

The Caucasus area is on a main road for the dispersal of early hominids out of Africa, as testified by the Dmanisi site with its date of 1.8 Myr BP. The area is rich in Middle Pleistocene sites, though dating has proved difficult due to the endemic character of flora and fauna. Stratified open air sites like Achalkalaki are very rare, while cave sites are common. Acheulean industries are known from Middle Pleistocene deposits in caves like Azych, Kudaro and Treugol'naja.

1. Introduction (by V.L.)

1.1. GEOGRAPHICAL OVERVIEW

The Caucasus – the Caucasian isthmus – forms a vast bridge between the Pontis and the Caspian Sea and connects the southern Russian steppe with the highlands of the Near East. The northern part of the Caucasus is characterized by a steppe landscape, while the central part is dominated by the mountains of the Great Caucasus, whose axis runs across the isthmus. The southern Caucasus is formed by the Transcaucasian Depression (Colchis-Lowlands and the Kura Basin) and the volcanic Transcaucasian Plateau, a northern outlier of the Armenian and Iranian Plateau. The boundaries of the Caucasus (to the north the Kuma-Mantysch Basin, to the south the Aras River) are not natural barriers in a geographical sense; there are no clear differences in the landscape in both directions, and access to both north and south and contacts to the Near East played a major role in the Palaeolithic settlement of the Caucasus.

The great regional differentiation of the Caucasus landscape is mainly the result of topography. The most important climatic boundaries are oriented along the ridge of the Great Caucasus and the northern slope of the Caucasus (Suram-Chain, Stavropol Hills). The climatic boundaries have a major influence on temperature and precipitation on the isthmus. The Great Caucasus divides two climatic zones: the temperate zone of the northern Caucasus and the subtropical climate zone of the Transcaucasus. Moreover, the topography subdivides the Caucasus region into a large number of local climatic provinces.

The climate of the western and central part of the flat Caucasus foreland resembles that of the southern Russian

steppe. The Black Sea region has an eastern Mediterranean climate; the influence of the central Asian steppes is noticeable in the Kura Basin and the eastern part of the Caucasus foreland. The continental climate of the volcanic Transcaucasian Highlands is dominated by aridity. Different belts of vegetation, determined by altitude, up to the zone of perennial snow and glaciers can be observed in the mountains (Gvozdeckij 1963).

A particularly noticeable feature of the Caucasus landscape is the presence of an extensive and stable refuge of relict vegetation in the Colchis (western Georgia) (Čočieva 1982). The core of the Colchis flora are relict Tertiary species (Kolakovskij 1961); approximately 20% of the species in the Caucasus are endemic and only found in the Colchis (Pavlov 1948). More than 6,000 species of plants are known from the Caucasus region whereas from the vast Russian plain only some 3,500 are known. The number of animal species is 130.

A particularly species-rich woodland is present in the Colchis region and numerous edible wild plants can be found there (Grossgejm 1942, 1946). The favourable climate and the rich food sources were particularly attractive to humans, as is shown by the concentration of Palaeolithic sites in this region. The Colchis region was apparently a particularly favourable refuge for animals, plants and humans during the glaciations (Ljubin 1969, 1974).

Limestone formations with caves and *abris* are present in the Great Caucasus and in the mountain chains of the Lesser Caucasus, an eastern extension of the Transcaucasian Highlands. A ring of karstic landscapes surrounds almost the entire northern slope of the Caucasus and the western part of the southern slope in the Colchis region (from Sotschi to the Kudaro Caves in South Ossetia). In the northern karst belt there are Palaeolithic sites in for instance the Monaseska, Barakaevska, Mezmajska and Treugol'naja caves. Hundreds of *abris* and caves are known from the western part of the south slope in the Colchis, where the mild and humid climate has led to particularly extensive karst formation. In many of these *abris* and caves, at all altitudes, Palaeolithic sites have been discovered and investigated, among them the sites of Kudaro I and III, and Cona (Fig. 1).

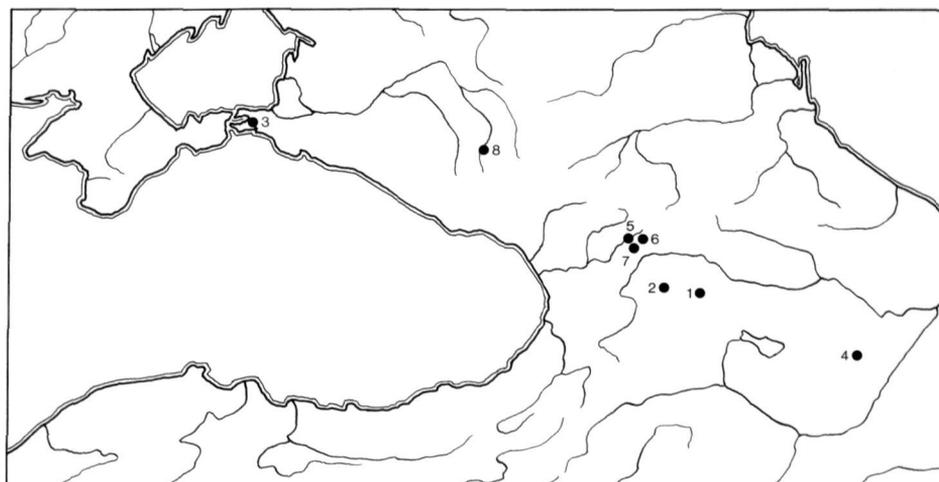


Fig. 1. Lower Palaeolithic Sites of the Caucasus Region.

1. Dmanisi; 2. Achalkalaki;
3. Taman; 4. Azych; 5. Kudaro I;
6. Kudaro III; 7. Cona;
8. Treugol'naja.

In the Lesser Caucasus karst caves are only known in the Somchetski, Sachdag and Karabach mountain ranges. In the foothills of the latter range is the multiple occupation site of Azych. Outside the karst region there are sites in caves beneath lava flows, for example in the narrow gorges of the Transcaucasian Highlands (Erevan Cave, Lusakert I and others). The volcanic region of the Transcaucasus holds a great potential for the discovery of Palaeolithic open sites; to date we only know the Lower Palaeolithic sites Dmanisi and Achalkalaki (Fig. 1).

The Caucasus region is well supplied with raw materials for the manufacture of stone tools. The range of available siliceous rocks – sedimentary and volcanic – includes almost all the lithic materials used for artefacts in the Palaeolithic; various types of flint, quartzite, sandstone, siliceous limestone, schist, obsidian, andesite, basalt etc. Volcanic raw materials (obsidian, andesite, basalt) are found in the regions of tectonic uplift in the Transcaucasus (Armenia, Džavacheti, Ossetia), whereas flint and other sedimentary rocks are dominant in the Colchis, the Black Sea area and Kuban.

1.2. RESEARCH HISTORY

The research of the Palaeolithic of the Caucasus region started in 1898 with the discovery of the Middle Palaeolithic site of Il'skaja by the French investigator J. de Baye. The discovery of Lower Palaeolithic artefacts followed shortly after this, during the Armenian expedition of the French savant J. de Morgan. He collected obsidian artefacts from the western slopes of Mount Ararat (Morgan 1909).

After the 1917 Revolution investigations were carried out by Soviet archaeologists. Special surveys and planned investigations of Palaeolithic sites were carried out in

Abchasia and the Black Sea region of the Caucasus before the Second World War. The first Acheulean sites were discovered in the Soviet Union near Suchumi and Maikop, while the first Palaeolithic cave sites were discovered and partially excavated near Sotschi (Achstyrskaja Caves and others) (Zamjatnin 1937, 1949, 1961). The most important result in the first decade after the Second World War was the discovery of two large new find provinces with Acheulean and Middle Palaeolithic sites in Armenia (Paničkina 1950) and South Ossetia (Ljubin 1954, 1960).

The third phase of research began in 1955. The first cave sites with undisturbed Acheulean layers were discovered at Kudaro I and III (1955) and Cona (1958) in South Ossetia, and at Azych (1960) in Azerbajdschan (Ljubin 1959; Kalandadze 1965; Gusejnov 1963). At the same time hundreds of new Acheulean and Middle Palaeolithic surface sites were discovered in different regions of the Caucasus: e.g. Abadzechskoe and Chodžoch at Kuban (Autlev 1963), Bogos and other sites at the Black Sea (Ljubin and Ščelinskij 1972), Sarbebi, Čilovani and further sites in Imeretien (Tušabramišvili 1962), Džraber and Fontan in Armenia (Ljubin 1961), Ziari in Kachetia (Bugianišvili 1979), Čikiani and Persati in southern Georgia (Kikodze and Koridze 1978). Among the most important recent discoveries are the Treugol'naja Cave in the northern Caucasus (Droničev 1992) and the open-air site Dmanisi in southern Georgia. The excavations in Dmanisi provided Lower Palaeolithic artefacts, an archaic fauna and the oldest remains of *Homo erectus* in Eurasia (Džaparidze *et al.* 1991; Gabunia 1992).

The majority of Acheulean and Middle Palaeolithic sites are located in upland situations, in the foothills and lower mountains of the western and central parts of the Caucasus

isthmus. This is certainly not only a reflection of the current state of research, but far more the result of factors such as the presence of ancient routes of communication between the Caucasus and the Near East, of numerous natural rock shelters and natural resources (including lithic materials) and the particularly favourable climatic conditions especially in the Colchis refugium.

Extensive Acheulean and Middle Palaeolithic sites and ateliers have been discovered in the immediate vicinity of raw material sources. Such flint workshops are located in the Šachan Mountains of the Kuban region near Maikop (Abadzechskaja and others), in the Jaštuch Mountains of Abchasia and on the upper Imereti Plateau close to Kutaissi in southern Georgia (Sarbebi and others). Obsidian and andesite workshops are found in Armenia (Satani Dar, Erkao-blus, Atis and other sites) and in southern Georgia (Čikiani, Persati).

The lithic assemblages at the atelier sites do not represent discrete chronological units. The stratigraphical context of finds collected from river terraces, exposed hillsides, gorges and river valleys is unknown. The stratigraphic position and the age of finds from sediments overlying terrace deposits and marine sediments are also often uncertain. The age of finds from the basal alluvial facies of terraces can be established with some more certainty. Wide ranging studies of the geological-geomorphological position and age of terrace surfaces are currently in progress in the region of Sotschi and Tuapse. The subdivision of Pleistocene deposits is based here on the sequence and the geochronology of marine terraces and of the related river terraces in the Black Sea region (see Fig. 2). A number of Acheulean and Middle Palaeolithic sites have been discovered in the basal, alluvial parts of these terraces (Ščelinskij and Ostrovskij 1970; Ostrovskij *et al.* 1977; Izmajlov 1990).

The majority of Acheulean finds in the Caucasus comes from surface sites. Characteristic of these sites and also of the cave sites is the presence of bifaces. Acheulean with bifaces is the most important facies of the Lower Palaeolithic of the Caucasus. Bifaces are found in particularly large numbers at sites in the southern part of the Caucasus, i.e. from the Transcaucasian Highlands, which form the northern part of the extensive Near Eastern Highlands. The Acheulean in the Caucasus appears to be a northern extension of a distribution whose centre lies in the Near East. There are appreciably less bifaces on Acheulean sites north of the Transcaucasian Highlands; in Imereti, the Black Sea and the Kuban regions. The only exception to this are surface finds and sites in the west of South Ossetia (Laše-Balta, Kaleti, Cdileti and others in the foothills and Kudaro I, Kudaro III and Cona in the mountains), where numerous bifaces occur. This region is located between the Liachvi River and the Suramsk (Lichsk) mountain range

and forms a link between the Transcaucasian Highlands and the Greater Caucasus. The large proportion of bifaces from the South Ossetian sites is, most probably, related to the more southerly finds from the Transcaucasian Highlands (Džavacheti). Evidence for such a relationship might be the occurrence of bifaces at sites in South Ossetia which are made of a non locally occurring andesite (from the Džavacheti region?). The presence of cleavers in assemblages from both the Transcaucasian Highlands (Azych, Satani-Dar, Čikiani) and South Ossetia (Laše-Balta, Cona and other sites) also indicates such a relationship (Ljubin 1981a; Kikodze 1986).

Especially important and comprehensively published Acheulean sites are Satani-Dar (Paničkina 1950) and Džraber (Ljubin 1961, 1981a, 1984), both in Armenia, Laše-Balta (Ljubin 1960, 1981a) in South Ossetia, Jaštuch (Korobkov 1967, 1971) in Abchasia and Abadzechskaja in the Kuban region. Sites with Upper Acheulean artefacts (Levallois technique, small numbers of late types of bifaces) are known from the northern Caucasus. Two morphologically primitive bifaces (amygdaloid, proto-limande), cores and flakes found near Saratovsk on the Psekups River at the foot of the 35 metre terrace are the only artefacts which might be evidence of an appreciably earlier phase. Zamjatnin (1961) classified these finds as Lower Acheulean. The probable archaeological layer was geologically assigned to the early or central part of the Middle Pleistocene (Veličko *et al.* 1969).

1.3. PLEISTOCENE CHRONOSTRATIGRAPHY

Different subdivisions of the Pleistocene period are used in the Caucasus region and they can only be correlated broadly in some cases (Fig. 2). The subdivision used in the eastern part of the region is based on the marine transgressions in the Caspian Sea (Fedorov 1978). In the western Caucasus transgressions of the Black Sea are the basis of classification (Fedorov 1978). In the north of the region the subdivision of terrestrial deposits, in particular moraines, established for the Russian plain is usually adopted (Nikiforova 1982). To the south, in the volcanic regions of the Transcaucasus, tephra deposits are being used increasingly for dating. Parallel to the geological zonation there exists a stratigraphical biozonation on the basis of faunal assemblages (Fig. 2).

The subdivision of the Pleistocene used in countries of the ex-Soviet Union, and therefore also in the Caucasus, differs from that in western and central Europe (Praslov 1984; Ljubin 1993a-b). The Tertiary/Quaternary boundary is located at the base of the Apšeron Layers and Gurija Layers of the Caspian and Black Seas respectively, and correlates with the Olduvai Event at 1.87-1.67 Myr BP. The Quaternary is divided into three units – Eopleistocene, Pleistocene and Holocene.

EASTERN EUROPE										CENTRAL EUROPE		
Russian Plain			Black Sea	Caspian Sea								
K.V. Nikiforova et al. 1980 Sediments Fauna			P.V. Fedorov 1978 Kitovani 1976	P.V. Fedorov 1978								
Holocene												
QUATERNARY	Pleistocene	Upper	Valdai	Mammoth Fauna	Late	New Evksin Post - Karangat	Upper Chvalyn Lower Chvalyn	Weichsel		Upper		
			Mikulín			Karangat	Upper Chazar	Eem				
		Middle	Moskva	Mammoth Early Chazar	Singil'	Regression	Regression	Lower Chazar (Kosož)	Saddle Warthe Treene Drenthe	Holstein		Middle
			Roslav			Uzunlar	Lower Chazar					
			Dnepr			Early Evksin (upper)	Lower Chazar (Singil')					
			Lichvin			Early Evksin (lower)	Lower Chazar (Singil')					
	Lower	Oka	Tiraspol		Regression	Regression	Elster		Cromer (I - V)			
		Kolkotov Platov Michajlov			Upper Čauda Regression Lower Čauda	Urundžik (Upper Baku) Lower Baku Tjurkjan						
	Eopleistocene			Taman	Čauda (Gurija)	Apšeron	Upper	Menap		Lower		
							Middle	Waal	C B A			
Lower							Eburon					
Upper Pliocene			Chaprov	Kujal'nic	Akčagyl	Upper	Tegelen		C B A			
						Middle	Pretegelen					
						Lower						
NEOGENE			Moldava	Kimmerija								

Fig. 2. Pleistocene chronology in Eastern Europe (note that the stratigraphical subdivision for northern and central Europe differs from the standard division for this area; see Roebroeks and Van Kolfschoten, this volume, figure 1).

Eopleistocene

The Apšeron layers of the Caspian Sea and the Gurija layers of the Black Sea are assigned to the Eopleistocene. In the terrestrial classification system of the Russian Plain this period includes the Domaškin, Bošernic, Ževachov, Nogai and Morozov Horizons. The faunal complexes from Odessa and Taman are also assigned to the

Eopleistocene.

The Eopleistocene is broadly equivalent to the Early Pleistocene of the western and central European classification and is subdivided into two further units. The Lower Eopleistocene contains the lower and lower-middle part of the Apšeron. This period is biostratigraphically characterized by the faunal assemblages from Odessa with the type species

Archidiskodon meridionalis meridionalis and is equivalent to the Late Villafranchian of western Europe.

The Upper Eopleistocene contains the upper-middle and upper units of the Apšeron and is characterized biostratigraphically by the fauna from Taman, with the type species *Archidiskodon meridionalis tamanensis*, a later form of the southern elephant. The equivalent stage in western Europe is the Epi-Villafranchian.

Pleistocene

The Eopleistocene/Pleistocene boundary is defined at the base of the Tjurkjan deposits of the Caspian Sea and the base of the Čauda deposits of the Black Sea. In the subdivision used in the Russian Plain region, this boundary is located at the beginning of the Michajlov horizon. The Eopleistocene/Pleistocene boundary is situated somewhat below the Matuyama-Brunhes boundary (0.78 Myr BP) which defines the beginning of the Middle Pleistocene in western and central Europe.

Lower Pleistocene

The Lower Pleistocene has two units. The older part includes in the Caspian Sea area the Tjurkjan, Baku and Urundzik layers, in the Black Sea area the Čauda layers. In the classification of the Russian Plain the equivalent units are the Michajlov, Platov and Kolkotov horizons.

The older phase of the Lower Pleistocene is defined by the fauna from Tiraspol, which includes *Archidiskodon trogontherii*, *Equus mosbachensis* and *Dicerorhinus mercki*. The younger phase of the Lower Pleistocene is represented on the Russian Plain by deposits of the Oka (= Elster) Glaciation; a period with a major marine regression of both the Caspian and the Black Sea. *Dicrostonyx* occurs in deposits of the Oka Glaciation.

The western and central European equivalent to this Lower Pleistocene is the first part of the Middle Pleistocene.

Middle Pleistocene

The Middle Pleistocene of the Caspian Sea is represented by the lower Chazar layers (Singil' and Kosož horizons), that of the Black Sea by the Evksin and Uzunlar deposits. On the Russian Plain the Middle Pleistocene contains the Lichvin, Dnepr, Roslava and Moskva horizons.

The Lichvin Interglacial is characterized by the Singil' fauna with *Palaeoaloxodon antiquus*. The deposits of the Dnepr Glaciation contain a faunal complex with *Mammuthus chosaricus*, the earliest true mammoth. The Roslava and Moskva horizons are characterized by an early phase of the Late Pleistocene fauna containing *Mammuthus primigenius*.

This Middle Pleistocene can be equated with the second half of the western and central European Middle Pleistocene.

Upper Pleistocene

The Upper Pleistocene begins with the Mikulin (= Eem) Interglacial and also includes the deposits of the Valdai glaciation. The equivalent deposits in the Caspian Sea region are the upper Chazar and the Chvalyn layers, in the Black Sea area the Karangat, Post-Karangat and Novoevksin deposits. This Upper Pleistocene is the equivalent of the central and western European Late Pleistocene.

The correlation table (Fig. 2) compares the division of the Pleistocene in the Caucasus region with that of northern central Europe. The comparison should be treated with reservation and is, especially for the older part of the sequence, relatively uncertain. Correlation with the Alpine sequence seems to be quite impossible, with the exception of the Late Pleistocene. For the sake of uniformity the standard continental subdivision of the Pleistocene as used in central and western Europe will be used in the following text.

2. The earliest occupation of the Caucasus

2.1. EARLY PLEISTOCENE: DMANISI (BY G.B.)

The site Dmanisi lies in southeast Georgia, close to the border with Armenia, in a volcanic area which extends into Armenia and Turkey to the south (Fig. 3). Important for the area are the volcanoes of the north-south oriented Džavacheti range, to the west of Dmanisi. During the Early Pleistocene, lava from a volcano of the Džavacheti range flowed eastwards through the valley of the Mašavera river and into the lower valley of the Pinezaouri (Fig. 4). The lava is normally magnetized and has been dated to 1.8 ± 0.1 and 1.9 ± 0.2 Myr BP, suggesting it should be placed in the Olduvai Event (Majsuradze *et al.* 1991). The lava was later cut by both the Mašavera and the Pinezaouri, leaving a triangular promontory of lava, which towers 90 m above the present level of the rivers. On this promontory lay the mediaeval town of Dmanisi; the citadel in the south of the ruined town is built on Cretaceous deposits.

The Lower Palaeolithic site was discovered in the pit-cellars of mediaeval houses. Following preliminary excavations by the Archaeological Centre, Tiflis between 1983-1987 and in 1989, the site has been investigated since 1991 (Džaparidze *et al.* 1991).

