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LOWER PALEOLITHIC OCCUPATION OF THE NORTHERN CAUCASUS

Vladimir. B. Doronichev

Abstract
Today only Treugol'naya Cave presents reliably dated evidence of human settlement on the northern slope of the Caucasus Mountains from its initial stage at the beginning of the Middle Pleistocene through the end of this period, as well as being one of the oldest sites in Europe. The cave is a small karstic cavity situated 1500 m above sea level in the Upper Kuban' Basin, and filled with up to 4.5 m of loam and rubble. Layers containing stone artifacts are dated (ESR, pale-magnetism, pollen, and fauna) to the early through late phases of the Middle Pleistocene. The artifact assemblages are assigned to the Lower Paleolithic flake and pebble tool industries completely lacking in hand axes.

Keywords
Prehistory, Lower Paleolithic, Middle Pleistocene, Caucasus

Introduction

Till recently any arguments concerning the initial colonization of the Northern Caucasus, and the peculiarities of the Lower Paleolithic culture as a whole in the region had been too hypothetical, due to the absence of reliably dated Lower Paleolithic sites. The well-known non-stratified finds of stone artifacts previously assigned to the Lower Paleolithic in quarry Tcimbal and Ignatenkov's Kutok location (Northwestern Caucasus) can be used today only as a ground for speculation (Liubin, 1984:57-58; Liubin & Bosinski, 1995:218; Bosinski, 1996:55; Liubin, 1998), but not as a scientific fact. The first yielded only two artifacts which had been found on a modern

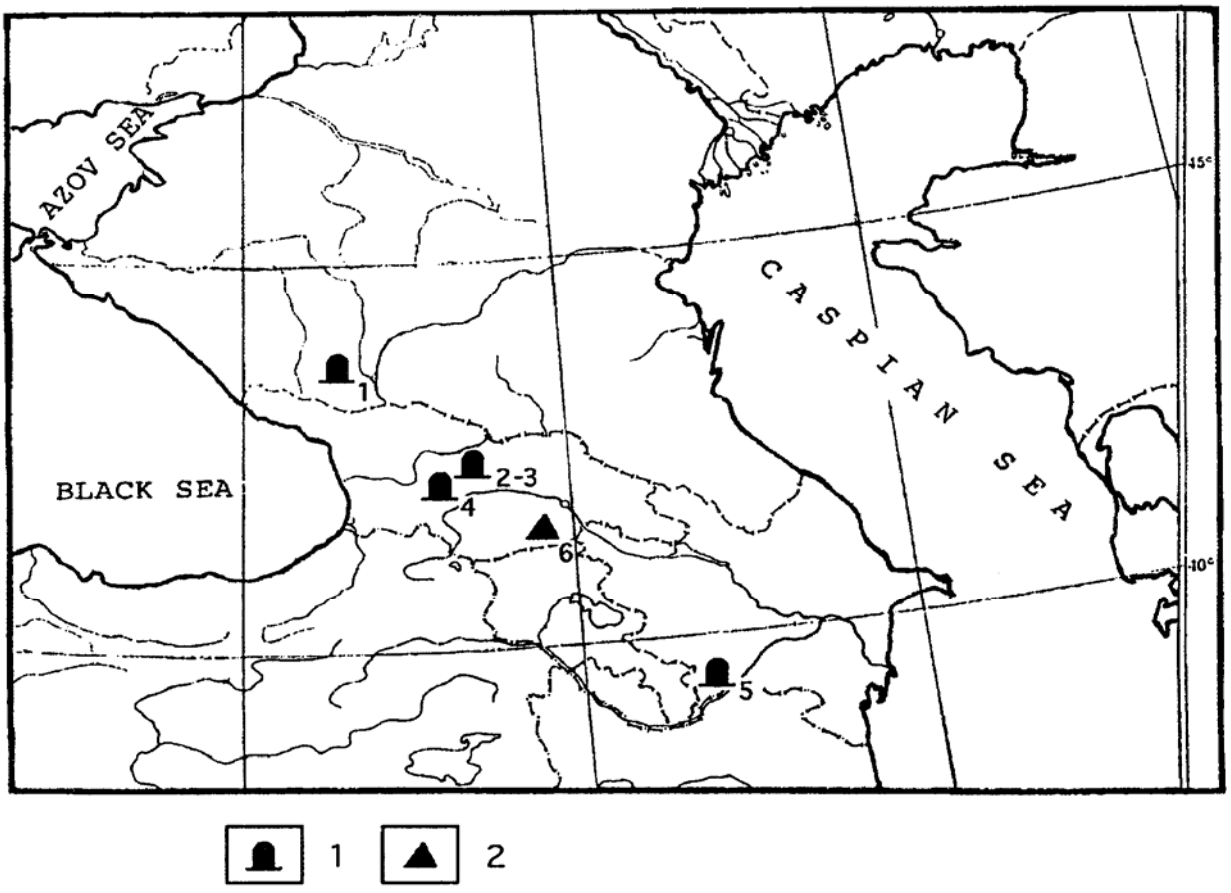

Figure 1. The map of Caucasus showing the main Lower Paleolithic sites. Legend: 1 - cave site; 2 - open-air site. Numbers: 1. Treugol'naya; 2-3. Kudaro 1 and 3; 4. Tcona; 5. Azykh; 6. Dmanisi.

strongly eroded surface of sediments containing the Lower Pleistocene mammal fauna. The second is represented by a richer assemblage of artifacts found under a high river terrace containing the early Middle Pleistocene mammal fauna, but none of the artifacts have a confirmed association with the fauna in spite of very long discussion (e. g., Zamiatnin, 1961).

