "an original technique of knapping…crushing of raw material by one blow" (Kulakovskaya 2003: 163) now is described in the assemblage.

CONCLUSION: THE PRE-MOUSTERIAN (TAYACIAN) COMPLEX IN EASTERN EUROPE

The stratified sites discussed above are all today known as Lower Paleolithic locations in Eastern Europe (Figure 11A). Explanations of the rarity of these sites for reasons such as the absence of regular surveys for the Lower Paleolithic or destruction of Lower Paleolithic occupations by glacial activity or marine transgressions (Praslov 1995: 61), or that human dispersal was limited to areas with available raw materials for lithic productions (Liubin and Beliaeva 2006: 44), or that human behavioral strategies were not yet adequate for adaptation to the cold, continental environments of Eastern Europe prior to 300kyr (Hoffecker 2002: 42) are not exhaustive explanations. Contrary to these hypotheses, Lower Paleolithic sites (except for those dating to the end of Lower – beginning of the Middle Paleolithic) are absent or few even in those regions that were not affected by glaciers or marine transgressions, that have been investigated rather intensively, that are areas with good flint sources, and that did not experience cold climates through much of the Middle Pleistocene (such as Crimea, Moldova, and the Northwestern Caucasus). Most likely, the scarcity of Lower Paleolithic occupations really does reflect an insignificant human expansion into Eastern Europe in the Lower Paleolithic. Why these were practically "desolate landscapes" is as yet unknown. The author believes that the explanation may derive from less obvious reasons. Although it only can be offered as a hypothesis at this point, perhaps the explanation may be related to different group sizes and population densities for Lower Paleolithic hominins who used Acheulian biface technology as opposed to those groups that did not have this technological inventory.

Nevertheless, even the available poor evidence testifies to a cultural unification in the Lower Paleolithic in Eastern Europe. This unification is expressed in the absence of both

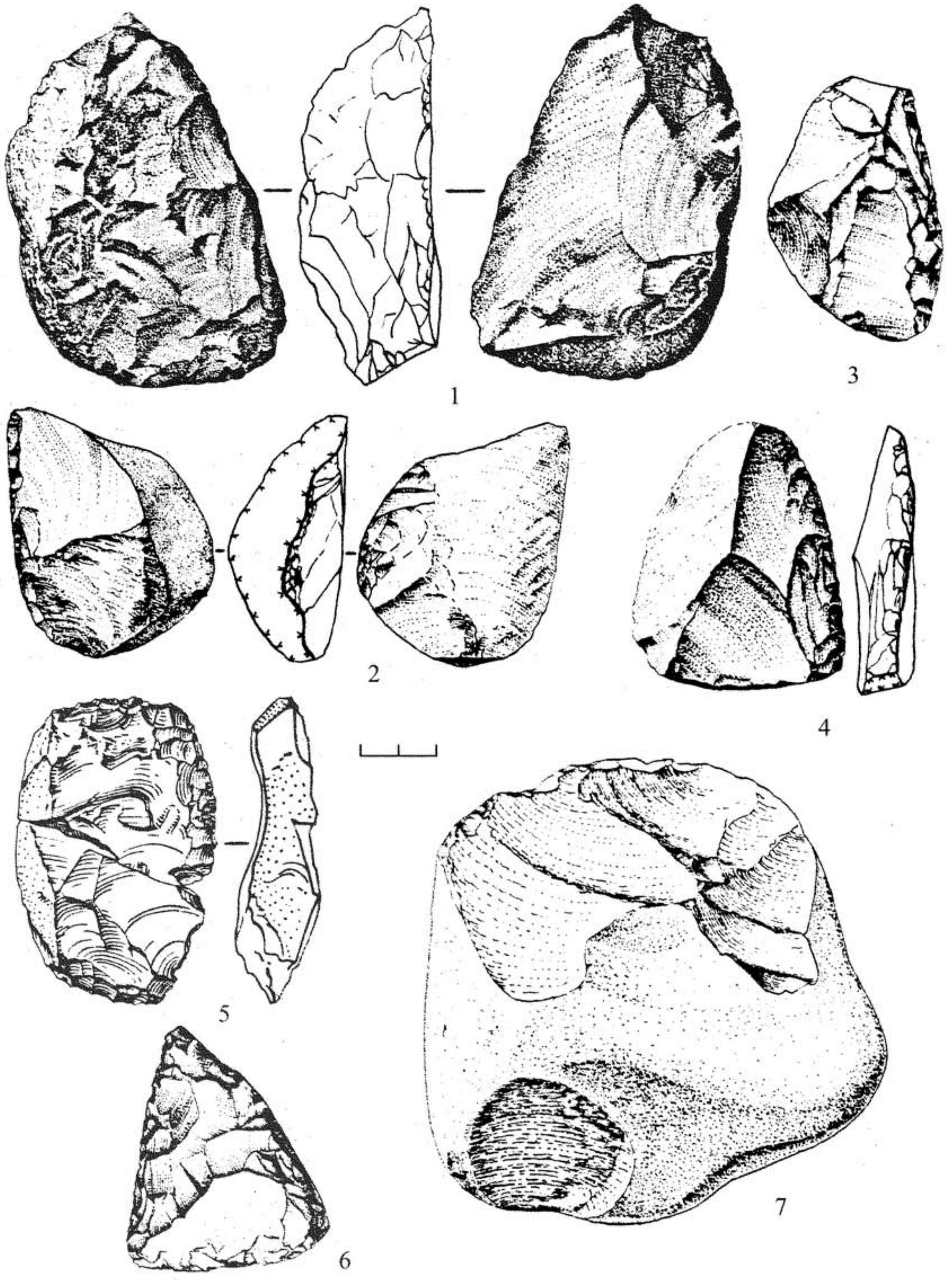
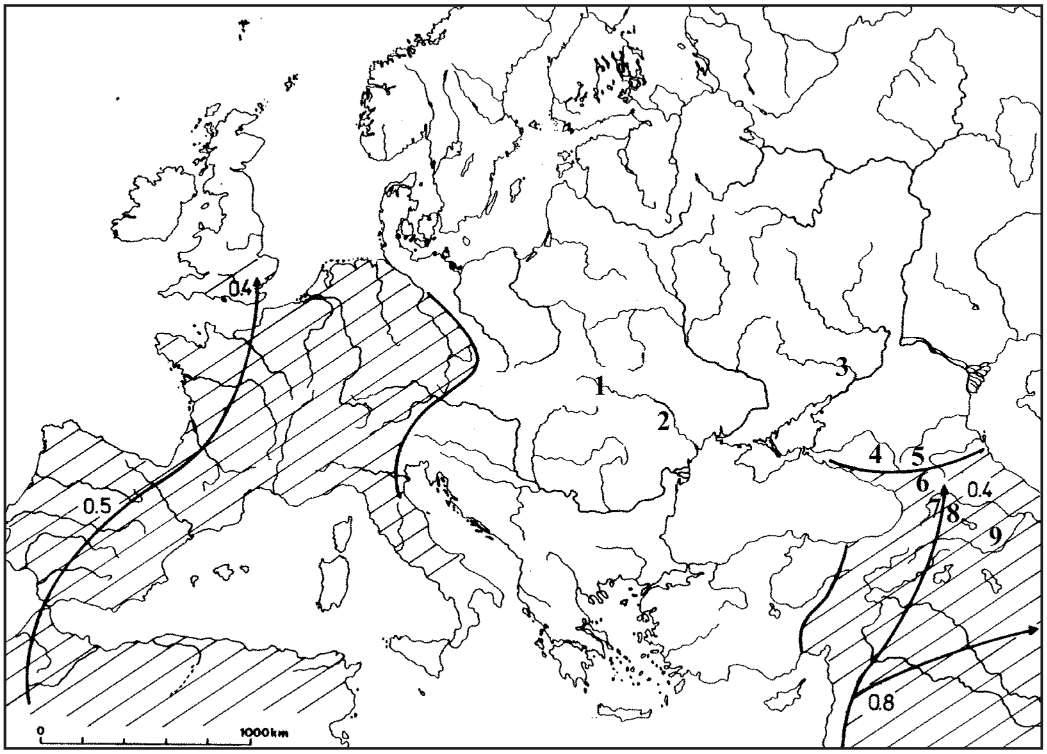


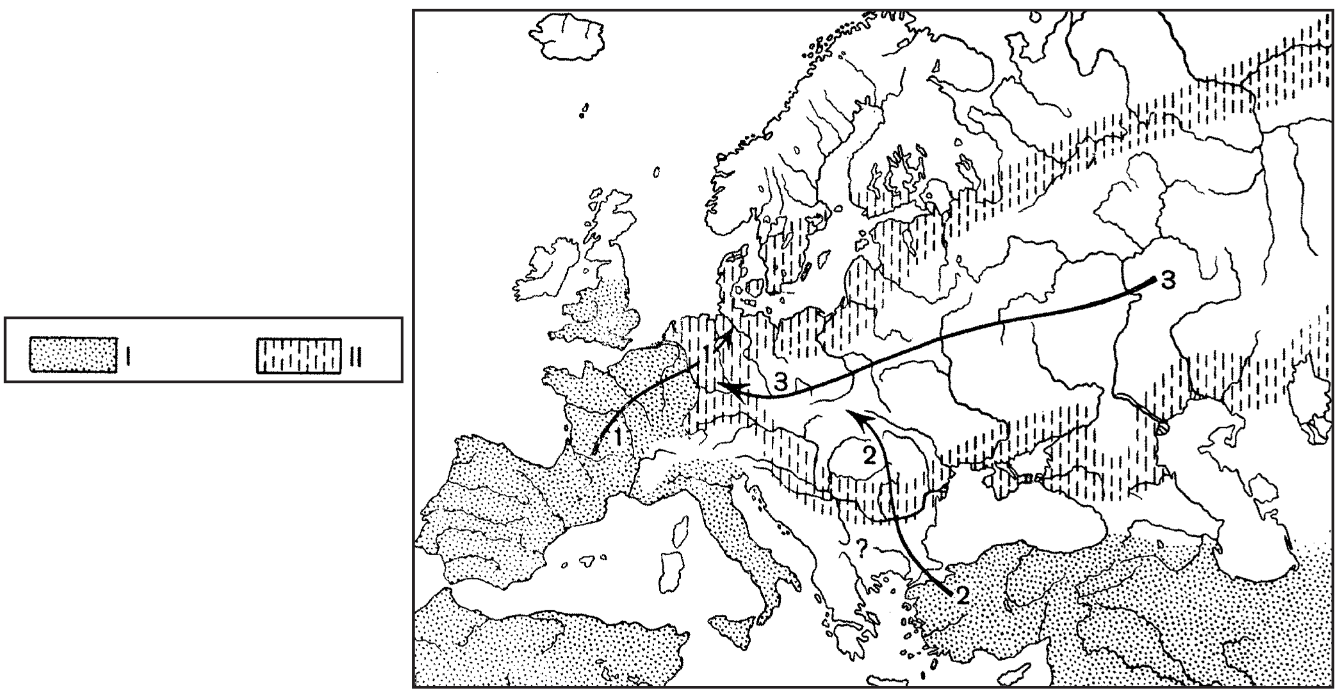
Figure 10. Korolevo I open-air site, assemblage VI: 1: semi-Quina side-scraper with a back thinned with flat ventral retouch; 2: simple side-scraper with a back thinned with flat ventral retouch; 3, 4: simple side-scrapers; 5, 6: angled side-scrapers; 7: chopper. Modified after Gladilin and Sitliviy (1990).

Acheulian handaxes and Levallois technologies from the oldest Assemblage IV at Treugol'naya Cave to the latest assemblage at Khryashchy (see Table 2). And, it is supported by the fact that the Lower Paleolithic sites considered above are located at different ends of Eastern Europe, are made on various raw materials, and represent, on the whole, a rather large assemblage of almost 1,500 artifacts.

Thus, the hypothesis proposed more than 50 years ago by Zamiatnin (1951: 105) that "soon a number of facts, testifying to hand axe distribution in Central and Eastern Europe, will considerably increase" was not prophetical. Likewise, the hypothesis formulated in the 1950s by Liubin (1960: 9), about the possibility of an Acheulian culture expansion from Western Asia through the Caucasus



A



B

Figure 11A. “Movius Line” and the distribution of the Acheulian techno-complex (slanting shaded areas), including proposed routes and arrival dates of the Acheulian. The Lower Paleolithic stratified sites in Eastern Europe and Caucasus are marked: 1: Korolevo I; 2: Pogreby and Dubossary; 3: Khryashchy and Mikhailovskoe; 4: Treugol’naya Cave; 5: Weasel Cave; 6: Kudaro I, Kudaro III, and Tsona; 7: Amiranis-gora; 8: Dmanisi; 9: Azykh Cave. Modified after Kozlowski (2003: Figure 7.1).

Figure 11B. Map showing the distribution of the Acheulian and Pre-Mousterian cultures, after Obermaier (1925): I: distribution area of the Acheulian culture; II: distribution area of the Pre-Mousterian culture. Points show spread of the Lower Paleolithic cultures proposed by Obermaier: 1–1: spread of the “West Acheulian culture” to Western Europe from Africa; 2–2: southern route to Central Europe from Anatolia through Balkans; 3–3: spread of the “East Acheulian culture” of leaf points to Central Europe from Western Siberia. Source of data: Zamiatnin (1951).

to Eastern Europe, is not supported by the facts. On the contrary, more and more facts confirm one of Obermaier's (1925) ideas regarding the distribution in Central and Eastern Europe of "Pre-Mousterian culture" (today called the Pre-Mousterian complex) vis-à-vis the area of "Acheulian culture" distribution in Western Europe and Western Asia. The frontier for the maximum expansion of the Acheulian techno-complex in Europe and Asia, which is now known as the Movius Line (see Figure 11A), actually was first determined for Europe and Western Asia by Obermaier (Figure 11B). By right of historical precedence for its Europe – West Asian section is more correctly called the "Obermaier Line." Obermaier belived that the closest region to Eastern Europe with Acheulian was the Southern Caucasus. New discoveries in the Caucasian Paleolithic have generally confirmed Obermaier's hypothesis, as well as introduced some important corrections to it.

THE LOWER PALEOLITHIC IN THE SOUTHERN CAUCASUS BEFORE THE ACHEULIAN (1,700,000–350,000YA)

Geographically, the Paleolithic of the Southern Caucasus is part of the Paleolithic of Western Asia. Currently, the beginning of the Paleolithic in the Southern Caucasus and Western Asia has been shown to have an unexpected time depth—going back to about 1.7 million years ago (at Dmanisi in the Republic of Georgia). The end of the Lower Paleolithic in the Caucasus can be attributed to ca. OIS 6 (Doronichev 2004). This coincides with the end of the Acheulo-Yabrudian in Western Asia at ca. 250kyr, based on TL chronology, or at ca. 200kyr, based on ESR chronology (Bar-Yosef 1995: Figure 1, 1998: 231).

DMANISI – A PRE-OLDOWAN ASSEMBLAGE IN THE SOUTHERN CAUCASUS

The open-air site of Dmanisi in southern Georgia is now the earliest Paleolithic occupation in the Caucasus and all of Western Asia. The geological age of this site is defined by the boundary between the Late Pliocene and Early Pleistocene, between 1.81 and 1.7Ma ago (de Lumley H. et al. 2005; de Lumley M.-A. et al. 2006). Since 1991, five skulls, four mandibles, and numerous fragments of postcranial skeleton from at least five human individuals have been found here. The Dmanisi hominids occupy an intermediate position between the earliest African human groups, *Homo habilis-rudolfensis* and *Homo ergaster*, and are most similar to the first group, especially *Homo rudolfensis* (ER 1470). At the same time, in some features, the Dmanisi hominids differ from both *Homo habilis-rudolfensis* and from the earliest humans in Eurasia (*Homo erectus* group). Therefore, hominids from Dmanisi have been assigned to a separate group, called *Homo georgicus* (de Lumley M.-A. et al. 2006). Earlier, researchers at this site hypothesized that hominids from Dmanisi could represent the hominine group the began the colonization of Europe and Asia (Gabunia et al. 2000a: 1025).

Archaeological collections from the 1991–1999 excavations at Dmanisi have been published (de Lumley H. et al. 2005). Although earlier reports noted either about 10,000 (Gabunia et al. 1999) or more than 1,000 (Gabunia et al. 2000a) lithics, now 4,446 stone pieces are identified from Layers I–VI at this site (de Lumley H. et al. 2005). The lithic collection from Dmanisi is very homogeneous, without any significant trends from the bottom to top layers. Complete pebbles, brought to the site from the closest small rivers (Mashavera and Pinesauri), compreise about 34% of the assemblage. These pebble manuports represent the spectrum of rocks, which were used as raw materials for flaking and tool production at the site—mostly fine- or coarse-grained volcanic tuff, basalt, and other volcanic and metamorphic rocks. The next largest group (about 30% of total assemblage) is composed of split pebbles and pebble fragments; percussion marks are frequently visible on their surfaces.