Stratigraphy

In the middle of the lava flow there is a basalt ridge with accumulated sediments on both sides (Fig. 3). The base of the section, on top of the lava, is formed by black basalt sand (VI), covered by a blackish brown sandy loam (V) with numerous bones and lithic artefacts. In a concentration at the base of layer V the human mandible (see below) was found. Next, a brown sandy loam (IV) is present, which

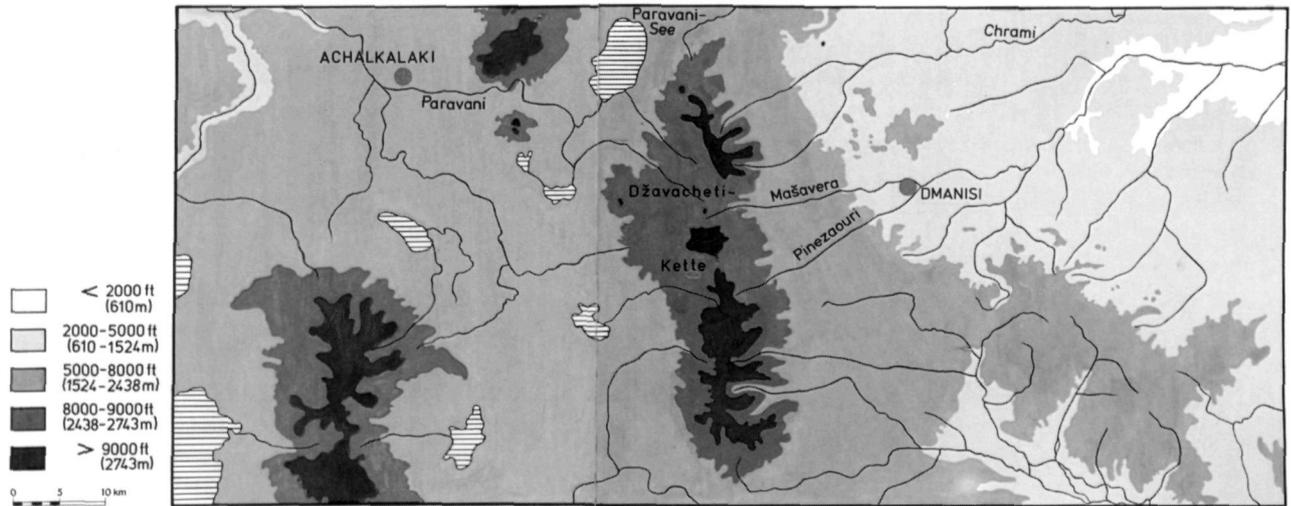


Fig. 3. Location of Dmanisi and Achalkalaki in the Dzvacheti region.

differs from the underlying layers mainly in the absence of a component of basalt ash. Bones and artefacts are also present in Layer IV, but less than in Layer V. A blocky deposit, composed of mainly horizontal bands of carbonate concretion *kerki* forms Layer III. It seems that the carbonate concretions of the *kerki* formed as a crust developed on the underlying sediments in warm and arid conditions. The molluscs and seeds found in the *kerki* indicate dry conditions. Bones and artefacts are also present in the deposit, indicating that humans were occasionally present during the formation of the *kerki*. Above the *kerki* follows 0.50 - 0.80 m of a yellow, weakly loamy sediment (Layer II). In the lower part of Layer II, 0.10 - 0.20 m above the *kerki*, there is a horizon with many stones including artefacts. The 1992-1994 excavations demonstrated that the stones of this layer extend over a surface of at least 70 × 70 m. In order to clarify this situation it is necessary to excavate larger and coherent surfaces. Bones are rare in this horizon, but a molar of *Archidiskodon meridionalis* found in 1991 indicates that Layer II is also to be dated to the Early Pleistocene (Vekua and Gabunia 1991). The top of the section consists of a grey sediment (Layer I), which probably represents an alteration (soil formation) of the underlying layer. The surface of Layer I is consolidated by carbonate concretions. On top of layer I is a thin humus layer with mediaeval finds and the rubble layers of the mediaeval town.

The lower layers (VI-IV) may have been formed in a relatively short period, by fluvial processes that decreased through time. The layers V and IV are normally magnetized (Majsuradze *et al.* 1991) which suggests a preliminary correlation of these layers with the Olduvai Event. The

chronological position of the upper levels, especially of layer II is difficult to establish. The palaeomagnetic analysis of Sologašvili indicates that layer II is magnetically reversed, which suggests a correlation to the Matuyama period after the Olduvai Event.

Faunal remains

The majority of the macro faunal remains recovered to date are from Layer V, while a number of bones belongs to Layer IV. Layer VI directly overlies the basalt lava and has only yielded a few bones, which, in colour and high degree of fossilization, differ from the other bones. The *kerki* Layer III contains only a small number of resistant faunal remains, mainly teeth. In Layer II bones are rare.

The fauna from Layer V is assigned biostratigraphically to the Late Villafranchian (Vekua and Gabunia 1991, Vekua in press).¹ The fauna is younger than the Villafranchian complexes from Kočachuri and Čalka (Vekua *et al.* 1985), which belong to the early Apšeronian (Gabunia and Vekua 1981, 1990; Vekua 1991a-b). Dmanisi is nevertheless, on the evidence of the stage of development of *Archidiskodon meridionalis*, older than Ubeidiya (Vekua and Gabunia 1991; Gabunia and Vekua 1993; Vekua in press).

Ecologically the fauna is dominated by species typical of warm climate, open grassland (*Struthio*, *Equus*, *Dicero-rhinus etruscus*, *Archidiskodon meridionalis*), but species indicative of forested conditions are also present (*Sus*, *Ursus etruscus*).

The bones of Layer V lay in separate concentrations, which repeatedly contained articulated skeletal parts (vertebrae, foot bones). Some of the bones are fragmented.

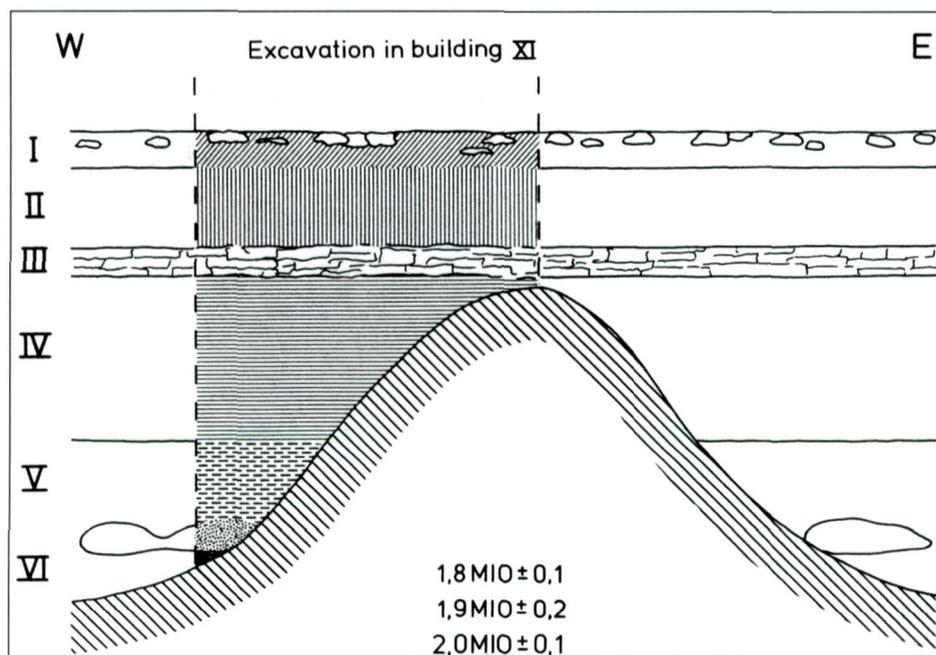


Fig. 4. Dmanisi. Schematic section (total height approximately 4 m).

Taphonomic studies have not been carried out yet, so for the time being it is impossible to evaluate the role of humans in the accumulation of the recovered assemblage; there are bones and antlers with possible traces of modification by humans, though small mammal remains and molluscs are found mainly in the lower Layers (V, IV). The following species are identified by A. Vekua and A. Muschelišvili: *Sorex* sp., *Marmota* sp., *Apodemus* aff. *dominans*, *Allocricetus* sp., *Epimeriones* sp., *Mimomys* ex gr. *hungaricus*, *Kowalskia* sp.

Flora

Pollen is only poorly preserved in the Dmanisi section. However, in a coprolite E. Kvavadze found a spectrum containing pollen of trees (pine, spruce, beech, alder, chestnut, lime, birch, hornbeam), shrubs (rhododendron, hazel) and grass and herbs (including Polypodiaceae, Chenopodiaceae, Cyperaceae and Gramineae) (Kloptovskaja *et al.* 1991). Additionally, seeds were identified of *Buglossoides arvensis*, *Anchusa* sp., *Staphyllea colchika*, *Nonea flavescens*, *Lycopsis orientalis* and *Celtis glabrata*.

Lithic artefacts

Lithic artefacts are particularly common in Layer II, but are also present in Layers V and IV. It is still not possible to recognize differences in the typology or technology of the various layers.

The artefacts are mainly manufactured from silicified volcanic tuffs and are occasionally of quartz (Bosinski *et al.*

1991). They are struck from cobbles which occur in the valleys of the Mašavera and Pinezaouri.

Flakes make up the majority of the artefacts (Fig. 5). A number of the smaller flakes are struck from more highly silicified flint-like tuffs, which are only rarely found in the river gravels.

The dorsal surfaces of the flakes normally have flake scars which are usually struck from the same direction as the flake itself and show serial knapping of flakes. The flake edges commonly show definite use wear (marginal retouch, splintering, small notches).

Retouched flakes (Fig. 6) are rare, but present in the form of edge retouch and stepped retouch. A multiple burin is present, manufactured on a large flake with an edge-retouched ventral face.

Cores are mainly spherical/polyhedral and struck from several directions. There are also conical cores whose striking platform is formed by one or, at most, a few blows. Pebble tools are both unifacially and bifacially worked and show a great overlap with the category of cores (Fig. 7).

The hominid mandible

The hominid mandible discovered in September 1991, in the lower part of Layer V, was found in the middle of a concentration of bones (Gabunia *et al.* 1991). Remains of *Megantereon* (cranium, atlas, epistropheus, vertebrae), *Canis* (cranium, phalanx 1, canini), *Ursus* (carpalia), *Equus* (tibia, radius, humerus, vertebrae), *Dicerorhinus* (M1-M3), *Cervus* (vertebrae), *Bos* (metacarpus, vertebrae), *Hypolagus*

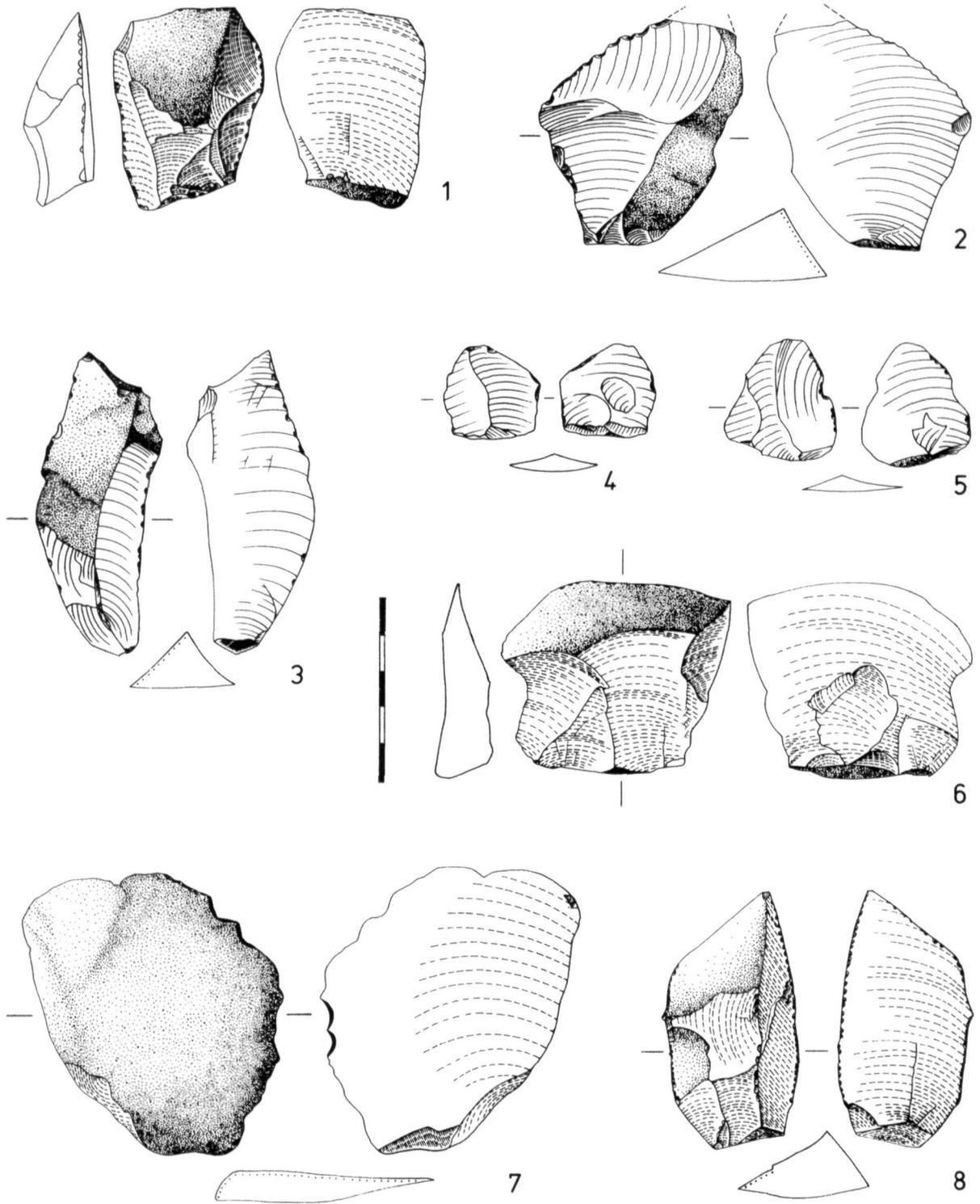


Fig. 5. Dmanisi. Flakes. Scale in cm.

(metatarsus) and Reptilia (vertebrae) could be identified. The concentration also contained artefacts and manuports. The mandible (Fig. 8) lay upside down in the middle of the concentration. The ascending ramus on both sides of the mandible has been fractured off. Otherwise the mandible is well preserved with all 16 teeth. The degree of wear on the teeth suggests an individual between 20-25 years at the time of death. The robusticity of the piece allows it to be identified as male (Gabunia 1992). The low width and the narrow alveolar arch of the medium-sized piece are notable. The region of the anterior symphysis is narrow and has a pronounced relief. The middle part of the symphysis is convex; a chin prominence is not present. The incisors project forwards and their alignment is only slightly curved. The canine is slightly pointed but does not protrude above the height of the other teeth. The premolars are relatively small. The molars have strongly folded enamel and have the *Dryopithecus* pattern and a sixth cusp (*tuberculum sextum*). The size of the molars diminishes appreciably from M₁ to M₃. According to L. Gabunia (1992) the mandible shows a range of archaic characteristics, such as the U-shaped alveolar arch, the anterior and relatively low placement of the foramen mentale, absence of the trigonum mentale, forward position of the beginning of the ascending rami and reduction of the retromolar fossa. At the same time, the mandible has certain features in common with early *Homo sapiens*, e.g. reduction in the size of the molars from M₁ to M₃, a tendency towards a vertical orientation of the planum alveolare, and only a slight recession of the anterior symphyseal surface.

The Dmanisi mandible shows similarities to certain Early Pleistocene specimens. Among African finds these are OH13 (*Homo habilis*), ER 730, ER 992 and, possibly, the admittedly very young individual WT 15000. Among the Java finds there are many similarities to Sangiran 9. L. Gabunia (1992) believes that the Dmanisi hominid and the similar *Pithecanthropus* from Sangiran represent a form derived from *Homo habilis* which already spread into Eurasia at the beginning of the Pleistocene. Derived from a hominid type which also contained the ancestors of *Homo erectus*, the representatives of this early migration of *habilis*-type hominids into Eurasia underwent their own evolution. In some features this led to parallels with the more recent *Homo erectus*, while in other ways the tempo of evolution was more rapid than for the latter species (L. Gabunia 1992).

2.2. EARLY MIDDLE PLEISTOCENE (BY G.B.)

2.2.1. Achalkalaki

East of the town of Achalkalaki in southern Georgia (Fig. 3) is the 1,883 m OD high volcano of Amiranis, which towers over the Džavacheti high plateau by some 150 m.

This high plateau is formed of Tertiary (Miocene-Pliocene) pyroclastic rocks and lavas and Pliocene-Early Pleistocene basalts (Maruašvili 1971; Gabunia *et al.* 1994).

In the early 1960's A. Vekua undertook palaeontological excavations on the lower slopes of Mt. Amiranis (Vekua 1962, 1987; Kahlke 1987). A rich fauna was excavated from the loamy weathered deposits, with *Ursus* sp., *Meles meles*, *Panthera* cf. *tigris*, *Mammuthus* aff. *trogotherii*, *Archidiskodon* sp., *Equus süssenbornensis*, *Equus hipparionoides*, *Dicerorhinus etruscus*, *Hippopotamus georgicus*, *Praemegaceros verticornis* and *Capra* sp. This fauna is assigned to the early Middle Pleistocene. Its composition suggests that at that time the Achalkalaki plateau and the surrounding region were covered by an open steppe vegetation. The admittedly few palaeobotanical remains support this interpretation (*Celtis*, *Lithospermum arvense*; Avakov 1960). It was supposed that humans were partly responsible for the accumulation of material found in Achalkalaki. For this reason M.K. Gabunia opened a test pit near the area investigated by A. Vekua. At 0.80 - 1.10 m below the recent surface he found artefacts and bones, identified as *Bison* sp., *Equus süssenbornensis*, *Equus hipparionoides*, *Dicerorhinus etruscus*, *Archidiskodon* sp., *Marmota* sp. and *Homotherium*. All these species, with the exception of *Homotherium*, were already known from this site.

Some of the limb bones were found in anatomical connection. This had also been observed during earlier investigations and suggests that the material has, at most, been only slightly reworked. An andesite flake with a broad scraper edge was associated with the bones (Fig. 9). It was thus established that Achalkalaki is also an archaeological site. Nevertheless, the precise role of humans in the accumulation of the faunal assemblage remains to be investigated.

2.2.2. Taman, Kurgan Cimbali

A number of palaeontological sites are known from the Taman peninsula between the Sea of Asov and the Black Sea (Vereščagin 1957). Sand quarrying on the eastern shore of the Bay of Taman close to the Greek city of Kepy, has uncovered numerous animal bones. The bones were mostly bedded horizontally, both in conglomerate and in intervening sandy layers. The majority of the recovered material consists of fragments of long bones and skulls, antler and isolated teeth. Vereščagin suggests that human activity is responsible for the breakage of certain bones (Fig. 10,3-4).

"Some long bones of medium-sized animals, e.g. deer, are fractured in a manner later practised by Middle and Upper Palaeolithic people... Comparable fracture patterns are sometimes found on bones from Middle Pleistocene deposits in the Central Volga region. However, to date we know of nothing comparable

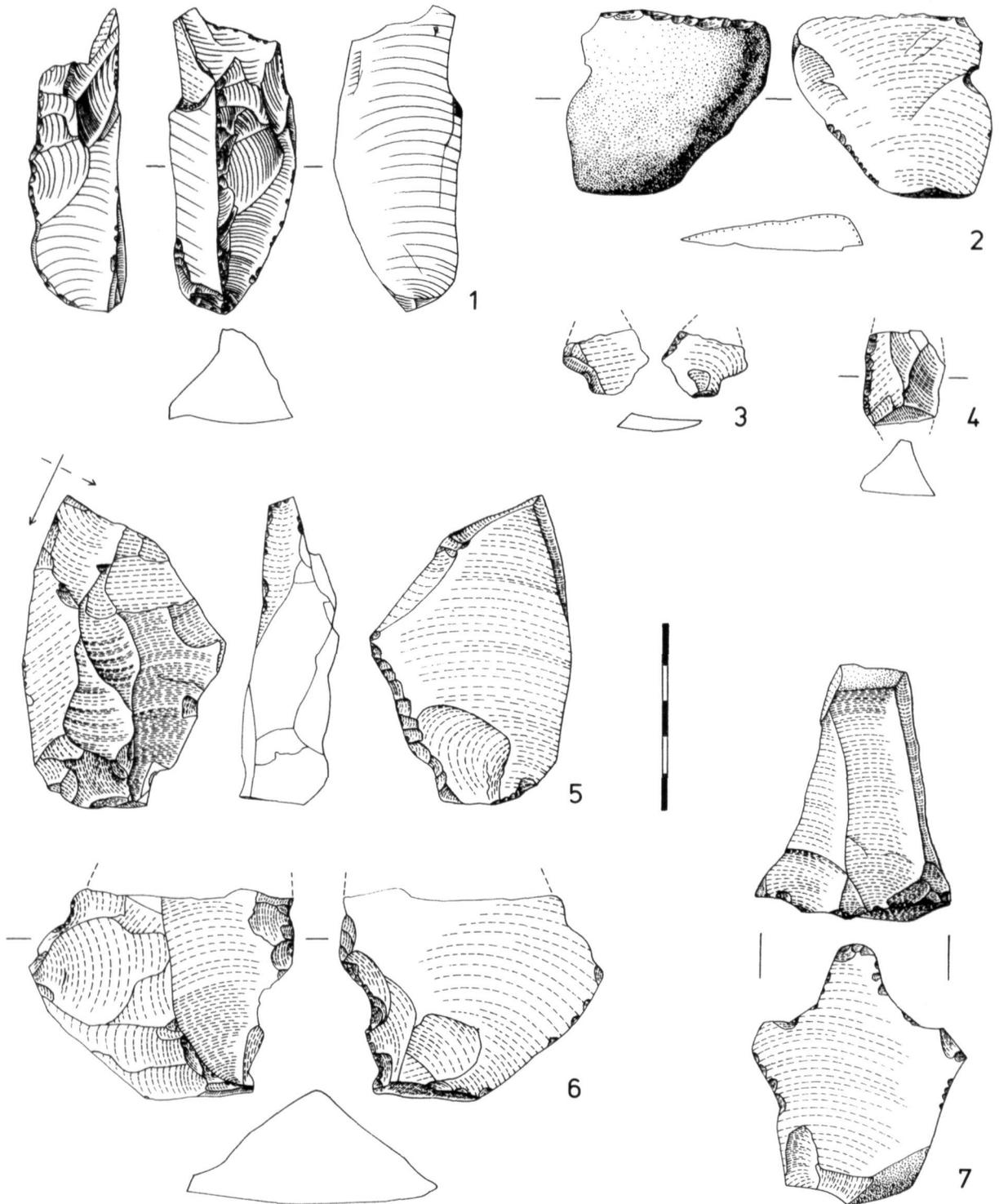


Fig. 6. Dmanisi. Retouched flakes (1-6) and core (7). Scale in cm.