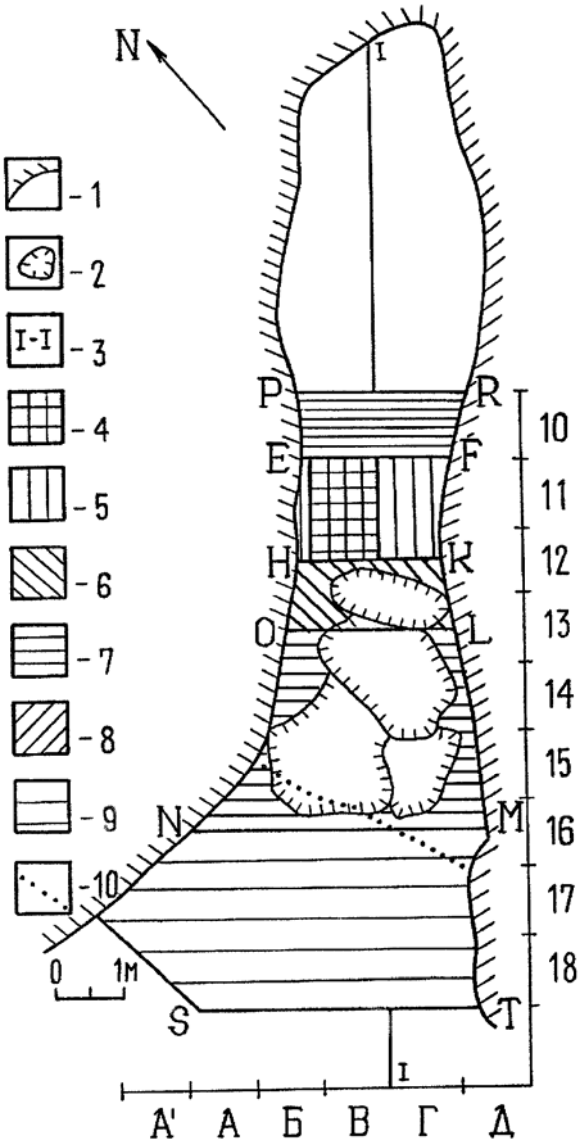

Figure 2. Plan of the Treugol'naya Cave showing excavation areas and cross-section labels. 1. walls of the cave; 2. limestone blocks; 3. longitudinal axes of the cave; 4-9. excavation areas (4. 1986; 5. 1987; 6. 1988; 7. 1989; 8. 1990; 9. 1991); 10. modern drop line.

The discovery in 1986 by L.V. Golovanova of Treugol'naya Cave in the Northern Caucasus (fig.1) has provided the first reliably dated traces of Lower Paleolithic settlement in this part of Eastern Europe. The cave, which is located in the Upper Kuban' Basin, in the Karachai-Circassian Republic, Russia, was excavated by V.B. Doronichev during 1987-1991 on a total area of 28 square m (fig.2) (Doronichev, 1987; 1991; 1992; Golovanova & Doronichev, 1993), and 1995 (last year's materials are not included in this article).

The cave is situated on the Baranaha plateau, which represents an orographic segment of the Skalisty Range. The plateau lies between the valleys of the Urup (a tributary of the Kuban) and the Kuva (a tributary of the Urup). The cave is in the middle part of the plateau, in the upper reaches of a deep ravine, at the base of a precipice where a bed of Upper Jurassic limestone (10 m thick) crops out. It lies at an elevation of 1500 m above sea level and 40 m above the ravine bed, in the upper part of the Vozdvijensk erosive cut according to a local geomorphologic scheme (by S.A. Nesmeyanov). The latter indicates that the mouth of the cave was probably exposed at the beginning of the Middle Pleistocene, most probably near the Matuyama-Brunhes boundary, i.e. not earlier than 780,000 years ago. Treugol'naya is a karstic cave of the gallery type, measuring 12 m in length, 2.5-3 m in width, and up to 5 m in height at the entrance, which opens to the southwest. The area of the cave does not exceed 30 sq. m. Before the cave there is a small terrace.

Stratigraphy

The stratigraphy of the deposits has been recorded in 6 cross-sections and one longitudinal profile along the axial line of the cave. The cross-section designated PR is the primary one. It exhibits the greatest thickness (4-4.5 m) and contains the most complete sequence of sediments (fig.3).

Generally, the section presents a modern layer 1, Upper Pleistocene layers 2, 3a, and 3b, as well eleven Middle Pleistocene layers 4a, 4b, 4c, 5a, 5b, 5c, 6, 7a, 7b, and 8. The oldest sediments of layer 8, most probably, were deposited before the cave was opened by erosion. The deposits can be divided into units corresponding to the main stages of sedimentation, which, in turn, can be tentatively correlated with the stages of development of the Urup river valley and Kuban Basin rivers as whole.

According to the results of paleo-magnetic dating, all the deposits beginning from layer 7b were formed during the Brunhes Normal Epoch, i.e. they are younger than 780,000 years (Pospelova & Levkovskaya, 1994). This is consistent with the conclusion that the cave was opened by erosion at the beginning of the Middle Pleistocene. ESR dates were obtained for layers 7a and 5b on shells of mollusks included into the sediments (Molod'kov,

