The Paleolithic of Crimea, IV

SIUREN I ROCK-SHELTER

FROM LATE MIDDLE PALEOLITHIC AND EARLY UPPER PALEOLITHIC TO EPI-PALEOLITHIC IN CRIMEA

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Illustration quatrième de couverture : En haut, vue de la vallée de la rivière Belbek (photo © Leonid Maksimov, Evpatoria, Crimée). En bas, sondage de 1995 (photo © Pierre Noiret).

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PREFACE

Marcel OTTE

La Préhistoire du continent européen s'est régulièrement heurtée à la cassure radicale qui la traverse d'est en ouest et qui semble superposer deux mondes, voire deux humanités. Les modalités prises par cette distinction ont subi de profondes, et parfois cruelles, joutes épistémologiques qui, en somme, se réduisent à deux processus classiques, mais souvent mal compris, précisément parce qu'il s'agit de notre propre espèce, celle dont d'éventuelles lois extérieures viendraient mettre en cause la sacro-sainte liberté.

Le premier mécanisme est d'ordre culturel : toute société se fonde sur un système de valeurs où elle trouve l'ultime raison d'exister et qui répond à ses contraintes mentales fondamentales. La mise en cause de cette structure, fut-elle fugace, doit être rejetée au risque de mettre en cause l'ensemble du tissu social. De tels bouleversements ne peuvent venir que de l'extérieur, en masse, rapidement et surtout dotés d'une charpente métaphysique nouvelle et très cohérente. En matière historique, il ne s'agit jamais de différences portant sur les aptitudes, mais toujours sur les réalisations. Le monde néandertalien possédait sa profonde cohérence multimillénaire et son rythme évolutif, bien qu'en perpétuelle activité, ne pouvait être que lent, au point de nous paraître nul par analogie avec les phases plus récentes de l'histoire humaine. Mais les sépultures, les colorants, les principes mêmes au fondement des techniques montrent l'omnipuissance, l'omniprésence d'un esprit en marche et en totale adéquation avec les forces naturelles. Pourtant, le passage au Paléolithique supérieur bascule brutalement tout cet édifice, si puissant et si souple. Là se trouve illustrée la première loi de la métaphysique en action. Les systèmes de valeurs qui autorisent la chasse à distance, par armes propulsées, faites dans le matériau même de la proie (ramures, défenses), et qui étend son emprise par la voie analogique de l'image, ébranla les traditions soudaines mises en contact. Car les processus évolutifs propres à une société ne présentent pas en leur sein de si nets bouleversements : l'évolution y paraît continue, conservatrice, telles les coutumes cléricales actuelles. Dès que les porteurs de la nouvelle métaphysique « gagnent » en densité, en démographie, en territoire, alors le changement s'impose : les valeurs, les mythes, les coutumes et la métaphysique s'effondrent toutes à la fois.

L'Extrême-Occident de l'Eurasie (comme aussi son Extrême-Orient) présente les cassures les plus nettes, car le cœur du pro-

The prehistory of Europe has regularly come up against the radical break that crossed it from east to west and which appears to have superimposed two worlds or even two human species. The modalities taken by this distinction have undergone deep, and sometimes cruel, epistemological battles which, in sum, are reduced to two classical, but often poorly understood, processes, precisely because the debate involves our own species, that for which possible external laws would undermine its sacrosanct freedom.

The first mechanism is of a cultural order: all societies are based on a system of values in which it finds the ultimate reason for existing and which responds to the society's fundamental mental constraints. The implication of this structure, while fleeting, must be rejected at the risk of calling into question the social fabric as a whole. Such transformations can only come from the exterior, en masse, rapidly and especially furnished with a new and coherent metaphysical structure. For historical matters, this does not involves differences in capacities, but rather always in realizations. The Neandertal world possessed a significant coherence over millennia and its evolutionary rate, although in perpetual activity, could only be slow, to the point that it appears unchanging in comparison to the more recent phases of human history. Yet burials, colorants, the principles themselves behind technology demonstrate the omnipotence and omnipresence of an active mind in complete harmony with natural forces. However, the transition to the Upper Paleolithic brutally altered this edifice, so powerful and flexible. The value systems permitting hunting at a distance using thrown weapons, made in the materials obtained from the prey itself (antler, horn), and which extend its influence by the analogical path of imagery, shattered the traditions suddenly brought into contact. This is because the evolutionary processes specific to a society do not present within them such clear transformations: evolution seems to be continual, conservative, such as modern clerical customs. Once carriers of the new metaphysics "gain" in density, in demography, in territory, change is imposed: preceding values, myths, customs and metaphysics collapse all at once.

The Far West of Eurasia (like the Far East) shows the clearest breaks, because the heart of the process is distant. When cessus en est éloigné. À mesure où l'analyse porte vers les aires orientales de l'Europe, les distinctions se dissolvent en une série de franges d'extension limitée, mais toujours orientées vers l'ouest. À l'est de la Plaine russe, le Paléolithique supérieur semble produit par les lames issues de modalités Levallois (Kara-Bom, en Sibérie) ; au centre, les industries aux pointes foliacées dérivent des Moustériens locaux (Ak-Kaien, Streletskien, Sungirien). Toutes les innovations sont là mais restent comme limitées aux territoires régionaux. Il en va tout autrement dans les aires méridionales, entre Oural et mer Noire, où l'Aurignacien apparaît subitement et entièrement constitué (Kostenki 14, Siuren I, Buran-Kaya III). La même observation fut notée en Géorgie, en Arménie, en Irak et au Levant. Seul le plateau iranien semble posséder de profondes racines régionales à ces ensembles gigantesques qui vont traverser l'Europe entière. Le « Moustérien du Zagros », tel celui de Turquie, possède des modes de réduction, dans les aires éloignées des gîtes, aux origines des productions lamellaires identiques à tout ce que sera la première phase de l'Aurignacien en Europe et au Levant (« Proto-Aurignacien » et/ou « Ahmarien »).

Conscients de cette dispersion, de leurs diverses variations, tenant compte aussi des apports venus d'Afrique du Nord sous une forme limitée, nous avons choisi avec nos amis ukrainiens, de reprendre les fouilles dans la région centrale où le passage des Néanthropiens avait dû se faire vers l'Europe, la Crimée. En effet, les steppes eurasiatiques étaient alors exondées (pas de mer Caspienne, ni de mer d'Azov), et l'unité géographique était totale depuis l'Asie centrale jusqu'aux franges européennes. Les sites propres à leurs marges devaient forcément nous en donner la clé.