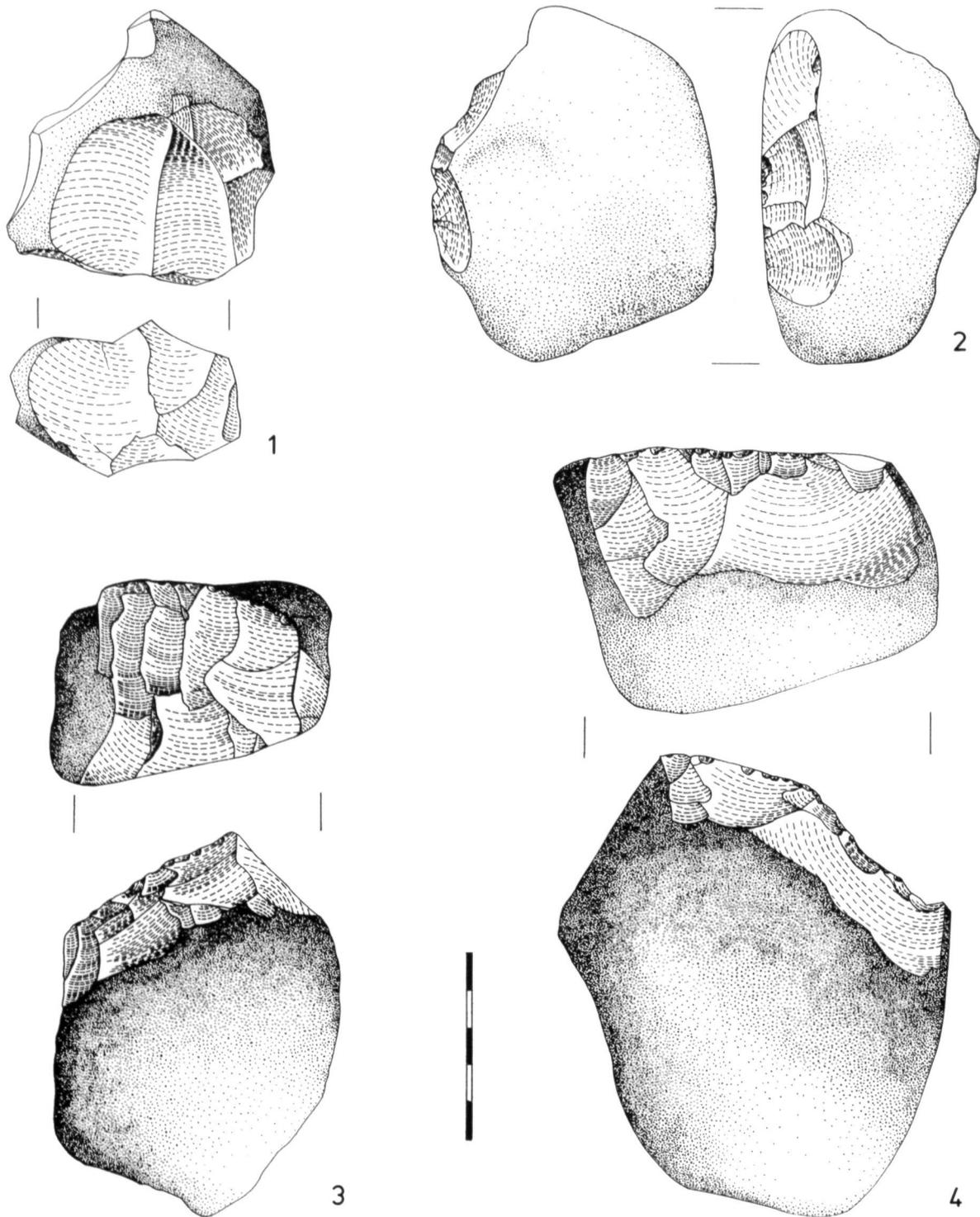


Fig. 7. Dmanisi. Core (1) and pebble tools (2-4). Scale in cm.

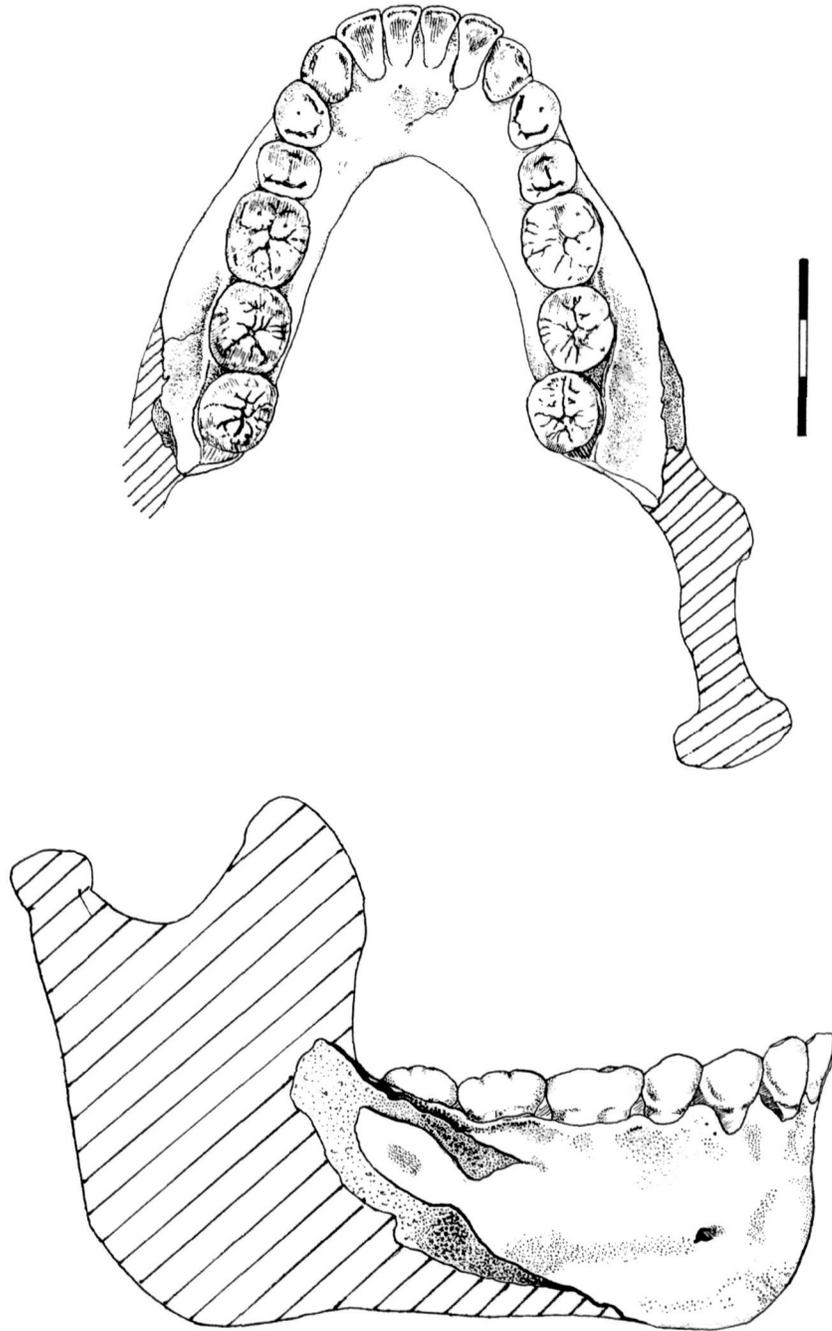


Fig. 8. Dmanisi. Human mandible.
Drawing L. Gabunia. Scale in cm.

from the well known Middle Pleistocene site at Binograd on the Apseron peninsula, where more than 35,000 different bones have already been recovered. The presence of stone artefacts at the site of Cimbali would be an important indication for a particularly early human presence in the territory of the USSR" (Vereščagin 1957a, p. 21).

Such artefacts have been found in the Cimbali pit and published (Formozov 1965). One of these is a flake with an unfaçeted striking platform and a pronounced bulb of percussion, the other a disc-shaped artefact (Fig. 10,1-2; see Formozov 1965).

2.3. MIDDLE PLEISTOCENE CAVE SITES (BY V.L.)

2.3.1. *Azych*

This cave lies close to the village of Azych in the foothills of the Karabach Range in the southeast of the Lesser Caucasus of Azerbaidshan (Fig. 1). The cave lies at 800 m OD (200 m above the surrounding area). It forms a horizontal passage of gallery-type with a main entrance formed by five chambers and a northern and southern gallery. The total area of the cave is some 2,150 m². The site was discovered in 1960 by M.M. Gusejnov and investigated by him over a period of more than 20 years. The first test pits at the cave entrance revealed a Middle

Palaeolithic horizon (Layer III), while subsequently an upper (Layer V) and a lower Acheulean horizon (Layer VI) were excavated. Even older material was discovered in 1974 (Layers VII-X) (Gusejnov 1965, 1981, 1985). The greatest depth of the deposits was 14 m, the total area excavated covered 200 m². Besides stone artefacts and faunal remains the 1968 excavation of the Acheulean layers recovered a jaw fragment of a "Pre-Neandertaler" (Gadžiev and Gusejnov 1970). In 1971 a small concentration of bear mandibles and skulls (the so-called hiding place) was discovered, while the excavation in 1972 uncovered hearths and that in 1973 a stone feature ("dwelling").

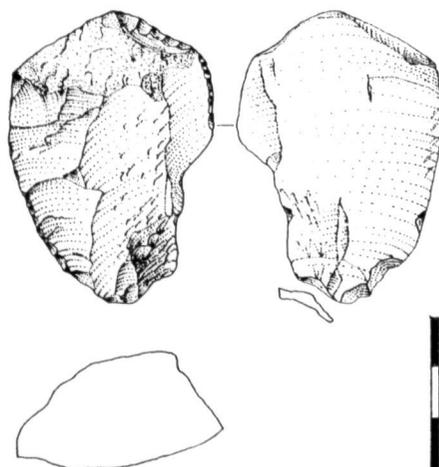


Fig. 9. Achalkalaki. Retouched flake. Scale in cm. After M. Gabunia.

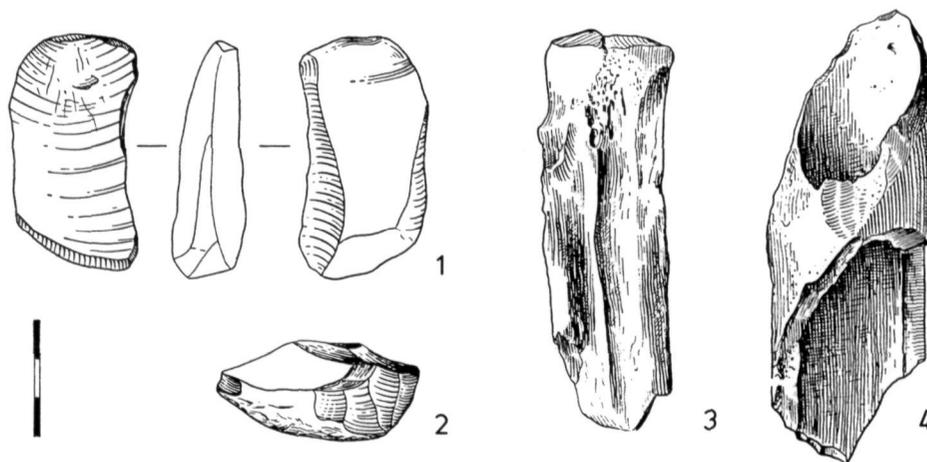


Fig. 10. Taman. Flake (1), core (2), splitted bones (3-4). Scale in cm. After A. Formozov (1-2) and N.K. Vereščagin.

Gusejnov (1974) identified 10 layers within the cave sections (I-X), but it is unfortunately not always possible to correlate these with the stratigraphy of the "main profile", sampled by Veličko, who discerned 17 horizons there. These were assigned to three units (Veličko *et al.* 1980):

Upper Unit: (Horizon I = Gusejnov's Layers I and II)
 Middle Unit: (Horizons 2-12 = Gusejnov's Layers III-VI)
 Lower Unit: (Horizons 13-17 = Gusejnov's Layers VII-X)

Fauna

Faunal remains were not recovered by lithological horizons but were assigned to the archaeological layers approximately identified by Gusejnov during excavation as "Early Acheulean" (Layer VI), "Middle Acheulean" (Layer V) etc. As a result the fauna from each of these layers is mixed due to the different conditions prevailing during the formation of the "layers". Only the small mammal remains, which were collected by Sulejmanov (1979) according to strictly defined lithological units and analysed by Markova (1982), have a good stratigraphical provenance. In the faunal list of all layers together there are 65 species, among which 11 rodents, 3 lagomorphs, 1 amphibia, 1 reptile, 4 bats and 21 birds. All 65 species are present in the deep "middle Acheulean" Layer (V). For more detailed information about the fauna the reader is referred to: Aliev 1969; Baryšnikov 1991a; Gadžiev *et al.* 1979; Guérin and Baryčnikov 1987; Markova 1982 and Veličko *et al.* 1980.

Flora

The palynological investigations of Zelikson and Gubonina (1985) demonstrated repeated changes in vegetation from deciduous forest with *Pterocarya*, walnut, alder, beech, *Zelkova*, oak, chestnut and elm (Horizons 17-16, 14-13, upper part of Layer VI, lower part of Layer V), such as is found today in the lower lying uplands and valleys, to upland forest with birch, *Ostrya* and hornbeam (Horizons 15-14, 12, Layer VI, main part of Layer V). Pollen from the archaeologically sterile Layer IV shows a subalpine vegetation.

Lithic Assemblage

Stone artefacts were recovered from Layers X-VII ("Pebble Culture"), VI ("Early Acheulean"), V ("Middle Acheulean") and III ("Late Acheulean" and "Early Mousterian")

– Layers X-VII: 186 finds of among other materials quartz, silicified limestone and chalcedony were excavated from the deepest layers. The raw material consisted of cobbles from the gravels of the Kuručaj River, 53 of which were recovered complete, without any traces of fracture. It

is difficult to decide whether the remaining pieces are true artefacts (Fig. 11). At a conference held in Baku in 1985 some researchers believed that all pieces were artefacts, whereas others thought that all were natural, unmodified pieces. A third group (with amongst others V.P. Ljubin) thought that some of the finds might be pebble tools and flakes. The character of the finds and the provisional nature of the publications makes it impossible to come to a conclusive decision regarding the artefactual status of these finds.

– Layer VI: (after Gusejnov 1985: 16-20, 33-36 and a number of drawings by the author [V. L.] (Figs 12-13). This layer was investigated over an area of 125 m², where 1890 artefacts were recovered. Some are heavily weathered and have rounded edges. Possibly these pieces are from the base of Layer V, which was formed under wet and warm environmental conditions. The artefacts are manufactured from lydite (1084) and flint (790), a small number are made of sandstone, quartzite, basalt and aphanite). The assemblage contains cobbles (37), tools (427 = 22,6 %) and debitage. The few cores (9) have a single striking platform (2) or are discoid. The 1116 flakes include 136 blades (12,1 %). A large proportion of the flakes (40-50 %) are long (5-12 cm with a breadth of 3 cm) and thin (less than 1,5 cm). 54,5 % of the striking platforms are unfaceted, 31 % dihedral and 14 % faceted (among the latter there are 30 flakes and blades with finely faceted, arched platforms). These technological details alone make it unlikely that the industry is early Acheulean. This is confirmed by the typological composition of the assemblage. Coarse pebble tools are relatively rare. The choppers (16) and chopping tools (5) were manufactured on cobbles with one flat and one convex side, the working edge being retouched on the flat face. The 8 bifaces from this level have a variable morphology (elongate-ovates, amygdaloid, lanceolate and rounded ovate). They were manufactured on flat cobbles, whose shape was selected in order to simplify the manufacture of the desired final form. As a result, there are several bifaces which are only partially worked, shown by their large areas of cortex (Fig. 12). Three cleavers were also found. Flake tools are present in large numbers (Fig. 13). Side-scrapers are particularly common and practically all forms described by Bordes (1961) are present. Simple scrapers are dominant (97); also present are double side-scrapers (33 - in part manufactured on blades), transverse side-scrapers (21), convergent side-scrapers (13) and *déjeté* side-scrapers (20). Points are, by contrast, rare (7) and of poor quality and include 6 double points (*limaces*). The assemblage also includes 24 end-scrapers, 4 borers and a backed knife. Finally, there are 62 denticulates and 15 notched pieces.

– Layer V: This layer is subdivided into 5 horizons which yielded numerous faunal remains (65 species), but

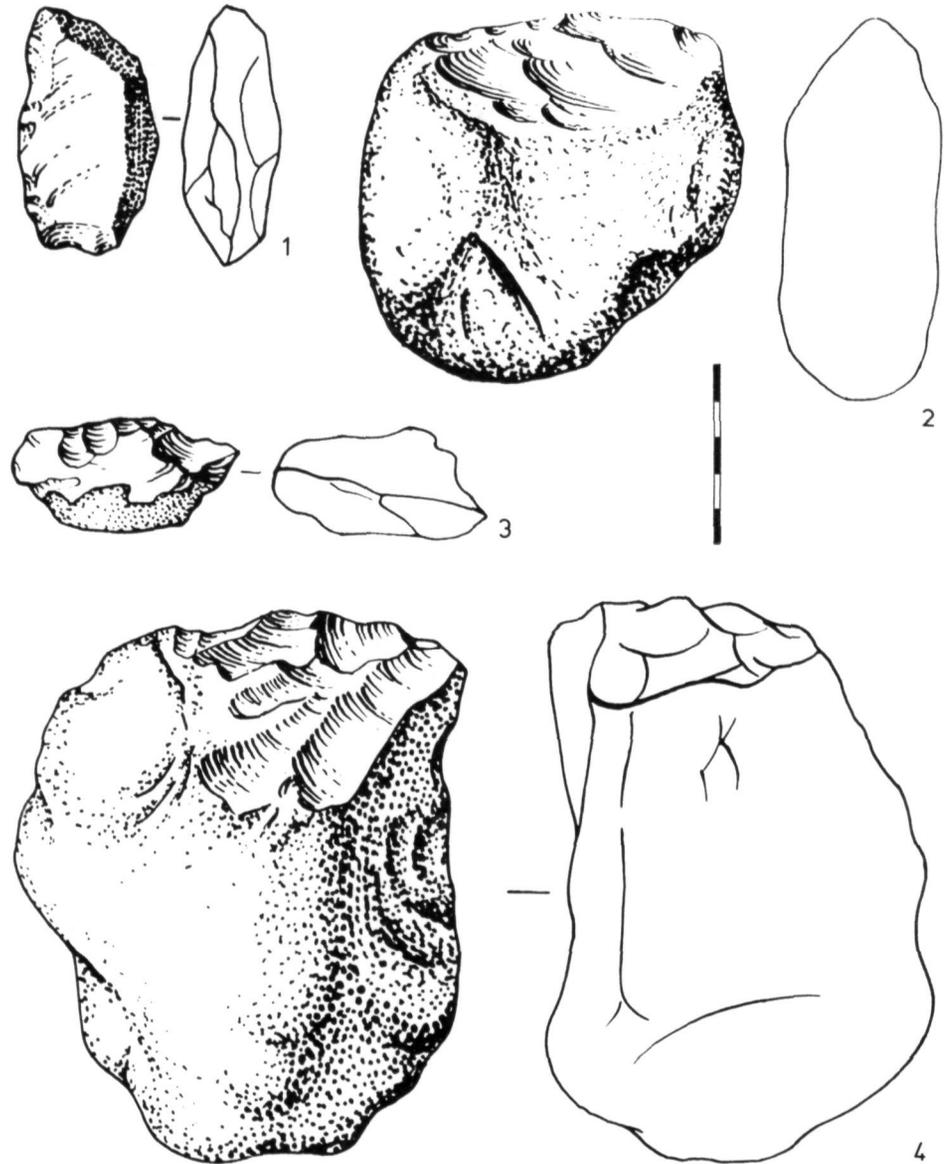


Fig. 11. Azych, levels X-VII. Artefacts (?). Scale in cm. After M.M. Gusejnov.