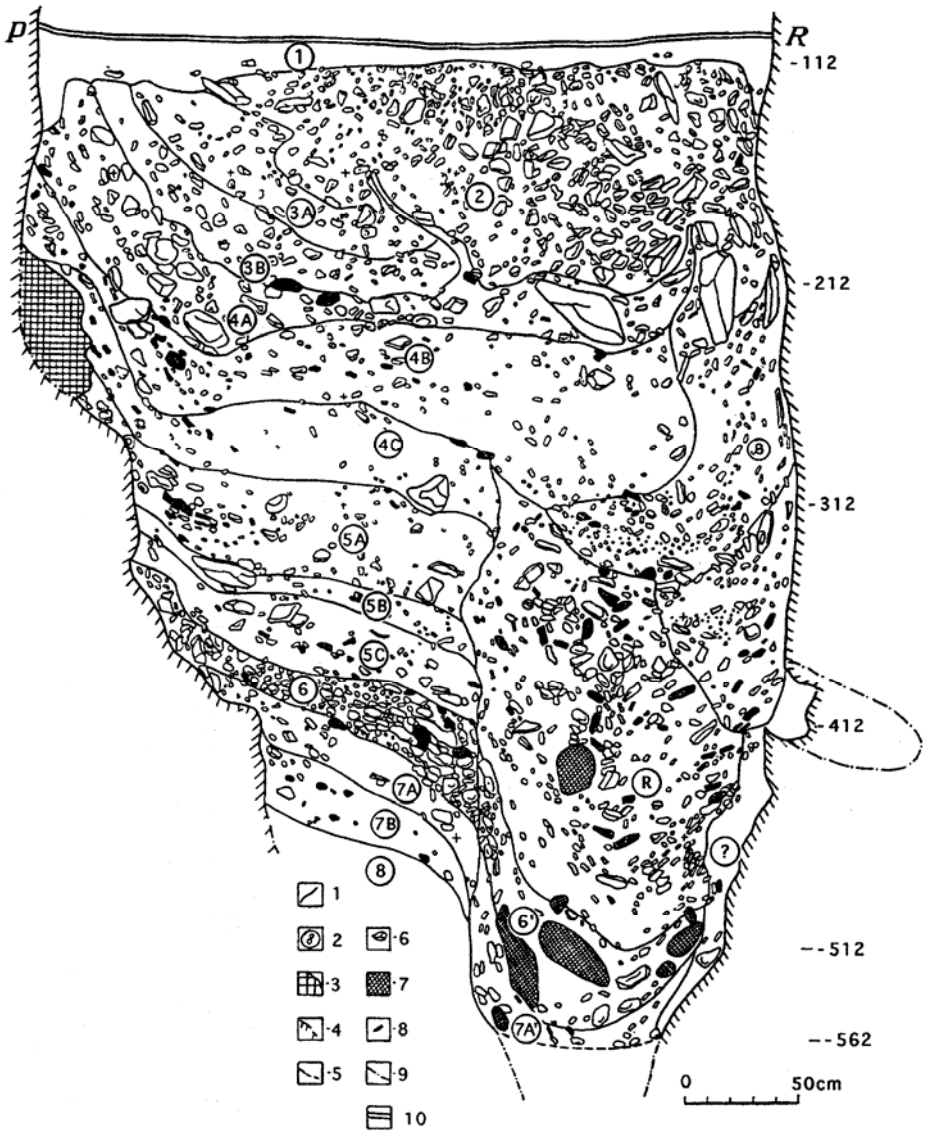

Figure 3. Transversal section PR in Treugol'naya Cave. 1. strata boundary; 2. strata number; 3. breccia; 4. bedrock; 5. lower boundary of the section; 6. limestone detritus; 7. glauconitic sandstone block; 8. bone; 9. proposed boundaries of erosional cuts into the floor and walls of the cave; 10. modern floor of the cave.

Layer	Character of deposits	Thickness (m)
1	Black, strongly humic sandy loam	0,05-0,35
2	Dark-gray sandy loam with blocks and angular detritus	0,05-1,10
3a	Orange-brown sandy loam	0,05-0,40
3b	Dark-brown loam with small detritus	0,05-0,35
4a	Orange-brown sandy loam with fragments of limestone, tuff and detritus	0,05-0,90
4b	Grey sandy loam with small detritus	0,10-1,06
4c	Light-gray sandy loam with small detritus	0,05-0,60
Lens ß	Filling of an erosive cut, consisting of thin layers of orange-brown and gray sandy loam and dark-brown loam	0,05-2,00
5a	Grey-brown sandy loam	0,10-0,50
5b	Dark-brown loam	0,10-0,15
5c	Brown sandy loam with detritus and isolated pebbles	0,15-0,35
Lens R	Grey sandy loam with limestone and sandstone detritus	0,05-1,50
6	Gravel, consisting of limestone pebbles and red-brown sandy loam	0,10-0,55
7a	Brown sandy loam	0,05-0,20
7b	Green-brown sandy loam	0,05-0,30
8	Fine-grained green glauconitic sand	0,05-0,30

1992; 1993). Two dates are available for layer 5b (420,000 and 365,000 yr.), whose average age is 393,000±27,000 yr. The average age of layer 7a, for which six dates were obtained (545,000 yr., 565,000 yr., 570,000 yr., 600,000 yr., 610,000 yr., 610,000 yr.), is 583,000±25,000 yr. Proceeding from the available absolute dates and a variation of the scalar magnetic properties of sediments (after G.A. Pospelova, personal communication), layers 7a-b may be correlated with oxygen-isotope stage 15, layers 5a-c with stages 10-13, and layers 4a-c with stages 7-8 (table 1).

Strata	Archaeology (V. Doronichev)		Terrace complex (S. Nesmeyanov)	Pollen analysis (G. Levkovskaya)	Faunal analysis (G.Barishnikov)	Correlation 18O scale (kyr)
	Layer	Assemblage				
1	Late Medieval layer		Kuban complex		Modern fauna	**Stage 1** 12
Erosion cut			~ 15 kyr.			
2	No		Gireisk complex	no data	Upper Pleistocene Fauna extremely cold, very humid	**Stages 2-4** 71
Erosion cut						
3a	Redeposited Lower Paleolithic					
3b	Redeposited Lower Paleolithic					no correlation
Deep erosion cut			~ 120 kyr. ?			
4a	L.P. layer 1	Cultural-Chronological Assemblage I	Gulkevich complex ~ 300 kyr. ?	Stage II no transregional exotics	Singil faunal Complex cooler, dryer	**Stage 7** 245
4b	L.P. layer 2					
Deep erosion cut						**Stage 8** 303
4c	Lower Paleolithic Layer 3		Vozdvijensk complex	extremely cold		
Erosion cut						339 **Stage 9?**
4d	L.P. layer 4	II		no data		362 **Stage 10**
5a	L.P. layer 5	Cultural-Chronological Assemblage III	ESR - 393±27 kyr (A.Molod'kov)	very warm, humid (interglacial)	warmer, moister	
5b	L.P. layer 6					**Stage 11** 423
5c	L.P. layer 7				cooler, dryer	**Stage** 524 **12-13**
Deep erosion cut					Late Tiraspol faunal complex very warm, dry	**Stages 14?** 565
6	Sterile					
7a	L.P. layer 8	IV	ESR - 583±25 kyr (A.Molod'kov)	cool, humid	cooler, moister	**Stage 15**
7b	Sterile				warm, dry	620
Deep erosion cut			Bruhnes ~780 kyr			
8	Sterile		(G. Pospelova)	Stage I Transregional Exotics	no data	**Stages 16-18 ?**
			Shahan	no data		

Table 1. The correlation of results of multi-disciplinary investigations at Treugol'naya Cave. Note: for stages 1-16, ages are as given in the SPECMAP calibration of Imbrie *et al.*, 1984.