Complete pebbles with percussion marks located on their ends (hammerstones?), or with scar negatives, are not numerous (1.3% of total assemblage). Cores, made on complete or split pebbles, comprise 5% of the industry, complete and split pebbles are excluded. Cores are characterized by a little reduction and mainly cortical striking platforms. One-platform (42.3%) and two-platform (34.2%) cores are numerous, while mutiple-platform cores are rare (6.3%). There are many unretouched flakes of mostly small sizes. At the same time, about 31% of all flakes, as well as many split pebbles, pebble tools, and cores have irregular retouch, and separate notches apparently resulted from heavy utilization of these lithics. Thus, one of the basic characteristics of the Dmanisi industry is that humans flaked stones for the production of small flakes and then used them without retouching (ibid.). Pebble tools comprise 4.8% of total assemblage or 10% of the lithic industry. However, about 60% of pebble tools (6% of the industry) are so-called "primary choppers" (pebbles with a few flake scars). As there is no intensive secondary retouching on these lithics, one can assume they are instead pebble cores in the initial or trial stage of reduction. True choppers with extended working edges, formed by a series of scars (on average, by three scars), and having relatively standardized morphology comprise only 21.2% of pebble tools or 2.1 % of the industry. Chopping-tools make up 8.7% of pebble tools or 0.8% of the industry (ibid.).

Based on the age and the techno–typological characteristics of the lithic industry (Figure 12), the Dmanisi assemblage is assigned to the "Pre-Oldowan" cultural horizon. This earliest type of hominine lithic industry or industrial complex, which appeared by 2.5Ma ago in East Africa and is characterized by the absence of fine retouched tools, has been recently identified in Africa as the evolutionary predecessor of the Oldowan cultural horizon. The latter also appears in East Africa about 1.8Ma ago, and is marked by the occurrence of standardized, fine retouched tools (de Lumley H. et al. 2004).

Thus, Dmanisi documents the fact that the earliest humans (probably bearing the most primitive Pre-Oldowan industry type) initially left Africa and appeared in Western Asia as early as 1.8Ma ago. Their further dispersal to Medi-

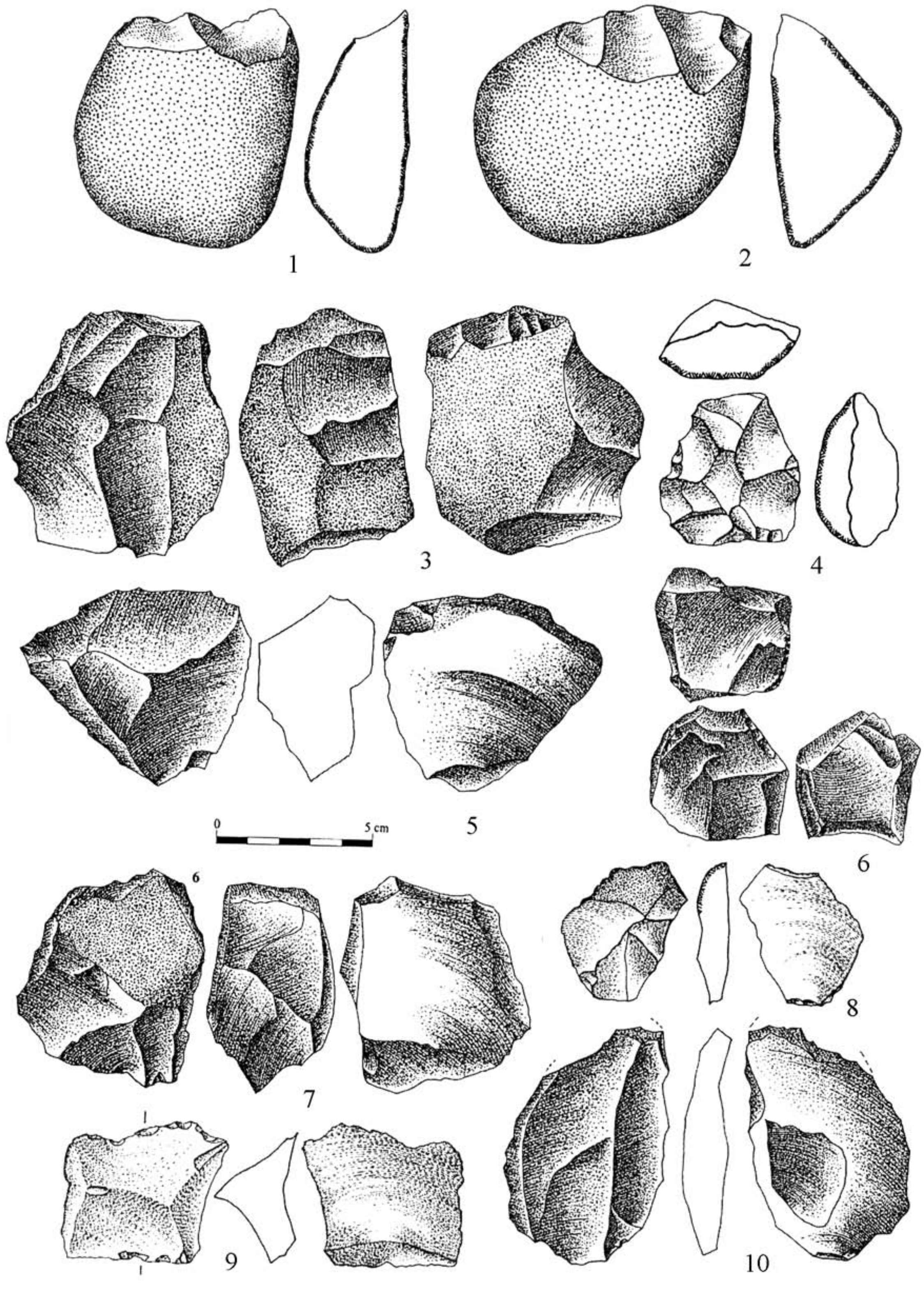


Figure 12. Dmanisi open-air site: 1, 2: choppers; 3: orthogonal core; 4: discoid unifacial core; 5, 7, 9: Clactonian flakes; 6: globular core; 8, 10: flakes. Source of data: de Lumley et al. (2005).

terranean Europe is apparently found at Barranko Leon (ca. 1.3Ma) and Fuente Nueva 3 (ca. 1.2Ma) (de Lumley H. et al. 2005). However, in the Caucasus, a long (more than one million years) hiatus in Lower Paleolithic occupation occurs after the Dmanisi episode. The author agrees that, contrary to Mediterranean Europe, Dmanisi is a record of "limited in time and not having direct continuation the earliest episode of early hominid penetration into the southern limits of Caucasus" (Liubin and Beliaeva 2006: 29).

THE APPEARANCE OF THE ACHEULIAN COMPLEX IN WESTERN ASIA

'Ubeidiya in Israel, which is dated to about 1.4Ma, is the most ancient and the unique Lower Acheulian stratified site in Western Asia. About 8,000 artifacts have been found in total, the majority of which are distributed among 13 basic archaeological assemblages (Bar-Yosef and Goren-Inbar 1993). The lithic industries of 'Ubeidiya are manufactured mainly on basalt and silicified raw materials. Like Dmanisi, the debitage includes flakes with plain platforms and various cores, from one-platform to bifacial discoid or polyhedrons. Tools are represented by choppers, small flake tools, spheroids, and bifaces. Among bifaces, the types indicative for the Developed Oldowan B or Lower Acheulian in East Africa—proto-bifaces, *proto-limandes* ("irregular ovals"), *naviformes* ("double pointed"), picks, bifaces with unworked bases—are well represented (ibid.: Table 24). Although the 'Ubeidiya assemblage as a whole is described by the excavators as Lower Acheulian, the occurrence of hominids, who did not make bifaces, is suggested in the earliest strata of the site (Bar-Yosef 1998: 242).

Certainly, the data available now are insufficient for an unequivocal interpretation, and various points of view are possible. One of them is that Dmanisi and 'Ubeidiya reflect diachronic migration waves of various human groups from Africa to Western Asia (ibid.: 269). On the other hand, one can assume that Dmanisi and 'Ubeidiya both reflect a regional, West Asian transition from Oldowan or even Pre-Oldowan (Dmanisi and the earliest assemblages of 'Ubeidiya) to Lower Acheulian (main assemblages of 'Ubeidiya)—a transition similar to that is revealed in one section in Olduvai Gorge in East Africa (Doronichev 2004).

THE LOWER PALEOLITHIC IN THE SOUTHERN CAUCASUS IN THE LATE EARLY TO EARLY MIDDLE PLEISTOCENE

Until recently, it was believed that a unique Lower Paleolithic location close in age to 'Ubeidiya was the open-air site, Amiranis Gora (or Akhalkalaki), in Southern Georgia (Gabunia 2000). A rich fauna (Akhalkalakian complex) is contemporary with the Tamanian faunal complex from Eastern Europe (1.4–0.8Ma) or bio-zone MN19 (Gabunia et al. 2000b: Figure 13), meaning that it is coincident with the same bio-zone as the fauna from 'Ubeidiya (between 1.4–1.0Ma). The lithic collection from Amiranis Gora (20 pieces) includes cores, retouched and non-retouched flakes, side-scrapers, and a few pebble manuports, and was assigned to the Early Acheulian (Gabunia 2000: 46). New excavation was undertaken at Akhalkalaki by a joint American–Georgian expedition in 1995–1996 and indicated that the age of the site was most likely in the late Matuyama Chron, probably between 980kyr and 780kyr. This excavation, however, did not conclusively demonstrate whether this location is an archaeological site, as no lithic artifacts were found *in situ* in association with the Early Pleistocene fauna. The artifacts reported by Gabunia (2000) were probably redeposited from the surface through ancient and recent rodent borrows filled with sediment and mixed in with the older fauna (Tappen et al. 2002).

A few Middle Acheulian sites in Western Asia are dated to the end of Early – first half of Middle Pleistocene (Bar-Yosef 1998). The best known is Gesher Benot Ya'aqov in Israel (Goren-Inbar 2000) and Latamne in Syria (Bar-Yosef 1998). Despite a small number of lithic industries, a chronological continuation of the Acheulian assemblages from the Lower Acheulian of 'Ubeidiya facies to the Middle Acheulian of Latamne facies can be suggested in the Levant. It was Korobkov (1978: 156–157) who first proposed that this be classified as the "Ubeidiya – Latamna Acheulian Tradition." Certain biface types are characteristic for the Acheulian assemblages of this tradition—elongated lanceolates or ficrons and biface-picks or trihedrals.

In the Southern Caucasus, Middle Acheulian sites are as yet unknown. Here there are no Levantine Middle Acheulian biface types (ficrons or picks) or the associated inventory of core-choppers, polyhedrons, and spheroids. Liubin (1998b: 27) also notes the absence of "the most archaic Levantine Acheulian industries with bifaces, as the industries of 'Ubeidiya, Joub Jannine and Latamne" or "the 'Ubeidiya – Latamne tradition" in the Southern Caucasus. Today in the Southern Caucasus, Lower Paleolithic stratified finds, presumably dating to the first half of Middle Pleistocene (from 800kyr to 350kyr), are known only from the 11 unpublished lithics from Stratum 8a at Kudaro III Cave (Liubin 1998a) and a few artifacts, which can be identified among more than 200 "possibiliths" in Strata VII–IX at Azykh Cave (ibid.: Figure 9–1, 10–2, 3, and 7). However, the age of all these finds is problematic. The Stratum 8a age at Kudaro III is supported by just one TL date 560 ± 112kyr bp, raising doubts for the following reasons:

1. According to the geomorphologic data, the Kudaro I and Kudaro III caves were opened by erosion and, hence, became available for human occupation no earlier than 300–400kyr (Nesmeyanov 1999: Table 21.1, 336);
2. The single TL date may be incorrect, as application of the TL method for dating rock fragments contained in cave deposits is problematic from a methodical point of view. Quartz or feldspar grains used for measurement of the luminescence can originate from much older rocks comprising the cave cavity. The impurity of such more ancient grains sometimes results in significantly older TL results (Schwarcz and Rink 2001: 364);

3. A synthesis by the author of radiometric and bio-stratigraphical data on the chronology of the Lower Paleolithic cave sites in Caucasus (Doronichev 2004) shows a much later age for the Acheulian assemblages in the Kudarian caves, Azykh, and Tsona, compared to Treugol'naya Cave (Table 3).

As for the lithics in Strata VII–X at Azykh Cave, when examining this material (231 pieces) in 2002, the author determined that only five were artifacts—a slightly abraded semi-cortical flake made from non-local red flint and an end-scraper on a brown flint flake in Stratum X; and, an unabraded chopper made on a sandstone slab and two flakes from grey basalt (both unabraded) in Stratum VII. However, there is some doubt about the original positions of these artifacts within the strata, as they may derive from collapsed sediments of the overlying layers (person. comm. of Mansurov, who participated in the excavation at Azykh, 2002). Other stones in Strata VII–X include abraded grey flint pebbles of different sizes (some up to 15–20cm), pebble fragments, and grey flint fragments with rolled edges.

Thus, in the Southern Caucasus there currently are no definitive Lower Paleolithic finds which can be dated confidently to the earlier Middle Pleistocene or earlier, i.e., to the period after the "Dmanisi episode." The only stratified site which can be used to discuss the Paleolithic in Caucasus during this period is Treugol'naya Cave. Based on the stratified assemblages found and excavated recently (Dmanisi and Treugol'naya), and recently published results of dating of the Acheulian layers at the long known cave sites of Kudaro I and Kudaro III, it is possible to draw the following conclusions:

1. Contrary Liubin's proposal, it is not the Acheulian complex but industries without Acheulian bifaces that comprise the main cultural horizon of the Lower Paleolithic in the Caucasus;
2. This non-Acheulian horizon is now documented in the Caucasus from 1.7Ma ago (Pre-Oldowan industry of Dmanisi) up to 350kyr ago (Pre-Mousterian industry of Treugol'naya Cave); and,
3. The earliest stratified Upper Acheulian industries appear by 350–330kyr in the caves of Azykh and Kudaro I (see Table 3).

It is necessary to remember that the Tayacian industries were noted early on in the Caucasus. For example, Liubin (1984) identified three groups of Lower Paleolithic industries in the Caucasus: a) "true Acheulian" assemblages with many bifaces; b) assemblages of the Acheulian of "Proto-Charentian appearance" with rare bifaces; and, c) Clactonian or Tayacian assemblages without bifaces. However, the Tayacian Complex was identified on the basis of only surface and mixed materials (the first being the Yashtukh location near Sukhumi, Abkhazia). On the other hand, the Acheulian complex was recovered not only in these types of situations, including typologically expressive obsidian lithic collections from the Little Caucasus, but also from stratified contexts in the caves of Kudaro I, Kudaro III, Tsona, and Azykh. Analysis of stratified Acheulian industries (from the oldest to the latest) in the Caucasus is presented below.

THE UPPER ACHEULIAN IN THE SOUTHERN CAUCASUS (350,000–200,000KY)

THE UPPER ACHEULIAN IN WESTERN ASIA AND THE FIRST ACHEULIAN INDUSTRIES IN THE CAUCASUS

Today about 170 Acheulian locations and stratified sites are known in the Levant (Bar-Yosef 1998), and the overwhelming majority of them date to the second half of the Middle Pleistocene. The Levantine Upper Acheulian essentially differs from the Lower and Middle Acheulian assemblages in the following features (ibid.):

1. predominance of flint or silicified raw materials;
2. a change in biface typology, with a prevalence of classical Acheulian biface types of pointed (lanceolate or triangular), rounded (oval or discoid), or cordiform (amygdaloid or cordiform) shapes, and an absence of picks and ficrons characteristic of the Lower or Middle Acheulian;
3. a more careful finishing of bifaces with an increasing role of soft hammer technique and reduction of biface sizes in the latest assemblages;
4. rarity of choppers, polyhedrons and spheroids; and,
5. the first appearance and further development of the Levallois technique.

Thus, a break in cultural continuity probably occurs between the Lower – Middle Acheulian ('Ubeidiya – Latamna Tradition and Gesher Benot Ya'aqov) and the Upper Acheulian in Levant.

The Levantine Upper Acheulian assemblages are characterized by significant typological variability that is especially clear in the biface typology. In Israel, the Upper Acheulian is divided into several industry groups or types (Bar-Yosef 1998; Gilead 1970). The earlier Upper Acheulian groups (Ma'ayan Barukh Group and Sahel el-Khoussin-Yiron Group) are characterized by the prevalence of cordiform-shaped (amygdaloid, cordiform, and sub-triangular) or rounded (oval or discoid) bifaces, then lanceolate or triangular bifaces, and biface-cleavers; thee is insignificant use of Levallois technique (IL usually does not exceed 12%). The later groups (Evron-Kissufim Group and Acheulo-Yabrudian) are characterized by a combination of rounded and triangular-shaped bifaces and usually more significant use of Levallois technique. Acheulo-Yabrudian (or Yabrudian) assemblages also are characterized by significant numbers of *Quina* type side-scrapers. Yabrudian is considered to be a specific cultural phenomenon within the end of Lower Paleolithic (from 400 to 250–200kyr) in the Levant. Bar-Yosef (1998: 268) assumed the Yabrudian appeared in the territory of Israel and then spread from there to Lebanon and Syria. A unique Acheulo-Yabrudian assemblage in the Caucasus seems to be the Tsopi open-air site in Southern Georgia (Golovanova and Doronichev 2003).