only relatively few stone artefacts (in 1985 Gusejnov refers to 289 pieces). The majority of the artefacts, and all the bifaces (Figs 14-15), were found in the middle part of the layer, which was described by Veličko *et al.* (1980:24) as follows: "Horizons 9 and 10 are characterized by horizontal layers of limestone slabs, lenses and concentrations of sand and charcoal and a high proportion of bone fragments. The possibility that these particular features represent a human occupation level cannot be ruled out. It should be emphasized that the hominid mandible was found in

Horizon 10". Layer V (Horizon 1) also contains a thick layer of hearth material and the remains of a stone feature (see below, "dwelling"), in which only a few stone artefacts (mainly side-scrapers) were found. The small number of stone artefacts and the high proportion of retouched forms suggest that Layer V is characterized by episodes of short term occupation. As is the case at the alpine site of Cona in South Ossetia only hunting artefacts (weapons and hide-working tools) were brought to the site. The raw material spectrum is dominated by flint (49,4%

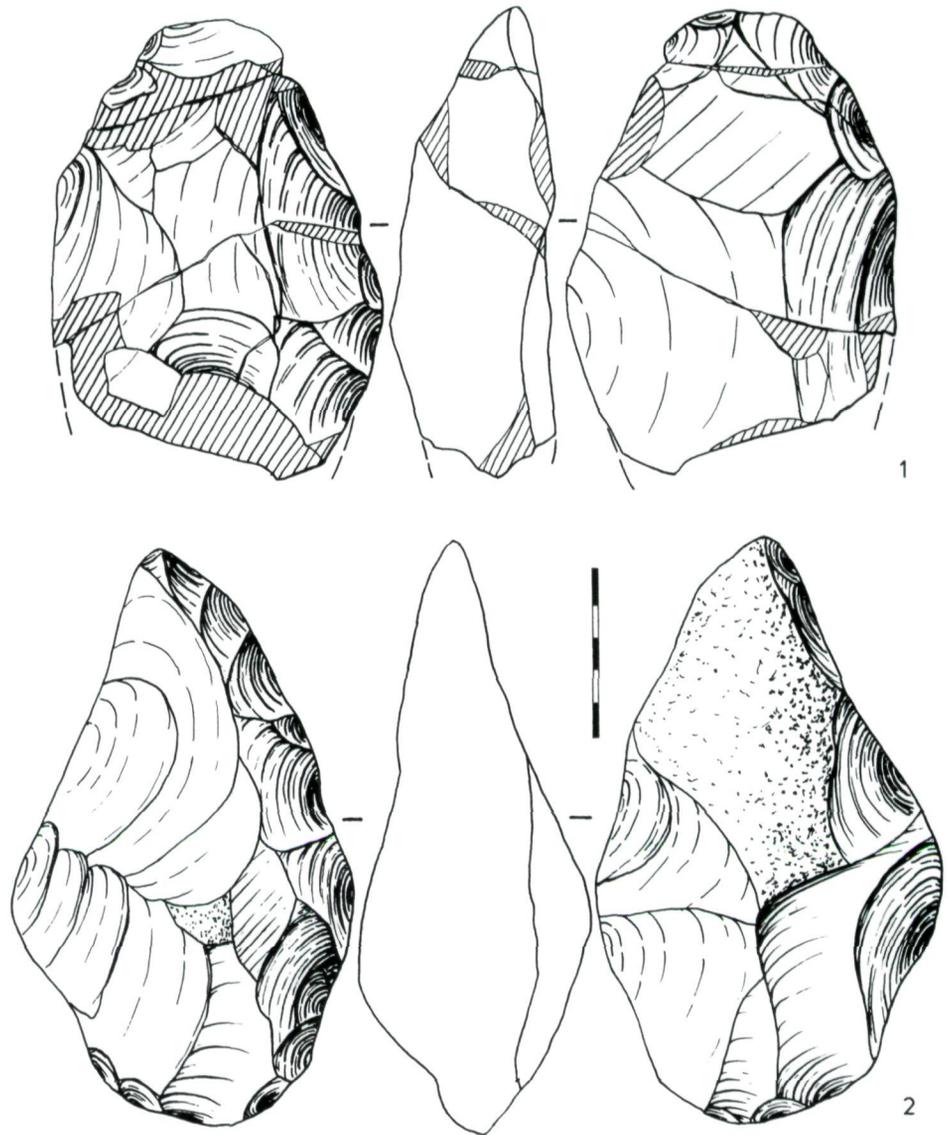


Fig. 12. Azych, level VI. Bifaces. Scale in cm. After M.M. Gusejnov.

here, 41,7% in Layer VI) and not by lydite (46,3% as compared to 57,6% in Layer VI). Artefacts are also rarely made of andesite and obsidian. Cores can have either a single striking platform (6 specimens), two or more platforms, or are of discoid form (Fig. 16,1). Flakes commonly have faceted striking platforms and a small number of Levallois flakes are present. The morphology of the choppers (6) is more uniform than in Layer VI. The 7 handaxes are manufactured from lydite, 4 of them on massive flakes. Flake tools are well represented and consist

largely of side-scrapers (26), points (2), end-scrapers (4), backed knives (3) and a number of denticulates and notched pieces. An important aspect of the investigation is the analysis of use-wear on the tools of this layer by Ščelinskij (1993). Traces of wear were found on 128 tools, among which are choppers, chopping tools and handaxes. The pebble tools were used for a range of (mainly heavy-duty) functions, such as cutting wood and breaking bone. The analysis shows that handaxes were used mainly for cutting meat.

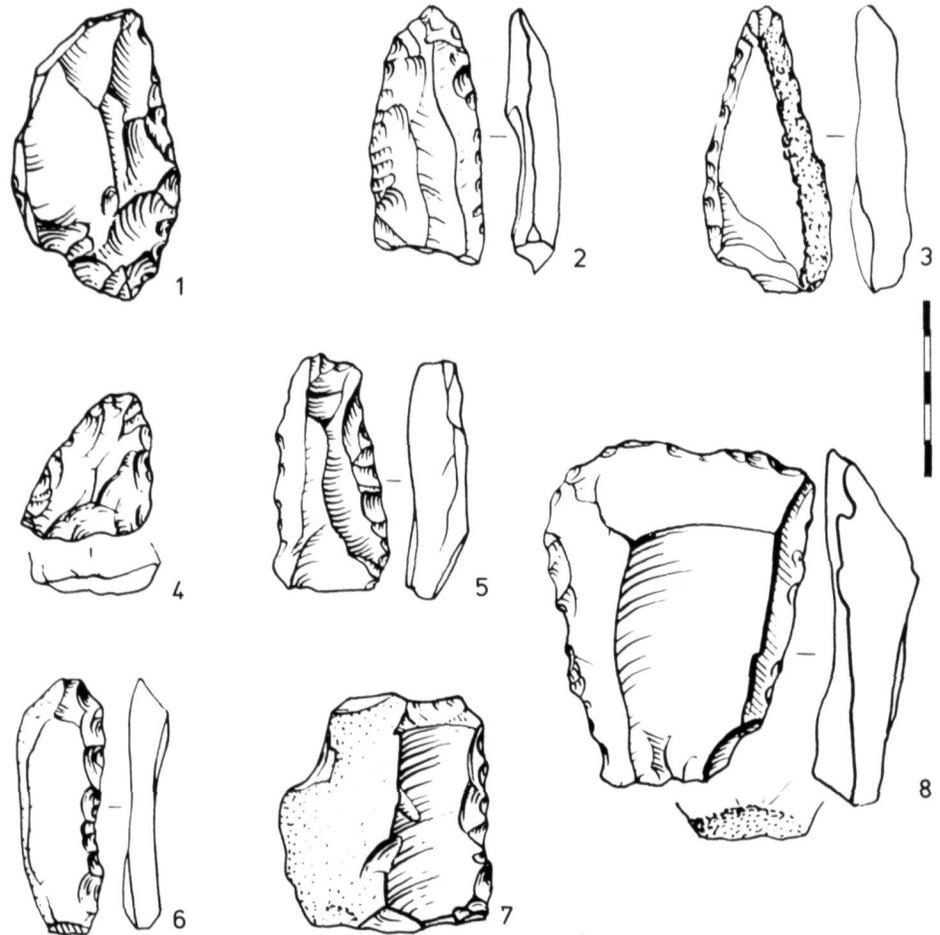


Fig. 13. Azych, level VI. Flake-tools. Scale in cm. After M.M. Gusejnov.

– Layer III: The artefacts from this layer are made of lydite (1786), flint (1293) and obsidian (14) and are probably late Middle Palaeolithic.

Settlement features

– The “Hiding place”: A concentration of four bear skulls from Layer V was discovered in a vertical fissure close to the south wall of the circular chamber by Gusejnov in 1971. It has certain features in common with the “bear cult” of the “Alpine Palaeolithic”. This concentration of bones probably has nothing to do with human activities.

– The “Dwelling”: A circular stone feature was discovered at the base of Horizon I in Layer V. It was located in the northeastern part of the circular chamber close to the northern wall (Gusejnov 1974, 1975). This

“foundation” was formed of limestone slabs and, in one place, of deer antlers. The structure was preserved to a height of 20-30 cm and the inner area was 10 m². A hearth was found at the northeastern corner of the structure (Hearth 4, see below), from which a 17 cm thick layer with burnt material extended 4 m into the centre of the feature (Gusejnov 1975: 84-85). This undoubtedly interesting settlement feature is unfortunately only provisionally and inadequately documented.

– Hearths: Between 1972-1973 a total of five hearths were discovered in Layers VI, V and IV. All were found in a poorly lit part of the circular chamber, 24 to 30 m from the cave entrance (Gusejnov 1974). Hearth 1 lay 8 m below the surface in the upper part of Layer VI. The hearth was in a shallow depression and measured 20 × 30 cm, with a fill

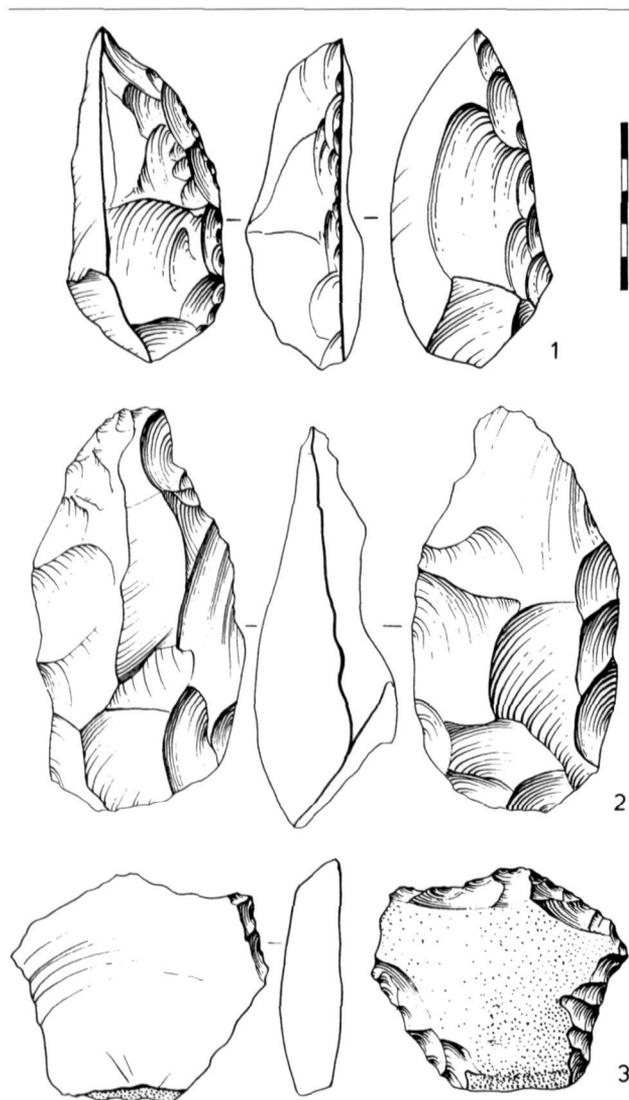


Fig. 14. Azych, level V. Bifacial (1-2) and unifacial (3) flake-tools. Scale in cm: After M.M. Gusejnov.

some 5-7 cm deep. Hearth 2 was 7 m below the surface in Layer V, horizon 4, and measured 45 × 50 cm with a 10 cm thick fill of charcoal-like material. Hearth 3 was found 5.5 m below the modern cave in Layer V, at the base of Horizon 1. This was the biggest hearth with a total surface of some 10 m², in the form of an L. Its width was 1 to 3 m. The upper part of the feature contained a layer of ash from between 7-8 to 13-17 cm thick, below which was a charred layer 6-9 cm in depth. Whereas the charred layer was of even depth, the overlying ash layer was of variable depth and in places appeared to form small piles. The 26 cm thick deposit was probably the result of the accumulation of material from several separate hearths (Gusejnov 1974).

Hearth 4 was found in the same layer as Hearth 3, but lay within the stone feature located against the northern cave wall. The hearth measured 20 × 40 cm and was dug some 15 cm deep into the floor. It was enclosed by limestone slabs and surrounded by burnt bones (Gusejnov 1974). Hearth 5, finally, was found in the Middle Palaeolithic level III, Horizon 3, 3.5 m below the surface. It was dug slightly into the floor and measured 40 × 55 cm, and its sides were lined with limestone slabs. With the exception of Hearth 4 (inside the stone feature) all hearths, irrespective of their stratigraphic position, were located at the same place within the circular chamber. This was at a point where the gallery structure of the cave caused a particularly strong draught (Gusejnov 1974).

The hominid mandible

In 1968 a fragment of hominid mandible was discovered in Layer V, Horizon 3. The posterior part of the body of the mandible and the lower part of the ascending ramus are preserved. Only the third molar is present; to judge by the fresh damage to the piece, the first two molars were probably destroyed during excavation. The crown of the second molar is missing and only parts of the roots of the first molar are preserved. A preliminary description of the find by D.V. Gadžiev emphasized the robusticity of the jaw, the small size of the teeth, the poorly developed taurodontism and the position of the foramen mentalis at the level of the first molar (Gadžiev and Gusejnov 1970). These and other features led to the Azych mandible being described as representing a form transitional between the late Archanthropes and the early Palaeanthropes and, in particular, to a comparison with the mandible from Mauer and finds from Arago (Charitonov 1989; Gabunia 1992).

Dating

A magnetic reversal, interpreted as the Matuyama-Brunhes boundary, was recognized in the lower part of the section in Horizon 15 (at the level of the "Pebble Culture" finds). In the layer immediately above this (Horizon 14) a tooth of *Microtus ex gr. arvalis socialis*, whose earliest occurrence is at the time of the Baku Transgression in the early Middle Pleistocene faunal complex from Tiraspol (Markova 1982), was found. *Bison schoetensacki* and *Equus süssenbornensis*, found in Layer VI with Acheulean finds (D.V. Gadžiev *et al.* 1979:11), also have their best parallels in the Tiraspol fauna. The finds from Layer V, including the hominid mandible fragment might more probably date to the second part of the Middle Pleistocene.

2.3.2. KUDARO I

The Kudaro cave sites are located in the central part of the southern slope of the Greater Caucasus, in the northeastern corner of the Colchis (Fig. 1). The caves lie

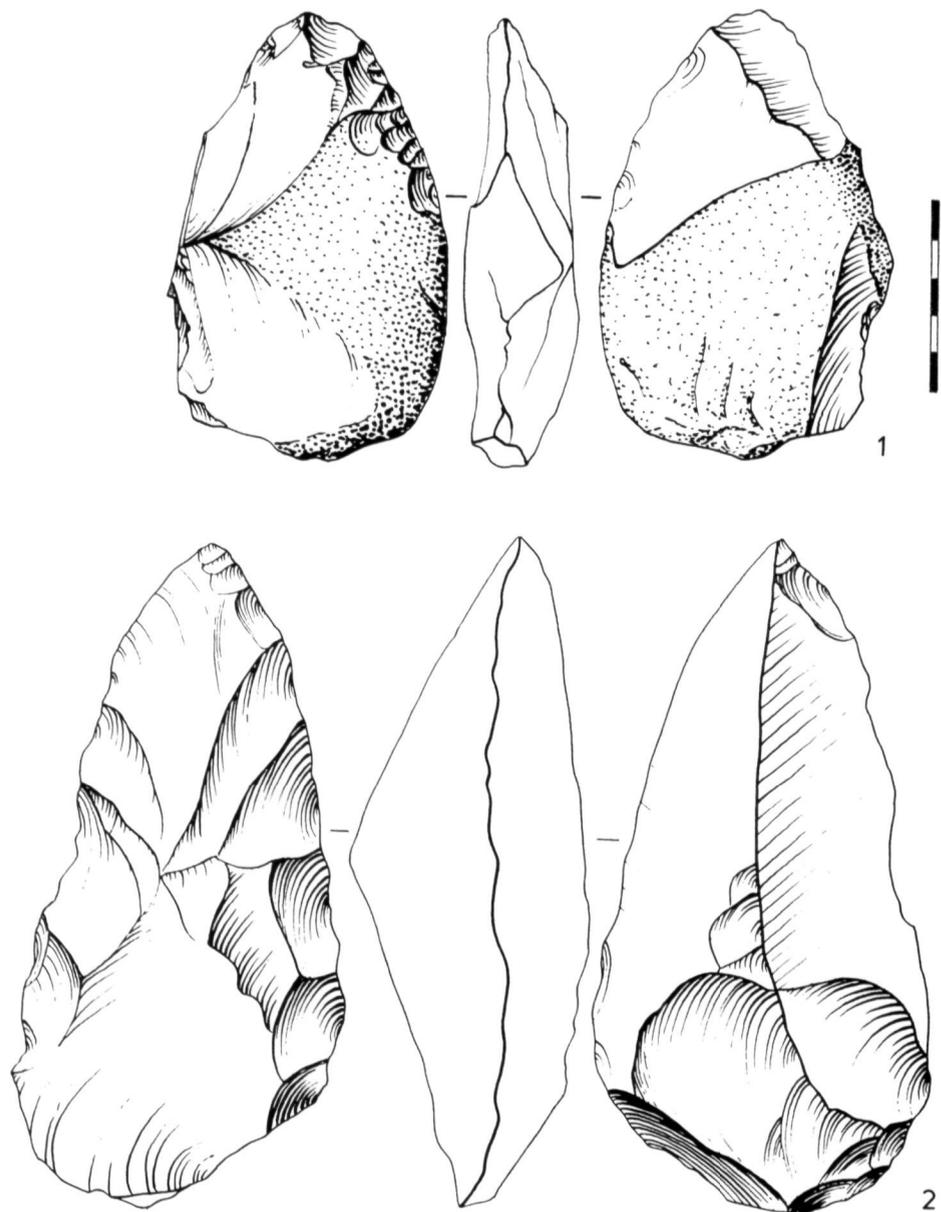


Fig. 15. Azych, level V. Bifaces. Scale in cm. After M.M. Gusejnov.

close to the tree line on the slope of the Časaval'ski mountain; Kudaro I is located at a height of 1600 m OD, 260 m above the river. The common genesis of the caves means that they are morphologically similar and, at a similar topographic position, possess similar stratigraphies. The caves, which open onto a steep slope in a bay between two ridges, consist of horizontal galleries. They face south and have an arched roof. Their entrances collapsed in

antiquity. Overall, their lithological and archaeological sequences are similar.