Palynology

At present, Treugol'naya Cave is situated in the sub-alpine zone. Palynological data (by G.M. Levkovskaya) indicate that the local vegetation underwent significant change during the period when layers 8-4a were being formed. Two major stages in the development of the paleoflora can be distinguished, the first corresponding to layers 8-5a (stage I), and the second to layers 4c-4a (stage II). The paleoflora of stage I includes transregional exotics, which today are found in habitats very distant from the Caucasus, such as *Engelhardtia, Cinnamonum, Taxodiaceae, Taxodium, Weigelia, Alanqium, Tsuga, Alnaster*, etc. In contrast, the paleoflora of stage II contains no transregional exotics.

According to the pollen data, layer 7a formed under cool and humid conditions. Layer 5b formed during an interglacial optimum (Mindel-Riss?), and contains the highest diversity of the pollen of

transregional exotics; *Juglans* dominated the forests of that period. The lower part of layer 4c formed under extremely cold conditions. On the basis of the pollen data, which are consistent with the absolute dates, layer 5b may be correlated with oxygen-isotope stage 11 (Pospelova & Levkovskaya, 1994), and layer 7a with stage 15 (not 16 as was previously supposed).

Paleontology

Numerous bones of vertebrates were collected in the cave deposits. The majority of micro-faunal materials are now under study and only preliminary results are available (Baryshnikov, 1990; 1991). Specific analyses have been conducted on voles of the genus *Chionomys* (Nadachovski & Baryshnokov, 1991), on birds (Baryshnikov & Potapova, 1992; Potapova & Baryshnikov, 1993), and large mammals (Baryshnikov, 1993).

Birds. The remains of birds assigned to 22 species were found in the cave. It is possible to divide the sequence of deposits into three units containing different ornithological assemblages, which may be further subdivided into 9 avian-phases reflecting the climatic and landscape alterations in the environs of the cave.

For layers 7a-b and 6 the following species were determined: *Alectoris graeca mediterranea, Perdiz palaeoperdix, Coturnix coturnix, Delichon urbica, Melanocorypha calandra, Eremophila alpestris, Motacilla alba, Pyrrhocorax pyrrhocorax primigenius,* and *Pyrrhocorax graculus vetus*. Layers 6 and 7b yielded some species indicative of warm and dry climate. Layer 7a formed under somewhat cooler and moister conditions. During the period when layers 6-7 were being formed, the cave was surrounded by an open rocky landscape.

In layers 4-5 there were found some of the species listed above, as well as *Phasianus colchinus, Columba livia, Asio flammeus, Apus apus, Hirundo rustica, Melanocorypha yeltoniensis, Lullula arborea, Alauda arvensis,* and *Emberiza calandra.* The ornithological materials of layers 5a-b indicate a moister and warmer climate compared with layers 5c and 4b-c.

Layers 2-3 yielded 6 species, including *Tetraogallus caucasicus, Perdix perdix, Turdus torquatus,* and *Turdus sp.*, which suggest a significant downward shift of the alpine zone and reflect the coldest and most humid climates of the sequence.

Mammals. More 38.000 bone fragments of 22 species of large mammals have been studied in the cave. Most of them are highly fragmented, in paret due to human, but mostly large predators activities. In the human occupation layers, large mammals are dominated by red deer (*Cervus elaphus acoronatus*). Mammal remains were accumulated in the cave by humans as well as carnivores; the cave sometimes served as a den for cave bears.

For layers 7a-b, medium and large mammal remains include *Spelaearctos deningeri cf. deningeri, Crocuta crocuta cf. praespelaea, Cervus elaphus acoronatus,* and *Bison shoetensacki*. Rodents are represented by *Ellobius sp., Chionomys gud* (an archaic form), and *Terricola sp.* In layer 6, these taxa are supplemented by *Meles hollitzeri, Equus cf. namadicus* (a small horse), *Stephanorhinus etruscus brachycephalus, Capreolus cf. sussenbornensis,* and *Capra sp.*. The cave bear is similar to the subspecies *Ursus deningeri kudarensis*. Among small mammals, there are abundant remains of *Sorex sp., Apodemus sp., Clethrionomys sp., Arvicola cantiana, Chionomys gud, Ochotona transcaucasica cf. Vekua,* and *Terricola ex gr. majori.* The fauna is indicative of a warm climate (oxygen-isotope stage 15). The species represented in layers 6-7 of the Treugol'naya cave have been assigned to the Urup Middle Pleistocene faunal complex of the Northern Caucasus. This is correlated with the late stage of the Tiraspol complex in Eastern Europe and the late stage of the Galerian in Western Europe, corresponding to the bio-stratigraphic zone MNQ 21 (Baryshnikov, 1993:42-43).

Layers 4-5 contain fossil remains of *Canis mosbachensis, Selenarctos mediterraneus, Spelaearctos deningeri cf. deningeri, Meles hollitzeri, Mustela nivalis, Panthera leo, Felis cf. lybica, Capreolus cf. sussenbornensis, Praedama sp., Dama sp., Cervus elaphus acoronatus, Bison shoetensacki, Capra sp.* (a large form), *Cricetulus sp., Lagurus cf. transiens, Eolagurus cf. volgensis,* and *Terricola sp.*. This assemblage indicates a drier and colder climate if compared with layer 6, and may also be assigned to the Middle Pleistocene. The fauna is analogous to the Singil complex in Eastern Europe.

Layer 3 contains the remains of *Vulpes vulpes, Cervus elaphus, Capra caucasicus,* and *Ovis orientalis.* Rodents are represented by *Spermophilus sp., Spalax sp., Arvicola terrestris, Chionomys nivalis,* and *Microtus arvalis* (predominant). Such a fauna is typical for the Late Pleistocene of the Greater Caucasus. The cave was

surrounded at this time by alpine grasslands.