TABLE 3. PROPOSED CHRONOLOGY OF THE LOWER PALEOLITHIC STRATIFIED ASSEMBLAGES IN THE CAUCASUS BASED ON ABSOLUTE DATES AND LARGE MAMMAL SPECIES. SOURCES OF DATA: BARYSHNIKOV 1993, 1999; DORONICHEV ET AL. 2004; HOFFECKER ET AL. 2003; LIUBIN 1998A; LIUBIN AND BELIAEVA 2004A. AGE OF OIS STAGES AFTER AITKEN AND STOKES (1997).

OIS Stages	Age of OIS Stages (Kyr)	Lower Paleolithic Cave Sites			Chronometric Data in kyr ago	Large Mammals								
		Total Lithics	Lithic Industries	Total Acheulian Bifaces		Wolf *Canis*	Cave bear *Spelaearctos*	Mediterranean bear *Selenarctos mediterraneus*	Brown bear *Ursus arctos*	Rhinoceros *Stephanorhinus*		Roe deer *Capreolus capreolus*	Red deer *Cervus elaphus*	Bison *Bison priscus*
7	190	105	**Tsona**	>15?		*C. lupus*	*S. spelaeus*		*U. arctos*			*C. capreolus*	*C. elaphus*	*B. priscus*
		238	**Kudaro I, Lenses X**	5	172 ± 35 (RTL)									
		35	**Kudaro III, Layer 5**	1	245 ± 49; 252 ± 51 (RTL)	*C. lupus*	*S. deningeri ?*	*S. mediterraneus*				*C. capreolus*	*C. elaphus*	*Bison sp.*
		18	**Kudaro III, Layer 6**	0		*C. lupus*	*S. deningeri praekudarensis*	*S. mediterraneus*				*C. capreolus*	*C. elaphus*	
		7	**Kudaro III, Layer 7**	0		*C. lupus*	*S. deningeri praekudarensis*					*C. capreolus*	*C. elaphus*	*Bison sp.*
		20	**Kudaro III, Layer 8**	0		*C. lupus*	*S. deningeri praekudarensis*					*C. capreolus*	*C. elaphus*	*Bison sp.*
	244	11	**Kudaro III, Layer 8a**	0	560 ± 112 (RTL)	*C. lupus*	*S. deningeri praekudarensis*					*C. capreolus*	*C. elaphus*	
8	244–301	289	**Azykh, Layer V**	7		*C. lupus*	*S. spelaeus ?*	*S. mediterraneus*			*S. mercki*	*C. capreolus*		
	301	~ 3,800	**Kudaro I, Layers 5a –5b**	13	322 ± 65; 350 ± 70 (RTL)	*C. lupus*	*S. deningeri praekudarensis*		*U. arctos*	*Stephanorhinus sp.*		*C. capreolus*	*C. elaphus binagadensis ?*	*Bison sp.*
		684	**Kudaro I, Layer 5c**	2	360 ± 90 (RTL); > 250-300 (T/U)	*C. mosbachensis*	*S. deningeri praekudarensis*	*S. mediterraneus*		*S. hundsheimensis*		*Capreolus sp.*	*C. elaphus (cf. acoronatus)*	*Bison sp.*
	334	188	**Kudaro I, Layers 5d –f**	0										
10		1,890	**Azykh, Layer VI**	1			*S. spelaeus ?*		*U. aff. arctos* Stenon horses *Equus* *E. suessenbornensis ?*	*S. hundsheimensis*	*S. mercki*		*C. elaphus*	*B. schoetensacki*
11	364		**Treugol'naya, Layer 4a**			*C. mosbachensis*	*S. deningeri (cf. deningeri)*					*cf. C. suessenbornensis*	*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
		280	**Treugol'naya, Layer 4b**	0	366 ± 12 (ESR enamel)	*C. mosbachensis*	*S. deningeri (cf. deningeri)*					*cf. C. suessenbornensis*	*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
			Treugol'naya, Layer 4c		375 ± 9 (ESR enamel)		*S. deningeri (cf. deningeri)*						*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
		70	**Treugol'naya, Layer 4d**	0		*C. mosbachensis*	*S. deningeri (cf. deningeri)*					*cf. C. suessenbornensis*	*C. elaphus (cf. acoronatus)*	
			Treugol'naya, Layer 5a		418 ± 10 (ESR enamel)				*E. altidens*					
	427	27	**Treugol'naya, Layer 5b**	0	406 ± 15 (ESR enamel) 365 ± 28; 420 ± 39 (ESR molluscs)	*C. mosbachensis*	*S. deningeri (cf. deningeri)*	*S. mediterraneus*		*S. hundsheimensis*			*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
12	427–474		**Treugol'naya, Layer 5c**			*C. mosbachensis*	*S. deningeri (cf. deningeri)*			*S. hundsheimensis*		*cf. C. suessenbornensis*	*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
13	474–528		**Treugol'naya, Layer 6**		504 ± 24 (ESR enamel)		*S. deningeri (cf. deningeri)*		*E. altidens*	*S. hundsheimensis*		*cf. C. suessenbornensis*	*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
15	568	18	**Treugol'naya, Layer 7a**	0	583±25 (ESR molluscs - 6 dates)	*C. mosbachensis*	*S. deningeri (cf. deningeri)*						*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*
	621		**Treugol'naya, Layer 7b**			*C. mosbachensis*	*S. deningeri (cf. deningeri)*			*S. hundsheimensis*			*C. elaphus (cf. acoronatus)*	*B. priscus-schoetensacki*

Bar-Yosef (1995) also proposed presumably synchronous Acheulo-Yabrudian and, typologically distinct from it, Upper Acheulian assemblages in the Southern Levant, East Turkey and the Southern Caucasus (at Kudaro I).

According to Liubin (1998a: 172), "The Caucasus (principally the Transcaucasus) is a distribution area of the Acheulian *sensu strictu*, meaning the Acheulian industries with bifaces." Indeed, the Caucasian Lower Paleolithic stratified assemblages (all in caves) contain various numbers of bifacial tools. Among them, Liubin identifies Acheulian bifaces and cleavers, and defines these assemblages as the Acheulian. At the same time, Liubin (ibid.) notes that "bifaces of classical types (lanceolate, Micoquian, cordiform, amygdaloid, oval, etc.) with correct linear outlines, manufactured using continuous bifacial retouch, and biconvex in cross section are not numerous here" while predominant types are "bifaces of no classical type"—partial, backed, various, and "transitional to side-scrapers with bifacial retouch." For example, "in the Kudarian Acheulian industries, it is possible to recognize as "classical" bifaces only 6–7 of 63 handaxes recovered here" (Liubin and Beliaeva 2004a: 29). The other bifaces include a wide spectrum of tool types—core-like bifaces, bifacial tools reworked from cores, bifacial side-scrapers, side-scrapers with thinned backs, etc. All these biface variations are not diagnostic forms of the Acheulian techno-complex.

The Acheulian Assemblage from Layer VI at Azykh Cave

Based on the faunal data, only Layer VI in Azykh and Layer 5b in Kudaro I can be compared in age with the top Middle Pleistocene layers at Treugol'naya. This is because these three specific contexts contain diagnostic species of the late Tiraspolian faunal complex of the earlier Middle Pleistocene—according to the latest data (Baryshnikov 2002), this fauna is defined as the early Singilian—such as Mosbahian wolf (*Canis mosbachensis*), small rhinoceros *Stephanorhinus hundsheimensis*, red deer similar to *Cervus elaphus cf. acoronatus*, and steppe bison similar to *Bison schoetensacki* (see Table 3). Faunal data suggest that Layer VI in Azykh, rather than Layer 5b in Kudaro I, is chronologically closer to Treugol'naya. Stenon horses, well-represented in the Early Pleistocene faunas at Dmanisi and Amiranis-Gora, are found also in the Lower Paleolithic Caucasus sites—in Layer VI at Azykh and at Treugol'naya Cave. Typical for the Early Pleistocene Gallerian fauna is small horse, *Equus altidens*—found at Treugol'naya and Dmanisi (Hoffecker et al. 2003)—and *Equus suessenbornensis*, in Layer VI at Azykh Cave (Velichko et al. 1980), and comprising 76.5% of the fauna at Amiranis-Gora (Gabunia 2000).

The palynological data (Zelikson and Gubonina 1985) documents a significant climatic cooling and lowering of flora belts by 800–1000m during the formation of Layer VI in Azykh. In the vicinity of the cave, conditions of forest and sub-alpine border zones existed. Today the cave is located at only 800masl. In the past, its elevation was probably even lower. These data together with the bio-stratigraphical (faunal) evidence indicate that Layer VI at Azykh was formed during a cold (glacial) period, apparently, during cold OIS 10 (330–360kyr). Hence, chronologically, this layer appears to be a little younger than the top Middle Pleistocene Layers 4a–c at Treugol'naya Cave, which date to the end of OIS 11 (see Table 3).

Liubin (1998a) provided the most complete typological description of the industry from Layer VI at Azykh Cave. Among 1,890 stone artifacts from Layer VI, Liubin identified 1,116 flakes (including 136 blades and several Levallois flakes), 427 tools, and only 9 cores. Indices of blades (12.1%), and plain (54.5%), dihedral (31%), and faceted (14%) platforms are provided. Among flake tools, side-scrapers (207 pieces) are the most numerous and variable, especially simple scrapers (97), then double (33), transversal (21), angular single (20) or double (6), ventral (15), and convergent (13) scrapers; other side-scraper types are rare. Besides side-scrapers, 18 denticulates and 44 "cutting tools with denticulate edges," 24 end-scrapers, 15 notches, 7 massive denticulate Tayacian points, 5 massive points similar to "*pointe surelevée*," 6 limaces, and 4 awls are noted. When examining this industry in 2002, the author also identified a few side-scrapers with thinned back and *Quinson* points.

Macro-tools are not numerous (31 pieces). Choppers (16), chopping-tools (5), and atypical cleaver-like tools (3) are made mainly on flat pebbles. Liubin and Beliaeva (ibid.: 252) identified 13 "core-like scrapers" (Figure 13: 2, 4), which can be defined as rabots (type 56 in Bordes' type-list). End-scrapers of rabot type are rare in the Lower or Middle Paleolithic in Europe (Debénath and Dibble 1994: 115). They are characteristic, however, of the Upper Acheulian at Kudaro I (see below). Liubin (1998a: 33) also noted an original rostro-carinated form—a uniface made on a split slate slab (see Figure 13: 1), which has a cordiform outline and lateral flaking reminiscent of partial cordiform bifaces from Kudaro I. Besides these macro-tools, the author's examination of this assemblage noted a bifacial knife of tsaldi type (fragmented at the base).

Among the eight handaxes and eight small handaxes identified by Liubin, there are no typical Acheulian bifaces with symmetrical outlines. Almost all "handaxes" are made on flat pebbles by rough partial flaking of their surfaces and without form enhancement using fine flaking or retouching. Therefore, their descriptions include adjectives such as "rough," "archaic," and "primitive" (Liubin and Beliaeva 2004a: 251). No well-made Acheulian handaxe is present in this industry. Only the largest example, defined by Liubin as amygdaloid biface, could be assigned to Acheulian bifaces, although this tool is just partially worked by large removals and has modifying retouching only along one lateral (see Figure 13: 5). Probably some bifaces, defined by Liubin in Layer VI, are cores. It should be noted that, in this layer, Liubin identified only 9 cores for 1,116 flakes—a ratio atypical for the Lower Paleolithic. The author believes that some exhausted cores were reworked into tools and, hence, would be defined as core-like bifaces (see Debénath and Dibble 1994: 168). An example of a core-like biface is the one broken during the excavation and described by Liubin (1998a:33) as "the most perfect handaxe" in the collection

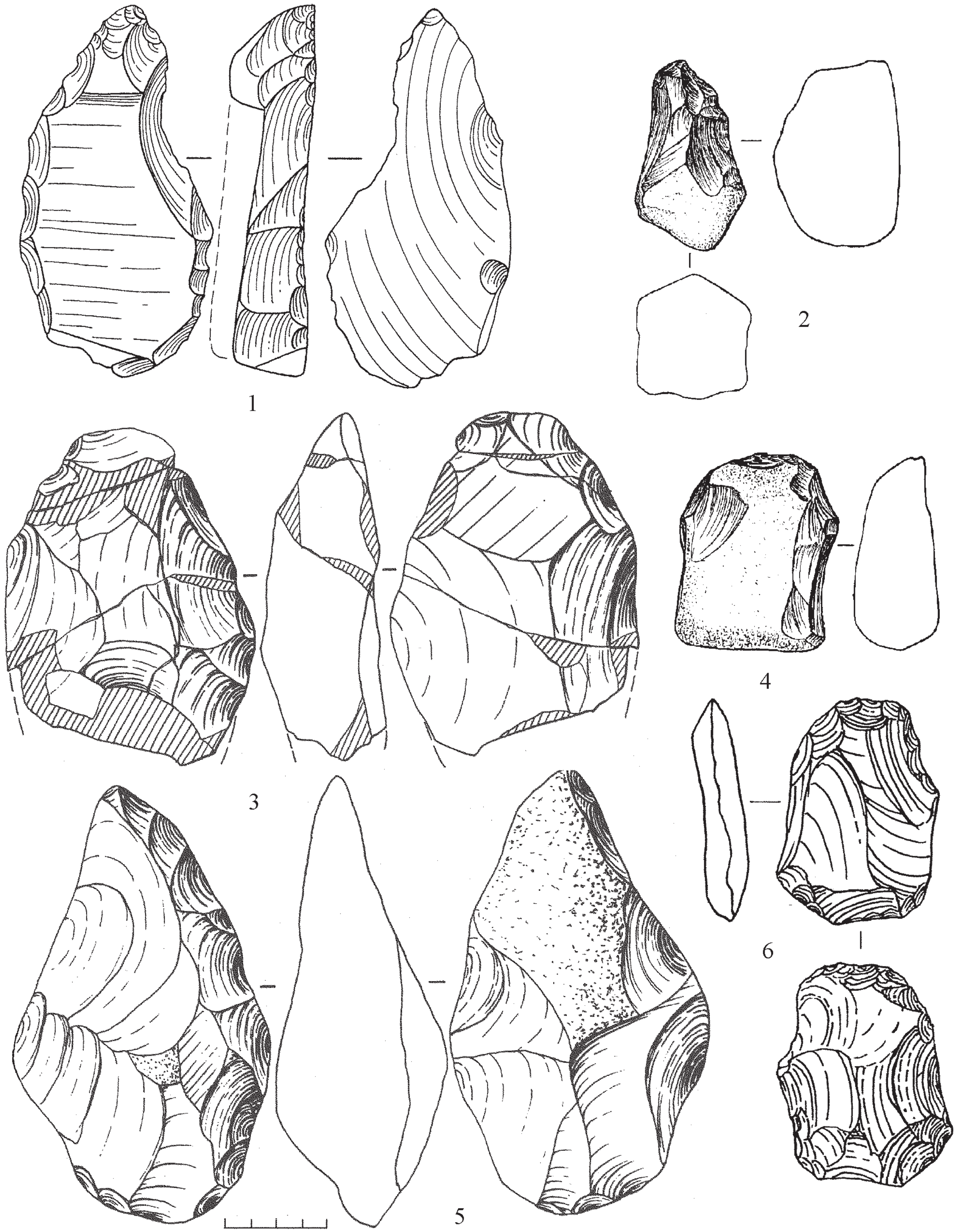


Figure 13. Azykh Cave, layer VI: 1: elongated cordiform uniface; 2, 4: core-like end-scrapers or rabots; 3, 6: core-like bifaces; 5: amygdaloidal partial biface. Source of data: Liubin (1998a); Liubin and Beliaeva (2004a).

(see Figure 13: 3).

A series of "small handaxes" are represented by "partial and atypical" small bifaces "made from slate or sandstone flakes or residual cores" and their "retouch has, as a rule, only a lateral character" (Liubin and Beliaeva 2004a: 252). They also noted (ibid.) "a series of similar small, as a rule, atypical bifaces, made on similar raw material, in the Acheulian inventory at Kudaro I and Tsona Cave." Obviously, at all the sites, this biface group incorporates different tool types, including core-like bifaces (see Figure 13: 6) or bifacial side-scrapers.

Thus, while the industry of Layer VI at Azykh Cave does not have standardized forms of Acheulian bifaces, this assemblage does show techno-typological features that do not occur in this combination anywhere, except for the Acheulian materials at Kudaro I. These features are:

1. advanced flake technique basing on parallel flaking (about 12% of all flakes are laminar flakes; 14% of striking platforms are prepared, but finely faceted platforms are few);
2. simple side-scrapers dominate the tool kit, and many of them have natural backs;
3. a group of convergent tools, including angular and convergent scrapers, denticulate Tayacian points, *Quinson* points, massive points of "*pointe surelevée*" type, and proto-limaces, are well-represented;
4. among macro-tools, besides choppers, there are *rabots*;
5. Acheulian bifaces are rare and characterized by a combination of massive amygdaloid bifaces made on pebbles or boulders (at Azykh, one roughly flaked partial amygdaloid biface) and flat partly bifacial sub-cordiform bifaces (at Azykh, a uniface) made on flakes; and,
6. in this collection, the author noted a fragmented bifacial knife of tsaldi type—a type known only at Kudaro I and Tsona in the Caucasus.