The Palaeolithic sites in the Kudaro caves were discovered in 1955 by the Leningrad researchers of the South-Ossetian Expedition of the Georgian Academy of Sciences under the leadership of V.P. Ljubin, who investigated the sites until 1990, with a heavy emphasis on the Kudaro I site. The results of the excavations have been presented in numerous

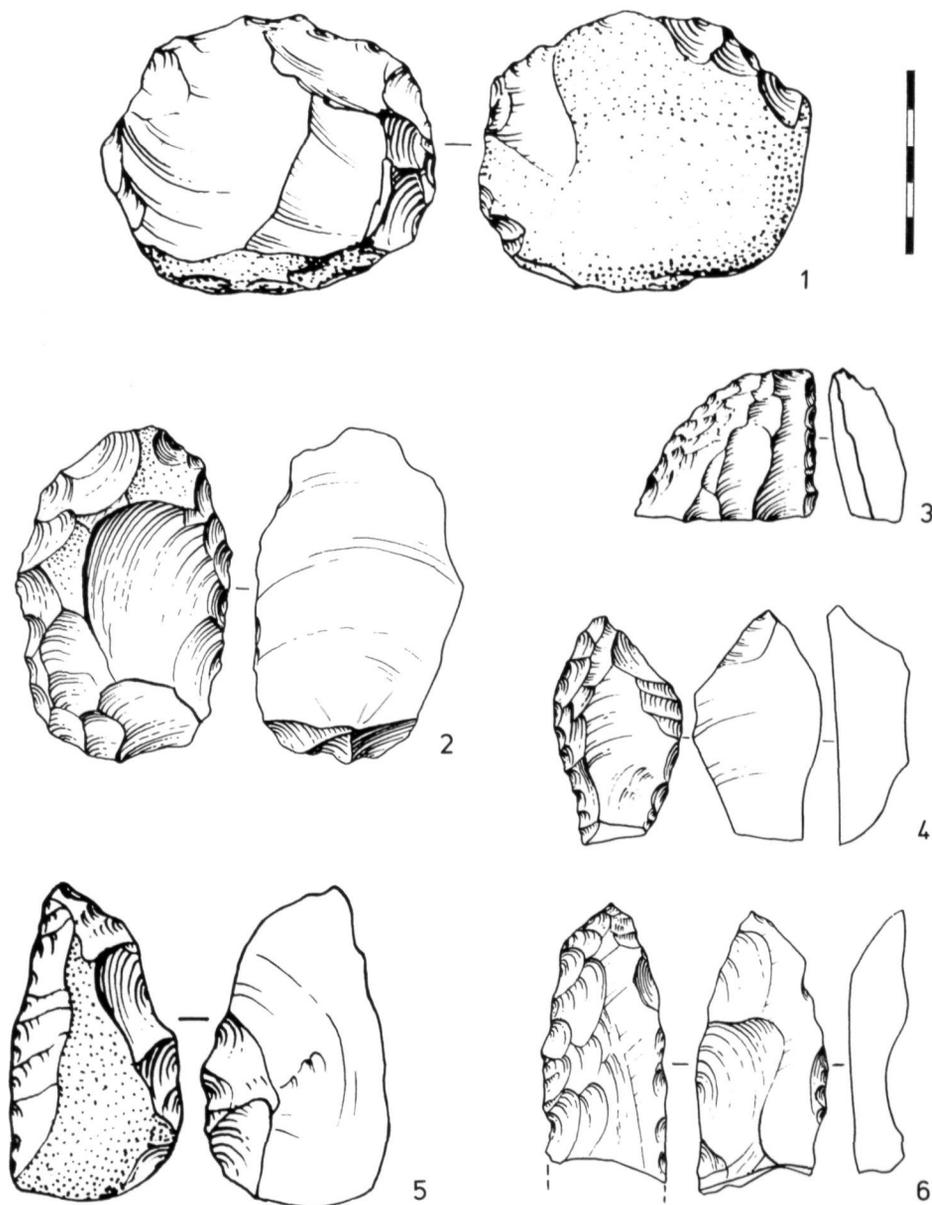


Fig. 16. Azych, level V. Core (1) and flake-tools (2-6). Scale in cm. After M.M. Gusejnov.

publications, synthetically in the book *Kudarskie peščernye paleolitičeskie stojanki v Jugo-Osetii* (Ljubin 1980a) and also in papers by Ljubin *et al.* (1978, 1985a-b); Ljubin and Baryšnikov (1985), Ljubin (1959, 1977, 1981a, 1981c, 1984, 1989, 1990, 1993a-b), Baryšnikov (1977, 1978, 1987), Baryšnikov and Dedkova (1978), Baryšnikov and Baranova (1983) and Nesmejanov (1989).

Stratigraphy

The sediments of each gallery have their own character, influenced by local fissures, erosional processes, factors of external weathering, differences in the facies of contemporary sediments and the character and degree of influence of animals and humans. This leads to special conditions in the fills of the different galleries, which can

be up to 1.5-4.5 m thick, and determines the character of the lithological and archaeological horizons.

The deposits in the eastern gallery are particularly uniform and typical (Fig. 17). Six different levels could be identified: level 1 contained Eneolithic and younger finds, level 2 a few final Palaeolithic and Mesolithic finds. Levels 3 and 4 are Middle Palaeolithic, level 5 (5a, 5b and 5v) Acheulean, while level 6 was sterile. Discordances between some horizons indicate stratigraphical gaps, which are the result of erosion of sediments and possibly also of non-sedimentation during cold phases. In addition there are facies variations among synchronous sediments from the cave's entrance to the inner parts, as well as local variations in the thickness of some horizons.

In the Dark Gallery the deepest Acheulean layer (level 5v) is up to 1,0 m thick and in an undisturbed position. During the formation of level 5v and the other Acheulean horizons (5b, 5a) there was much organic material in the cave, first of all as a result of human activity, which was the source of phosphate of these levels.

Fauna

Altogether 90 species have been recorded from levels 2 to 5 (Vereščagin 1957b; Baryšnikov 1977; Vereščagin and Baryšnikov 1980a; Baryšnikov and Baranova 1982; Ljubin *et al.* 1985a; 1985b). The lowermost Acheulean deposits (level 5v) contained amongst others *Microtus ex. gr. arvalis*, *Macaca cf. sylvana*, *Ursus deningeri*, *Dicerorhinus etruscus brachycephalus*, *Cervus cf. elaphus* and *Capra cf. caucasia*, while the uppermost Acheulean level (5a) yielded *Auricola terrestris*, *Ursus spelaeus*, *Alces alces* and *Rupicapra rupicapra*.

The larger mammal bones from the Acheulean horizons are typical "kitchen" waste, with small fragments of longbones. During the formation of these layers the cave was an occupation site, used for a long period of time. In the Middle Palaeolithic levels (3 and 4) there are, however, many bones of the axial skeleton and remarkably less bones from the extremities; these bones were partly deposited without human interference. The bones of the Middle Palaeolithic levels partly reflect a natural taphocoenose. Many bones from the Middle Palaeolithic levels are gnawed by large carnivores. In the Acheulean levels gnaw-marks of porcupine (*Hystrix*) occur.

Many bird remains have been collected from the Acheulean and Middle Palaeolithic layers (Burčak-Abramovič and Ljubin 1972; Burčak-Abramovič 1980; Baryšnikov and Čerepanov 1985). Furthermore these levels yielded a huge number – more than 50,000 – of fish remains. These belong without exception to the Black Sea salmon (*Salmo trutta labrax*). These salmon-fragments consist of numerous fin-radiates radalia and other parts of

the axial skeleton but also of vertebrae, hypuralia and head fragments. To judge from the better preserved vertebrae and hypuralia the size of the salmons varied between 0,5 and 1,3 m.

Pollen analysis

The pollendiagram of the cave deposits shows 14 pollen zones and a number of sub-zones, which represent part of the Pleistocene and Holocene evolution of vegetation and climate (Levkovskaja 1980; Ljubin *et al.* 1985a). The Acheulean levels reflect 3 warm phases (lower part of level 5v, level 5b, middle part of level 5a) and 3 cold phases (upper part of level 5v, lower part of level 5a, upper part of level 5a). The climate was especially warm and dry during the formation of the lower part of level 5v.

Lithic artefacts

The lithic artefacts are predominantly of locally occurring raw materials (quartzite, alevrite, limestone, slate, flint) which could be found either as pebbles on the bank and in the terraces of the Džodžori or as slabs at the outcrops of limestone or slate. The limestone near the cave contains layers of siliceous slate-like material, in parts transforming into alevrite and clayey limestone. Non-local raw materials are only represented by a few pale, reddish and red flints and a single obsidian artefact (a *limace* in level 5v). Most of the artefacts are made out of quartzite (sandstone), followed by flint and flint-like rocks, alevrite, slate, and limestone. There are important differences in the rock types represented in the various levels. In the deepest level (5v) more than one-third of the artefacts consist of badly sorted, local raw materials from the slate-like, clayey, silicified limestone-sediments. In the upper levels (5a, 5b) the raw material-selection was better. Local silicified rocks are present in smaller numbers and the use of alevrites, slates and flints increases. The artefacts of the Acheulean levels are characterized by a high percentage of retouched tools and artefacts with use retouch (about 50%). The following types are numerous (Figs 18-21): chopper, chopping tools, bifaces, simple and transversal side-scrappers, scraper-like tools, notched and denticulated pieces, cleaver-like artefacts, *limaces*, Quinson-points, triangular pieces with notches.

The various raw materials with their different knapping-characteristics resulted in a selection of specific rocks for specific tools. Choppers, chopping-tools, bifaces, side-scrappers, cleaver-like tools and big notched artefacts (with Clacton-notches) are mostly made out of quartzite pebbles. The artefacts from flint-like rocks are smaller (seldom longer than 5-6 cm) and more carefully worked. Some types – Quinson points, *limaces* – are only made

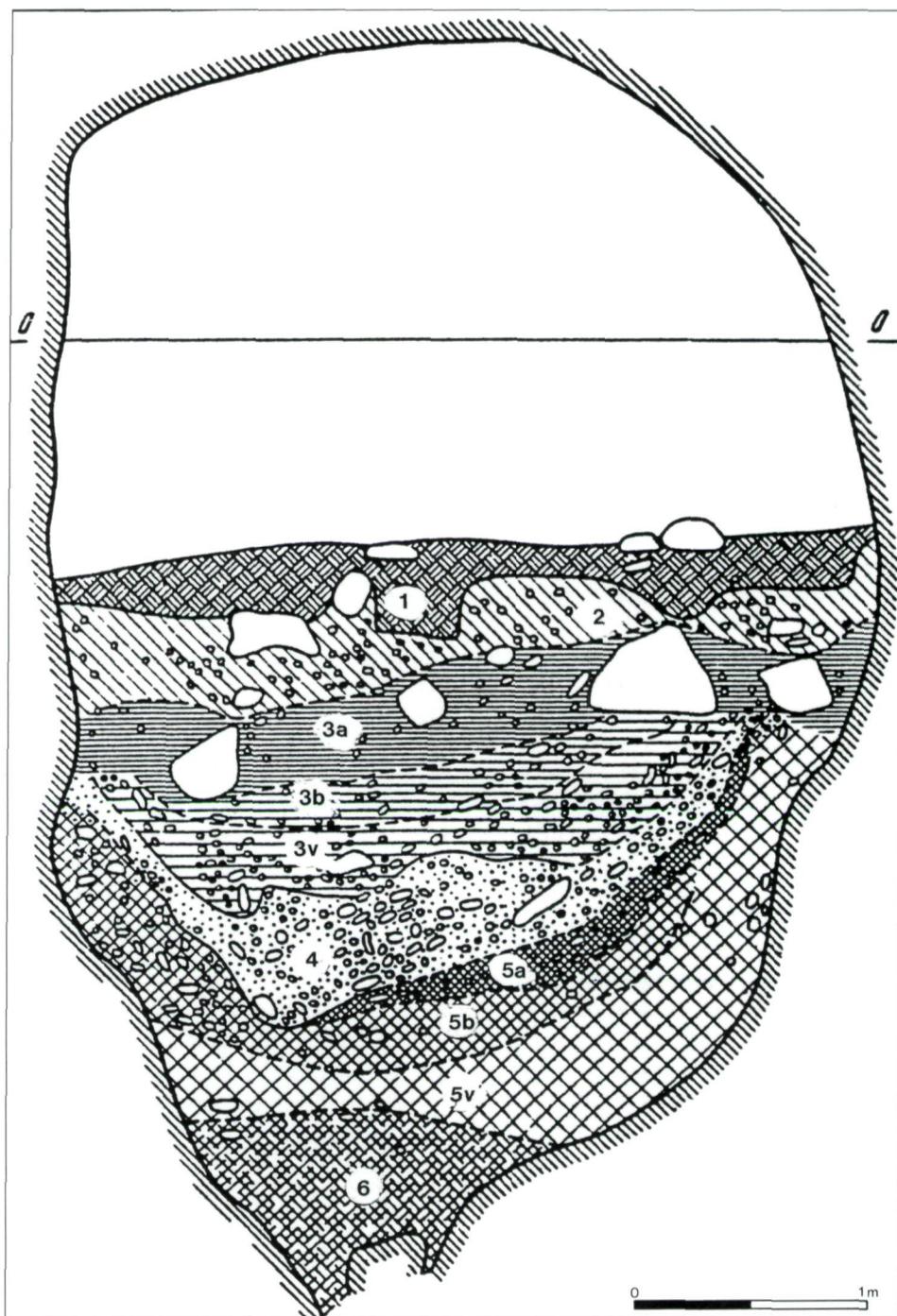


Fig. 17. Kudaro I. Section in the eastern gallery. 1: black loam with sporadic angular stones and limestone blocks; 2: yellow-grey loam with numerous sharp-edged stones and larger blocks; 3: clay-rich, porous yellow-white (Horizon 3a) and grey-brown (Horizon 3b, 3v) loam; 4: grey-white, clay-rich loam with heavy carbonate dissolutions; 5a: Compact, clay-rich yellow-grey loam with grey-green layering; 5b: clayey compact yellow loam with some rounded, not much corroded limestone debris; 5v: yellow-brownish loam, in parts stone-like by phosphatisation; 6: brownish-yellow sandy clay or clayey alverit with well developed crumbly structure, the upper part phosphatized.

out of flint. Other flint tools are simple and transversal side-scrapers. Hammerstones, cores and many cortical-flakes indicate that stone knapping took place within the cave.

Altogether there are 5,000 artefacts from the Acheulean levels (5a,b,v). The cores are globular or with one striking platform as well as disc-like. The flakes have broad, plain – sometimes cortical – striking-platforms, well developed percussion cones and bulbs. Careful edge-retouch – stepped retouch, marginal retouch – is rare and occurs only on some side-scrapers, small end-scrapers, isolated *limaces* and Quinson-points of flint (Fig. 21). The edges of numerous flakes show irregular use-retouch. The more than 50 bifaces vary in form and knapping-technique (Figs 18-20). Those made from slate-like rocks have 'steps' on their surface as a result of the laminated structure of the raw-material. Some bifaces made on flat pebbles or flakes are only partly retouched. Six very 'archaic', massive slate bifaces were found at the base of level 5v. Their almost rectangular shape with a slightly rounded distal end, makes them similar to cleavers. Other bifaces also have an almost rectangular outline. Especially well worked are two lanceolate quartzite-bifaces with slightly convex edges and thin, elongated and pointed distal parts. Other bifaces are almond-shaped. The cleavers are less typical than in the Cona cave. An especially characteristic flake-cleaver was found together with 4 bifaces in front of the entrance of the Dark Gallery. The flake-cleavers also comprise some partially retouched bifacial tools which are trapezoidal at the distal end. The pebble tools found in all Acheulean levels and in all parts of the cave are mostly made from quartzite pebbles. Especially numerous are unifacially retouched pebble tools with straight or convex working edges. In addition there are side-scrapers and points as well as many notched and denticulated pieces.

Hominid remains

Three hominid teeth (two incisor fragments and one premolar) were discovered in the Acheulean levels in 1959 and 1984. The fragment of a middle lower incisor was found in level 5b in the Central Chamber (Zubov 1980). The other two finds – the fragment of a permanent incisor and the premolar – come from level 5a and 5b of the Dark Gallery (Charitonov 1989).

Palaeogeography and chronology

The palaeontological results indicate a distinct change in the amplitude of the vegetation belts. The variations in the frequencies of many larger mammals, rodents and birds in the different levels and the occurrence of some species in certain periods of the Pleistocene illustrate these changes. In the Acheulean levels, 5b and 5v, the percentage of *Cervus*

elaphus, indicative of a forested landscape, is almost twice as high as the percentage of *Capra caucasica*, a species which inhabits subalpine meadows. In layer 5a *Capra caucasica* is much more important. The importance of *Capreolus capreolus*, *Martes*, *Meles meles*, *Bison* etc. also increases during forested phases (Baryšnikov 1977, 1978; Vereščagin and Baryšnikov 1980a; Baryšnikov and Nikolaev 1982; Ljubin 1980b).

The variation in the Pleistocene vegetation belts is also reflected in the portion of bears which represent the main part of the faunal material. In the lower levels, where forest-steppe conditions are indicated, 75-85 % of the bones are from bears, whereas in levels from colder periods this is only 30-45% (Baryšnikov 1977; Baryšnikov and Dedkova 1978).

The composition of the fauna in the lower level 5v, with *Macaca cf. sylvana*, *Ursus cf. thibetanus* and *Dicerorhinus etruscus brachycephalus*, indicates a forest-steppe or a savannah-like warm climate landscape. This corresponds to the results of pollen analysis. Palynological data as well as the mammal fossils indicate cold conditions during the deposition of the upper part of level 5v and a second warm optimum in level 5b. In the upper part of level 5v animals of the mountain meadow belt occur for example the rodents: *Marmota caucasica*, *Prometheomys schaposhnikove* and *Chionomys gud*. The warm climate during the formation of level 5b is underlined by the occurrence of forest dwellers (*Castor fiber*, *Glis glis*, *Capreolus capreolus*) and animals which prefer a warm climate (*Hystrix*).

Dating the climato-stratigraphical succession in the Kudaro caves is a difficult enterprise. Earlier Uranium/Thorium measurements of the Acheulean layers of Kudaro I yielded dates of 250-300 Kyr BP for level 5v and 110 ± 10 Kyr BP for the upper part of level 5a (Čerdyncev *et al.* 1959). Corresponding TL ages were recently obtained by Kulikov: level 5v in the South Gallery 360 ± 90 Kyr BP (RTL 379), level 5b 350 ± 70 Kyr BP (RTL 373) (Ljubin and Kulikov 1991). The dates of Čerdyncev and Kulikov give a first indication of the age of the Acheulean in the Caucasus region. An assessment of these dates by other methods seems very necessary, however.

Earlier a correlation of the lower Acheulean levels to the Mindel-Riss interglacial (Ljubin 1974; Levkovskaja 1980) or the Riss-Würm interglacial (Ljubin, Rengarten *et al.* 1978) was proposed. In the meantime palaeomagnetic analysis by M.A. Pevzner showed a reverse magnetisation of the basal level 6. As a result new pollenzones were established and new indicator species such as *Dicerorhinus etruscus* and *Ursus deningeri* were discovered. These new observations demand a cautious revision of the date of the lower Acheulean levels (Ljubin *et al.* 1985a). *Dicerorhinus etruscus*, *Ursus deningeri* and *Macaca sylvana* commonly

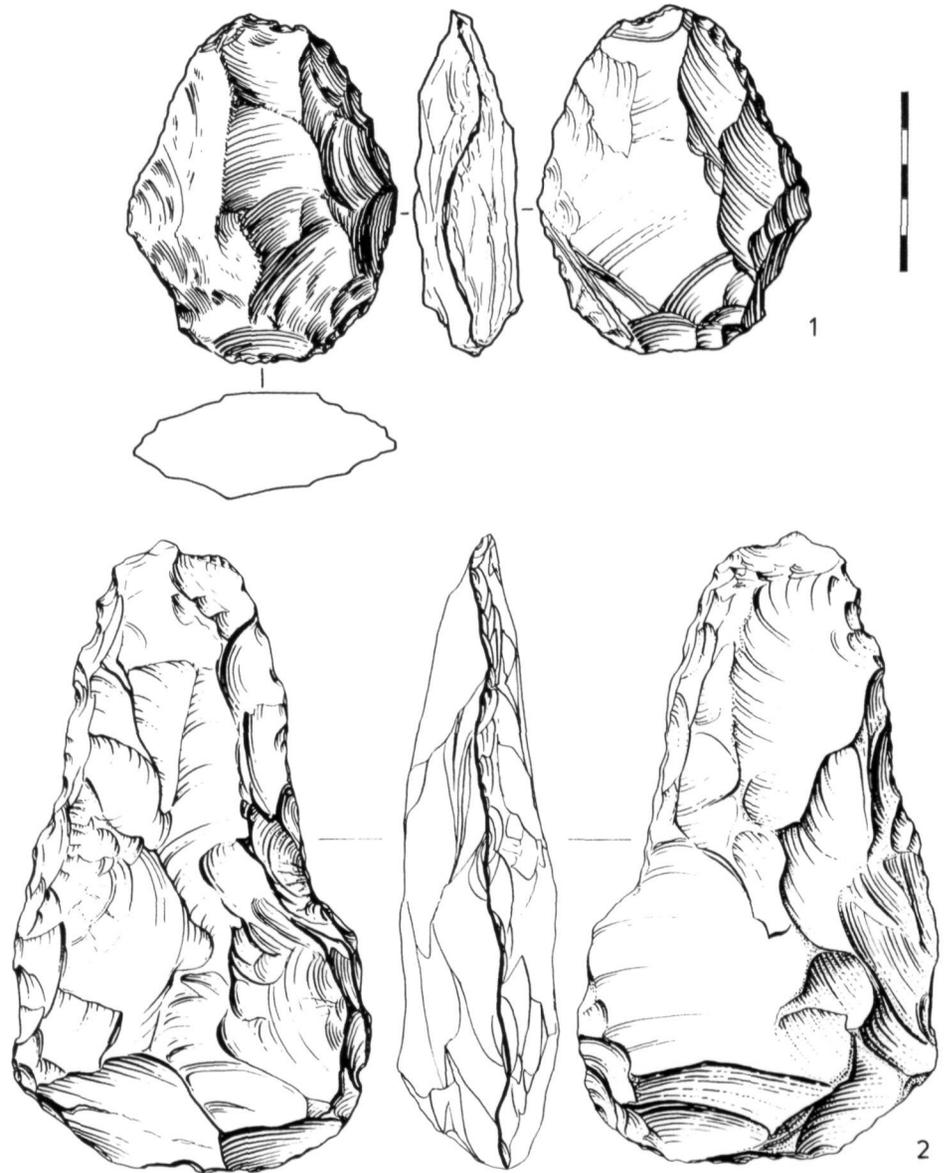


Fig. 18. Kudara I. Bifaces. Scale in cm.

occur in the fauna Mosbach I, while *Dicerorhinus etruscus* and *Macaca* occur in Le Vallonnet (Ljubin *et al.* 1985a). Bones of *Dicerorhinus etruscus* and *Ursus deningeri* were found at Bammental and Jockrim, Hangenbieten and Mauer as well as Nanterre. The presence of species such as *Mimomys*, *Homotherium* and *Eucladoceros* suggests that the fauna from the lower Kudara levels could correspond to the Tiraspol fauna of the Russian Plain,

which is characterized by *Ursus deningeri*, *Dicerorhinus etruscus* and arvicolids with rootless molars (Alekseeva 1977) and also the late Galerian fauna of western Europe (Azzaroli 1983). The fauna might also belong to the beginning of the east-european Singil' fauna-complex. Similarities to the Kudara fauna, but with indications of a dryer climate, also exist within the faunal material of the Acheulean levels V and VI of the Azych cave in Azerbaijan.