Archaeology

Treugol'naya Cave contains eight layers yielding *in situ* stone artifacts (layers 4a, 4b, 4c, 4d, 5a, 5b, 5c, and 7a). On the basis of typology, the author has grouped both *in situ* and redeposited artifact collections into four cultural-chronological assemblages. Artifacts and faunal remains in the lowest occupation level (layer 7a, Assemblage IV) are dispersed across most of the excavated area, with the exception of the area adjacent to the cave entrance. Artifacts in layers 5a-c (Assemblage III) are few, in spite of the highest density of faunal debris found on these levels. The remains on all three cultural levels are distributed over most of the excavated area inside the cave, and artifacts in layer 5c also were found in the area adjacent to the cave entrance. The artifacts and faunal remains in layers 5a and 5b are dispersed throughout the sediments. Unlike these layers, horizon 1 of level 5c near the cave entrance, probably, can be interpreted as an occupation level. Cultural-chronological Assemblage II yields only little information about spatial distribution of the finds because only a small residue of layer 4d is preserved along the cave wall. Evidently, the layer formerly was very thick; in cross-sections EF, HK, and OL, its thickness reaches 1.3 m, 1.0 m, and 1.5 m, respectively. All the stone artifacts found in layer 4d are derived from its uppermost level (35-40 cm in thickness). Faunal remains in layers 4a-c (Assemblage I) are few, and stone artifacts are dispersed throughout the deposits.

Cultural-chronological Assemblage IV. The stone industry of the lowermost assemblage is represented by 11 artifacts only, which includes four small (up to 5 cm) non-Levallois flakes with cortical or plain beveled butts, five tools on the same flakes, a chip (tiny flake), and a small pebble fragment. Among the tools there are three naturally backed side-scrapers (fig. 4-11) and two combined tools (fig. 4-10, 12).

Cultural-chronological Assemblage III. The industry of this assemblage numbers 18 artifacts from cultural layers 5-7. The artifacts in these layers were combined both on the basis of their low numbers and typological uniformity. The industry includes eight tools, three non-Levallois flakes with plain beveled butts (fig. 4-8), six small flakes, and a core-like pebble fragment. The tools are represented by a high-form end-scraper (fig. 4-6), and an end-scraper on a flake with small denticulate retouch (fig. 4-7) from layer 5c; a transverse concave side-scraper on a flake with a massive cortical butt (fig. 4-9), and a triangle with a retouched notch (fig. 4-4) from layer 5b; an end-scraper on a flake fragment (fig. 4-3), a double end-scraper on a flake (fig. 4-5), an atypical *limace* (fig. 4-1), and a chopper on a limestone pebble from layer 5a (fig. 6-4). The predominance of end-scrapers gives the industry a Tayacoid appearance and provides a contrast with Assemblage IV dominated by backed side-scrapers.

Cultural-chronological Assemblage II. The industry of assemblage II is notable for the fact that almost all the artifacts are made of local raw materials: limestone pebbles and slabs. The debitage includes medium-sized (5-10 cm) pebble fragments with scars of flaking as well generally large (> 10 cm) pebbles and slabs with one or more flake scars; a single-platform core, and two three-platform, one-sided pebble cores (fig. 6-1); two polyhedrons and a sub-spheroid; small (< 5 cm long) non-Levallois flakes, among which there are most numerous cortical and semi-cortical ones with cortical or plain strongly beveled butts.

Flake tools are represented by a transverse convex side-scraper on a pebble flake, a flake with a Clactonian notch, an end-scraper like tool on a flake fragment, an end-scraper on a flake, and a small fragment of a tool. The overwhelming majority of tools are made on limestone pebbles and slabs. Choppers make up about 60% of all tools. Over 70% are side choppers (fig. 5-1; 6-2) and end choppers (fig. 5-3; 6-5). Almost all choppers have convex working edges formed by small (1-5 cm) and medium (5-10 cm) flake scars. Usually the choppers are unifacially flaked; only three tools possess bifacially worked edges (fig. 5-1). The base and lateral edges of the choppers often represent either natural surfaces (fig. 5-1,2; 6-2,3) or breaks (fig. 5-6; 6-5), and they often exhibit clear signs of intentional fragmentation (fig. 5-3,5; 6-5). There are five choppers with two working edges, which are rather heterogeneous (fig. 5-5,6). There are also pebble scrapers that may be distinguished from choppers by their smaller size and, more importantly, by the character of preparation of their working edges which are formed by heavy retouch (< 1 cm) and small flake removals. The pebble scrapers can be divided into side convex forms and end convex forms. Large cutting tools include proto-bifaces or pointed choppers, and an atypical biface (fig. 5-2). Proto-bifaces are partly bifacially worked, though, as characteristic of nearly all pebble tools from Assemblage II, only one surface is flaked intensively, while the opposite one has traces of 2-