La seconde question relative aux brusques modifications anatomiques apparentes entre ces deux populations se résout également en termes de paléogéographie et de démographie. L'isolement relatif de l'Europe y provoqua un phénomène d'endémisme assez classique dans ce genre de situation. Dès que le rythme de reproduction interne à un milieu donné devient supérieur aux rythmes des migrations d'origine extérieure, les critères morphologiques tendent à s'accentuer, ou à se stabiliser, tel un « Néandertal ». Inversement, toute autre population, dispersée et suffisamment espacée, aura tendance à répartir les modifications mécaniques propres à toute l'espèce humaine assez rapidement. La bipédie procède par rétroactions échelonnées vers la boîte cervicale et vers la face, selon des lois en perpétuel mouvement aujourd'hui encore. Dès que cette population adopte des méthodes nouvelles, défie les lois naturelles, se dote de mythologies puissantes, sa démographie ne fera qu'augmenter et finira par atteindre ses « marges » originelles où elle pourra être ressentie comme spécifiquement distincte. Ainsi, l'histoire se poursuit, rythmée par d'apparentes saccades, au sein d'une masse humaine restée fondamentalement identique depuis environ trois millions d'années.

Mais cette histoire, ces soubresauts ont conduit finalement à façonner ce que nous sommes et, ainsi, apporte-t-elle l'intelligence de nous-mêmes, en même temps qu'une nécessaire humilité.

La Crimée et Siuren ont ainsi un pied entre les deux mondes : l'aire de formation asiatique et l'aire d'extension européenne.

analyses focus on the eastern regions of Europe, distinction dissolve in a series of fringes of limited extension, but always oriented toward the west. To the east of the Russian Plain, the Upper Paleolithic seems to have produced blades using Levallois methods (Kara-Bom, Siberia); in the center, leaf-point industries derive from the local Mousterian (Ak-Kaian, Streletskian, Sungirian). All of the innovations are present, but remain limited to regional territories. The situation is entirely different in the southern areas, between the Urals and the Black Sea, where the Aurignacian appears suddenly and completely formed (Kostenki 14, Siuren I, Buran-Kaya III). The same observation was made in Georgia, Armenia, Iraq and the Levant. Only the Iranian plateau seems to have had deep regional roots for these gigantic ensembles which would cross all of Europe. The "Zagros Mousterian", such as that in Turkey, includes modes of reduction in areas far from the sites that led to identical bladelet production methods in all which would be the first phase of the Aurignacian in Europe and the Levant (the "Proto-Aurignacian" and/or the "Ahmarian").

Conscious of this dispersal, their range of variability, taking into account contributions from North Africa in limited form, we have chosen with our Ukrainian friends to undertake excavations in the central region where the passage of Neanthropians would have taken place toward Europe, the Crimea. Indeed, the Eurasian steppes were then exposed (covered neither by the Caspian nor the Azov Seas), and the geographic unit was continuous from Central Asia to the European border. Sites proper to its margins should necessarily provide us with keys to understanding.

The second question related to the abrupt anatomic changes apparent between the two populations can also be resolved in terms of paleogeography and demography. The relative isolation of Europe would lead to a phenomenon of fairly classic endemism in this kind of situation. Once the reproduction rate within a given context became higher than migration rates from external origins, morphological criteria tend to be accentuated, or stabilized, such as a "Neandertal". Inversely, any other population, dispersed and sufficiently spaced, would have the tendency to distribute the mechanical changes proper to all human species fairly rapidly. Bipedalism proceeds by retroactions leading to the cranium and the face, following ongoing laws in perpetual movement. Once this population adopted new methods, defied natural laws, developed powerful mythologies, its demography would only increase and conclude by reaching its original "borders" where it could be considered as specifically distinct. In this way, history follows, punctuated by apparent leaps, within a humanity remaining fundamentally identically for around three million years.

Yet this history, these upheavals, led finally to create who we are and, in this way, contributing self-awareness and intelligence at the same time as a necessary humility.

The Crimea and Siuren have a foot in both worlds: the region of Asian formation and the region of European expansion. It is likely that this expansion was also toward the south to the Levant, and southeast to Pakistan and India. Yet the core region seems to have been located between the Zagros and

Probablement cette expansion s'est-elle faite aussi vers le sud, au Levant, et vers le sud-est, au Pakistan et aux Indes. Mais la région nucléaire semble se situer entre Zagros et Altai. Le site aurignacien de Kara-Kamar en Afghanistan en montre l'extension orientale. Et son histoire ira vers l'allègement des armatures, probablement liées à l'extension de l'arc : le Zarzien au centre, le Mézinien à l'ouest. L'ensemble a tendu par ses succès, à la densité démographique croissante, à la sédentarité qui s'en suivit, aux portes du « Paradis terrestre » où l'homme regrette encore d'avoir mordu à la pomme de la Connaissance. Cette histoire « récente » début encore dans l'Asie toute proche et se répand avec la même fulgurance que nos Aurignaciens le firent à partir de Siuren.

Altai. The Aurignacian site of Kara-Kamar inAfghanistan demonstrates its eastern expansion. And its history leads to the lightening of armatures, probably linked to the expansion of the bow: the Zarzian in the center, the Mezinian to the west. The ensemble led by its successes to an increasing demographic density, the sedentism which followed, to the gates of "earthly paradise" where man still regrets have bitten the apple of knowledge. This "recent" history also begins in nearby Asia and expands with the same brilliance that our Aurignacian did from Siuren.

Translated by Rebecca Miller

1 - THE HISTORY OF INVESTIGATIONS AT SIUREN I AND DIFFERENT INTERPRETATIONS OF THE SITE'S ARCHAEOLOGICAL CONTEXT

Yuri E. DEMIDENKO

Introduction

Until the 1980s and 1990s, the Siuren I rock-shelter was the only known *in situ* stratified Upper Paleolithic site in the Crimea. Moreover, the Siuren I rock-shelter is still the only Crimean Aurignacian site. Taking into consideration the uniqueness of Siuren I in the Crimea, before discussion of new investigations of the site during the 1990s and their results, it is useful to describe previous investigations and interpretations of the archaeological record at the site. This background will help to explain both the methodology employed during our new investigations and our attempt to understand the entire archaeological context of the site in the framework of modern Paleolithic research.

Merejkowski's excavations at Siuren I (1879-1880)

The site was first discovered and partially excavated in 1879-1880 by K.S. Merejkowski (b.1855-d.1921), at that time a 25 year-old student at St. Petersburg University, during his pioneering and outstanding discoveries of the first Crimean Stone Age sites during the period of the Russian Empire (Merejkowski 1881, 1887). Here it is interesting to note that K.S. Merejkowski's younger brother, D.S. Merejkowski (b.1866-d.1941) was well-known in Europe as a writer and religious philosopher, showing the highly intellectual atmosphere within this family. All information on Merejkowski's work at Siuren I has been obtained from publications by G.A. Bonch-Osmolowski (1934, 1940) and E.A. Vekilova (1957, 1971, 1979) and not from Merejkowski's original preliminary reports. This was made possible since these archaeologists continued field investigations at the Siuren I and Siuren II rock-shelters in the 1920s and 1950s, respectively, thoroughly publishing all available data on Merejkowski's earlier work (E.A. Vekilova) and comparing his data to finds from the 1920s excavations, making the initial results of the 19th century excavations much clearer.