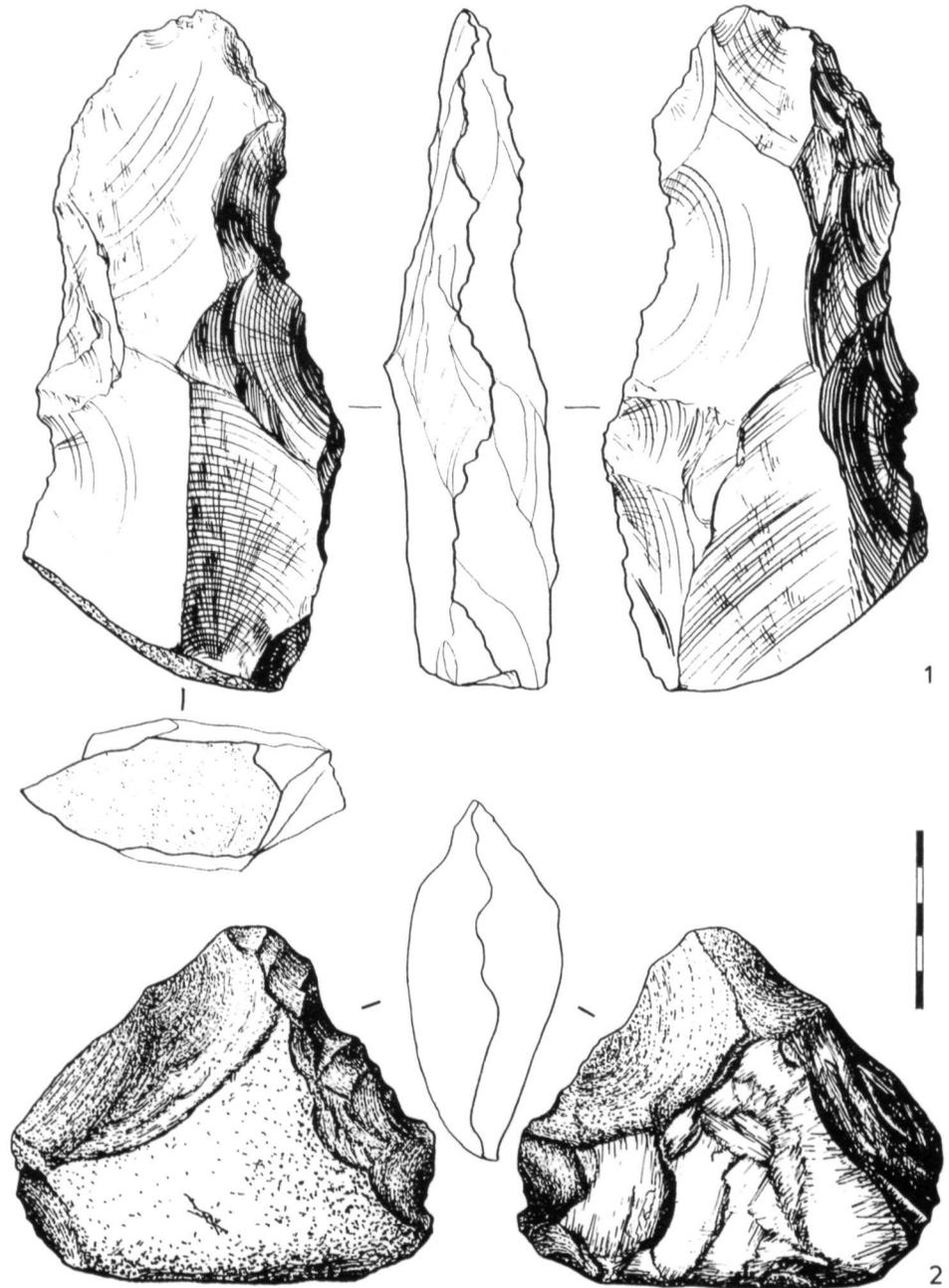


Fig. 19. Kudara I. Bifaces. Scale in cm.

Palaeontological age assessments should be cautiously used, however, in view of the special conditions of the Colchis refuge. The rather slow rate of evolutionary changes within some species has been stressed several times

already (*Ursus deningeri* - *Ursus spelaeus*, *Equus stenonis* - *Equus caballus*) for the Caucasus region, as well as the survival of some relict species (*Proochotona*) and the special evolution of the fauna in this region (Gabunia 1959;

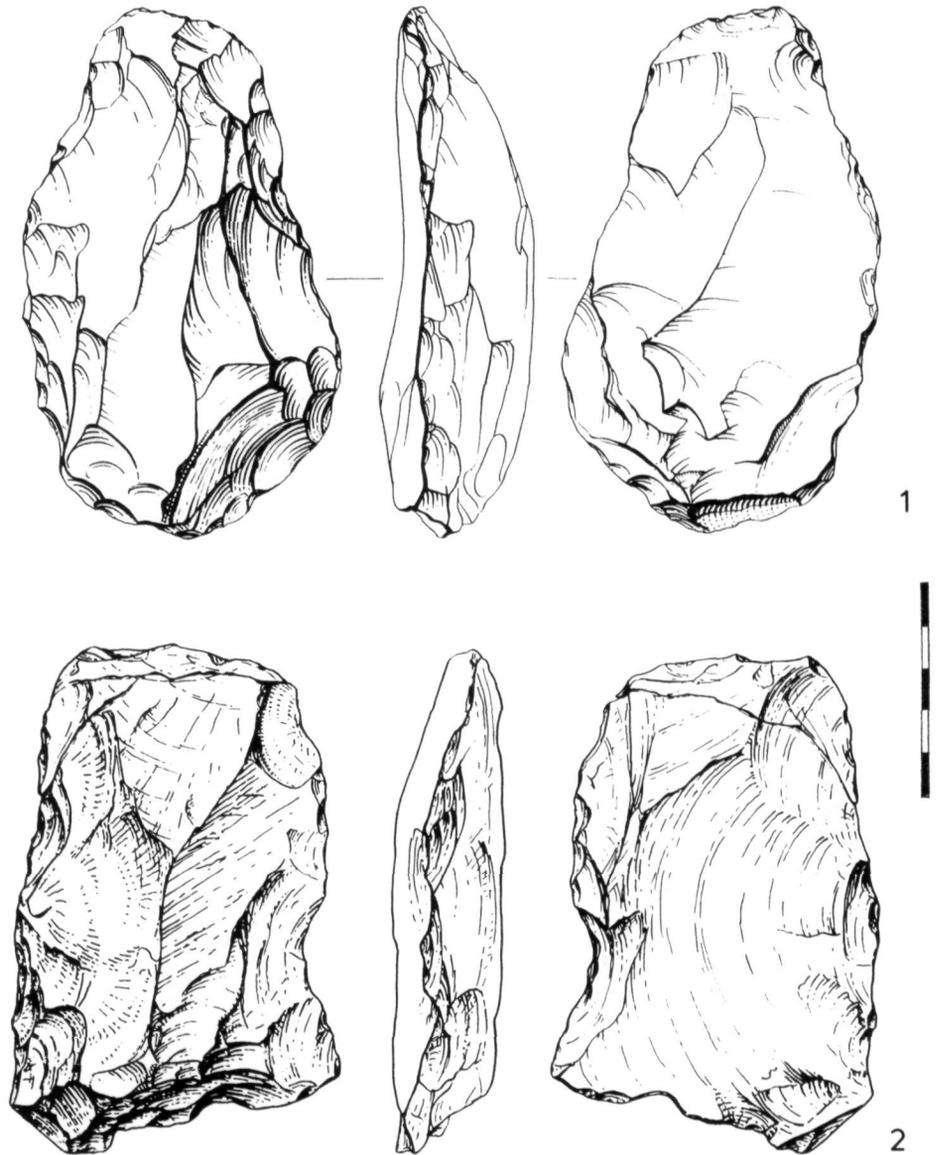


Fig. 20. Kudaro I. Bifaces. Scale in cm.

Baryšnikov 1977; Markova 1982). “The reason of this could be a long isolation of the Caucasus fauna” (Baryšnikov and Dedkova 1978) and also the existence of the Colchis refuge during the cold periods.

The palaeobotanical observations also indicate a longer survival of Pliocene relicts in the Colchis flora, compared to western Europe and other Caucasus regions. The reasons are the special climatic conditions, first of all the humid subtropical climate of the Colchis, which is still a stable

refuge of floral relicts (Čočieva 1982). As mentioned earlier in this paper, the core of the Colchis vegetation consists of tertiary relicts and about 20% of the Colchis flora is endemic (Pavlov 1948; Kolakovskij 1961).

In any case the new results seem to indicate a higher age of the lower Acheulean layers of Kudaro I. The lower part of level 5v formed during a dry-warm, possibly earlier Middle Pleistocene, period. The humid-warm subtropical climate phase (level 5b) might correlate to another Middle

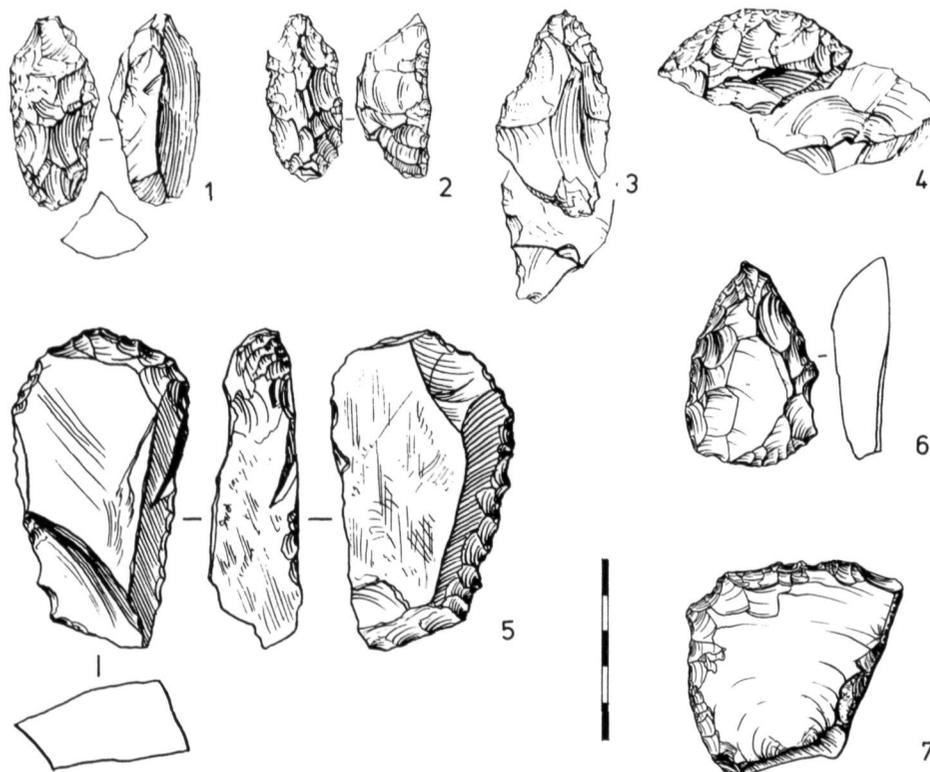


Fig. 21. Kudaro I. Flake-tools. Scale in cm.

Pleistocene interglacial. But these dates are preliminary, as the special evolution of fauna and flora in the Colchis makes the comparison with the European biostratigraphy difficult.

2.3.3. Kudaro III

The Kudaro III cave (Fig. 22) is situated beneath the caves Kudaro I, II and V, in the fourth level (from below) of the cave-system. The entrance is at 1564 m OD and 220-230 m above the Džodžori-river.

Pleistocene and Holocene sediments are 6-7 m thick and fill 80-90% of the cave. In the most important transversal section 10 levels could be identified. Levels 3-4 date to the Middle Palaeolithic, 6-8a are Acheulean levels. The marked humidity in the cave led to sinter formation, fragments of sinter being an important component of the cave's deposits.

Fauna

(after Baryšnikov 1977, 1980, 1987, 1991a; Baryšnikov and Dedkova 1978; Vereščagin and Baryšnikov 1980 b; Baryšnikov and Baranova 1982, 1983; Baryšnikov and

Nikolaev 1982; Baryšnikov and Cerepanov 1985). As yet the main part of the fauna from the Middle Palaeolithic levels 3-4 and the Acheulean level 5 is determined and published. For the other Acheulean layers (6-8a) there are only preliminary lists based on determinations. The still incomplete faunal lists (Acheulean and Middle Palaeolithic levels combined) comprise 40 mammal species, 15 birds, 2 reptilia, 2 amphibia and 1 species of fish. From the Acheulean levels 7-8a there are 2374 determined bones of larger mammals. The small fauna has not yet been analysed yet.

The lower Acheulean levels (8a, 8, 7) are strongly dominated by remains of *Ursus deningeri praekudarensis* (*Spelaesus deningeri praekudarensis*) which represent more than 85% of the determinable larger mammal bones. Bones of adult animals dominate. Very big upper last molars, some of them longer than 48 mm (males?) are present. Many molars especially from level 8 are heavily to very strongly worn. Milk teeth seldom occur – but from level 5v there are more than 500 milk canines. In levels 7 and 8, as in the upper Middle Palaeolithic levels from Kudaro I,

bones of old animals are numerous (Baryšnikov and Dedkova 1978). The bears died naturally, without any human interference.

Pollen analysis

The palaeobotanical samples from Kudaro III analysed earlier came only from the upper three levels, from material extracted from the longbones in the laboratory (Ljubin and Levkovskaja 1972). More recently samples were taken directly from the section K-S, which resulted for levels 1-5 in the definition of 11 pollen zones (Levkovskaja 1980). The lower zones (10-5) showed a repeated alternation of warm and cold phases. During the cold phases (cryomerer) there were always less pollen and spores. The occurrence of conifer pollen in all cryomerer indicates a more humid and colder climate during these periods than today. The levels from the warm phases (thermomerer) contain much more pollen and spores. These pollen spectra differ in composition, especially in the presence of exotic species as well as the AP and NAP values.

Lithic artefacts

The only partially excavated Acheulean levels yielded 91 artefacts. In levels 6 and 7 the raw material is mainly bad quality local rock (flint with fissures, silicified limestone), but at the same time there are artefacts of good flint from non-local sources in these layers. In levels 5, 8 and 8a only local raw materials are present. These are often suitable such as sandstone pebbles and in some cases slate.

A majority of the artefacts from all levels are flakes and – especially in level 6 – flake-fragments and debris from local flint. Chips are rare and retouched tools are not numerous (12-13 pieces). Most of the tools – biface, proto-bifaces, side-scrapers, cleaverlike tools – come from level 5. The three “proto-bifaces” were made out of a low-quality sandstone. The artefacts of the middle Acheulean levels include two flint artefacts from non-local flint.

Chronology and palaeoenvironment

An indication of the age of the various assemblages is given by some absolute dates. TL-dating of sediments resulted in three dates: Acheulean horizon 8a: 560 ± 112 Kyr BP, the eroded lower part of the Middle Palaeolithic layers and the transition to Acheulean layer 5: 252 ± 51 Kyr BP and 245 ± 49 Kyr BP (Ljubin and Kulikov 1991; Ljubin 1993a-b). There are also two Uranium-Thorium dates on bone material from the lower part of Middle Palaeolithic layers in the 1957 sondage (Čerdyntsev *et al.* 1959): 110 ± 10 Kyr BP and 80 Kyr BP.

Information on aspects of both the palaeoenvironment and the age of the layers is provided by the changing

percentages of deer, mountain goat and cave bear, as worked out by G.F. Baryšnikov. Additional indications are provided by the morphological characteristics of wolf and cave bear. In the lower Acheulean levels (8a-7) differences in species composition are small; the percentages of bones of mountain goat, inhabiting the higher mountain regions, and red deer, living in forested environments, is more or less the same throughout these layers. In level 8a and 7 there are some bones of more forest indicative animals such as beaver, porcupine and lynx, which until now are unknown from level 8. Additional indications are given by the carnivores. From level 7 there are two maxilla fragments of a small wolf. Based on the length of the upper canine (23 mm) this wolf was similar to *Canis lupus lunellensis* of Lunel Viel (Bonifay 1971). As for the cave bear remains, it is only possible to conclude that the teeth are comparable in size and structure to *Ursus deningeri praekudarensis* (*Spelaesus deningeri praekudarensis*) of level 5v of Kudaro I (Baryšnikov, in press).

In the upper Acheulean layers (6-5) cave bear also dominates, but there are some differences in the overall species composition: level 6 is characterized by the occurrence of warmth indicators such as *Emys orbicularis* and *Ursus mediterraneus*, together with alpine species like *Cuon* and Caucasian turkey (*Tetraogallus caucasicus*). Bones of red deer are not numerous. The fauna of level 5 contains beaver, porcupine and *Ursus mediterraneus* as well as many bones of red deer and mountain goat. The molars of cave bear show a combination of archaic and evolved features indicating a transitional form between *Ursus deningeri praekudarensis* from Kudaro I, level 5v and *Ursus deningeri kudarensis* from Kudaro III, level 4v.

In the Acheulean layers the cave bear dominates with 84-87% (levels 7-8) up to 92-98% (levels 5-6), in the Middle Palaeolithic levels this animal attains 77,2% (level 4) and 71,1% (level 3). The Middle Palaeolithic levels are also characterized by different percentages of *Cervus elaphus* and *Capra caucasica*: in level 4 *Cervus elaphus* is represented by 18,3%, while *Capra caucasica* is only represented by some bones, whereas level 3 contains 5,9% of *Cervus elaphus* and 6,9% of *Capra caucasica* (Ljubin and Levkovskaja 1972; Vereščagin and Baryšnikov 1980b). In the Acheulean layers bones of goat and deer are not numerous but red deer is especially in level 5 better represented than goat.

More warmth demanding species like *Macaca*, two species of porcupine and the etruscan rhino occur in the lower Acheulean horizons of Kudaro I (level 5v), but are absent in the Acheulean levels of Kudaro III. This corresponds well to the morphological features of the wolf and the cave bear that indicated a younger age for the Acheulean layer of Kudaro III.

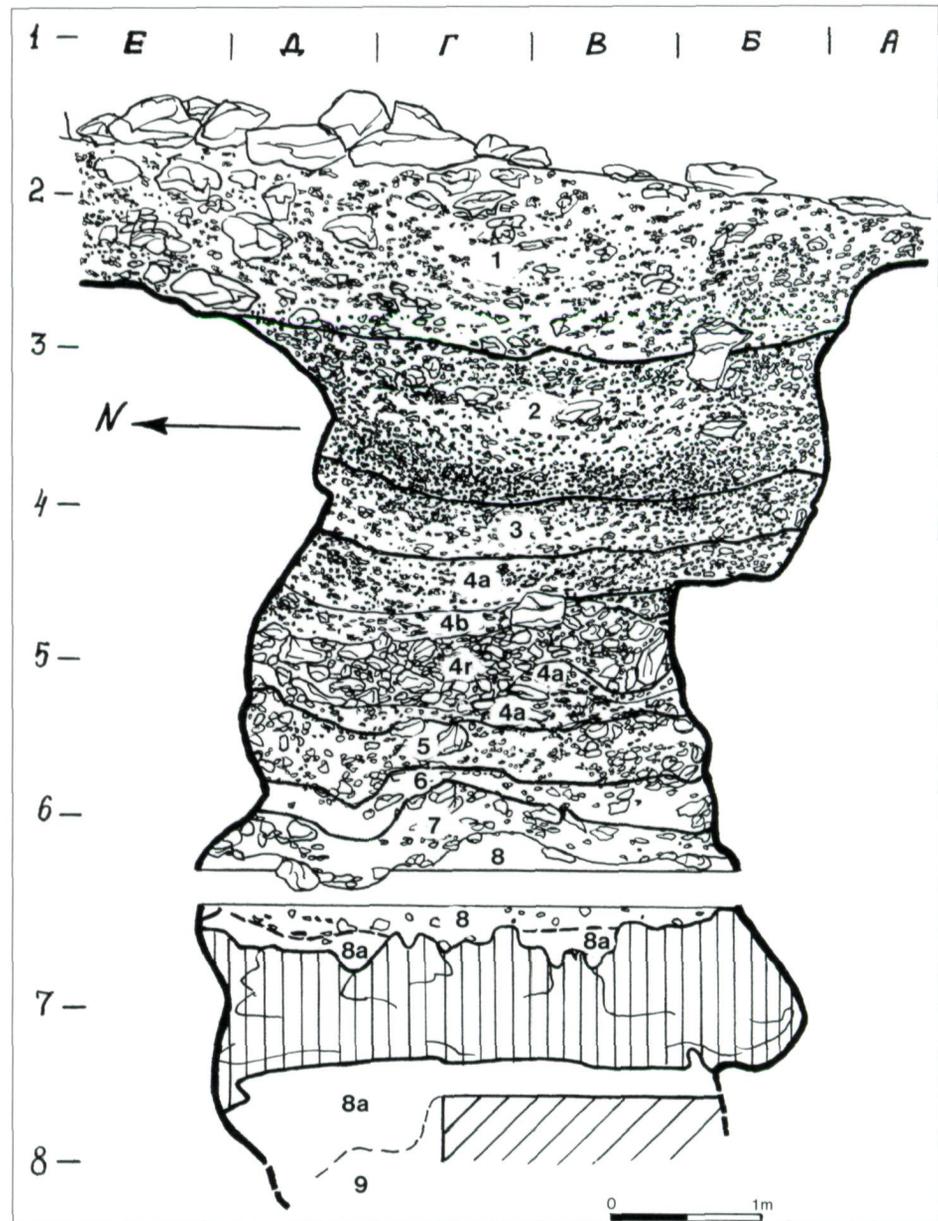


Fig. 22. Kudaro III. Section (O_1 - K_1 - M_1). 1: Dark brownish loam with many debris; 2: Grey brownish loam with unsorted slope-debris and big limestone blocs; 3: Pale loam with medium and coarse debris and some bigger blocs; 4: Dark greyish loam in places greenish, with many debris and limestone fragments; 5: Compact yellowish loam with differently rounded debris; 6: Yellow brownish loam, clayey and crumbly; 7: Less compact, clayey loam, greenish-grey; 8: Dark brown crumbly loam with many debris, coarse in the upper part; 8a: Brown loam with phosphate dissolutions and isolated small debris; 9: Brown compact sticky clay; 10: Light yellow sandy loam with gravels.