In summary, it is necessary to note that Layer VI at Azykh Cave not only represents the oldest Upper Acheulian stratified assemblage in the Caucasus, but also shows the main diagnostic features of that cultural phenomenon, which Liubin (1984) identified as a Proto-Charentian variant of Acheulian. Now, after a reappraisal of the Proto-Charentian aspect of the Acheulian from cave sites in the Southern Caucasus, this variant should be redefined as a Kudarian variant of the Upper Acheulian or as the Kudarian. This definition is similar to how, in the Levant, a site name Yabrud was used as the label for the Yabrudian variant of the Upper Acheulian or Yabrudian. Further development of the Kudarian variant can be observed at the eponym site of Kudaro I Cave.

Chronology of the Acheulian Assemblages at Kudaro I and Kudaro III

The faunal data indicate the later age of the Lower Paleolithic layers at the caves of Kudaro I and Kudaro III compared to Layer VI at Azykh. Stratigraphically, the earliest strata of the Kudarian caves are the lowest layers 5c–5f at Kudaro I. Of these, only Layer 5c has faunal remains. In this layer, Mosbahian wolf (earlier defined as *Canis cf. etruscus*), rhinoceros *Stephanorhinus hundsheimensis* (earlier defined as *Dicerorhinus etruscus brachycephalus*) and red deer similar to *C. elaphus acoronatus* were found. These species were not identified in any other layer at the Kudarian caves, as was the case at the nearby Tsona Cave. At all of these sites, the later Kvaisa faunal complex, identified by Baryshnikov (2002) as an analogue of the later Middle Pleistocene Khazarian fauna, is present. It includes mostly living forms of those species represented by their fossil forms at Treugol'naya Cave (see Table 3).

According to the pollen data, Acheulian layers at Kudaro I formed during a long interglacial period. Based on three radio–thermoluminiscent (RTL) and a Th/U date, this period appears to correspond to the warm OIS 9 (see Table 3). In Layers 5b–5c, conditions of a warm and dry (Layer 5c and the upper part of Layer 5b) interglaciation with a very warm and humid optimum (Layer 5b) and domination of arid forest-steppe (Layer 5c and top of Layer 5b) or humid forested (Layer 5b) landscapes were identified. Wooded areas, which have no analogies in modern forests in the Caucasus, were represented by mixed coniferous and broad leaf forests with a prevalence of pine and various deciduous trees including many arboreal exotics (Liubin 1998a: 52–56, Table 1; Pospelova et al. 2001). Today the Kudaro I Cave is located 800 m above Azykh Cave, while in the Lower Paleolithic the altitude of Kudaro I was some 1200–1350 m.a.s.l. (Nesmeyanov 1999). During the accumulation of the lower part of Acheulian Layer 5a at Kudaro I, climate deterioration (conditions of a sub-alpine belt under cold and humid climate) is noted, while in mid-Layer 5a, a moderate warming is expressed by conditions of middle and high-mountain coniferous woods (Liubin 1998a: Table 1). The age of the Acheulian layers at Kudaro I as within OIS 9 agrees with the geomorphologic data. These indicate that the cave was opened by erosion and became accessible to human occupation presumably by 300–250kyr ago (Nesmeyanov 1999: 336).

At Kudaro III Cave, the pollen spectrum reflects mostly warm climatic conditions with domination of forest-steppe landscapes in Lower Paleolithic Layers 6–8a. The cooling intervals, identified during this warm phase, were either moderate (in Layer 8), or their paleogeographical reconstructions were impossible (in Layer 8a) because of the rarity of pollen grains (Liubin 1998a: 81–83). Assumptions about the pollen data synchronization of the top Acheulian Layer 5a at Kudaro I with Layer 5 at Kudaro III (ibid.: 83) are based only on the similarity of the pollen spectra, but are not supported by other data. According to Nesmeyanov (1999: 336), the opening (by erosion) of Kudaro III occurred by 200kyr ago, i.e., approximately 50–100 thousand years later than Kudaro I. Thus, if correlation of the Acheulian layers at Kudaro I with OIS 9 (330–300kyr) seems to be the most probable from faunal, geomorphologic, and palynological data, as well as absolute dates, the same data (see Table 3) allow one to correlate the Acheulian layers at Kudaro III with the younger OIS 7 (250–200kyr). Probably only the uppermost Middle Pleistocene strata at Kudaro I (erosional lenses X and Z cut into Layer 5a) are correlated with OIS 7. This age definition is supported by an RTL date of 172±35kyr bp, obtained for the eroded top of the Acheulian strata at Kudaro I (Liubin and Beliaeva 2004a: 265).

The Lower Paleolithic material at Kudaro III is not very numerous. Only 91 lithics were found from Layers 5–8a—Layer 5 had 35, Layer 6 had 18, Layer 7 had seven, Layer 8 had 20, and Layer 8a had 11. The lithics are represented mainly by flakes and fragments. Tools number no more than 13 pieces, mostly found in the top of Layer 5. Certainly, this collection is insufficient for industrial diagnostics. The only diagnostic form is found in Layer 5, a large (19.3cm x 8.1cm) lageniform biface (Liubin 1998a: Figure 43-6)—a type known at Kudaro I in the uppermost Acheulian assemblage from lenses $X_{1–3}$ only (see below in Figure 19: 2, 3).

At Kudaro I, the Lower Paleolithic deposits are 1–2.5m in depth, and were excavated in an area of about 98m^2. The excavation area was divided into four parts—the eastern and southern entrance galleries, a dark internal gallery, and the central chamber, into which all three galleries enter. The Lower Paleolithic deposits are subdivided into strata (from top to down) as follows: erosional lenses X1–3 and R1–3 were excavated only in the dark gallery; Layers 5a, 5b, and 5c were excavated in all parts of the cave; Layers 5d, 5e, and 5f were excavated within a limited area only in the southern gallery. Some 5,732 lithics were found in total in all these layers (Liubin and Beliaeva 2004a: 211).

Because the excavations in the cave were carried out since 1955, various methodical strategies were used over the years. The largest collection (2,268 lithics or about 40% of all finds) is from the excavation of the central chamber in 1955, 1959, and 1961. Methods used were substandard compared to modern excavations. The Lower Paleolithic sediments were dug in arbitrary horizons of 10–15cm each. The same technique of arbitrary horizons was typical of the 1955–1956 excavations in the southern gallery, where 585 lithics were found, and during 1957–1958 excavations in the eastern gallery, where 983 lithics were found (ibid.: 41, 83, 164, 211). The Lower Paleolithic collections from the central chamber, eastern gallery, and 1955–1956 excavations in the southern gallery therefore have no level-by-level designation. All together, 3,836 stone artifacts or 67% of all lithics found in the cave were recovered from these early excavation seasons. If this material is augmented by the 179 artifacts which came from the collapsed sediments of the excavation in the dark gallery (ibid.: 121), then artifacts without level-by-level designations make up 70% of all the Lower Paleolithic artifacts from Kudaro I. Certainly, one can say that the application of modern methodical approaches with a priority on level-by-level analysis of the archaeological material is limited. However, such an approach is feasible for the remaining 30% of the finds and, with certain caveats, can be accomplished for most of the collections that were not divided into layers. A level-by-level analysis of the Lower Paleolithic at Kudaro I is justified because this is the only methodically correct approach. Besides, it has the potential to reveal some tendencies in the development of the Kudarian Acheulian variant.

Layers 5d–5f (Assemblage V) at Kudaro I Cave

At Kudaro I, the oldest Lower Paleolithic in Layers 5d–5f was investigated only in the 1986–1987 excavations in the southern gallery. Lithics are distributed in the layers as follows: Layers 5d–e has 90 and Layer 5f has 98. Taking into account the localized distribution of these layers and the small number of finds in each level, these artifacts can be seen as a separate assemblage, especially because the excavators consider that the finds from Layers 5d–-5f are all together "the lower bed of Layer 5" (ibid.: 167–169).

The archaeological assemblage from "the lower bed of Layer 5" thus numbers 188 lithics in total. They are made only from rocks occurring in the vicinity of the cave—sandstone, slate, alevrolite, and local flint (ibid.: Table 15). The assemblage includes 10 cores and core-like pieces (including four one-platform, a double platform, a sub-discoid, and a *globuleaux* type), 99 flakes and flake fragments, 26 small (<2.5 cm) flakes or chips, and 53 tools. According to the excavators (ibid.: Table 17), the tool set includes 2 choppers, 2 pebble scrapers, 5 small handaxes, a leaf-like tool, 15 side-scrapers (of which 10 are simple scrapers), 5 end-scrapers, 5 notches, 5 denticulates, 2 becs, and 9 composite tools. The reference to artifact descriptions and illustrations, provided by Liubin and Beliaeva (ibid.: 178–180, Figures 115–117), allows one to conclude that all reported "handaxes" and a "leaf-like tool" are actually rather residual cores without modifying secondary retouch; true Acheulian bifaces are absent.

Thus, the lithic assemblage from Layers 5d–5f at Kudaro I is characterized by flake technique, a set of flake tools, rare macro-tools (pebble scrapers [ibid.: Figures 115-8, 9; 116-2]), and an absence of Acheulian handaxes. Among flake tools, alongside simple side-scrapers, end-scrapers, and notched and denticulate tools, one can note a type characteristic for the Kudarian Acheulian—a simple side-scraper with the ends thinned with flat ventral retouch (Figure 14: 1). Based on the absence of Acheulian handaxes, the earliest industry at Kudaro I may be formally called the Pre-Mousterian. However, taking into account the small number of tools (only 51 tools in all of Layers 5d–5f compared to more than 200 tools in all layers at Treugol'naya Cave or about 430 tools in Layer VI at Azykh), one can hypothesize that the absence of Acheulian bifaces or other characteristic Kudarian Acheulian tool types (except for a side-scraper with thinned ends) is explained simply by the small number of artifacts.

Layer 5C (Assemblage IV) at Kudaro I

The next Lower Paleolithic assemblage at Kudaro I is represented by finds from Layer 5c. These include 225 artifacts, found in the 1986–1987 excavations in the southern gallery, and 459 artifacts from the 1978–1984 excavations in the dark gallery. In the dark gallery, excavators labelled Layer 5c as "the fourth Acheulian level" (ibid.: 122, 131, 165). Fol-

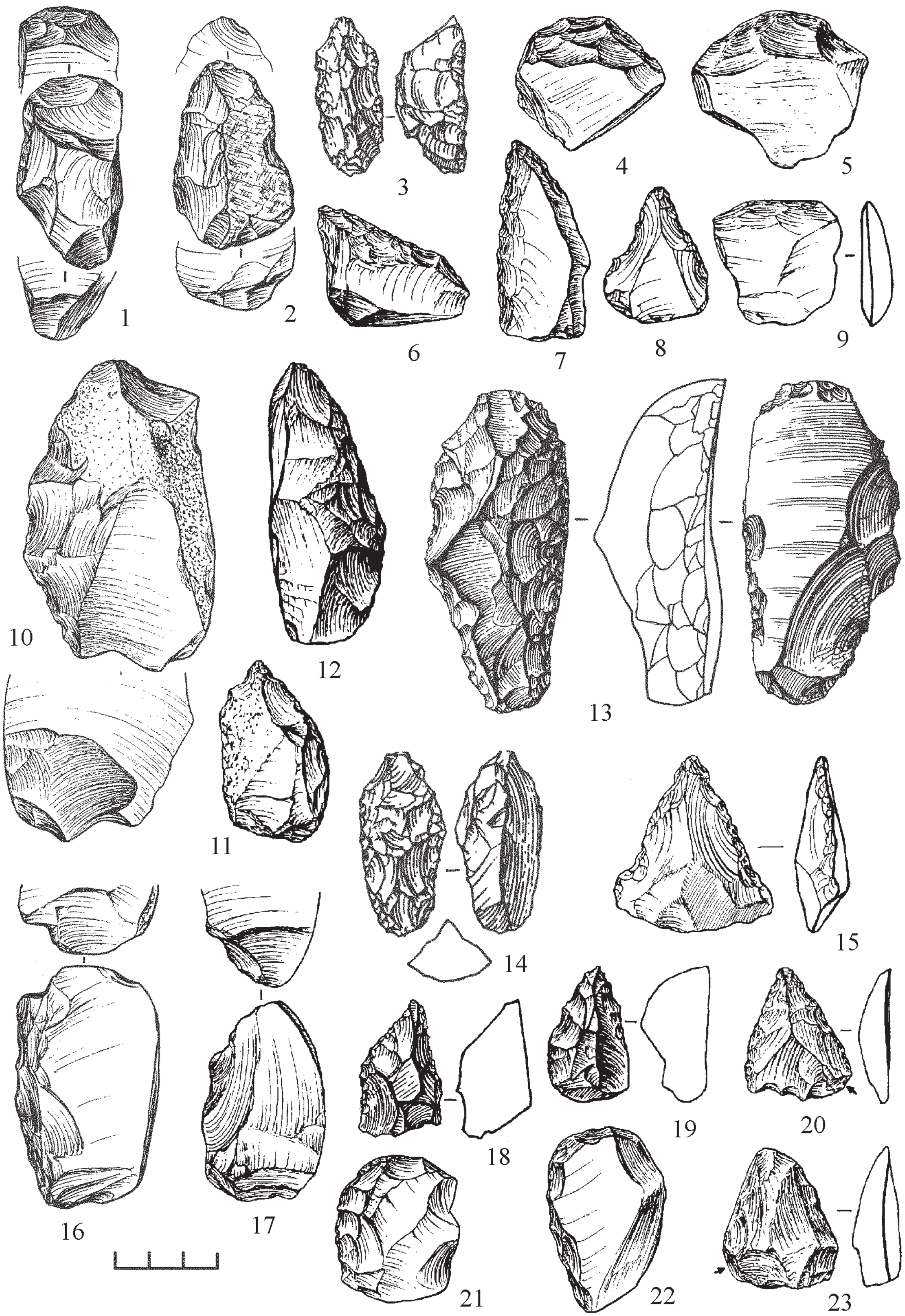


Figure 14. Kudaro I Cave: 1, 2, 10, 16, 17: simple side-scrapers with bases thinned with flat ventral retouch; 3: limace; 4, 5, 9, 21, 22: end-scrapers; 6, 7, 20, 23: angled side-scrapers; 8: Tayacian point; 11, 12: simple side-scrapers with deep modifying retouch; 13: Quina side-scrapers with back thinned with flat ventral retouch; 14: Quinson point; 15: convergent side-scraper; 18, 19: massive points. 1: Assemblage V; 2–9: Assemblage IV; 10–23: Main Assemblage III. Source of data: Liubin and Beliaeva (2004a).

lowing this nomenclature, one can refer to total collection from Layer 5c from both the galleries as Assemblage IV. If so, then it is logical to label the total collection from the underlying Layers 5d–5f as Assemblage V.

Assemblage IV totals 684 artifacts. They are made mostly from local rocks—various slates or sandstones, and then local flints. Imported rocks (more than 15 lithics from non-local flint, eight andesite, and one obsidian piece) are represented by flakes and tools only, while cores from non-local rocks are absent. Assemblage IV includes (ibid.: Tables 9, 15) 22 cores and core-like pieces, 441 flakes and flake fragments, 51 small (<2.5cm) flakes or chips, 17 sandstone pebble manuports, and 171 tools. Liubin and Beliaeva (ibid.: 131–133, 176–178) defined the following tool types:

- Macro-tools made from pebbles or fragments include three chopping-tools (ibid.: Figure 82-1), three choppers (ibid.: Figure 82-2, 112-4), a proto-handaxe (Figure 15: 1), four core-like scrapers—*rabots*—and eight hammer stones.
- Among the four handaxes, five small handaxes, and three leaf-like tools, identified by the excavators (ibid.), are two roughly flaked tool fragments and a small (10.2 x 6.6cm) sub-cordiform biface with a tip broken in antiquity. It is made on a flake and has partial ventral retouch along the contour and a base retouched from the dorsal face. Another Acheulian handaxe with a broken end has an atypical morphology noted by the excavators—a sub-rectangular shape, parallelogram-like cross-section, and bifacial flaking with fine and larger scars (see Figure 15: 5). So called "small handaxes" and "leaf-like forms" (ibid.: Figure 84-6) are made on flakes by partial bifacial flaking. As in the previous assemblage (V), these tools are formal bifaces because of the bifacial flaking, but they are not Acheulian handaxes (see Figure 15: 2–4, 6). To the contrary, they may be identified rather as bifacial side-scrapers or core-like bifaces.
- Among the 57 side-scrapers, simple side-scrapers (35)—often having massive natural backs (ibid.: Figure 84-7)—are common. There are also serial transversal, double, convergent (ibid.: Figure 84-5, 8), and angular side-scrapers (see Figure 14–6, 7). There are also a few side-scrapers with ends thinned by flat ventral retouch (see Figure 14: 2) and a typical *limace* (see Figure 14: 3).
- Other flake tools include 17 end-scrapers (see Figure 14: 4, 5), 8 "chisel-like tools" or "flat end-scrapers" (ibid.: 133)(see Figure 14: 9), 19 bec-like tools, one of which may be identified as a Tayacian point (see Figure 14: 8), 19 notches, 8 denticulates, and 20 composite tools.