During his extensive search for Stone Age sites in Crimean caves and rock-shelters, 34 of which he tested by sondages and/or excavations with discoveries of prehistoric sites in 9 of them, it is unsurprising that Merejkowski did not miss the two huge rock-shelters of Siuren (south-western Crimea) situated very close to one of the main Crimean roads: Bakhchisarai-Yalta. First, in 1879, Merejkowski dug a 3.5 x 2.5 m test pit in the central part of the Siuren I rock-shelter, to a depth of about 3 m without reaching bedrock. During this testing, two archaeological layers (upper and lower) were identified, separated from one another by a sterile level 0.15 m thick.. Below the lower cultural layer were found only archaeologically sterile deposits about 1.5 m thick. The entire lithic collection numbered about one hundred artifacts. The initial testing at Siuren I proved for Merejkowski the significance of the site and led him to continue investigations there. The discovery of several Stone Age sites in the Crimea in 1879 promoted Merejkowski to be funded by the Russian Geographical Society (St. Petersburg) for further investigations and, as a representative of this Society, he continued archaeological research in the Crimea in 1880. In 1880, Merejkowski significantly enlarged the area for excavations around the test pit to cover an area of ca. 60 square meters in the central part of the Siuren I rock-shelter near its back wall (fig. 1). These new excavations confirmed the presence of the two previously recognized Stone Age cultural layers, but recovering many more lithic artifacts and animal bones. No data is available for the deposits below the lower cultural layer and the problem of reaching bedrock was not noted, and remains unclear if it was, in fact, attained. During the 1880 excavations, Merejkowski thoroughly gathered all finds, and made several maps of spatial distribution of the artifacts and drew stratigraphic profiles. He soon was able to interpret the Siuren I rock-shelter as a Stone Age site with two different, non-contemporaneous, cultural layers which, along with such Crimean sites as Siuren II and Kacha rock-shelters, Chatyr-Dag caves and Kizil-Koba, evidenced human occupation in the Crimea "... *in alluvial period when did not exist such extinct animals as mammoth, rhinoceros, cave bear and others*" (Merejkowski 1881:121-122, quoted in Vekilova 1957:238). In terms of modern Paleolithic chronology, Merejkowski combined Upper Paleolithic, Final Paleolithic/Mesolithic and Neolithic sites, while keeping Volchi Grotto separate as a Mousterian site (Merejkowski 1884; Mortillet 1900). It should to be noted that aside from the article on Volchi Grotto, no other publications were separately devoted to any of the sites he discovered in the Crimea; the available data on each site found in preliminary reports are limited and too general. All results from the Siuren I rock-shelter excavations were intended to be published together with data on other

Crimean sites in a special monograph by Merejkowski, "*Essay of Stone Age in the Crimea*", "traces" of which were seen by S.N. Zamyatnin in the 1920s in the form of some printed tables that had been prepared (Formozov 1983:61).

Unfortunately, after two very productive years for Crimean prehistory, Merejkowski rapidly completely abandoned the discipline, the book was never finished or published, and all finds were distributed among different museums, and some even lost. Something happened. G.A. Bonch-Osmolowski was inclined to think that it was connected to the harsh social life in the Russian Empire at a time when the Orthodox Church did not welcome "*any scientific research which could break its dogmas*" (Bonch-Osmolowski 1940:3). Much later, A.A. Formozov (1983) further investigated this problem. He agreed with Bonch-Osmolowski that after the homicide of Czar Alexander the Second in 1881 and the establishment of the "*reaction epoch*" in social life, the "*publication of a book on Prehistoric Man after 1881 became impossible o*r, at least, undesirable" (Formozov 1983:62). At the same time, Formozov came to the general conclusion that Merejkowski's abandonment of prehistoric investigations may be explained more by a common "*deep internal crisis experienced by Russian intellectuals during last twenty years of XIXth century*" (Formozov 1983:63), which can be seen in the personal lives of many scientists at that time. Concerning Merejkowski's subsequent fate, Formozov noted that despite being a Professor of Botany at Kazan' University from 1902 to 1914, he had serious psychological problems that never really allowed him to be a productive scientist and to feel comfortable in social life (Formozov 1983:64-70). The main frustration of Merejkowski's abandonment of archaeology is that the so-productive beginning of Crimean Stone Age research was suddenly interrupted and this lasted until the 1920s – a "research hiatus" of more than 40 years. This certainly accounts for the lack of publishing of the book on Crimean Stone Age and articles with detailed descriptions of the discovered and