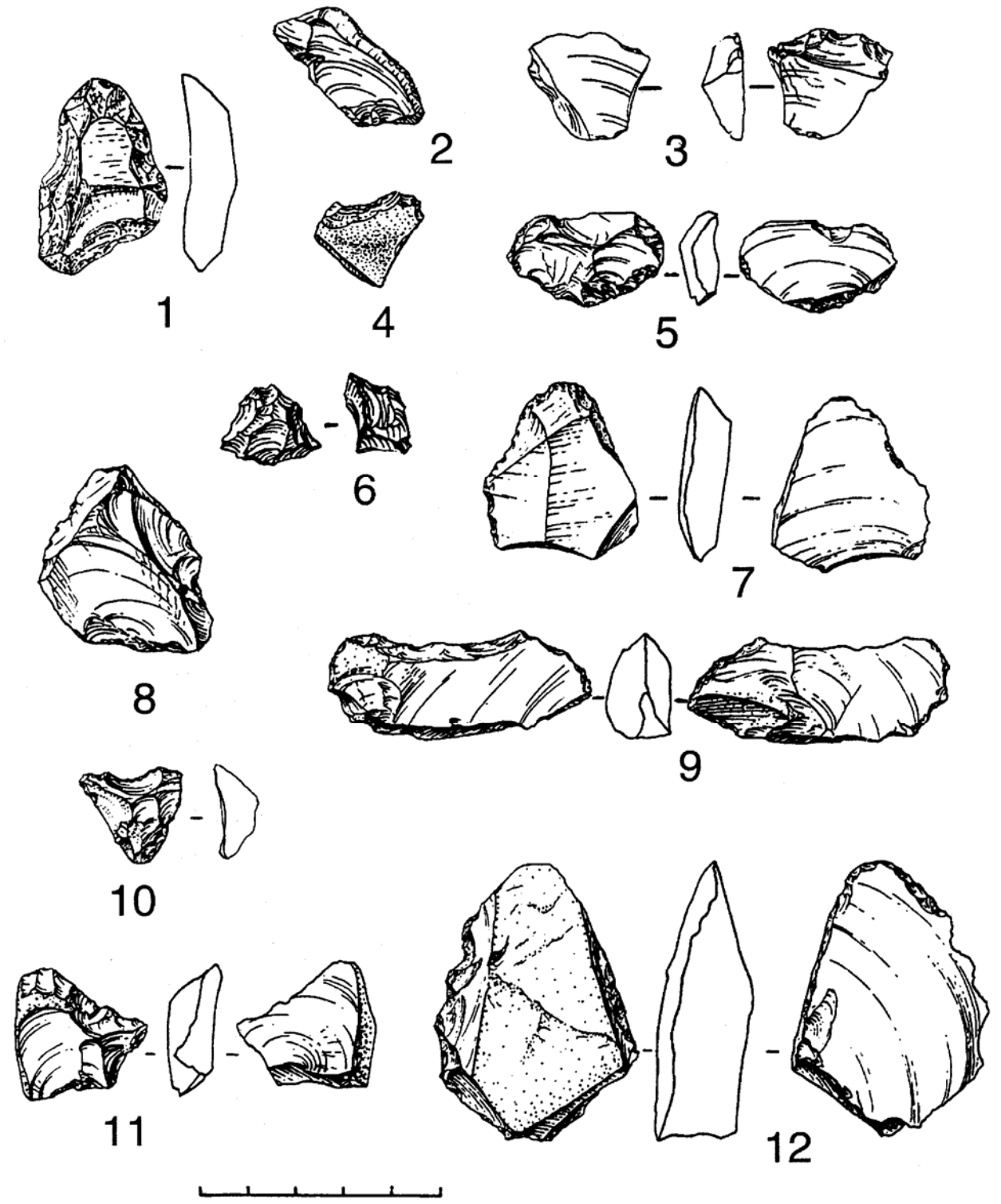

Figure 4. Stone artifacts from the lower assemblages: 1, 3-9. Assemblage III; 2. Assemblage II; 10-12. Assemblage IV.

3 removals (fig. 5-4; 6-3).

Cultural-chronological Assemblage I. The distinctive feature of the stone industry of the uppermost assemblage is the prevalence of artifacts made of gray flint that is not known on the Baranaha plateau. This is a flake industry characterized by small flakes (3-5 cm) with shortened proportions, relatively massive sections, and mainly plain beveled butts. Only two flakes can be defined as Levallois (fig. 7-3,9). Their dorsal surfaces bear usually irregular flake scars, often combined with cortical areas, although a series of parallel scars also are sometimes found. Cores are represented either by exhausted specimens (fig. 7-2), or by formless core-like pieces. Secondary treatment was mainly carried out using of small marginal, scalar (fig. 7-1,4,9,10)

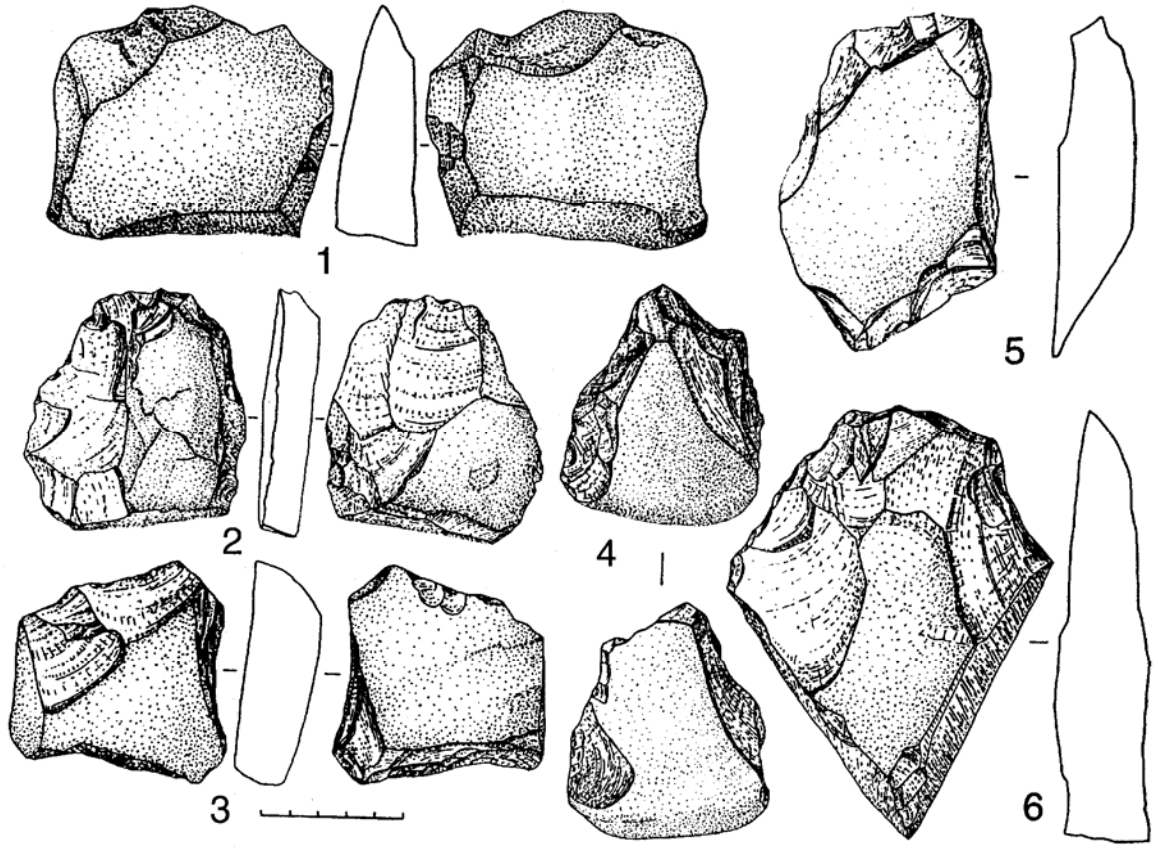

Figure 5. Stone artifacts from Assemblage II.