Thus, from the techno-typological parameters, Assemblage IV at Kudaro I is similar to the industry of Layer VI at Azykh. Like the latter, Assemblage IV is characterized by the following features:

1. Advanced flake technique based on parallel flaking (in Layer 5c in the dark gallery, about 54% of flakes have negatives of parallel or sub-parallel flaking from one-platform and 10-17% of the platforms are facetted);
2. Among the tools, simple side-scrapers prevail, and many of them have natural backs, as well as the fact that there are a few side-scrapers with ends thinned by flat ventral retouch;
3. A group of convergent tools that includes angular and convergent side-scrapers, a denticulate Tayacian point, and a limace;
4. Among macro-tools, along, with choppers, there are serial core-like scrapers or *rabots*;
5. Acheulian bifaces are few, roughly flaked, and characterized by a combination of two types—a massive amygdaloid biface made on a boulder and a flat partial sub-cordiform biface made on a flake.

Layers 5a–5b (the main Acheulian Assemblage III) at Kudaro I

The assemblage from layers 5a–5b has special significance for the characteristics of the Kudarian Acheulian at Kudaro I, as it is possible to treat this assemblage as the main portion of the Lower Paleolithic material rather than breaking it into level-by-level assemblages. Inevitable errors in the attribution of some artifacts thus are less important compared to the opportunity to give an exhaustive description—based on a really large lithic collection—of the Kudarian Acheulian at Kudaro I. Moreover, this approach allows one to make a comparative analysis of the two most representative assemblages of the Kudarian Acheulian—the earlier one (presumably dated to OIS 10) from Layer VI at Azykh Cave and the later one (dated to OIS 9) from Layers 5a–5b at Kudaro I.

Lithic finds from Layers 5a and 5b have not been sub-divided per each level in any of the excavation areas at Kudaro I. In the dark gallery, this industry was identified as "the third Acheulian level" (ibid.: 128), so it can be designated as Assemblage III. It includes 983 lithics from the eastern gallery where "the main bulk of finds was excavated in the top of the Acheulian layer" (Levels 5a and 5b in that area), while in the lowermost horizons (apparently, Level 5c) the finds were rare (ibid.: 41–42). The same Acheulian Layers 5a–5c were excavated in the central chamber where, in the most dense excavation area near the western wall, "Acheulian layers lose their individual attributes … become an undifferentiated thickness of cemented loams" (ibid.: 83). This lithic collection from the central chamber numbers 2,268 artifacts. In the dark gallery, 435 lithics were recovered from Layers 5a–5b, and 120 more lithics were found in the layers in the southern gallery (ibid.: 122, 128, 165). Thus, about 3,800 artifacts can be attributed to Layers 5a and 5b in total. This is approximately 65% of all the Lower Paleolithic finds at Kudaro I. Thus, this lithic industry can be called the main Acheulian assemblage at Kudaro I Cave.

The main Acheulian assemblage includes about 130 cores and core-like pieces, more than 2,500 flakes and flake fragments (including flake tools), about 650 small (<2.5cm)

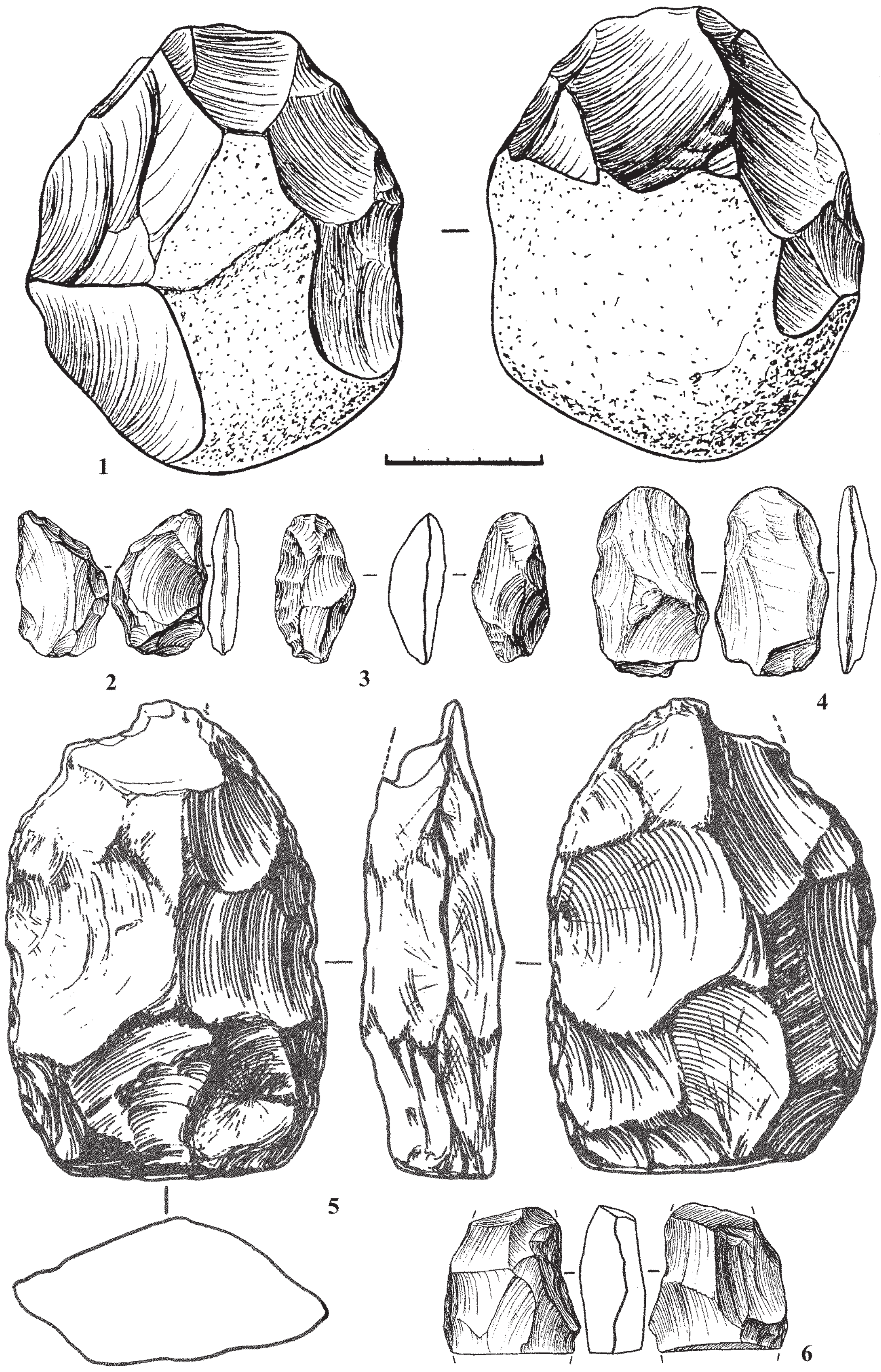


Figure 15. Kudaro I Cave, Layer 5C (Assemblage IV): 1: proto-biface; 2–4: bifacial side-scrapers; 5: amygdaloidal biface with broken tip; 6: core-like biface. Source of data: Liubin and Beliaeva (2004a).

flakes or chips, 45 pebble manuports and pebble retouchers–hammers, and about 850 tools (ibid.: 42, 47, 84, 88, 95, 122, 128, 131, 167, 175, 176). The industry is based on local poor quality raw-materials—mostly various slate, then sandstone, alevrolite, and poor quality flint or chert. The exploitation of transported high quality raw materials (obsidians, andesite, and colored flints was minimal—mostly for tool production, while cores from these non-local rocks are very rare.

Among the cores, there are one-platform cores with proto-prismatic flaking surfaces (ibid.: Figures 42, 43-5), double-platform (ibid.: Figure 17-3), multiplatform unifacial (ibid.: Figure 43-4) or bifacial (ibid.: Figure 65-1), and multiplatform orthogonal (ibid.: Figure 18-2) cores. A large group of core-like pieces includes pebbles or fragments with few flake scars, as well as small, heavy reduced and shapeless residual cores (ibid.: Figures 18-1, 43-1–3). The prevalence of unidirectional parallel flaking is documented better on the dorsal surfaces of flakes. Unidirectional parallel scars are observed on more than 50% of flakes, bidirectional crossed scars are 15–25%, bidirectional alternative scars are 15–20%, and three- or four-directional scars are rare at 3–8%. Among complete flakes, laminar flakes comprise from 5% to 14% depending on raw material type. However, real blades with parallel or sub-parallel laterals are few and Levallois blanks are absent. Plain or cortex platforms prevail on flakes, fine faceted platforms are rare (5–8%), and prepared platforms comprise from 9% to 28% (the highest percentage being in flint flakes) (ibid.: 44- 46, 54, 84–87, 125).

Tools are numerous and variable. Tool percentage varies from 20% of the total lithics in the eastern gallery and central chamber, and up to 30% in the dark gallery. The excavators identified the following tool types (ibid.: 47–55, 88–97, 128–131, 175, 176):

- Macro-tools made on pebbles, boulders, and fragments are not numerous. This tool group includes 15 choppers (ibid.: Figures 46, 75-2, 110-1), 3 chopping-tools (ibid.: Figures 20-1, 21), 7 core-like scrapers-*rabots* (ibid.: Figures 22-2–4, 45), and two macro-tools with chisel-like ends (ibid.: Figure 110-1, 2).
- Bifacial tools include three amygdaloid handaxes (Figure 16: 2) made from sandstone (ibid.: Figures 25, 47-2); the best finished in the assemblage lanceolate biface made from silicified limestone (see Figure 16: 1); five flat partial sub-cordiform bifaces (Figure 17: 2, 3) made on slate flakes (ibid.: Figures 28-2, 30-1, 49-2), two flat partial double-pointed (*naviforme*) bifaces made on sandstone (see Figure 17: 1) and slate (ibid.: Figure 76-1) flakes, a subtriangular handaxe made on a slate flake (ibid.: Figure 76-2), and a partial biface with natural back made on flat slate pebble (ibid.: Figure 30-2).
- All the other artifacts identified by the excavators as "hand axes," "small handaxes," and "leaf-like tools" often have amorphous outlines or heavily weathered surfaces. Some of these lithics should be attributed only to a category of bifacial tools (ibid.: Figures 28-1, 29, 32-1, 4, 5, 49-1, 50-5, 7, 51-2) or core-like pieces (ibid.: Figures 32-6, 50-3). Others can be identified as bifacial side-scrapers (ibid.: Figures 50-6, 51-1, 77-1) and scrapers with ends (ibid.: Figures 31-1, 51-4) or backs (ibid.: Figures 31-2, 3, 32-2, 48-1) thinned by flat ventral retouch.
- Side-scrapers comprise the most numerous category of tools. They are manufactured from the best types of raw material—silicified slate or alevrolite (57–62 %) and flint (12–22 %). They are made mostly by lateral retouch, while about one-third of side-scrapers are made by deep modifying, scalar (see Figure 14: 11) or stepped semi-*Quina* (see Figure 14: 12) retouch. Abrupt, *Quina* (see Figure 14: 13), bifacial, and *surelevée* retouch is rare. Among side-scrapers, single scrapers prevail (80% of all scrapers), and about one-third of single scrapers have natural backs. They are mostly lateral, then transversal (ibid.: Figures 33-2,5; 34-4; 54-3,9; 56-1,4; 77-3,5,7) scrapers. Concave, ventral, and double scrapers are rare. A characteristic feature of the side-scrapers is ventral thinning of one (see Figure 14: 10, 16, 17) or both ends, and less often, a lateral side or a natural back (see Figure 14: 13). Liubin and Beliaeva (2004a:91) note that the thinning of ends with flat ventral retouch was mostly applied to side-scrapers made on slate flakes. These single side-scrapers with ventral thinned ends (and frequently with natural backs) have relatively standardized morphology and are a diagnostic tool type in the main assemblage of the Kudarian Acheulian at Kudaro I.
- A convergent tool group is very small compared to the simple side-scrapers. It includes a few convergent (see Figure 14–15) or angular side-scrapers (Figure 14–20,23), four flint massive points (see see Figure 14–8,19), five Tayacian points (ibid.: Figure 52-5,8), a *Quinson* point (see Figure 14–14), and a few proto-limaces.
- Various end-scrapers are well-represented (see Figure 14: 21, 22), including few massive rounded end-scrapers (ibid.: Figure 78-8) and nosed end-scrapers (ibid.: Figure 78-3, 4, 6). Notched (ibid.: Figures 57-11, 12, 79-1), bec-like (ibid.: Figures 36-11, 58-4; 79-6, 10), denticulate, chisel-like tools with flat ventral retouch (ibid.: Figures 37-5, 7, 8; 38-3, 39-1, 60-6), and multiple tools are variable in their presence.
- Bifacial knives of tsaldi type are represented by one almost complete tool made on a very thin slate slab (Figure 18: 3) and three fragments (see Figure 18: 1, 2).

Thus, the main Acheulian assemblage at Kudaro I is characterized by the following features typical of the Kudarian Acheulian variant:

1. Flake technique based on parallel flaking (flakes with unidirectional parallel or convergent scars

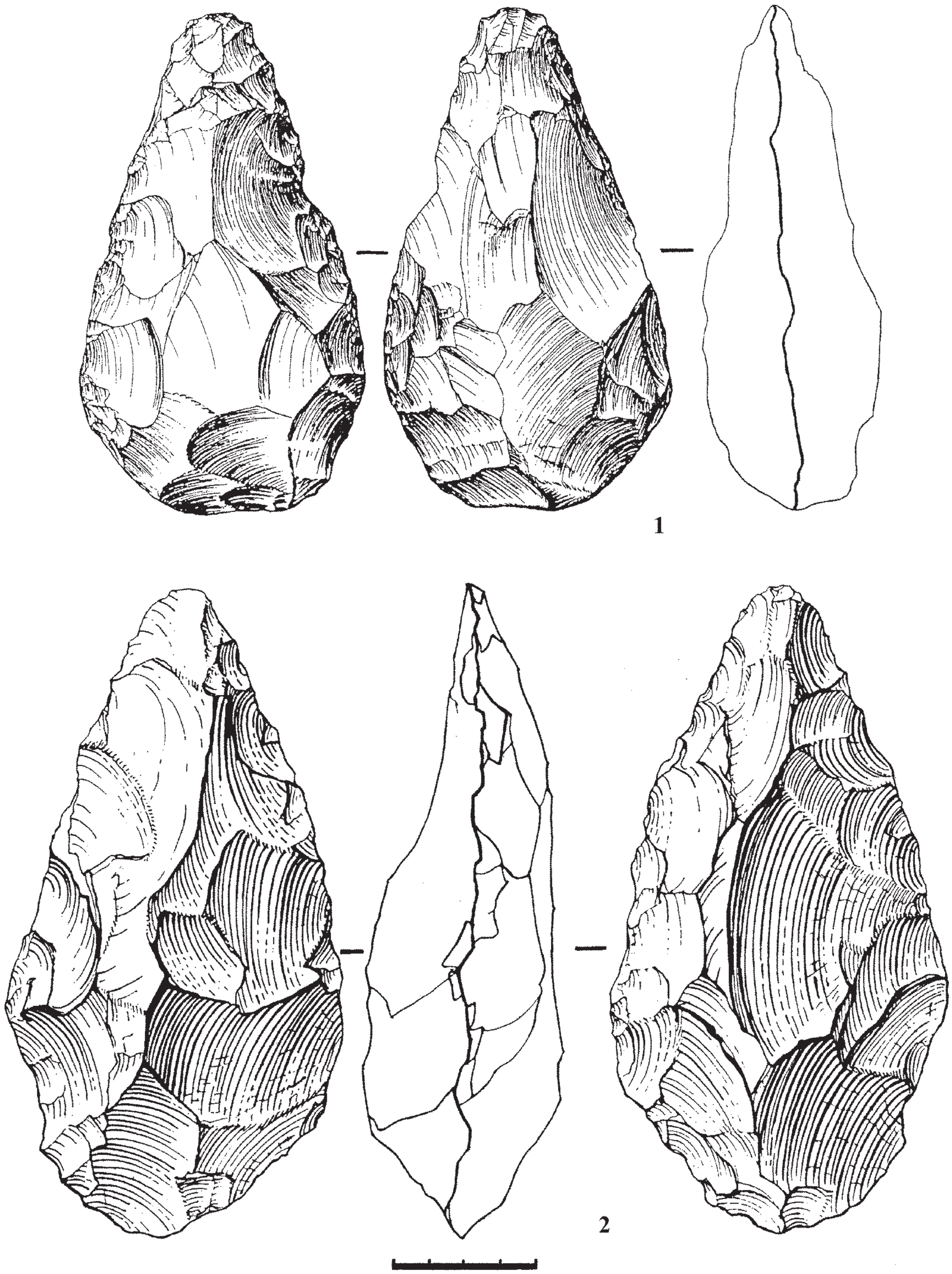


Figure 16. Kudaro I Cave, Layers 5A–5B (Assemblage III): 1: lageniform biface; 2: amygdaloidal biface. Source of data: Liubin and Beliaeva (2004a).

on dorsal surfaces comprise 45–60% of all flakes depending on raw material) and prepared by one scar or natural flaking platforms (flakes with plain or natural platforms comprise 60–80% of all flakes). Real blades or flakes with fine faceted platforms are rare, and Levallois blanks are absent.