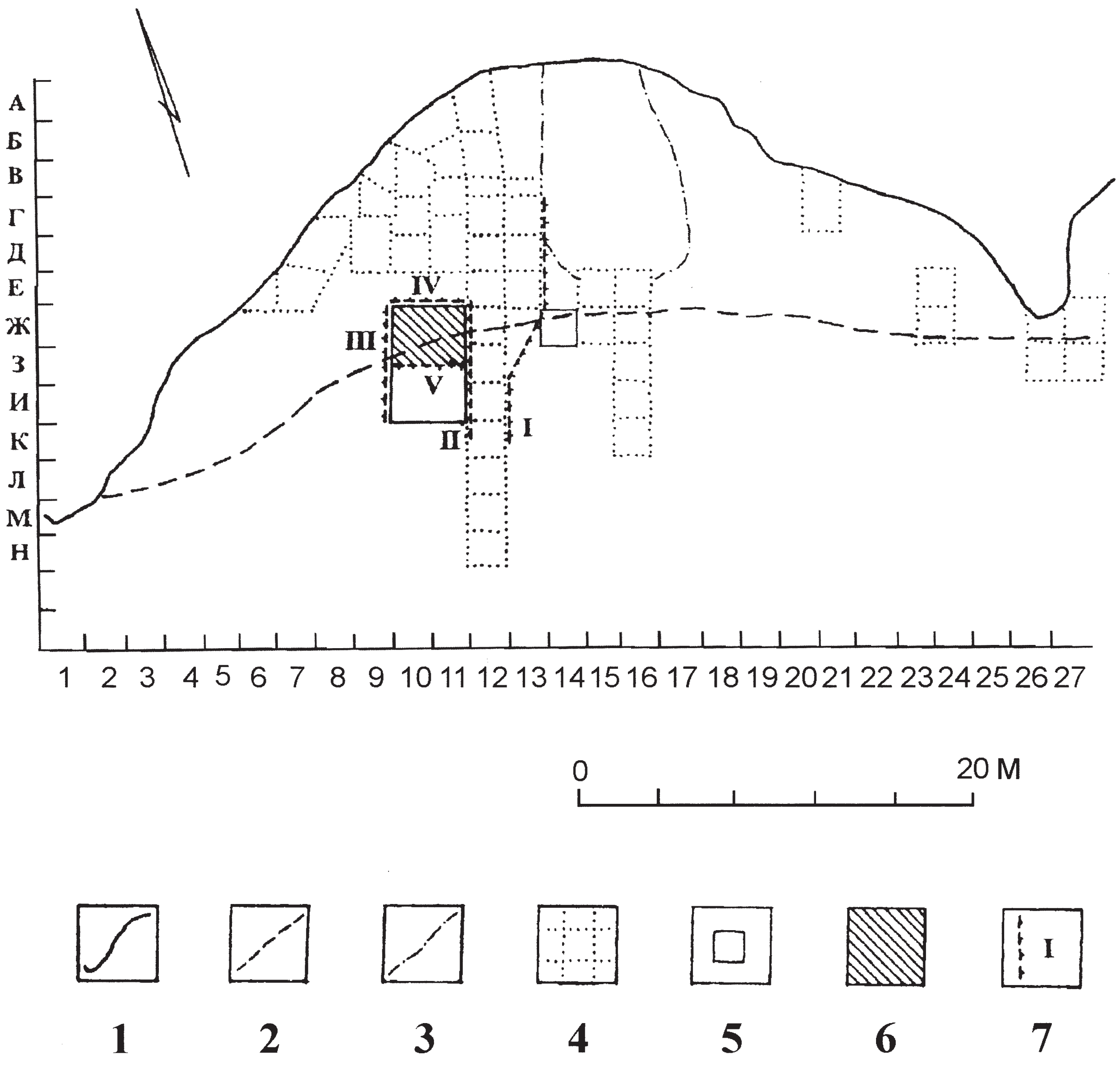

Figure 1 - Siuren I, map of the excavations (modified after Vekilova 1957: Fig. 2 on p. 237). 1, back wall of the rock-shelter; 2, drip line; 3, Merejkowski's excavation area (1879-1880); 4, Bonch-Osmolowski's excavation areas (1926-1929); 5, Tarasov's excavation area (1981-1982); 6, new excavation areas (1995-1997); 7, the site's main stratigraphic profiles.

excavated sites, which would have led to broad acceptance of Crimean prehistory in the scientific community, and for the lack of training of students for further research. Thus, little groundwork was laid for the succession of Stone Age research in the Crimea, while elsewhere, for example Paleolithic investigations at Kostenki in the Middle Don region, also discovered in 1879 by I.S. Polyakov, were further continued with no serious interruption because of publications, education and training of new researchers and a constant scientific interest in the region (Praslov & Rogachev 1982). Merejkowski's Crimean research became just a bright starting episode with no continuation. Moreover, before the First World War in 1914, German archaeologist R. Schmidt undertook test excavations in some Crimean caves with no success in finding Stone Age material, leading him to the general conclusion that there was no human presence in the Crimea during the Pleistocene (Schmidt 1919). Particularly regarding Siuren I rock-shelter, some obvious doubts on the antiquity of the finds were expressed by A.S. Bashkirov (1915, 1925; quoted by Bonch-Osmolowski 1934:119), who pointed out the presence of domesticated animals (*Canis familiaris* and *Bos bubalus*) in fauna species remains listed by Merejkowski for the site.

What is really known about Crimean Stone Age prehistory in general and Siuren I in particular before the 1920s investigations? Very little information was available for the new generation of archaeologists from Leningrad, Moscow and Simferopol, among which G.A. Bonch-Osmolowski was the most prominent. Despite claims by R. Schmidt for the absence of Stone Age remains in the Crimea, some Soviet archaeologists had seen parts of Merejkowski's collections in Leningrad and Moscow, were aware of his publications and field reports, and correspondingly believed in the existence of Stone Age sites in the Crimea. However, the information was too poor for real interpretations as the Merejkowski's materials had "*almost lost any scientific importance*" (Bonch-Osmolowski 1934:119). Therefore, all sites discovered by Merejkowski, including Siuren I, were simply considered as potential Stone Age sites which should to be revisited and reinvestigated while searching for new sites. In this regard, the general attractiveness of the Crimean mountains, with many caves and rock-shelters, was an additional stimulus for believing that the Stone Age existed in the Crimea and for their research perspectives.

The detailed analysis of Merejkowski's lithic artifacts from Siuren I was only done in the 1950s by E.A. Vekilova (1957:283-288). She was able to identify and classify these materials at the Department of Historical Geology at Leningrad University and at the Department of Archaeology at the Leningrad Institute of Ethnography. In total, three complexes were distinguished: lower layer – 1,137 flints, including 7 cores and 111 tools; upper layer – 1,517 flints, including 6 cores and 89 tools; and mixed finds from both layers – 367 flints with neither characteristic cores nor tools. General techno-typological descriptions and conclusions about the flints from the two layers of Merejkowski's Siuren I excavations were done by E.A. Vekilova after her analysis of the lithics from three layers identified during Bonch-Osmolowski's 1920s excavations at the site. Accordingly, she was able to compare flint assemblages from the 19th century investigations with much more abundant and indicative finds coming from the well-controlled excavations of the 1920s. On the basis of Merejkowski's stratigraphy, the presence of bladelets with alternate retouch, a scaled tool and a large number of tools made on colored flints, E.A. Vekilova came to the conclusion that "the entire identity" (1957:286) of materials from the lower layer of Merejkowski's excavations corresponded to the artifacts from the Lower layer of Bonch-Osmolowski's excavations. On the other hand, flints from the upper layer of the Merejkowski's excavations did not allow Vekilova to correlate them to any of the flint assemblages from layers defined by Bonch-Osmolowski, leaving this question open. Taking into consideration her artifact descriptions, we may assume that most of the flints from the upper layer of the 19th century investigations, an assemblage with such techno-typological feature including the rarity of burins on truncation, the prevalence of dihedral and "core-like"/carinated burins and the significance of bladelets with twisted general profile, are identical to artifacts from the 1920s excavations Middle layer. At the same time, the presence of some backed bladelets may also indicate inclusion in this collection pieces corresponding to the Upper layer of Bonch-Osmolowski's excavations. Moreover, the scarcity of flints typical of the Upper layer in the 1920s excavations (many backed bladelets, including some Gravette and microgravette points, shouldered pieces which in total compose no less than 50% of all the tools in the Upper layer) may also testify to an absence of real cultural remains of this Upper layer complex in the interior part of the rock-shelter near its back wall , the area investigated by Merejkowski. Thus, Merejkowski's Siuren I collection, in light of both their representation and correspondence to the 1920s and the 1990s excavations, did not lose its scientific importance, especially when related to finds from the apparently quite homogeneous lower layer. Thus, their possible new detailed classification applying modern techno-typological definitions and attribute analysis, and not done from Vekilova's artifact illustrations, could certainly broaden general knowledge of the entire archaeological context at the site.