The pollen analysis enlarges the possibilities of dating and palaeogeographical reconstruction. The flora of the Acheulean levels of Kudaro III, studied by G.M. Levkovskaja, is different from the extant vegetation by the types of exotic plants present. In almost all the samples there are pollen of many regional exotics, plants which occur to-day in other regions in the Caucasus. During the formation of the Acheulean layers some of these exotic species were even dominant - *Pterocarya* sp. and *Pistacia* sp. in the thermomeres 3 and 4 of the levels 6 and 7. The composition of the transregional exotics is also multifarious: *Adiantum* cf. *pedantum*, cf. *Gingko* sp., (level 10), *Tsuga* sp., *Cedrus* sp., *Glyptostrobus* sp., *Parrotia* sp., *Carya* sp., *Osmunda cinnamomea* ssp.

The exotic species vanished in different regions in different periods and it is therefore impossible to date the sediments of the cave by their extinctions. Some of the criteria worked out in western Europe can not be applied to the Caucasus region. *Pterocarya*, for example, was present in Central Europe during the Middle Pleistocene (Zagwijn 1957, 1963), but in the Caucasus it still belongs to the modern vegetation. However, the high number of exotics in the Acheulean layers indicates a high age for these deposits. According to Gričuk (1982 Tab. 39) the percentage of the north-american, east-asian and balkanic-colchidis elements in the palaeovegetation of the previous Soviet Union clearly decreases after the Lichvin Interglacial. During the Mikulin Interglacial these components almost disappear. In our region the plants of the Colchis flora give no age indication because they are still present in the recent vegetation. However, the Acheulean layers of the Kudaro caves contain a number of american/east-asian and southeast-asian plants: *Tsuga* sp., *Carya* sp., Taxodiaceae, *Glyptostrobus* sp., *Eucommia* sp., *Osmunda cinnamomea*.

The composition of the flora is multifarious up to the end of the early climatic optimum in level 5 (pollenzone X) (Ljubin *et al.* 1985a Tab. 1). The antiquity for the Acheulean layers is also indicated by the phytozenoses (the dominance of regional exotics in different periods). Level 8a of Kudaro III displayed six climatic changes (three cryomeres and three thermomeres of different climatic types). For the end of the last thermomere there is a TL-date of 560 ± 112 Kyr BP. Judging from its lithology, level 8 was deposited during a cold period. The levels 6-7 were formed in a period of climatic variability. A warm period (pollen horizon 3), established for levels 6-7, could correspond to the Holsteinian of western Europe. The pollen analytical dates indicate a high age for the Acheulean level 5, which lower part can be correlated to the base of level 5a at Kudaro I.

The palaeontological age assessments of G.F. Baryšnikov and the pollen analysis of G.M. Levkovskaja indicate slightly

different ages for the Acheulean horizons of Kudaro III. The different opinion of the palaeontologist may depend on the small size of the excavation in the oldest Acheulean horizon and the resulting small size of the faunal assemblage. In addition the microfauna of these levels has not been studied yet. The differences between the Kudaro I and Kudaro III faunas also reflect the different origins of the faunal remains. At Kudaro I the anthropogenic factor dominated, while Kudaro III was only rarely visited by humans, and is first of all a natural bone accumulation.

2.3.4. Cona

The Cona cave (Fig. 23) is situated in the Džavski region (South Ossetia, Georgia) on the southern slope of the limestone mountain Bub (Val'-Choch) at an altitude of 2100 - 2150 m OD, 250-300 m above the valley, and 5-6 km south of the Kudaro caves (Fig. 1). The cave entrance is orientated SSW and sheltered to the west and north by narrow rock-spurs. Cona is the biggest cave site of the Caucasus region, with excavations possible over an area of 1.000 m², of which 140 m² have been excavated.

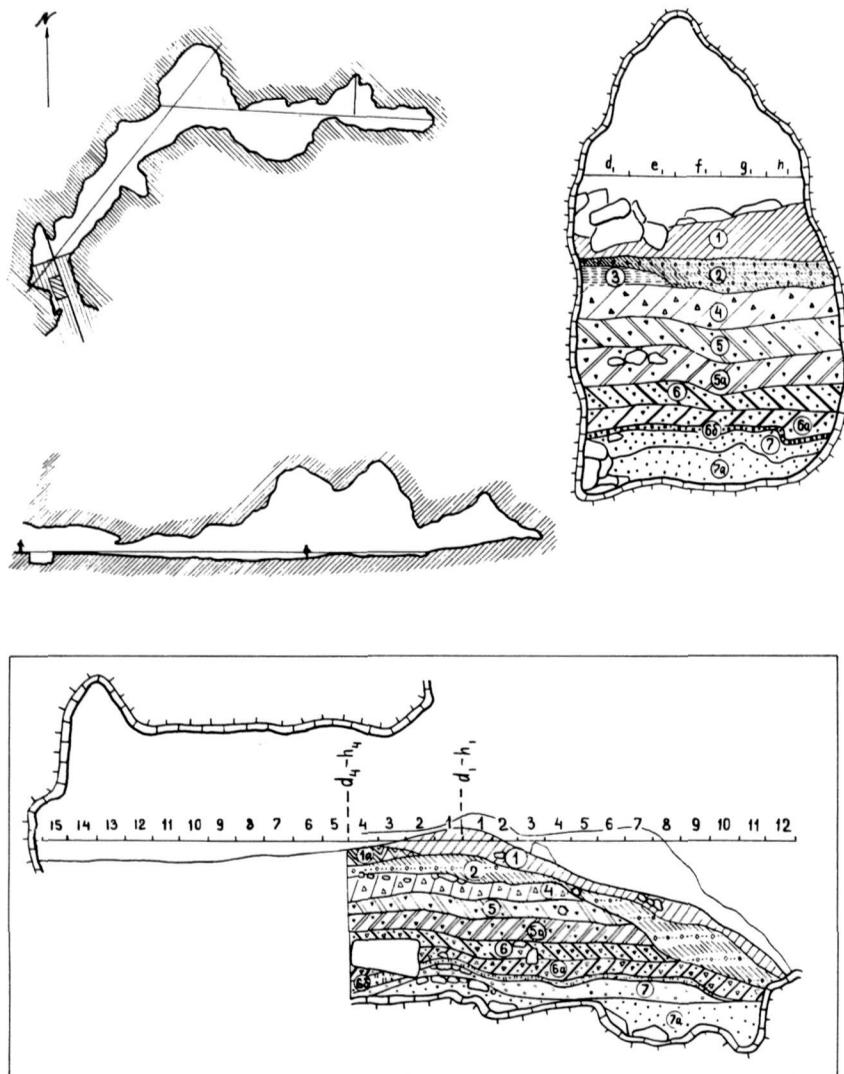
Palaeolithic finds in the Cona cave were discovered in 1958. The first 2 × 2 m sondage in the entrance area went through the three upper layers (Neolithic, Mesolithic, Middle Palaeolithic), and the success of this work led to a large excavation programm which finished in 1978.

Stratigraphy

The sediments in the cave were eventually subdivided into 10-11 levels (Kalandadze 1960, 1961, 1962, 1965). The description of the transversal section d₁-h₁ observed in 1961 by A.N. Kalandadze seems to characterize the sedimentary sequence fairly well (Kalandadze 1962) (Fig. 23). It is to be noted, however, that later on a more complex subdivision of the sequence has been proposed (Tušabramišvili 1978; 1984).

Between the various levels there are more or less pronounced erosional features. Especially marked were the erosional phenomena in the lower part of the section. Kolbutov (1961) observed that the loam of the lower Acheulean layer contained a gravel horizon 0,60 - 0,80 m thick.

The profile contains some characteristic horizons which can be correlated to layers in the Kudaro caves. First of all this concerns the archaeological sterile light yellow loam with many limestone debris (level 4), which may correspond to the glacial maximum of the last glaciation. Likewise the dark grey loam with small limestone debris and Middle Palaeolithic finds (level 5a) can be observed in the Kudaro caves. The discordantly underlying yellowish sandy loam (level 6) forms the topmost Acheulean layer both at Cona and in the Kudaro caves, while the lower part



Level	Lithology	Finds
1	0,76 m Humus, soil formation	
2	0,70 m Brownish loam with limestone blocs	Mesolithic
3	Yellowish loam	Mesolithic
4	0,75 m Light yellow loam with many limestone debris	
5	0,59 m Yellowish loam with limestone debris	Middle Palaeolithic
5a	0,80 m Dark grey loam with small limestone debris and ochre	Middle Palaeolithic
6	0,55 m Yellowish sandy loam	Upper Acheulean
6a	0,45 m Light yellow sandy loam with limestone debris	Upper Acheulean
6b	0,25 m Dark brown "rusty" loam	Upper Acheulean
7	0,45 m Greenish grey loamy coarse sand	Lower Acheulean
7a	0,35 m Yellowish-reddish loamy sand with big limestone blocs	Lower Acheulean

Fig. 23. Cona, transversal section d1-h1, after Kalandadze 1962.

of the Acheulean levels consists both at Cona and in the Kudaro caves of greenish-grey coarse sands with much limestone debris (level 7).

Fauna

The Cona deposits yielded about 15,000 animal bones, including remains of lizards and birds (Vekua *et al.* 1981, 1987; Burčak-Abramovič 1971). Wet screening did not take place, and 99,4% of the bones are from larger animals e.g. *Canis lupus*, *Vulpes vulpes*, *Ursus spelaeus*, *Ursus arctos*, *Panthera spelaea*, *Sus scrofa*, *Cervus elaphus*, *Capreolus capreolus*, *Bison priscus*, *Capra caucasica* and *Ovis cf. ammon*.

In their comments on this faunal list Vekua and his colleagues pointed out that the Acheulean levels contained about 7000 bones, virtually all of cave bear (99,1%). In the Middle Palaeolithic layers (5, 5a) the amount of cave bear diminished (62,1 %) with at the same time an increase of artiodactyls (31,7 %). "All the mammals represented in the Acheulean layers occur also in the Middle Palaeolithic levels" (Vekua *et al.* 1987:93). On the other hand, *Cuon* as well as *Sorex* sp., *Meriones* sp., *Lagurus* sp. and *Ellobius* sp. occur only in the Middle Palaeolithic levels. *Hystrix* is only present in the two Acheulean layers (6, 7), and *Allactaga* sp. only in the lower Acheulean horizon (7).

Pollen analysis

Zelikson and Gubonina (1985) conclude that the cave was not far from the upper limit of the forest belt at the time of the formation of the upper Acheulean horizon (6) (to-day it is in the sub-alpine zone). The composition of the upper forest belt was very different from that of the recent forest though: dry slopes had an open forest vegetation with Xerophytes and scattered *Carpinus orientalis*, while on steep slopes and debris-covered slopes *Juniperus* was present. Deciduous trees (oak, maple, ash, elm) were rare.

In the deepest part of the Acheulean layers pollen were only seldom preserved (Vekua *et al.* 1987). The middle and upper part contained a high amount of tree pollen, with pine dominating (28-50%) and spruce (3-6%), fir (3-25%) and *Tsuga* (2-8%) less well represented. Deciduous trees were primarily represented by beech (6-19%), alder (6-15%), birch (1-5%) and oak (4%). Hornbeam, lime tree, elm, hazel and rhododendron were present in small numbers only. Especially interesting is the occurrence of exotic genera like *Cyathea* and *Dicksonia?* as well as *Podocarpus*, *Cedrus*, *Tsuga* and *Taxodium*. According to Mamacašvili there was a mixed forest with deciduous and coniferous trees in the neighbourhood of the cave during the formation of the Acheulean levels. The Middle Palaeolithic levels did not contain enough pollen, but the archaeologically sterile

level 4 indicates a climatic deterioration. During that time the cave was situated in the subalpine vegetation belt (Vekua *et al.* 1987:98).

Lithic artefacts

The stone artefacts have only been published in a very preliminary and selective way. This review is therefore mainly based on our personal knowledge of the 1959-1961 and 1965 finds and preliminary sketches.

The Lower Acheulean layer (7) yielded only 30 artefacts, found in the eastern part of the entrance area (Kalandadze 1962). Raw material was senonian and turonian flint, sometimes argilit (Kalandadze 1965). Besides 13 flakes there are "simple convex side-scrapers and rough cutting instruments" (Tušabramišvili 1984:12-13).

From the upper Acheulean layer (6) there are 104 artefacts, mostly tools (Figs 24-27). Raw materials are argilit (64), andesit (11), flint (11), silicified limestone (3) and sandstone (5) (Tušabramišvili 1984:13). The tools are dominated by bifaces (29 in the studied series of the 1959-1961 and 1965 excavation; Fig. 24). With the exception of some pieces of sandstone and silicified limestone they were made of locally available slate (argilit). The slate-structure of the raw material influenced the form of the tools. The surface of some bifaces of argilit is heavily weathered and rounded. The bifaces were made out of elongated flat pebbles as well as from flakes, and most of them are long and flat (15). Their edges are straight or only slightly zig-zag-like. The lower end is often sharp, but some pieces display a thicker "butt". Some bifaces are backed. Long-triangular and almost *cordiform* bifaces dominate. Important are the cleavers (10; Figs 25-26), made out of locally occurring rocks: slate (5), quartzite-like sandstone (2), silicified limestone (2) and flint (1). As at other sites, and surely linked with their function, cleavers of glassy homogeneous flint are very rare. Both flake- and bifacial cleavers are present. The cleavers from Cona represent the biggest series from the Caucasian Acheulean. A few flake-tools are also present: points, side-scrapers and denticulated pieces (Fig. 27).

The strong dominance of retouched tools, and the almost complete absence of flakes and cores, underlines the special character of this inventory. We see here the remains of a hunting camp where finished tools were imported. In contrast to base camps, for instance those identified in the Kudaro caves, there was no stone-working on the spot at this site.

Chronology

It is difficult to date the Acheulean levels from the Cona cave. In the literature there is a certain tendency to push its antiquity back in time. Kalandadze (1960, 1961) classified the material as final Acheulean and later as second part of

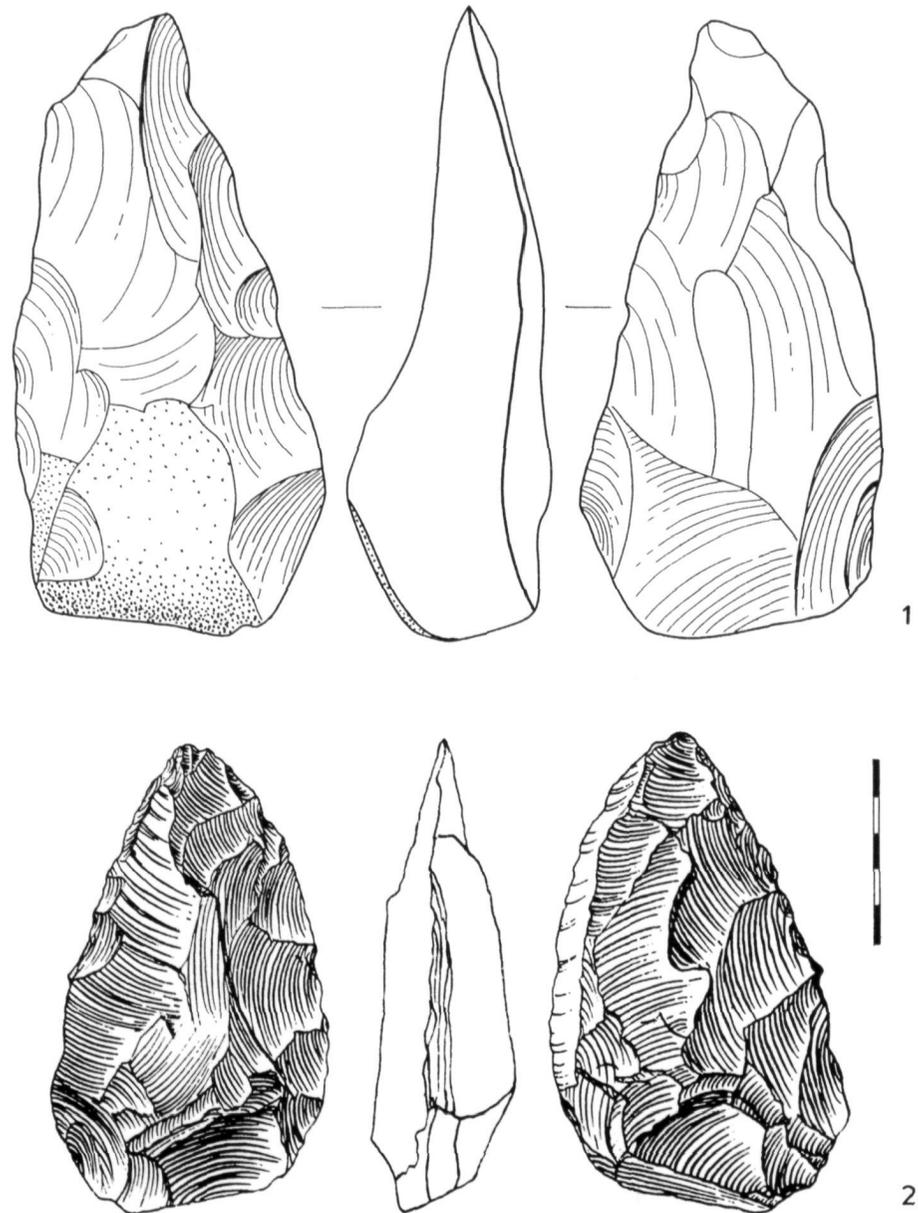


Fig. 24. Cona. Bifaces. Scale in cm.

the Acheulean (Kalandadze 1965), while Tušabramišvili (1978, 1984) spoke of middle Acheulean.

An absolute date is only available for a stalagmite fragment from an "upper horizon": 46 ± 4 Kyr (Uranium/Thorium; Čerdynceev *et al.* 1966).

The chronostratigraphy of cave deposits in the Kudaro-Cona-region depends on the corresponding influences of

climatic oscillations in the mountainous region. This permits a comparison of the sections. The temperate (interglacial) conditions during the formation of the Acheulean layers at Cona and in the Kudaro caves are comparable. The typology of the Cona Acheulean, however, seems to indicate a more evolved, younger Acheulean stage than at Kudaro.