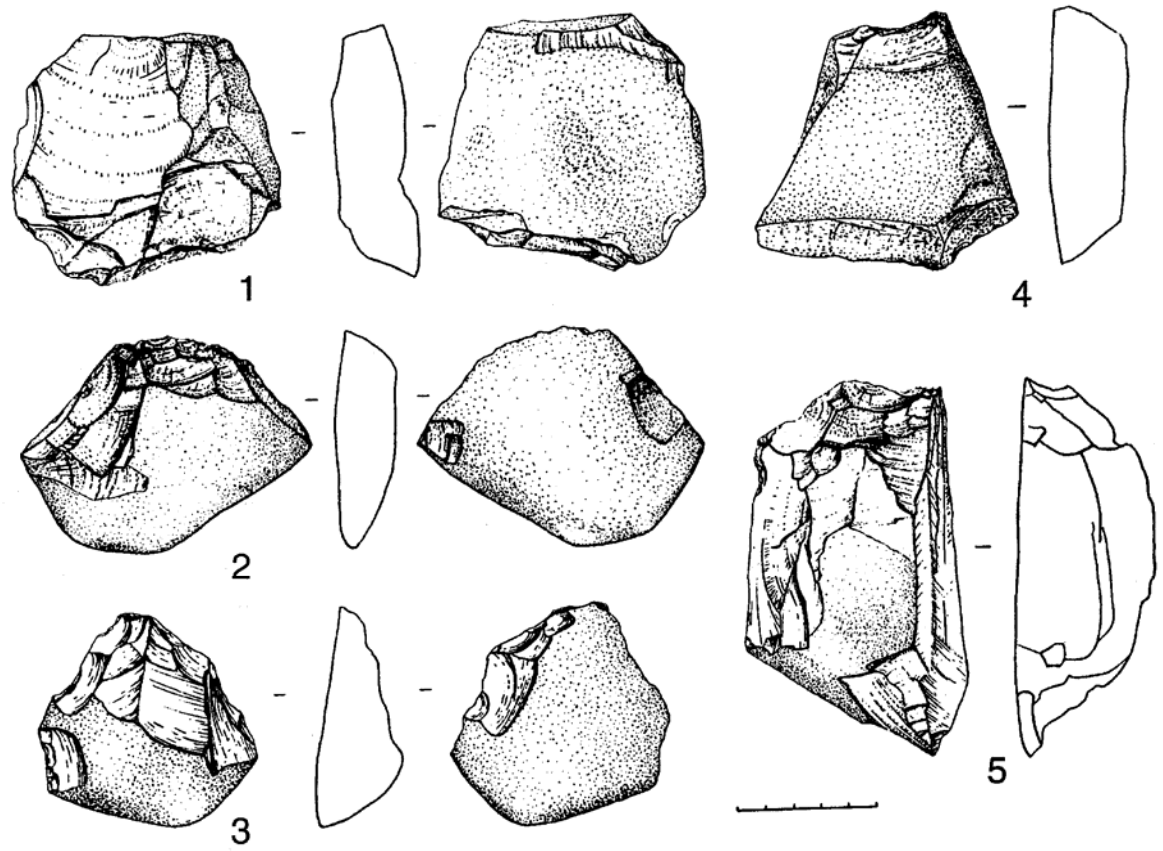

Figure 6. Stone artifacts from Assemblage II.