Bonch-Osmolowski's excavations at Siuren I (1926-1929)

The site's subsequent investigations are connected to the name of G.A. Bonch-Osmolowski (b.1890-d.1943). It is difficult to exaggerate his contribution to Crimean Paleolithic field research and understanding of the Paleolithic in the 1920s and 1930s, as well as the great influence of his works on subsequent development of Soviet Paleolithic science, recently summarized by V.P. Chabai and Yu.E. Demidenko (Chabai 1998; Chabai & Demidenko 1998). Initiating broad-scaled Paleolithic research in the Crimea in 1923, almost 50 years after Merejkowski, Bonch-Osmolowski undertook new investigations at the Siuren I rock-shelter during four field seasons, from 1926 to 1929. Concrete information on the 1920s excavations at Siuren I comes from two sources: a general article on the Crimean Paleolithic by Bonch-Osmolowski (1934) and a long detailed article focusing on Siuren I by Vekilova (1957). The only monography by Bonch-Osmolowski was on his excavations at Kiik-Koba cave (1940, 1941, 1954), while all other Crimean Paleolithic sites investigated by him were discussed in several articles, of which the main one was published in 1934. Accordingly, information directly from Bonch-Osmolowski about work at Siuren I in the 1920s is not very detailed. However, Vekilova wrote her PhD dissertation (1953) specifically on the Siuren I materials and completely published this work in the 1957 article. Thus, Vekilova's publication was and remains the main source for information about excavations at the Siuren I rock-shelter preceding our fieldwork in the 1990s, which sometimes even led to partial forgetting and not using of some Bonch-Osmolowski's original descriptions and ideas about Siuren I (e.g. Klein 1965). Taking into account these publications about the Siuren I 1920s excavations, it appears better to discuss information from these two archaeologists separately for a more complete understanding of the site's archaeological record.

In brief, Bonch-Osmolowski's (1934) own published conclusions on the Siuren I 1920s excavations are as follows. Three cultural layers were defined, "*related to 3 different developmental stages of Aurignacian culture*" (1934:120). These three cultural layers were studied in a rather homogeneous, gray limey sand (ca. 6 m thick) with huge limestone blocks present within it, above which were modern humus deposits (0.2 m) and below which were three meters of archaeologically sterile sediments (1934:124 and fig. 9 on p. 127) (fig. 2). He also considered that the sedimentation processes for cultural layers at Siuren I were brief and quick, suggesting that there was not a large chronological difference between the three cultural layers (1934:124-125). It should to be also noted that the 1920s excavations at Siuren I, as at other Crimean sites, were conducted by Bonch-Osmolowski with a strong concern for collection of all possible data for specialists in the natural sciences – charcoal remains for paleobotanical studies; animal, rodent, bird and fish bones for paleontological studies. This research was done by well-known specialists at that time: A.F. Gammerman, V.I. Gromova, V.I. Gromov, A.A. Belyanitski-Biryulya, M.I. Tikhiy, and A.Ya. Tugarinov, although with no differentiation by cultural layer (1934:128-129). On the basis of these studies, Bonch-Osmolowski concluded that the "*Aurignacian layers of Siuren I, reflecting very clear climatic depression, should to be related to maximum or to second half of Last Glacial, without more precise indications*" (1934:129).

The 1920s Siuren I artifact assemblages were described by Bonch-Osmolowski (1934:148-155). Technologically, the lithic industries of all three cultural layers were quickly grouped together, as being significantly different from the Crimean Mousterian due to real blade/bladelet production. On the other hand, from a typological point of view, tool descriptions were made separately for each cultural layer with, however, only a minimum of notes on the exact number of different tool types. In brief, typological descriptions can be summarized as follows, where definitions in quotation marks are those of Bonch-Osmolowski. The *Lower* layer was the richest in artifacts, and included about 1,000 tools. Most of the tools are "*truly Upper Paleolithic types*" among which the most characteristic are "*core-like end-scrapers with elongated fronts*", burins on truncation, "*large blades with lateral retouch*", "*a Chatelperron point*" and "*a large number of bladelets with lateral, ... mainly alternate retouch*". There were also specially noted "*a remarkable quantity of archaic forms*" – some "*small hand axes*" and more than 20 "*points and side-scrapers of Mousterian sort*". The *Middle* layer, with 260 tools, was generally considered as similar to *Lower* layer tool types with, however, some "*typological improvements*" and "*quantity variations*". Such changes were described: "*grattoirs caréné*" replaced "*core-like end-scrapers*"; dihedral burins became very characteristic, and five typical "*burins busqués*" were noted; the presence of "*only 2 massive rough side-scrapers of casual character*"; and "*considerable decreasing in quantity and in size of bladelets*". The *Upper* layer (380 tools) was characterized by many multifaceted burins, a few "*Gravette points*", "*increased quantity of bladelets with backed edges including some of them resembling small Gravette points*".

There were also several bone points and 50 awls from all three layers. Moreover, there were also seven shell beads from the *Lower* layer - six Tertiary marine mollusk shells of *Aporrhais pespelicani* and one river mollusk shell of *Taeodoxus fluviatilis,* as well as a human (*Homo sapiens*) molar.

On the basis of such artifact characteristics for the Siuren I three cultural layers, Bonch-Osmolowski defined three stages for the Crimean Aurignacian (1934:154-155). The presence of some Mousterian tool types, "*a Chatelperron point*", core-like end-scrapers and bladelets with fine retouch in the *Lower* layer prompted him to call this assemblage the *Lower Aurignacian*, comparable to the Aurignacian complexes from Krems-Hundssteig (Austria), Bos-del-Ser (France) and Grimaldi caves (Italy). The *Middle* layer was attributed to the *Middle Aurignacian* because of the occurrence typical carinated endscrapers and busked burins so characteristic of the French Middle Aurignacian. The *Upper* layer was called *Upper Aurignacian* as it contained Gravette points and backed bladelets that in Bonch-Osmolowski's opinion "*quite reminds industries of Upper Aurignacian type all over in Europe*" and particularly in France it is "*very close to sites of Gravette type*".

Thus, Bonch-Osmolowski placed the Siuren I Paleolithic layers and assemblages in European Upper Paleolithic context. At the same time, he did not consider similarities of the Siuren I three Aurignacian complexes as the result of migration from the West, but discussed these Crimean finds as reflecting a common stadial evolution of the European Upper Paleolithic (1934:155), a common practice for Paleolithic archaeology at this time. In addition, interpretation of the Siuren I Upper Paleolithic complexes as Aurignacian ones was a very traditional approach before World War Two for European Paleolithic archaeology and was based on subdivision of the French Aurignacian as defined by Abbé H. Breuil in the early 20th century (Breuil 1912). It should also be noted here that works of D. Peyrony on the separation of Aurignacian and Perigordian industries in France (Peyrony 1933, 1936) were not yet accepted and even unknown, particularly to Bonch-Osmolowski during his analysis of the Crimean Paleolithic in the early 1930s.