2. Absolute prevalence of small flake tools (about 90% of all tools). Among them, side-scrapers comprise about half of all tools, and single scrapers comprise about 90% of all side-scrapers. Among the side-scrapers, a diagnostic for the Kudarian Acheulian is a simple scraper with an end thinned with flat ventral retouch and often with

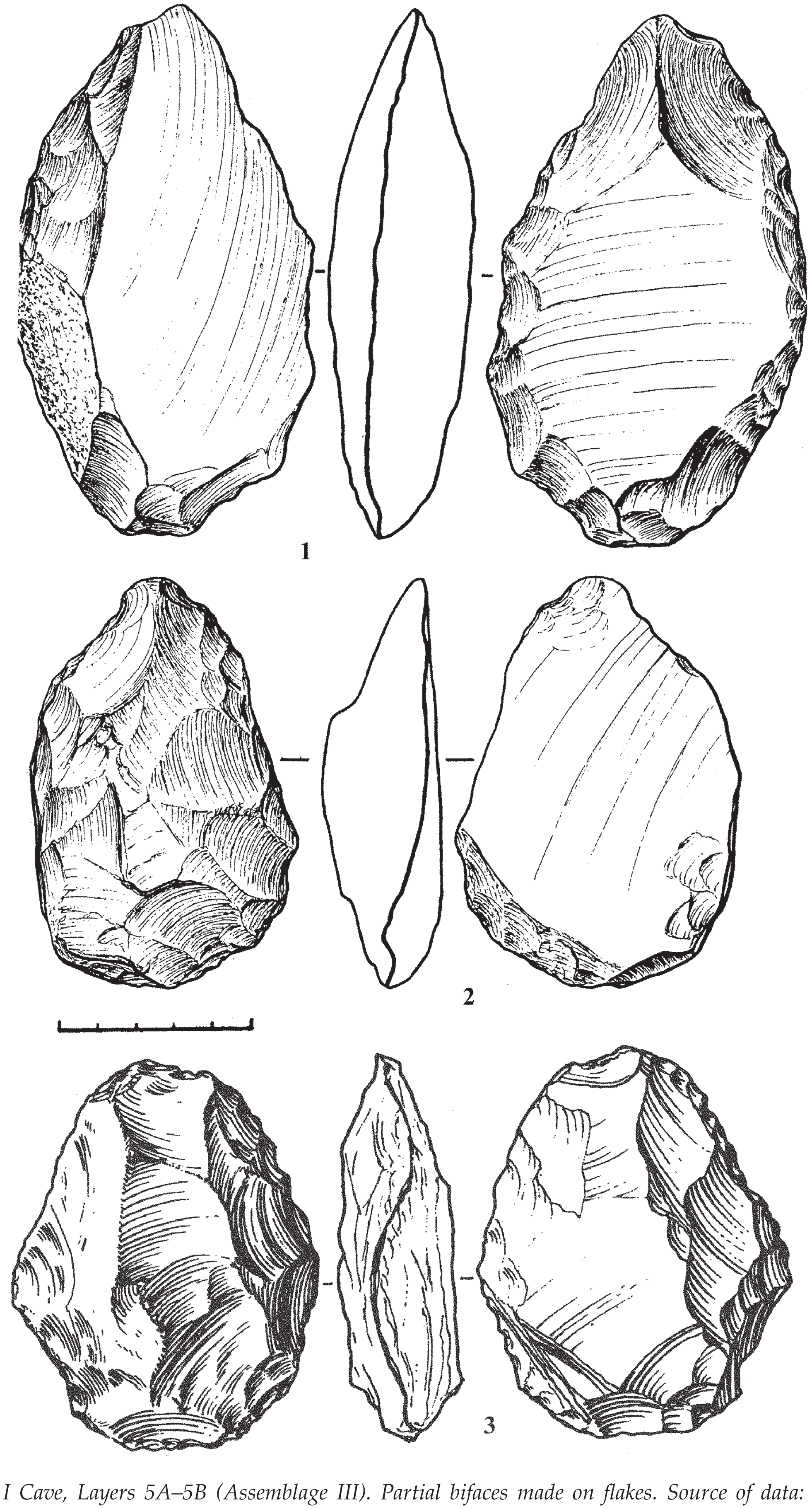


Figure 17. Kudaro I Cave, Layers 5A–5B (Assemblage III). Partial bifaces made on flakes. Source of data: Liubin and Beliaeva (2004a).

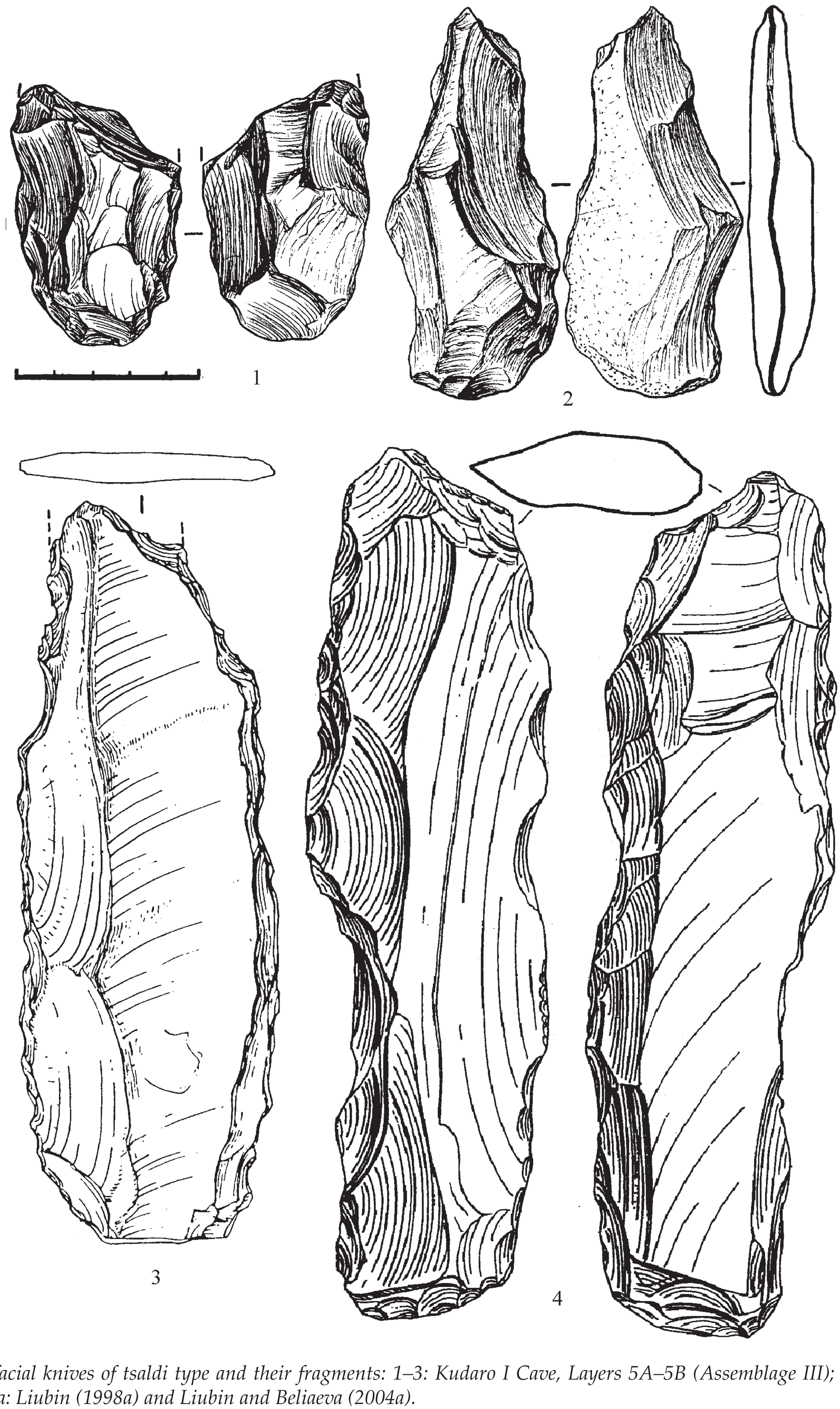


Figure 18. Bifacial knives of tsaldi type and their fragments: 1–3: Kudaro I Cave, Layers 5A–5B (Assemblage III); 4: Tsona Cave. Sources of data: Liubin (1998a) and Liubin and Beliaeva (2004a).

a natural back. This scraper type is not found at Treugol'naya Cave.

3. Among other flake tools, there are numerous notched, bec-like and denticulate tools, and also various end-scrapers (ibid.: 55, 95–97).
4. Convergent tools are quite variable—convergent and angular side-scrapers, massive points, Tayacian or *Quinson* points, and proto-limaces.
5. Macro-tools are not numerous. Core-like scrapers-*rabots* represent a specific type for the Kudarian Achiulean macro-tools At Treugol'naya Cave, only one tool of this type was found.
6. Acheulian bifaces form a small, but typologically very distinctive and diagnostic tool group. This group is characterized by a combination of two main biface types—amygdaloid and then lanceolate massive handaxes, and flat sub-cordiform partial bifaces made on flakes. In adidition to these biface groups, partial double-pointed (*naviforme*) bifaces made on flakes and partial backed bifaces are represented.
7. Bifacial knives of tsaldi type are a characteristic but extremely rare tool type.

Lenses R and R_1 (Assemblage II) at Kudaro I

This small assemblage (52 lithics including 12 tools) was identified as "the second Acheulian level" only in the dark gallery at Kudaro I. The assemblage consists of finds redeposited from Acheulian Layers 5a–5b and the top part of Layer 5c (ibid.: 128) and consequently has no independent cultural-chronological meaning.

Lenses $X_{1–3}$ (Assemblage I) at Kudaro I

The latest Acheulian Assemblage I, or "the top Acheulian level" at Kudaro I Cave also was found only in the dark gallery. As this assemblage consists of artifacts, found in erosional lenses and, probably includes an admixture of materials from Mousterian Layer 4 and the top Acheulian Layer 5a (ibid.: 120, 126), an independent cultural–chronological meaning for the assemblage is not obvious. Nevertheless, some typological features of this collection can be used to understand aspects of the final stage of the Kudarian Achiulean at Kudaro I Cave. Assemblage I consists of 238 lithics including 81 tools (34% of all finds). The tools include:

- Acheulian handaxes made from slate, including an elongated lageniform biface with a transversal distal extremity (Figure 19: 3), a partial sub-cordiform biface made on a split pebble (ibid.: Figure 68), two partial sub-cordiform bifaces made on flakes (Figure 19: 1), and one biface with a transversal end made on a flake (Figure 19: 2);
- Convergent tools such as a massive point similar to *pointe surelevee* (ibid.: Figure 71-1), two Mousterian points (probably introduced from the upper Mousterian levels [ibid.: Figure 71-2, 6]), two *Quinson* points, and a convergent side-scraper;
- Side-scrapers, mostly single lateral or transversal (ibid.: Figure 71-5, 7, 9); there is one bifacial side-scraper (ibid.: Figure 71-3); and,
- Other flake tools including various end-scrapers, notched, denticulate, becs, and composite tools.

One can note the absence of all diagnostic Kudarian Acheulian tool types in this top Acheulian assemblage at Kudaro I—pointed bifaces of amygdaloid or lanceolate forms, core-like scrapers–*rabots*, side-scrapers with ends thinned with ventral retouch, and knives of tsaldi type. Moreover, Acheulian bifaces in Assemblage I differ from bifaces of the main assemblage in the cave—all of them are flat bifaces, mostly made on flakes, and have partly bifacial retouch; there are two bifaces with transversal extremities that are unknown in the earlier assemblages at Kudaro I or Layer VI at Azykh.

As noted above, a lageniform biface made on sandstone boulder was found in the top Acheulian Layer 5 at Kudaro III, likewise a numerically small lithic industry that does not have most of tool types diagnostic for the Kudarian Acheulian. One can explain these discrepancies as being due to the small numbers of tools in the top assemblage at Kudaro I and at Kudaro III. On the other hand, the absence of massive biface types (amygdaloid or lanceolate), characteristic for the earlier Acheulian layers at Kudaro I, and the appearance of a new type (flat bifaces with transversal ends) are both correlated with the later age of the top assemblage at Kudaro I and Layer 5 at Kudaro III. In addition, the author has noted one more tendency—a gradual increase in the Acheulian biface proportion per total lithics. In the earliest assemblage from Layer VI at Azykh Cave, for example, this ratio is about 1:2,000; in Layers 5c and 5a–5b at Kudaro I, this ratio is, respectively, 1:350 and 1:300. In the latest Acheulian Assemblage I at Kudaro I, the proportion is about 1:50 (in Layer 5 at Kudaro III, it is 1:35). These data might be interpreted as obvious progress in the development of Acheulian biface technology. This is supported by the fact that the best-made Acheulian handaxes are found only in the main assemblage from Layers 5a–5b and in the latest assemblage from Lenses $X_{1–3}$ at Kudaro I, while the most perfectly made flat Acheulian bifaces are present only in the latest of these assemblages. At Kudaro I, two more trends in the development of the Kudarian Acheulian are noted by the excavators (ibid.: 97, 134, 167):

1. A gradual transition from a raw material type (slate) that is easier to flake (55% of all lithics in Layer 5c in the dark gallery) to more dense sandstones (from 29% in Layer 5c up to 37–39% in Layers 5a–5b and Lenses $X_{1–3}$ in the dark gallery). A similar trend can be shown in the southern gallery (data on flakes only)—slate flakes comprise 52% of all flakes in the lowermost levels 5d–5f, in Layer 5c they are about 59%, and in Layers 5a–5b, about 42%. In contrast, sandstone flakes comprise about 30–36% of all flakes in Layers 5d–5f and 5c, and up to 51% in Layers 5a–5b; and,
2. A significant number of side-scrapers with ends thinned by ventral retouch only in the upper Acheulian Layers 5a–5b. In the earlier layers (Layer VI at Azykh and Layer 5c at Kudaro I),

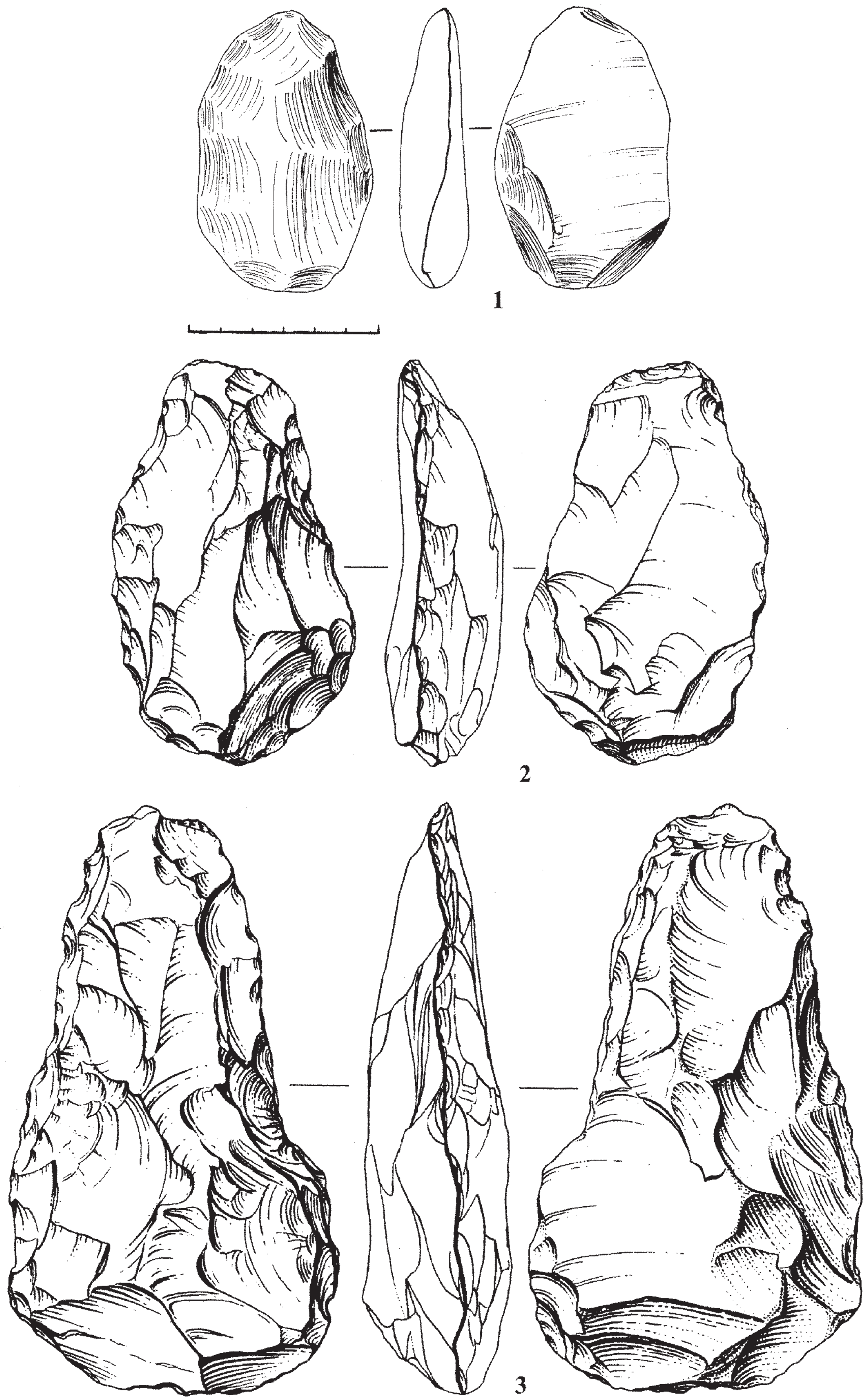


Figure 19. Kudaro I Cave, Lenses $X_{1\text{–}3}$ (Assemblage I). Partial bifaces made on flakes. Source of data: Liubin and Beliaeva (2004a).

these side-scrapers are few, while at Treugol'naya Cave, they are absent.