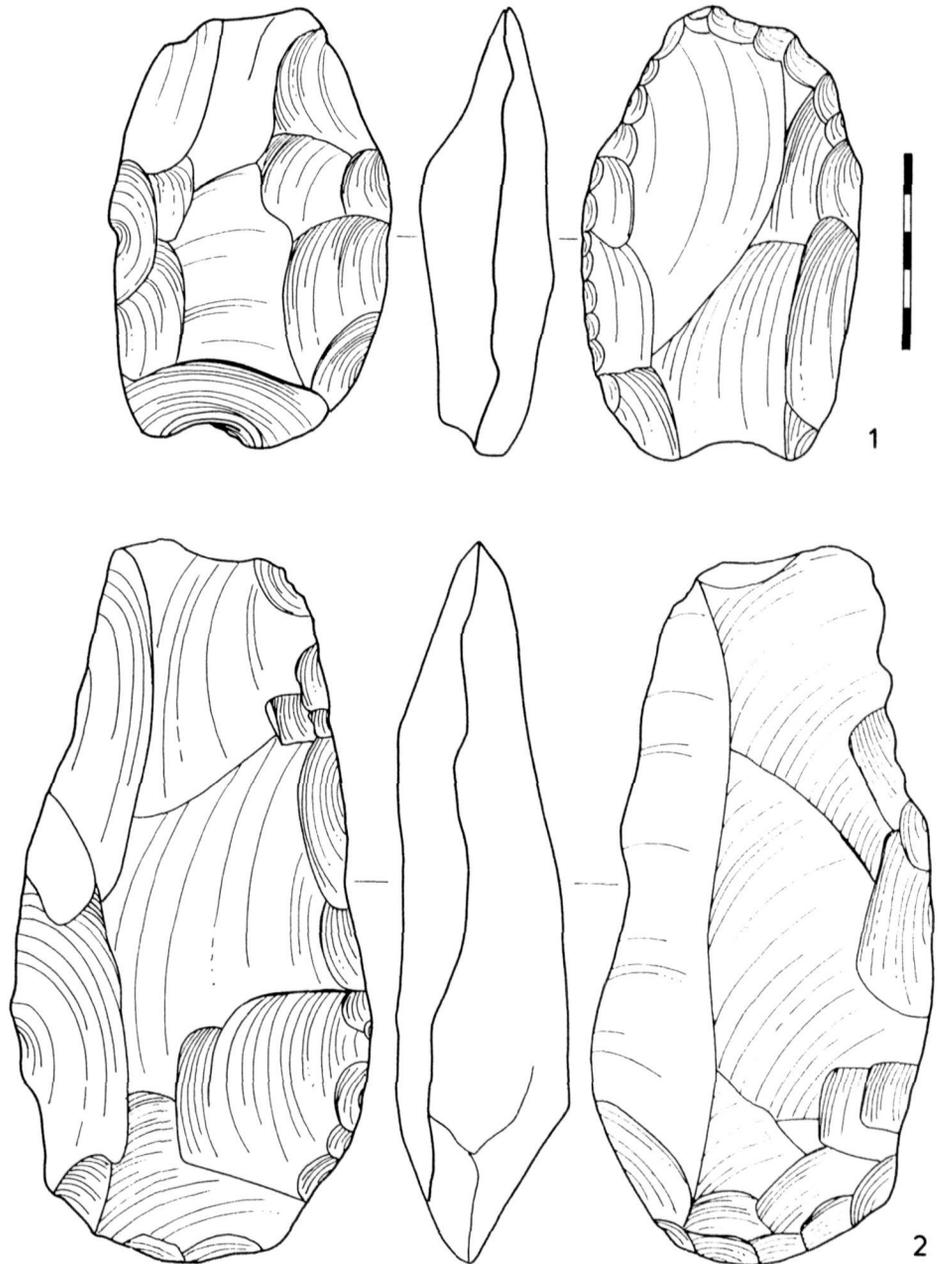


Fig. 25. Cona. Cleavers. Scale in cm.

2.3.5. *Treugol'naja Cave*

The Treugol'naja cave is located in the western part of the Caucasus on the Baranach plateau, between the Urup river and its small tributary Kuva in the Kuban depression (Fig. 1). The cave is situated at the limit of the present upper forest-belt and the mountain meadows. The cave was discovered in 1986 by L. V. Golovanova. In a test-pit

Pleistocene sediments and Palaeolithic artefacts were found.

The 3-4,5 m thick fill of Treugol'naja cave is complex and disturbed by erosional processes. The eastern part is completely removed and characterized by deep erosional pockets. In the less disturbed western part of the section 14 different lithological units can be identified. The section consists first of loose loamy sands, which are difficult to

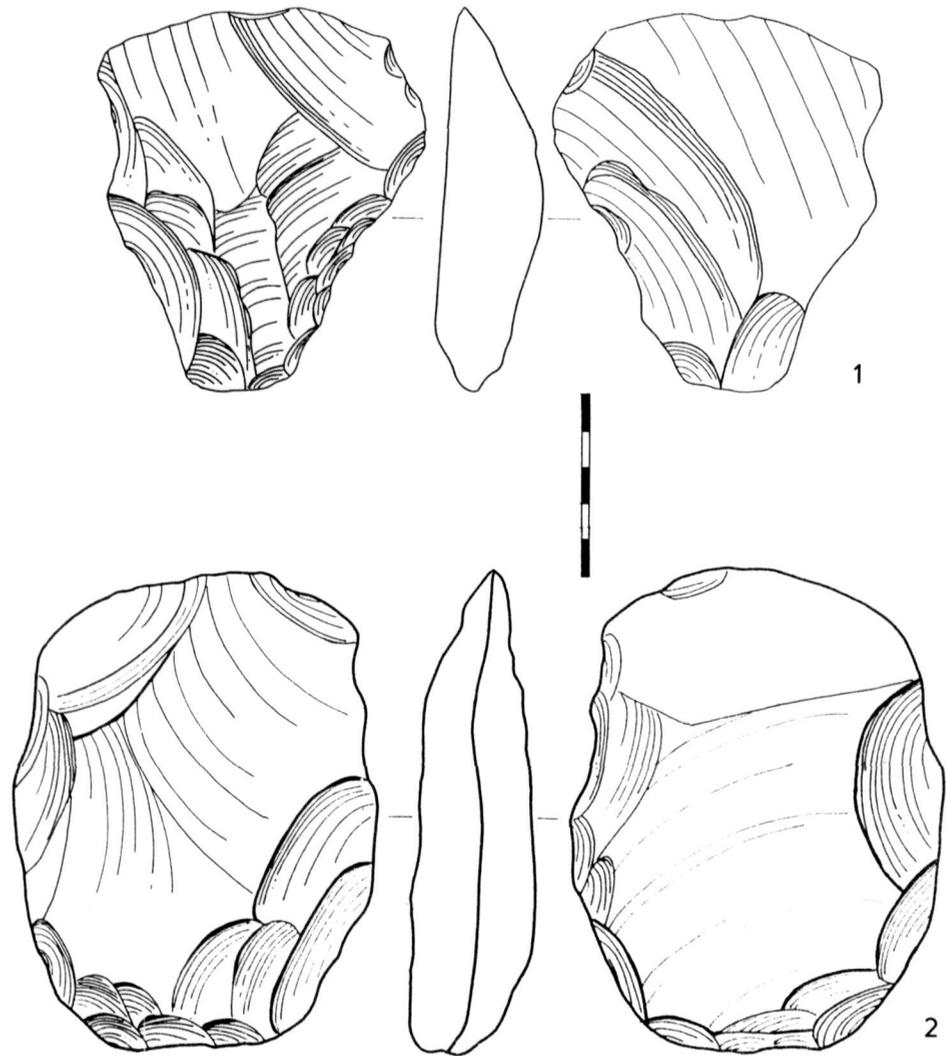


Fig. 26. Cona. Cleavers. Scale in cm.

differentiate. Only the pebble layer (6) in the lower part is a good marker for subdivision. All levels contained pollen (Pospelova and Levkovskaja 1994). Animal bones are recorded from all the Pleistocene layers (Baryšnikov 1990, 1991b). The fauna from the levels 3a-3b with e.g. *Marmota paleocaucasica* and *Saiga* sp. is typical of an open landscape and has been assigned to the last glaciation (Baryšnikov 1991b). The remains of the levels 4-7 represent an interglacial fauna with *Arvicola cantiana* (= *A. terrestris cantiana*), *Ursus deningeri*, *Stephanorhinus etruscus brachycephalus*, *Cervus elaphus acoronatus* and *Bison schoetensacki*, a fauna indicative of a wooded environment.

Bones of red deer dominate. Especially in levels 5b and 5v the bones are heavily fragmented. Besides undeterminable pieces there are fragments of long bones, ribs, antler and teeth. Many mollusc studied by L.M. Licharev, have been collected from the lower part of the deposits (levels 5-7): e.g. *Chronodrula tridens*, *Improvisa pupoides*, *Menacha caucasicola*, *Chrondrina clienta caucasica*, *Pseudochrondrula tuferifera*, *Quadriplicata aggesta aggesta* and *Sphyradium doliolum*.

During the 1986-1990 excavations 228 lithic artefacts were found. Raw materials are generally locally occurring flat limestone pebbles as well as non-local flint. From level 7b

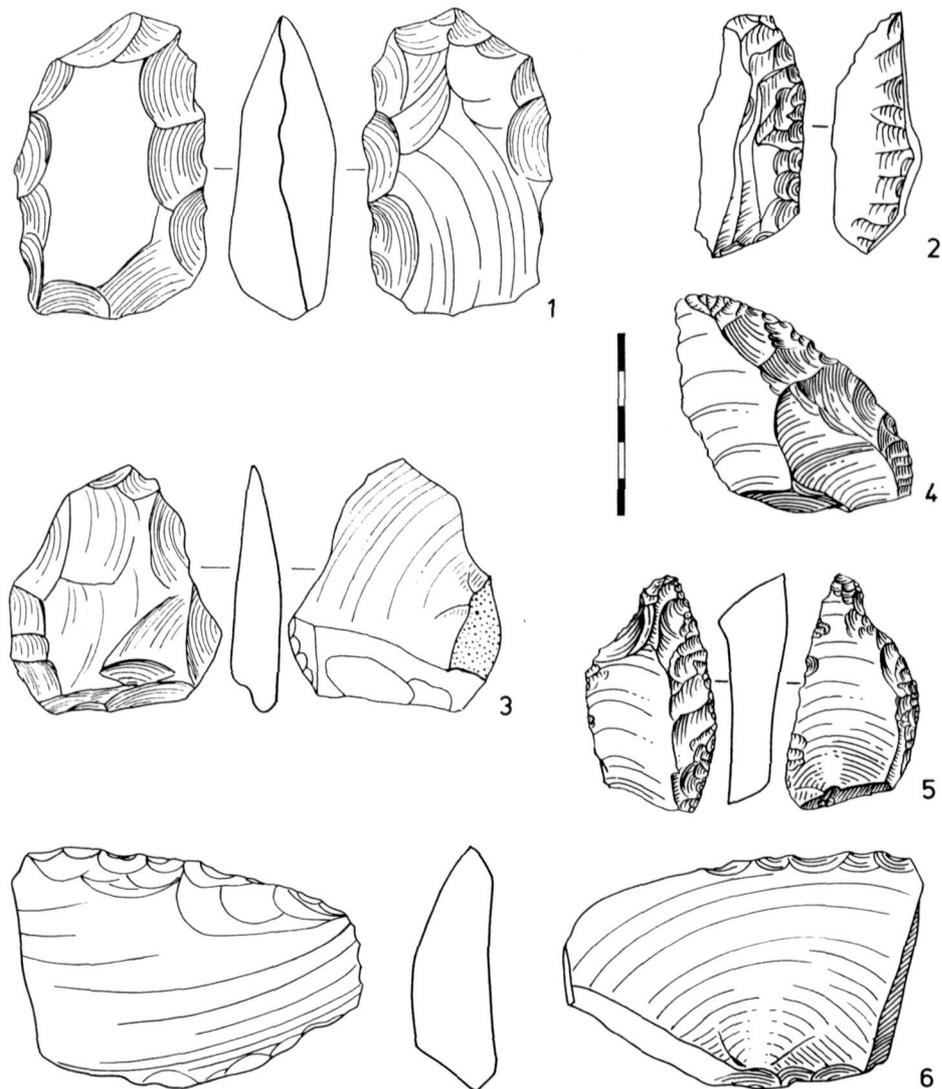


Fig. 27. Cona. Flake-tools. Scale in cm.

comes one flake, from level 7a seven artefacts (small flakes, three retouched flakes). From level 5v there are 8 artefacts (small, sometimes retouched flakes), from level 5b two flakes and from 5a five artefacts (flakes and a side scraper). From the lower part of level 4a as well as from levels 4b and 4v there are altogether about 90 artefacts, mostly flakes. The retouched tools include side-scrapers, 2 *limaces* as well as denticulates and notched pieces. The upper part of level 4a yielded several pebble tools. V.B. Doronichev subdivided the finds, including artefacts from uncertain stratigraphical positions, into two different groups, one being characterized

by pebble-tools (Fig. 28) the other by flakes (Fig. 29). In our opinion he might have overestimated the importance of Lower Palaeolithic stone artefacts by suggesting the former existence of two different cultural traditions.

4. Conclusion (by V.L. and G.B.)

The oldest site of the Caucasus region, at the same time one of the oldest proofs of human occupation in Eurasia, is Dmanisi in Southern Georgia. Its proposed age of 1.87-1.67 Myr BP (the time of the Olduvai-Event) is based on the results of absolute dating methods, palaeomagnetic

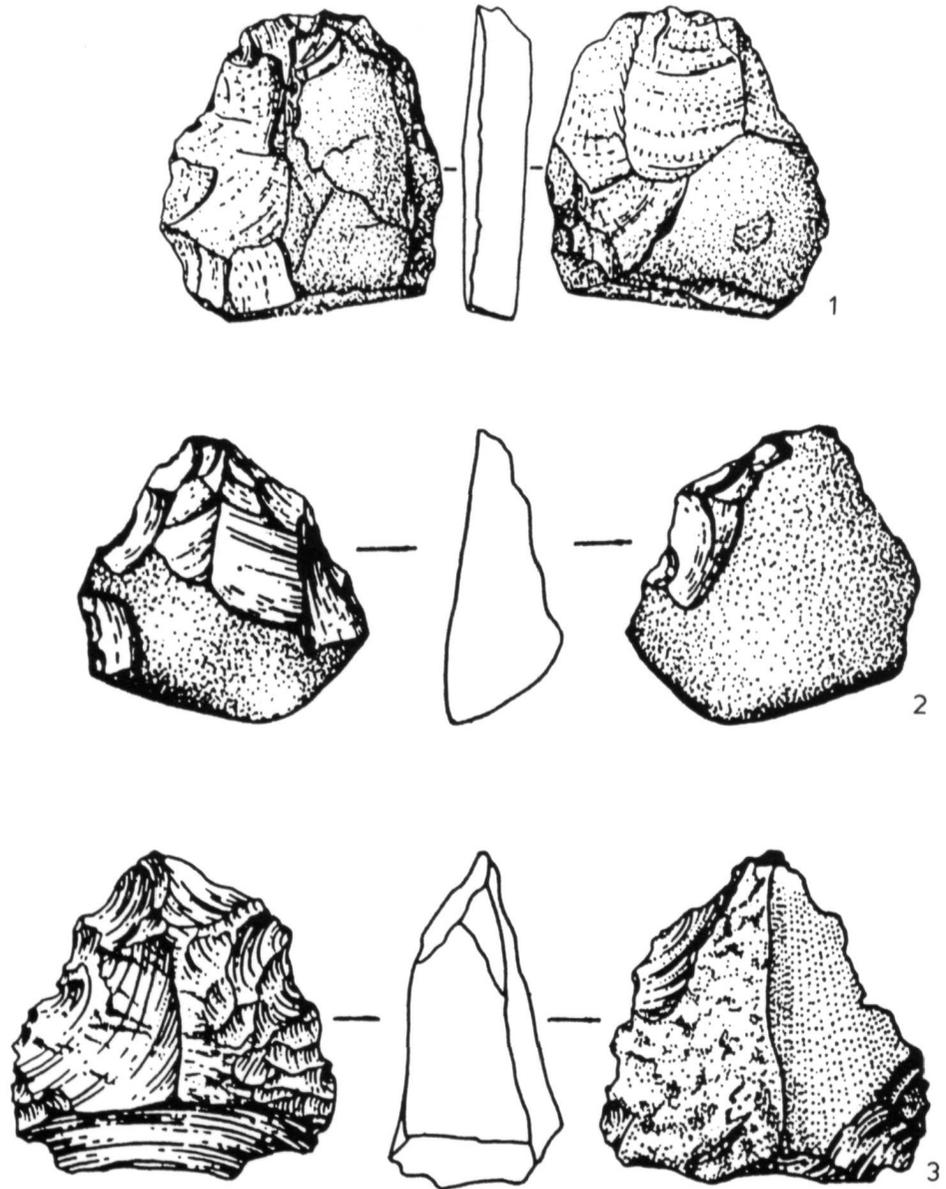


Fig. 28. Treugol'naja. Bifaces. Scale 2:3.

studies and on biostratigraphical evidence. The larger animals including *Archidiskodon meridionalis*, *Equus stenonis*, *Gazella* and *Struthio* point to a savannah-like landscape. The ongoing work will give additional information on environment and the way of life of the hominids there.

The finds of Taman and Achalkalaki are dated to the Early - Middle Pleistocene transition. Both sites are first of

all characterized by extensive palaeontological material. Especially at Achalkalaki it can be shown that humans participated in the formation of the bone accumulation. Here too, future excavations will yield new results concerning dating, environment and subsistence.

The Lower Palaeolithic cave sites of the Caucasus region date to the Middle Pleistocene. The finds from the lower levels (VII-X) of Azych are not obviously artefacts. The

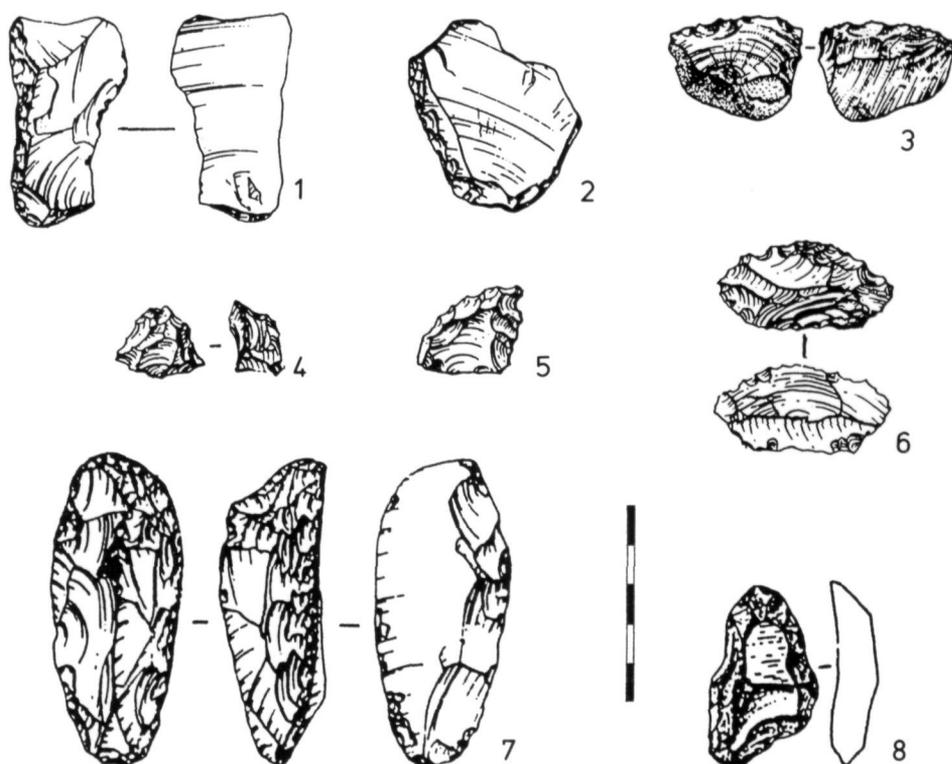


Fig. 29. Treugol'naja. Flake-tools. Scale in cm. After V.B. Doroničev.

oldest archaeological assemblage comes from level 5v at Kudaro, where *Macaca cf. sylvana*, *Canis cf. etruscus*, *Ursus deningeri* and *Dicerorhinus etruscus brachycephalus* point to an older stage of the Middle Pleistocene.

The only preliminary known deeper levels (4-7) of Treugol'naja cave (including *Arvicola cantiana*, *Dicerorhinus etruscus brachycephalus*, *Bison schoetensacki* and *Ursus deningeri*) as well as Azych level VI (with *Dicerorhinus etruscus brachycephalus*, *Dicerorhinus mercki*, *Equus süssenbornensis*, *Bison schoetensacki*) may be

assigned to a middle stage of the Middle Pleistocene.

The upper Acheulean layers of Azych (level V, with the human jaw bone) and Kudaro (levels 5a and 5b) date to a later part of the Middle Pleistocene, as indicated by the fauna, stone knapping-technique (Levallois) and tool-types (flake-cleavers). This is also the case at Kudaro III and Cona.

All Lower Palaeolithic finds of the Caucasus region belong to warmer periods when the neighbouring regions of the sites were forested. This is the case at Kudaro at an altitude of 1600 m OD and even at Cona, at 2100 m OD.

note

1 A. Vekua and L. Gabunia identified the following species at Dmanisi (Vekua and Gabunia 1991, A. Vekua in press): *Testudo* sp., *Lacerta* sp., *Struthio dmanisensis*, *Hypolagus brachygnathus*, *Canis etruscus*, *Ursus etruscus*, *Ursus* sp., *Martes* sp., *Pachy-*

crocuta perrieri, *Pachycrocuta* sp., *Homotherium crenatidens*, *Megantereon megartereon*, *Archidiskodon meridionalis*, *Dicero-rhinus etruscus etruscus*, *Equus* cf. *stenonis*, *Equus* aff. *altidens*, *Sus* sp., *Dama* aff. *nestii*, *Cervus perrieri*, *Eucladoceros* cf. *senezensis*, *Cervus* sp. (ex gr. *Arvernoceros ardei*), *Dmanisibos georgicus*, *Gazella* sp., *Soergelia* sp., *Ovis* sp.

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