Vekilova's studies of Siuren I materials in the 1950s

After Bonch-Osmolowski's 1920s investigations, excavations at Siuren I rock-shelter were not continued until ours in the 1990s, excluding a very limited (ca. 4 sq. m) excavation of only the *Upper* layer conducted by L.M. Tarasov (Leningrad) in the early 1980s (fig. 1). Nevertheless, the work of E. A. Vekilova (Leningrad, b.1915-d.1989) on Merejkowski's and Bonch-Osmolowski's excavations (1957) should be considered as equal in value to new excavations for this rock-shelter, since without

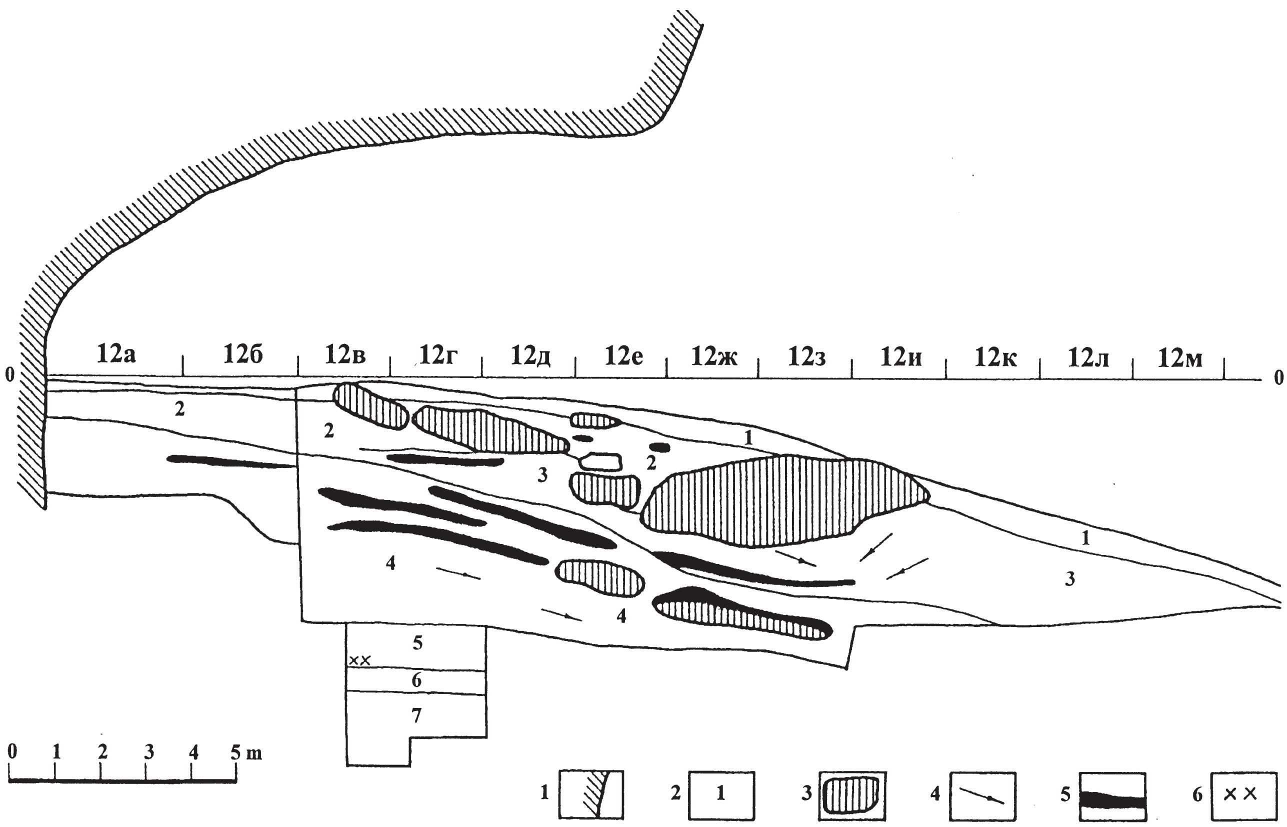

Figure 2 - Siuren I, stratigraphic profile from Bonch-Osmolowski's 1926-1927 longitudinal trench (squares 12 а-м), eastern side (after Vekilova 1957: fig. 4 on p. 240). 1, back wall of the rock-shelter; 2, numbers of lithological layers (2 – Upper cultural layer, 3 – Middle cultural layer, 4 – Lower cultural layer); 3, huge limestone blocks and slabs – representing different rock falls from the roof of the rock-shelter; 4, direction of fall of huge limestone blocks and slabs; 5, hearth/ash lenses; 6, Mammoth bone finds in archeologically sterile lithological layer 5 (lower part).

this publication all possible information on the site's excavations and finds would be too scarce. Vekilova did not participate in Bonch-Osmolowski's excavations at Siuren I, but she knew the site firsthand from her excavations of the Final Paleolithic at Siuren II rock-shelter in the 1950s (1954-1955). She was thus able to recognize the excavated portions of the site, but her main sources of information were numerous detailed field notes, profiles, plans and photographs made by Bonch-Osmolowski, lithic collections and other artifacts recovered in the 1920s and stored in Leningrad (most of the finds) and Simferopol (less than 100 artifacts). The analyses of all these sources and their publication in the monograph-like long article by Vekilova we are inclined to equal to new excavations as, from the point of view of Paleolithic archaeology in the early 1950s, all of the known details of the site's excavations in the late 19th century and the 1920s are clearly presented.

In sum, Vekilova confirmed the information on Siuren I published by Bonch-Osmolowski, but with much more detail. Therefore, we briefly enumerate her main specifications for the Siuren I excavations and their results:
(1) A detailed map of the site's excavated areas was made (1957:237, fig. 2) with comments on specific areas and cultural layers that were investigated during each field season (1957:238-240).
(2) She described the field methods used, such as attention to stratigraphy and the spatial distribution of the main finds showing the variable occurrence of artifacts and artifact density in specific areas of the site (1957:238-250, 258) during the 1926-1929 field investigations. Bonch-Osmolowski concentrated his excavations mainly in the western and central parts of the rock-shelter. On the whole, he investigated an area of about 120 sq. m (fig. 1). The entire stratigraphic sequence of the site was composed of 9 m of deposits, in which seven geological strata were recognized (fig. 2). The Middle Strata 2-4, with Paleolithic remains, are archaeologically significant, while Upper Stratum 1 (about 0.2 m thick) contained only modern humus sediments and Lower Strata 5-7 (basal 3 m of the sequence above bedrock) did not contain any archaeological remains, although these Lower Strata were excavated only in one 3 x 2 sq. m test pit (squares 13-В, Г in Bonch-Osmolowski's grid system). Stratum 2, which was excavated over a 120 sq. m area, contained the *Upper* cultural layer; Stratum 3 (excavated over a 95 sq. m area) contained the *Middle* cultural layer, and Stratum 4 (excavated over an 85 sq. m area) contained the *Lower* cultural layer. Stratigraphically, these three Strata were separated one from another by huge limestone blocks representing different episodes of rockfall from the shelter's roof. While Bonch-Osmolowski distinguished several horizons for each cultural layer on the basis of deposit thickness and the presence of hearths/ashy lenses at different depths, clearly seen in his field stratigraphic profiles (1957:239-245, figs. 3-4, 6, 8-9), he combined all finds from each cultural layer together because of the rather homogeneous nature of the artifacts and his strong belief that deposition occurred rapidly. Describing Bonch-Osmolowski's stratigraphic observations and conclusions, Vekilova completely agreed with him. Concerning the spatial distribution of finds in each cultural layer, Vekilova came

to the conclusion that the *Lower* layer occurred in all portions of the rock-shelter investigated by Merejkowski and Bonch-Osmolowski, while the *Middle* and *Upper* layers are mainly concentrated in the central part of the rock-shelter – both inside and outside of its dripline, as well as occurring in "*separate islands in western part of the rock-shelter*" (1957:240).