The Acheulian Assemblage from Layer V at Azykh Cave

The problems with the materials from Azykh Cave due to poor quality excavation are considered fully by Liubin (1998a). Uncertainty of chronological position of the layer has resulted, in the estimation of Liubin and Beliaeva (2004a: 250), in "Acheulean Layer V as possibly dating to the later Middle Pleistocene … or even the beginning of Upper Pleistocene." In the entrance part of the cave, Layer V had the greatest thickness (up to 5m) and was subdivided into 5–7 lithological levels. Based on the palynological data, the main part of this layer was formed during a cold period which witnessed a shrinking of the extent of vegetation belts. At that time, the cave was located near the upper border of forest belt, represented mostly by hop hornbeam, birch, and sub-alpine meadows (Liubin 1998a: 24).

The archaeological material, found in Layer V over an excavated area of almost 200m^2, is very insignificant—only 289 lithics, the majority of which were recovered from the middle levels of this layer. Among the artifacts, Liubin and Beliaeva (2004a: 252) identified 204 flakes and blades, 13 cores and core-like fragments, 39 flake tools, and 19 macro-tools. Similar to the Acheulian sequence at Kudaro I, there is a tendency toward an increase in denser rocks (flint at Azykh) in the upper levels compared to the use of slate. In Layer V, almost 50% of the artifacts are made from flint compared to 42% in Layer VI. Layer V at Azykh, in contrast to the Acheulian material at Kudaro I exhibits a higher blade index—17.6% versus 5–14% depending on the raw material used in the main assemblage at Kudaro I. These distinctions appear to be due to the prevalence of the better flint raw material at Azykh (at Kudaro I, better quality raw material does not exceed 9–12.5%).

In Layer V at Azykh, macro-tools include 10–12 choppers and chopping-tools. Of the seven Acheulian bifaces identified in this assemblage, five are published. All of them are made of silicified slate. Massive bifaces include three of the best bifacially flaked elongated lanceolate handaxes (two of which were broken during the excavation) and one elongated amygdaloid handaxe with partial bifacial trimming (Figure 20: 4). Flat bifaces are represented by one elongated cordiform handaxe, which is made on a large flake and has narrow transversal edge (see Figure 20: 3). Two bifaces with natural backs were made on flat pebbles by partial bifacial flaking. Flake tools consist mainly of side-scrapers (n=26), then end-scrapers (n=4), and denticulates (n=3). Also, a demi-*Quina* side-scraper with a back thinned with flat ventral retouch (see Figure 20: 2) and a backed side-scraper with a base thinned with flat ventral retouch (see Figure 20: 1) were found.

Thus, although the lithic assemblage from Layer V at Azykh Cave seems not to be a homogeneous archaeological assemblage, especially taking into account the great thickness of this layer and the poor quality excavation of it—admixture of lithics from the Mousterian layers is possible—one can note the following features that suggest this assemblage belongs to the Kudarian Upper Acheulian variant:

1. a flake knapping technique with parallel flaking from roughly prepared platforms;
2. prevalence of small flake tools, especially side-scrapers, and the occurrence among the latter of characteristic Kudarian Acheulian side-scraper types with ventral thinning;
3. among macro-tools, backed bifaces made on flat pebbles by partial bifacial flaking. This tool type is known also from Kudaro I and Layer VI at Azykh; and,
4. Acheulian bifaces characterized by the diagnostic Kudarian variant combination of amygdaloid or lanceolate massive bifaces and flat sub-cordiform partial bifaces made on flakes.

At the same time, features such as the absence of core-like end-scrapers-*rabots*, presence of a flat biface with a transversal end, and rarity of side-scrapers with ventral thinned ends, in combination with a high ratio of bifaces to all lithics (in Layer V, about 1:40) place the assemblage from Layer V at Azykh together with the latest Acheulian assemblage from Lenses X_{1-3} at Kudaro I. These similar typological characteristics allow one to assume a similarity in age for both assemblages. However, as noted above, a strong climate cooling was identified in Layer V at Azykh. This event may be correlated best with the cold OIS 8. Thus, in considering the typological features and paleo-geographical data, one can assume a chronological position for the Acheulian assemblage from Layer V at Azykh Cave between the main assemblage from Layers 5a–5b at Kudaro I (OIS 9) and the assemblages from Lenses X_{1-3} at Kudaro I and the Acheulian layers at Kudaro III (see Table 3).

The Acheulian Assemblage at Tsona Cave

Tsona Cave is located in a sub-alpine zone at an elevation of 2100–2150masl. This is the highest Lower Paleolithic site in the Caucasus. As Liubin and Beliaeva (2004a: 260) note, the quality of the excavation at this cave was as poor as that at Azykh Cave. Nevertheless, there are several distinctions. Although the excavation area at Tsona Cave was about 140m^2 (the total cave area is about 1000m^2), and the total thickness of the Lower Paleolithic strata exceeded 2m, only 134 stone artifacts were found. Moreover, about two-thirds of the artifacts were found within the eastern half of the entrance area, outside a modern drip line and in the adjoining area under the cave roof, while only a few lithics were found in the cave interior. At the same time, the Lower Paleolithic layers yielded about 7,000 animal bones, with 92% of them identified as cave bear (Liubin 1998a). These data clearly show that, similar to Kudaro III, the Acheulian material from Tsona Cave reflects sporadic human visits to this cave site.

Based on the pollen data, the Lower Paleolithic occupation at Tsona Cave occurred during a significant warming of the climate. During the accumulation of the main part of the Lower Paleolithic layers, the cave was surrounded by mixed coniferous and broad leaf woods comprised of pine,

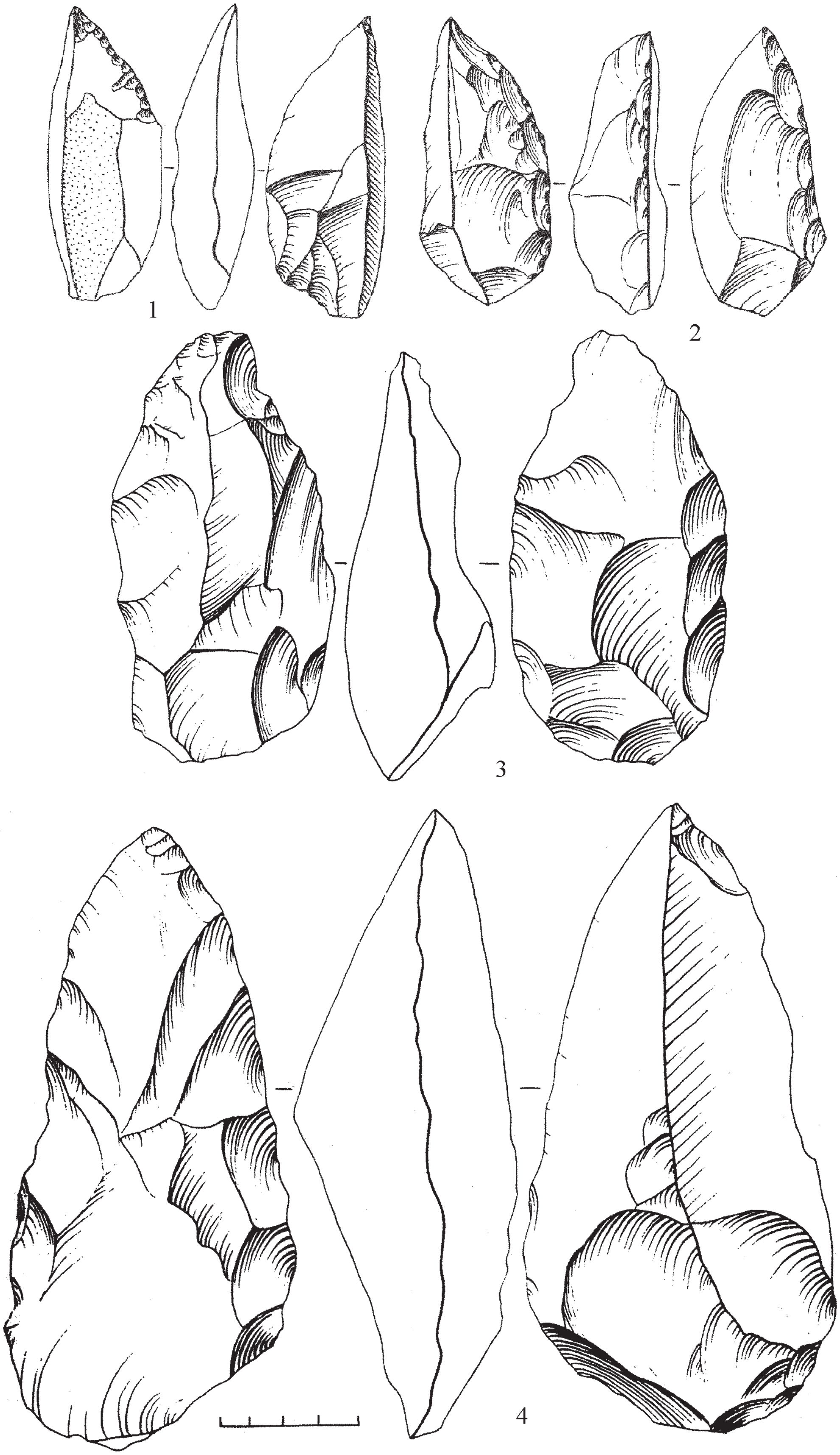


Figure 20. Azykh Cave, Layer V: 1: backed side-scraper with a base thinned with flat ventral retouch; 2: demi-Quina side-scraper with a back thinned with flat ventral retouch; 3: elongated cordiform biface made on a flake; 4: elongated amygdaloidal biface. Source of data: Liubin (1998a).

fir, beech, alder, and other coniferous or deciduous trees, while during the final stages, the setting was characterized by proximity to the upper border of the forest belt represented mostly by hop hornbeam forests (ibid.). These data allow correlation of the main part of the Lower Paleolithic strata at Tsona Cave to a warm oxygen-isotope stage.

At Tsona Cave, two Acheulian layers were identified, each of which included several strata. This subdivision into layers has no meaning, as layer nomenclature, as well as the number of layers or strata within them varied during the excavations. Principally, all the lithic finds can be considered one assemblage, especially due to the small total number of artifacts. As at Azykh Cave, Liubin (1998a) provides the most complete critical analysis and description of the material from Tsona Cave.

In the lower layer at Tsona, only 30 small flakes and flake tools (side-scrapers, end-scrapers, and a limace) were found. Mostly tools and a few flakes represent the inventory of the upper layer, totally 104 stone artifacts. Waste products of flaking are not present. Among the flake tools, only a few side-scrapers, a limace, and a denticulate tool were identified (Liubin 1998a: Figures 58-1, 2, 59-5–6; Liubin and Beliaeva 2004a: 260–261; Figure 142-2). No choppers or core-like end-scrapers were found, but Acheulian bifaces and biface fragments comprise a large assortment. Macro-tools include three cleavers on flakes (Liubin 1998a: Figures 51-2, 52-3, 58-5) and two knives of tsaldy type (see Figure 18: 4). Based on the published tool figures, one can conclude that the collection also includes typologically unidentifiable tool fragments or reutilized tools, some of which are reminiscent of core-like bifaces or side-scrapers made from residual cores (Liubin and Beliaeva 2004a: Figure 14).

The category of Acheulian bifaces includes at least 18 pieces. For comparison, the excavator of the cave, Tushabramishvili (1984), reported 47 handaxes in the industry, but published only five of them. Liubin (1998a) identified 10 cleavers (among them, 2–3 flake cleavers) and 29 handaxes (including 10 biface fragments) and published figures for 20 bifacial tools. The assortment of bifacial tools at Tsona sharply differs from that characteristic of the Kudarian Acheulian. The following biface types were identified:

- four bifaces with a transversal edge or biface cleavers (ibid.: Figures 50, 52-2, 53-2), two of them are made on flakes (Figure 21: 2);
- two sub-cordiform bifaces (ibid.: Figures 51-1, 58-3) including a partial biface with an unworked base;
- a sub-triangular biface (ibid.: Figure 54-2);
- three sub-triangular bifaces (see Figure 21: 1) with plano-convex bifacial retouch (ibid.: Figures 52-4, 54-1, 59-7);
- two triangular bifaces with plano-convex bifacial retouch (ibid.: Figures 55-2, 56-1);
- an oval biface (ibid.: Figure 55-1);
- an amygdaloid biface (ibid.: Figure 53-1);
- a backed biface (ibid.: Figure 57-1); and,
- three biface fragments (ibid.: Figure 57-1-3).

Such a large variety of Acheulian bifaces, as well as an extremely high ratio of total bifaces per total lithics (more than 1:5 in the upper layer at Tsona) cannot be easily explained. Whether it is due to an economic/activity focus of the Acheulian occupations in the cave (short-term hunting camps?) or to "negligent excavations that have caused losses of a part of the material: in 1961 even hand axes were found in the backdirt" (Liubin and Beliaeva 2004a: 260) or to an extreme phase of the chronological trend noted above—an increase in biface proportion from the earlier to later Acheulian assemblages—is not certain. Obviously, only future high-quality excavation at this site can clarify these issues.

The hypothesis that Tsona "could serve as a hunting camp for the Acheulian inhabitants of Kudaro I Cave" (ibid.: 261) cannot be accepted any longer, as this idea is in conflict with the more advanced typology of the Acheulian bifaces from Tsona. The presence at Tsona of two knives of tsaldi type, which are known also at Kudaro I, is not sufficient basis for the conclusion that = these finds are—"a rare case of an opportunity to judge confidently the cultural and chronological similarity…of these cave sites" (ibid.). First, there are substantial typological (and chronological) distinctions between these Acheulian industries. Second, finds of tsaldi type tools are known outside the Caucasus, for example, in the Acheulian industry at Meshkhed III in Southern Arabia (Amirkhanov 2006: Figure 73-1). Third, the poor quality excavation at Tsona Cave does not exclude admixture of archaeological materials of various Acheulian industry types (for example, Kudarian Acheulian and a later Acheulian variant).

The cave excavators, Kalandadze and D. Tushabramishvili, were at a loss to determine the geological age of the Lower Paleolithic at Tsona Cave. They dated this industry to the end or second half of the Acheulian (Kalandadze 1965) or from Riss-Wurm to an inter-Riss interstadial (Tushabramishvili 1984). The author believes that the age of the Acheulian assemblage from Tsona is within OIS 7 and is supported by the paleo-geographical data (see Table 3) and a developed biface typology. Such features as the absence of core-like end-scrapers (*rabots*) and side-scrapers with ends thinned with ventral retouch, and the presence of bifaces with transversal edges (or biface cleavers), in combination with the high ratio of bifaces to total lithics, place the Acheulian material from Tsona Cave with the latest Acheulian assemblages from Lenses X_{1-3} at Kudaro I and Layer 5 at Kudaro III. The close typological similarities allow one to assume an age similarity for all these assemblages. At the same time, biface cleavers (see Figure 21: 2) and sub-triangular and triangular handaxes with plano-convex retouch (see Figure 21: 1) are found only at Tsona.