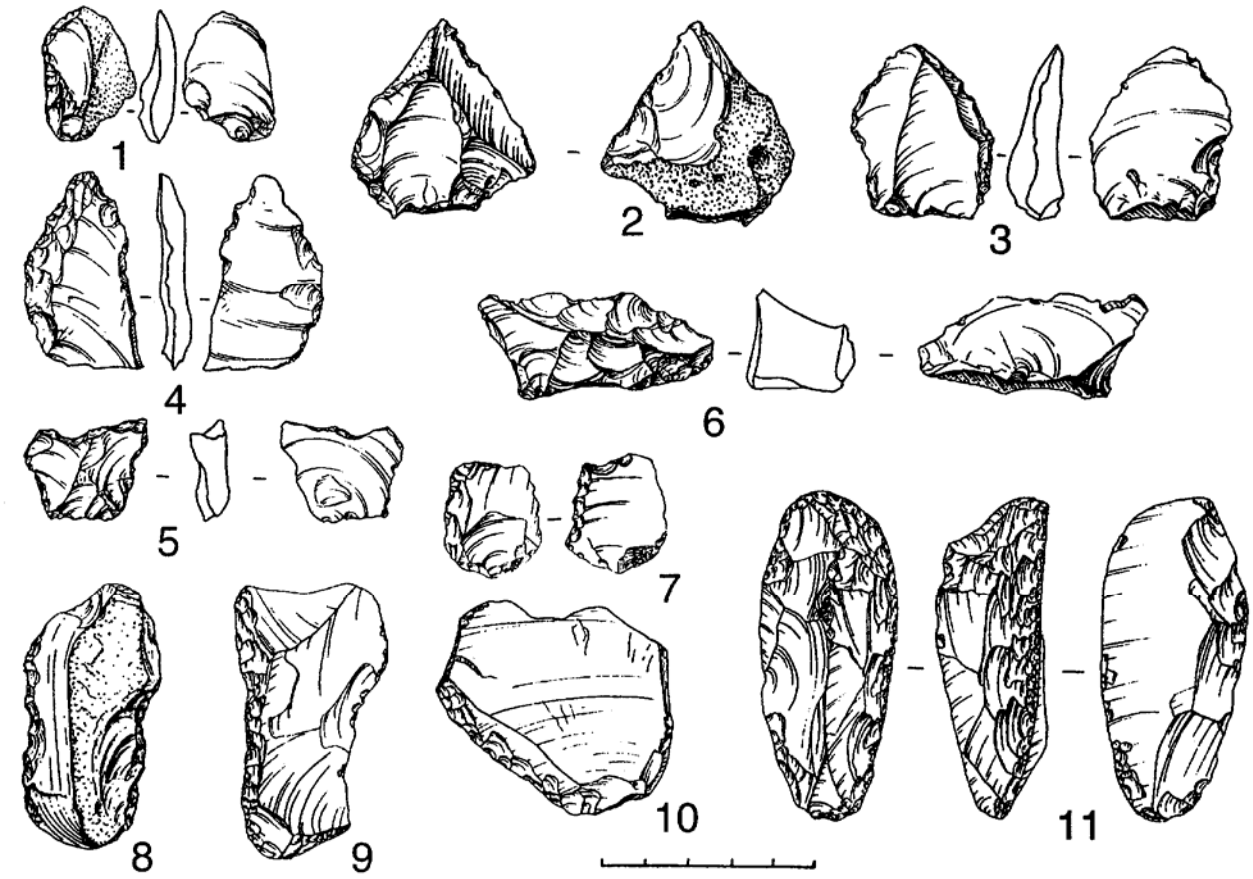

Figure 7. Stone artifacts from Assemblage I.

or denticulate (fig. 7-7,8) retouch. Quina (fig. 7-11) and abrupt retouch, as well as deep sub-parallel (*surélevée*) retouch (fig. 7-6) were used very seldom. Numerous retouched flakes have, probably, utilization retouch (irregular, often very small, sometimes the *grignotée* type retouch) (fig. 7-3).

Side-scrapers make up 50% of all tools. Most numerous are simple convex, simple straight (fig. 7-1,10), and transverse convex side-scrapers. Concave side-scrapers are much less common. Some simple side scrapers are naturally backed. *Déjeté* side-scrapers are presented by two hump-shaped tools (*incurvé*), and a triple one. Three side-scrapers are notable by the thickness of the blanks and steep convex working edges formed by Quina retouch (fig. 7-11). There are also denticulate tools on flakes (fig. 7-8). Three tools are notches. End-scrapers can be divided into two groups : 1) made on flakes, and 2) high end-scrapers made on shivers. The collection contains also two perforators with retouched points, a backed knife, and combined tools. The latter include a tool, which combines a lateral convex side-scraper with a nosed end-scraper formed on the proximal end of a flake (fig. 7-4); a small flake with one edge formed by scalar retouch and the other by denticulate retouch (fig. 7-7); and a small flake combining a retouched point and a nosed end-scraper (fig. 7-5).

Conclusions

As indicated by the available data, including absolute dates, geomorphologic context, pale-ontological and pale-botanical remains, and stone artifacts (table 1), the assemblages from Treugol'naya Cave are among the oldest Paleolithic industries of the Caucasus and adjacent regions. Recently on the territory of Eastern Europe there are known less than ten Paleolithic sites which could be dated prior to isotope stage 6, i.e. before 200 ka BP. Only two of them yielded relatively abundant lithic artifacts in good stratigraphic contexts, the oldest of which are dated by the beginning of Middle Pleistocene. They are Korolevo I in the west and Treugol’naya Cave in the south of Eastern Europe. These two sites have shed light on the initial settlement of Eastern Europe, and the development of the Lower Paleolithic culture in this part of the world. The Treugol’naya cave material is the most significant for the study of the Lower Paleolithic colonization

of the Northern Caucasus, as well leading to the north regions of Eastern Europe.

Aside from Assemblage IV, the absolute date of which by 600,000 yr., points to its early Middle Pleistocene age, only two archaeological occurrences are currently known in the Caucasus region that date back to this time range or earlier. These are Dmanisi in southern Georgia, with its supposed considerably earlier age of more 1.5 my BP, and, probably, layers VII-X of Azykh Cave in Azerbaijan. Both of them represent the Pebble industry while the Assemblage IV of Treugol'naya has not any pebble tools. Moreover, although both lower assemblages IV and III of the cave are represented by very poor flake industries, which cultural appearances are hardly identified, they indicate that the initial colonization of the southern region of Eastern Europe, including the Northern Caucasus, began about 600 ka BP, and until nearly 350 ka BP, the Lower Paleolithic culture of the region likely had no Pebble appearance, but some Proto-Charentian or Tayacoid.

By 350-300 ka BP the first appearance on the Northern Caucasus of the Pebble culture is representing by Assemblage II in the Treugol'naya Cave. It has no analogues in the Paleolithic of the Caucasus or Eastern Europe excluding the pebble industries of Dmanisi, mentioned above, and Korolevo 1, layer VI in Transcarpathian Ukraine. The latter was classified as "Carpathian facies of the Unifacial Acheulean" (Sitliviy, 1988; Gladilin and Sitliviy, 1990:129-130), and, surprisingly, has the same age of 350 ka BP. Coming from a currently supposed very large chronological gap between the pebble industry of the Treugol'naya Cave and the Dmanisi materials, it is difficult to compare these sites. Therefore, now one may only speak tentatively, first, about a cultural affinity of Assemblage II with some Middle Pleistocene pebble industries known in Europe, including the so-called Carpathian facies; second, about a possibility of Central European origin of the Pebble culture in Eastern Europe. Due to this it has to be noted that 400-300 ka BP was a starting point for the wide spread of pebble industries in the southern regions of Europe (Tieu, 1991: fig.12).

The uppermost assemblage I (layers 4a-b) in Treugol'naya Cave has a clear Proto-Charentian appearance like the Proto-Charentian industries defined by V.P.Liubin, probably of the same age in the Transcaucasian caves Kudaro 1, Kudaro 3, and Azykh. This assemblage, however, differs from the latter by a complete absence of Acheulean bifaces. It is difficult now to discuss the genesis of Assemblage 1, because neither its origin nor relationship with the other coeval sites is clear.

Thus, assemblages IV and III of Treugol'naya occupy an intermediate position between the Pre-Acheulian pebble industry of Dmanisi, on the one hand, and the Acheulian industries of Kudaro I and Azykh, on the other hand, whereas Assemblages II and I are broadly coeval to the latter. The significance of Treugol'naya cave as the oldest Lower Paleolithic site in European Russia is beyond any doubt.

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