(3) She initiated a reevaluation of the faunal collections originating from Bonch-Osmolowski's excavations by paleontologists N.K. Vereshchagin and I.M. Gromov, analyzing each of the three cultural layers separately. This allowed her to compose a concrete species lists for each layer (1957:254-257), thus providing much more detailed paleoenvironmental data.

(4) Regarding the lithic assemblages from the three cultural layers of the 1926-1929 excavations, Vekilova paid a great deal of attention to them by the standards of Paleolithic archaeology in the 1950s. Some raw material outcrops from which flints were likely used by Paleolithic inhabitants at the site were identified (1957:259). Cores and tools from each layer were precisely counted, classified and in general well-illustrated, while all debitage and debris flint categories and sub-categories were approximately counted using Bonch-Osmolowski's and his assistant S.A. Trusova's inventory lists (1957:260, 274, 278), but not studied as is the usual practice today. Vekilova confirmed the main techno-typological features of the three Upper Paleolithic industries at Siuren I as defined by Bonch-Osmolowski (1934) but, of course, used much more detailed statistics. Concrete data on Vekilova's classifications of cores and tools from each of the three cultural layers from Bonch-Osmolowski's excavations will be given in Chapter 16 for comparisons to the 1990s assemblages for more complex understanding of the site's archaeological record.

During analysis of the site's lithic assemblages, Vekilova, however, took a very different view on the Siuren I Upper Paleolithic complexes than Bonch-Osmolowski. She did not use any Aurignacian and/or Perigordian definitions for tool classification with the only exceptions two "*Châtelperron points*" from the *Lower* layer (1957:269-270) and one "*Gravette point*" from the *Upper* layer (1957:281). Of course, it should to be remembered that before the publications of D. de Sonneville-Bordes (1955,1960) acceptance of different Aurignacian and Perigordian tool types varied significantly; it seems clear that Vekilova consciously avoided such terms because she did not consider any of the Siuren I Upper Paleolithic complexes as either Aurignacian or Perigordian (Gravettian). Instead, she considered them not as Aurignacian at all in "a wide definition" (Bonch-Osmolowski's point of view), but as representing the entire developmental sequence of the Crimean Upper Paleolithic. Accordingly, she concentrated her "typological eye" not on the industrial differences between these Upper Paleolithic complexes, but on their similarities and developmental trends through time. This is quite evident in her concluding common description of the Siuren I Upper Paleolithic.

"*There are two characteristic features for flints implements of all Siuren I three Paleolithic layers: (a) a presence of a large number of core-like tool forms and (b) an early appearance of microlithic pieces. Microlitization in the lower layer is expressed by an abundance of bladelets with alternate retouch and bladelets with backed edges, in upper layer – by an appearance of geometric microliths. The rest flint tool types – simple end-scrapers on blades and flakes, burins of usual types – are represented in different combinations and variations in all layers. Only for two lower layers is characteristic a presence of some Mousterian forms, mainly points and side-scrapers. Bifacial tools ... are only noted by single examples in lower layer. There is also noted a series of scaled tools in this layer. Characteristic is an appearance of some new forms in flint implement of upper layer – single examples of geometric microliths in a view of crescents, truncated bladelets and shouldered bladelets*" (1957:316).

Moreover, Vekilova saw the closest analogies for the Siuren I Upper Paleolithic not in the West, as Bonch-Osmolowski did, but rather in the East – in the Trans-Caucasian region (1957:316-320). Such a direction for comparisons of the Siuren I Upper Paleolithic complexes was proposed by Vekilova not only on the grounds of her own analysis, but was also caused by the opinions of S.N. Zamyatnin and P.P. Efimenko – the most authoritative Soviet Paleolithic archaeologists in the 1940s-1950s (Vekilova 1957:315). S.N. Zamyatnin especially emphasized an abundance of core-like tools in the Imeretian Upper Paleolithic (Georgia) showing a general succession in development of three Upper Paleolithic stages there and, accordingly, wrote that "*a richness of core-like tool forms is also characteristic for Upper Paleolithic sites in the Crimea... As in Georgia, this feature serves ... as one of the main reason for exaggerated age for Siuren I*" (1937:73) and the actual chronological gap between the "Aurignacian" and the Mesolithic in the Crimea was not great at all (1935:118). P.P. Efimenko put into doubt the "Aurignacian accessory" of the Siuren I Upper Paleolithic and also pointed to Georgian sites published by S. N. Zamyatnin as similar to Siuren I by their abundance of core-like tool forms (1953:418). These two archaeologists, as well as many of their followers in the Soviet Union (Vekilova 1957:314-315), considered the southern European areas of the USSR and Soviet Central Asia as belonging to the Mediterranean-African ("Capsian") Paleolithic province which, in their opinion, was very different from the Western European Paleolithic. Taking all this into consideration, Vekilova agreed to include the Siuren I Upper Paleolithic into the so-called Mediterranean-African province and then directly compared the three Upper Paleolithic complexes from Siuren I with sites showing the three Trans-Caucasian stages for the Upper Paleolithic, noting "*the common similarity and a number of particular coincidences between them*" (1957:318). On the basis of this comparison, she made the following chronological determinations for the Siuren I Upper Paleolithic: the *Lower* layer was dated to the Aurignacian period; the *Middle* layer was likely related to the Solutrean and the beginning of the Magdalenian period;while the *Upper* layer could correspond to the late Magdalenian and early Azilian periods (1957:318). These European terms, used by S.N. Zamyatnin to define the three stages of the Imeretian Upper Paleolithic, were directly transferred by Vekilova to describe the Siuren I Upper Paleolithic. Such chronological determinations for the Siuren I have "enveloped" the entire Upper Paleolithic period that corresponded well to Vekilova's opinion that the entire developmental sequence of Crimean Upper Paleolithic was represented at the Siuren I rock-shelter.

Attempts to understand Siuren I after Bonch-Osmolowski's excavations and/or Vekilova's publication from the late 1950s to the early 1990s

As has already been shown by mention of Zamyatnin's and Efimenko's published points of view on the Siuren I Upper

Paleolithic for the period between the publications of Bonch-Osmolowski and Vekilova (1930s and 1950s), a wide range of opinions existed on interpretation of the archaeological context at this Crimean rock-shelter since its excavations in the 1920s. Some of these opinions were based on Bonch-Osmolowski's brief published data, other scientists were aware of both Bonch-Osmolowski's and Vekilova's publications and, finally, several more archaeologists personally studied the Siuren I artifacts from the 1920s excavations stored in Leningrad as well. These differences in knowledge of the Siuren I materials, as well as different personal ideas on the European Upper Paleolithic among archaeologists discussing Siuren I are connected to a variety of different opinions. But before analysis of these opinions on the industrial attribution of the Siuren I Upper Paleolithic complexes, let us first discuss proposed chronological determinations for Siuren I made by specialists in the natural sciences, since they sometimes had a strong influence on interpretations of the site's archaeological context.