Thus, the high biface proportion (from 20% up to 40% of all lithics, depending on the researcher), the most advanced biface composition (prevalence of flat sub-triangular or sub-cordiform handaxes), and technology (plano-convex technique) indicate that the Acheulian assemblage from Tsona appears to have the youngest age among the stratified Acheulian assemblages in the Caucasus. The paleo-geographical data suggest a chronological position

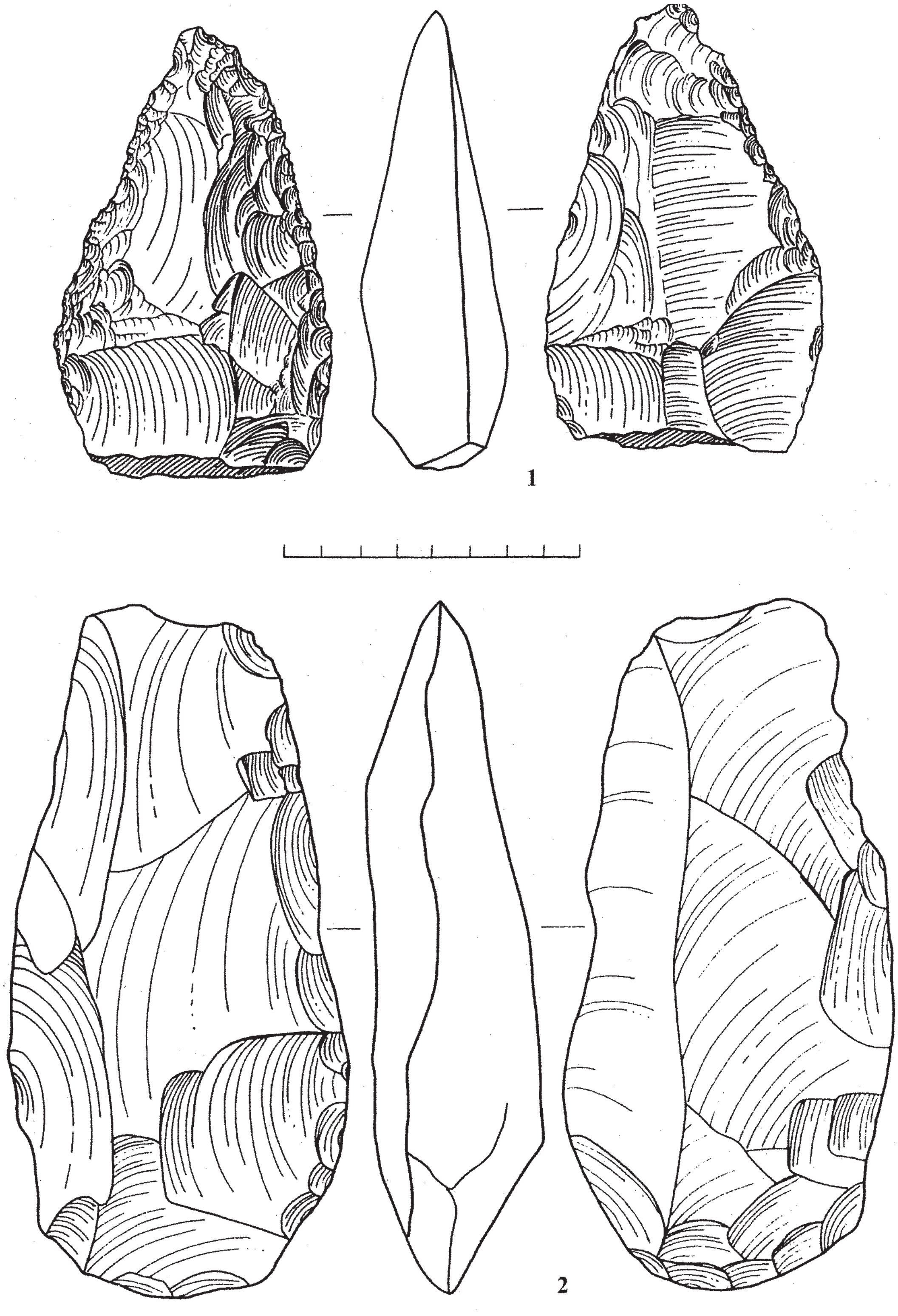


Figure 21. Tsona Cave: 1: sub-triangular biface with plane-convex retouch; 2: biface cleaver. Source of data: Liubin (1998a).

within the end of OIS 7 (see Table 3) for the Acheulian at Tsona.

ACHEULIAN TECHNO-COMPLEX IN THE CAUCASUS: CONCLUSIONS

The stratified assemblages considered above do not exhaust the Acheulian industries in the Caucasus. In the Southern Caucasus, Acheulian sites are divided into two groups (or industrial variants):

1. Based on lava raw materials, the Acheulian industries from locations in volcanic uplands in Southern Georgia and Armenia form an original "enclave" of the Upper Acheulian assemblages limited to between the upper Kura River and the Araks River (Liubin 1998a: Figure 1). Basalt bifaces are known to the south as separate finds (in northern Iran [Liubin 1984: 68]), to the west (in the Kars–Trabzon area in northeastern Turkey [Taskiran 1998: 571]), and to the north (on the southern slope of the Great Caucasus [Liubin 1998a]). In Armenia and Southern Georgia, the following common features characterize these Acheulian industries (Doronichev 2004; Doronichev and Golovanova 2003; Liubin 1998a): a) developed blade (Levallois) flaking technique together with radial flaked cores, with a highly variable blade index and flakes mostly used for tool production; b) Acheulian bifaces frequently comprise a high percentage of tools (in some locations, up to 50%). Among them, flat bifaces (sub-cordiform, oval, and triangular) prevail, and thick bifaces (amygdaloid or lanceolate) are less well represented. Reduction in biface size (to "small handaxes") and biface manufacture on flakes with partial, sometimes plano-convex preparation occurs in typologically later assemblages; and,
2. Acheulian assemblages based on sedimentary rocks are found at the cave sites of Kudaro I, Kudaro III, Tsona, and Azykh. Here, the author has offered a definition of this industry group (except for Tsona) as the Kudarian variant of Upper Acheulian or Kudarian. Obviously, further research will refine this definition, as well as provide detail of chronological distinctions among the Acheulian industries. As separate finds, Acheulian bifaces from silicified rocks are found on the Imeretian Plateau in Western Georgia and along the Caucasian Black Sea coast (northwestward up to the Cape of Kadosh near Tuapse). In the Northern Caucasus, only a few bifaces of Upper Acheulian types are found (Liubin 1998a: Figure 92-2). The most representative Acheulian assemblages of Kudarian variant are from Kudaro I Cave and Layer VI at Azykh Cave. These have the following features (Doronichev 2004; Liubin 1984): a) flake flaking technique; b) high frequency of retouched tools, and among them, a prevalence of simple side-scrapers; c) very low (less than 1%) representation of bifacial tools, especially classical Acheulian handaxes, which are represented mostly by amygdaloid or lanceolate massive bifaces and flat sub-cordiform bifaces made on flakes.

Generally, the available chronological data document a late age for the Acheulian in the Southern Caucasus, comparable to the Upper Acheulian or Acheulo-Yabrudian in the Levant. Absolute dates (see Table 3) indicate that the age of the Kudarian Acheulian industries falls between 350 and 200kyr in the Kudarian caves. Likewise, the earliest Lower Paleolithic finds on the Caucasian Black Sea coast (from the fifth sea terrace at the Yashtukh location in Abkhazia) have a TL-date of 358–330kyr bp (Liubin and Beliaeva 2004a). There are a few Acheulian handaxe surface finds along the Black Sea coast in the Caucasus "including Yashtukh ones that have an Upper Acheulian shape" (ibid.: 229), as well as in Western Georgia where "only rare Acheulian bifaces of a late type occur" (Liubin 1998a: 7). The data for age determination of the Acheulian locations in the Little Caucasus is very limited. Typologically they are defined mostly as the Upper Acheulian of Levallois facies (Liubin 1989: 92) or the Final Acheulian, as at Satani-dar (Liubin 1984; Matiukhin 2001), Arzni (Liubin 1998a), and Atis I (Kazarian 1986).

Apparently, the two groups of Acheulian industries represent independent cultural traditions within the Acheulian. Besides distinctions noted in raw-material preferences, flaking techniques, and biface typology, researchers have argued for independent development of the Acheulian in Armenia (Eritsian 1972) or noted that no flint handaxes were found in Armenia or Southern Georgia (Kikodze 1986). The lava-based Acheulian industries of the Little Caucasus, containing plenty of Acheulian bifaces (by rough calculations, more than 700), appear quite possibly to be the "top of the iceberg" of the Upper Acheulian in Western Asia—the nearest region where Acheulian assemblages with numerous bifaces are known. Regarding the lava-based Acheulian assemblages of the Southern Caucasus, the available data appear to confirm a hypothesis of Liubin and Beliaeva (2004a: 265) that for the "roots of the Caucasian Acheulian, certainly, it is necessary to search in the Near East."

On the contrary, the Acheulian industries with rare typical Acheulian handaxes from cave sites in the Southern Caucasus appear to have a different origin. The data, synthesized by the author, point to the later age of the Acheulian in caves compared to Treugol'naya Cave (see Table 3) and the increase of handaxe production, and expansion of biface typology and technology. On this basis, the author previously offered a hypothesis that the basis for the origin of the Kudarian Acheulian would be found in the earlier Lower Paleolithic assemblages without Acheulian bifaces, such as Treugol'naya Cave (Doronichev 2004).

This hypothesis is similar to a common tendency in the interpretation of distinctions between the industries of the Acheulian techno-complex and the Lower Paleolithic industries with small flake tools and without Acheulian handaxe technology. It is now noted (Burdukiewicz and Ronen 2003) that these small tool assemblages, differently defined by researchers, are widely spread from Western Europe to China from about 1.0 million years ago. In some regions (e.g., East Germany and Poland), the small tool industries precede the Acheulian, or coexist with it (as in Western Europe and Israel), or develop independently during the entire Lower Paleolithic (China). For example, in Britain a long discussion about the chronological and industrial relationship between Clactonian and Acheulian industries has resulted in a compromise approach. On the one hand, it is admitted that Clactonian industries preceded the appearance of the Acheulian in the southeast of England in the second half of the Hoxnian interstadial. On the other hand, "the long-established orthodoxy that the Clactonian and the Acheulean are the industrial traditions of two separate groups has also been rejected in favor of an explanation which involves technological change within a hominid population network over a long period of time in response ultimately to changing raw material availability" (Wenban-Smith 1998: 96).

CONCLUSIONS

THE AGE AND ROUTES OF THE LOWER PALEOLITHIC OCCUPATION OF EASTERN EUROPE

Prior to twenty years ago, different authoritative scholars (see [Gladilin 1976] for cited references) hypothesized about human settlement of the Russian Plain as occurring by the Early–beginning of the Middle Pleistocene, and about the leading role of the Caucasus or Central Europe in the initial hominine occupation of Eastern Europe. Today, all these ideas have been shown to have no factual basis. Although humans first appeared in the Southern Caucasus (Dmanisi) by 1.7Ma, in the Northern Caucasus, the earliest human occupation is currently dated to 600kyr (Assemblage IV at Treugol'naya Cave). In the Russian Plain, human occupation is now documented no earlier than 300kyr ago (the alluvial assemblage at Khryashchy?). Moreover, the earliest Lower Paleolithic sites on the western borders of Eastern Europe (Korolevo I, Layer VI at Ukraine and, probably, Pogreby and Dubossary in Moldova) are dated no earlier than 400kyr ago. Thus, current data indicate, first, a quite late (the middle of Middle Pleistocene) time for the initial human settlement of the southern areas of Eastern Europe; and, second, approximately the same age for the first human appearance as in the southern and western areas of the East European plain. Moreover, all these earliest human occupations are located near the southern or western boundaries of Eastern Europe and, probably, outline the limits of Lower Paleolithic occupation of neighboring regions. Eastern Europe proper appears outside these boundaries.

The beginning of a large-scale human settlement of Eastern Europe is shown by current archaeological data only by the end of Lower–beginning of the Middle Paleolithic, or from about 200kyr. Probably, it was primarily caused by human migration from Central Europe. This process appears to be marked by the distribution of industries with bifacial leaf points or foliates (Kozlowski 2003) in the southern zone of Eastern Europe, which are characteristic in Central Europe for the end of Lower–beginning of Middle Paleolithic. The leaf point industries penetrated also to the Caucasus (Doronichev 2004). It is supposed (Hoffecker 2002: 3; Hublin 1998) that the first people who began the widespread colonization of the East European plain were Neanderthals adapted to cold climate. This hypothesis hypothesis cannot be confirmed as there are no anthropological finds in the earlier sites with leaf points. However, in the later sites of this industrial complex in Central Europe, Neanderthal finds are known at sites of the Taubachian variant dated to early OIS 5—a travertine endocranium cast from Ganovce and teeth from Taubach.

ACHEULIAN DISTRIBUTION IN THE CAUCASUS

Contrary to a widespread view that during the Lower Paleolithic the Caucasus was a region of mostly Acheulian industries (Liubin 1998a; Liubin and Beliaeva 2004a), the data summarized in this paper show the late—in comparison to Western Asia—appearance of the Acheulian techno–complex in the Caucasus. In the Southern Caucasus, the earliest Acheulian industries are dated to the second half of the Middle Pleistocene or no older than 350kyr. Recently Liubin and Beliaeva (2004a: 265) also have agreed "that penetration of the Levantine Acheulian into the Caucasus occurred no-earlier than the middle of Middle Pleistocene." Certainly, this does not exclude an opportunity of future discoveries of earlier Acheulian sites, especially in the Little Caucasus.

Mapping of handaxe finds shows the Acheulian distribution in the Caucasus. It indicates their concentration in the southern limit of the Caucasus or in the Little Caucasus (Liubin 1998a: 23–24). Outside the Little Caucasus, a concentration of Acheulian assemblages (including the cave sites of Kudaro I, Kudaro III, and Tsona) occurs in the Central Southern Caucasus, where about 150 Acheulian bifaces were found (ibid.). The Acheulian penetration into the Northern Caucasus and the Black Sea coast in the Western Caucasus is documented by only a few Acheulian bifaces. Thus, the Acheulian techno-complex distribution is limited to the Little Caucasus and the Central Southern Caucasus.

Liubin (ibid.) attributes this restriction to natural factors—the mountain barrier of the Great Caucasus in the north, the boggy and forested Kolhic lowland in Western Georgia, and flooded (by the Caspian Sea) Kura lowland in the Eastern Southern Caucasus. In his opinion, these natural barriers prevented colonization of the Northern Caucasus by bearers of the Acheulian biface industries who migrated from the Levant. The idea of natural barriers is not new and is attractive by virtue of its simplicity. However, it does not explain why some natural barriers limited distribution of the Acheulian biface technology while others, no less significant, did not.

The author's analysis of the Lower Paleolithic industries in this paper allows proposal of a complex concept of the origin of the Acheulian and its distribution in the Caucasus. This concept suggests different origins (migration for lava-based Upper Acheulian assemblages and local evolution for Kudarian Acheulian) for the Acheulian assemblages in the Southern Caucasus and a large cultural area across Eastern and Central Europe, where Acheulian handaxe technology was not known throughout much of the Lower Paleolithic and the first bifaces appeared at the end of the Lower Paleolithic or in the beginning of Middle Paleolithic. A cultural peculiarity of Central and Eastern Europe is that the biface technology developed here as a technology of bifacial leaf point production, and the most distinctive bifaces are bifacial foliates. Moreover, most of leaf point assemblages in Central and Eastern Europe, including the Northern Caucasus, are dated to the end of the Middle Pleistocene. The author believes that the appearance of bifacial leaf point technology demarcates a chronological boundary between the Lower and Middle Paleolithic, and hence assemblages with leaf points earlier attributed to the Lower Paleolithic have to be redefined as Middle Paleolithic. Likewise in Central Europe, the industries with Acheulian bifaces, leaf points, and Levallois technique, earlier assigned to the Later Acheulian, are currently attributed to the Middle Paleolithic (Bosinski 2001).

THE LOWER PALEOLITHIC NON-BIFACE INDUSTRIES AND THE "MOVIUS LINE"

The Lower Paleolithic stratified sites (Dmanisi and Treugol'naya Cave) document that it is not the Acheulian Complex but industries without Acheulian bifaces that constitute the main cultural horizon of the Lower Paleolithic in the Caucasus. This horizon now is documented with the first human appearance in the Caucasus at about 1.7Ma (Dmanisi) up until the middle of Middle Pleistocene about 350–400kyr (Treugol'naya Cave). The earliest assemblage at Dmanisi now is identified as a Pre-Oldowan pebble-tool industry (H. de Lumley et al. 2005). The later industries without Acheulian bifaces from Treugol'naya Cave are proposed to be the Pre-Mousterian (Tayacian) Complex (Doronichev 2004). Moreover, the analysis (discussed above) of stratified Acheulian assemblages allows one to assume that the Lower Paleolithic assemblages without bifaces are the basis for the origin of the Kudarian variant of the Upper Acheulian in the Southern Caucasus.

Like the Caucasus, industries without Acheulian bifaces are known in the Early–first half of the Middle Pleistocene in Central Europe. In Eastern Europe, the Pre-Mousterian industries exist until the end of the Middle Pleistocene. The distinctiveness of the Lower Paleolithic of the Alps–Caucasian zone was noted by Obermaier (1925) and later introduced in the "Movius Line" concept. According to this concept, a border of maximal distribution of the Acheulian techno-complex in Western Asia occurs along the Great Caucasus Ridge (see Figure 11). In Eurasia, this border separates two extensive Lower Paleolithic cultural provinces, one of which represents the development of the Acheulian handaxe technology, and, the other, techniques of tool manufacturing on flakes or pebbles (Bordes 1968: Figure 47; Klein 1989: Figure 4.11; Kozlowski 2003: Figure 7.1). It is obvious that "Movius Line" is not a concrete line on a map like a country border. This is confirmed by a few finds of Acheulian bifaces in Western Central Europe (Bosinski 1995), the Balkans (Darlas 1995), Anatolia (Taskiran 1998), and the Northern Caucasus (Liubin 1998a; 2002).

Although the data now available are limited, they allow one to hypothesize that the Acheulian expansion to Eastern Europe through the Caucasus did not occur. This is because, first, the appearance of the Acheulian biface technology in the Southern Caucasus is late (after 300kyr ago); and, second, there is a quite early (after 200kyr ago) and relatively fast, widespread dispersion across Central and Eastern Europe of bifacial leaf point industries, probably introduced by Neanderthals. A clearer explanation why the Acheulian did not spread far into Central or Eastern Europe requires new finds and further scientific analysis of the large Lower Paleolithic cultural areas that are demarcated geographically by the Movius Line, their probable interactions, logics of internal development, and an appraisal of the industrial variability at various chronological periods.

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