Establishing the Siuren I chronology

Conducted during and immediately after the 1920s excavations, special research on the site's stratigraphic profiles, paleontological and paleobotanical data composed the main body of information for interpretations of the Siuren I chronology. Therefore, only chronological determinations proposed on the basis of all these data will be discussed here; propositions based either on partial data or even speculative conclusions are not taken into account. For these reasons, only the opinions of two professional geologists (V.I. Gromov and I.K. Ivanova) should to be taken into consideration, although they are quite controversial one to another in a sense of recognition of Pleistocene time periods.

First, V.I. Gromov attributed the Siuren I Upper Paleolithic deposits to the maximum and post-maximum (i.e., latter part) of the Riss Glacial on the basis of the great quantity of fresh limestone slabs, cold-loving fauna (*Rangifer tarandus, Vulpes lagopus, Lepus timidus, Lagopus lagopus, Pyrrhorax graculus, Otocoryx alpestris*), arboreal flora (especially the presence of *Betula sp., Populus tremula, Sorbus aucuparia*) and, finally, of Bonch-Osmolowski's recognition of the artifact complexes of the three layers as Aurignacian – Early Upper Paleolithic (Gromov 1948:248-250). This was fully in accordance with his chronological scheme (Gromov 1948: fig. 217) whereby the Upper Paleolithic of the Russian Plain falls at the end of the Riss Glacial (Aurignacian), the Riss-Würm Interglacial (Solutrean) and the Würm Glacial (Magdalenian), while Mousterian sites were thought to be contemporaneous to the Riss Glacial and even partially precede it.

Then, after common acceptance of the Last Glacial (Würm) time span for the Upper Paleolithic in Soviet archaeology in the late 1960s, I.K. Ivanova, using the same data base as Gromov, attempted to evaluate the Siuren I chronology. First of all, she completely agreed with Gromov's opinion on attribution of the Siuren I Upper Paleolithic deposits to a cold Pleistocene phase, but, instead of the Riss Glacial, she proposed the Würm Glacial. Initially, she was very careful in selection of a Würm cold phase, suggesting two cold periods "*either before Bryansk Interval – 30-31000 BP or the second, maximum, after Bryansk Interval – 18-20000 BP*" with the further comment that "*the decision of the named question could help archaeological data. Unfortunately, archaeologists do not have the unanimous opinion on the archaeological age of Siuren I site*" (Velichko *et al.* 1969:33). In the same year, however, she already seems to have made her chronological choice for Siuren I – "*to cold, probably, post-Paudorf phase of Würm time*" (Ivanova 1969:34) and, accordingly, left aside the suggestion of a period before the Paudorf/Bryansk Interstadial. Later, her opinion on this matter became simply that "*there are no doubts that maximum cold conditions, so clearly reflected in fauna and floral structure of Siuren I rock-shelter, are connected to noted in the global scale cooling of Second half of Würm/Valdai (20-18000 BP)*" (Ivanova 1983:29).

The only attempt to obtain absolute dates for Siuren I was undertaken by V.V. Cherdyntsev in the 1950s was a single U-series date of 20000 BP on an animal bone from an unknown cultural layer (Cherdyntsev 1957:445). Although this absolute date corresponds the Last Glacial Maximum period suggested by Ivanova for the site's cultural deposits, it was never seriously considered as a valid result.

Industrial attribution of the Siuren I Upper Paleolithic complexes

It should be noted that differences of opinion on attribution of the Siuren I Upper Paleolithic industrial complexes fall into two camps: (1) in support of Vekilova's interpretation – that the three cultural layers represent the entire developmental sequence of the Crimean Upper Paleolithic, its similarity to Trans-Caucasian Upper Paleolithic and not Aurignacian affinity for these complexes; and (2) in support of Bonch-Osmolowski's interpretation on the Aurignacian character of the site's *Lower* and *Middle* layers. Here it is interesting to note that the first way of thinking about the Siuren I Upper Paleolithic was completely supported by all Soviet archaeologists and by just a few Western specialists, while the second was exclusively held by Western archaeologists. Of course, these attempts on industrial attribution of the Siuren I Upper Paleolithic were often based on new ideas and specifications, the understanding of which helps to make clear reasons for the two different interpretations.

First, let us discuss the background for support of Vekilova's interpretation. There are mainly three such starting points which has entirely led to validation of this idea. Differences in faunal remains for the three cultural layers shown by Vekilova demonstrate that there existed chronological breaks between each of these layers and, accordingly, that they are not penecontemporaneous (Vekilova 1957:256-257, 1971:142-144), as was supposed by Bonch-Osmolowski and Gromov. Since the late 1950s, the position of A.N. Rogachev (1955, 1957) for the existence of various Upper Paleolithic cultures in Eastern Europe different from the Western European Upper Paleolithic both chronologically and techno-typologically became prevalent in Soviet Paleolithic archaeology with one peculiar feature – strict comparisons with Western and Central European traditional industrial technocomplexes (Aurignacian, Szeletian, Gravettian, Magdalenian) were "a bad old fashion". Finally, adherents of Upper Paleolithic stadial development through "old fashioned" Aurignacian-Solutrean-Magdalenian cultural and chronological stages (e.g., A.P. Chernysh) still continued to support such ideas in the 1960s-1980s, but often with special underlying local features for many Upper Paleolithic complexes leading to unique cultural definitions (e.g. P.I. Boriskowski, I.G. Shovkoplyas). So, among the adherents of Vekilova's interpretation of the Siuren I Upper Paleolithic, we should, first of all, note the following Soviet archaeologists: E.A. Vekilova herself (1971:141-144, 1990:11-12), P.P. Efimenko (1960), S.N. Bibikov (1959:27, 1969:148), I.G. Shovkoplyas (1969:52-53, 1971:62) and A.P. Chernysh (1985:73-74, 77). Some of them have personally seen Siuren I cores and tools (P.P. Efimenko, A.P. Chernysh) or personally participated in Bonch-Osmolowski's excavations at Siuren I (S.N. Bibikov), while others (e.g., I.G. Shovkoplyas) only used Bonch-Osmolowski's and Vekilova's publications. P.P. Efimenko and S.N. Bibikov further noted that the Crimea in general and Siuren I in particular occupy an intermediate position between the so-called "Capsian" and "Atlantic" Paleolithic provinces. I.G. Shovkoplyas and A.P. Chernysh in essence repeated Vekilova's conclusions, although the latter specialist additionally suggested the following chronological frameworks for Siuren I: *Lower* layer – 35-30000 years BP (Würm II Stadial) and *Middle* layer – 30-23000 years BP (Würm II-III-Paudorf/Bryansk Interstadial), putting these two layers of the site into the Early Upper Paleolithic on the basis of their techno-typological features (Chernysh 1985:77).

The last significant published points of view supporting Vekilova's Siuren I interpretation is connected to M.V. Anikovich (Leningrad/St.-Petersburg). First, being a co-author with A.N. Rogachev, he cautiously suggested such chronological frameworks for the site's three cultural layers: *Lower* layer – Early Upper Paleolithic (40-24000 years BP), *Middle* layer – Middle Upper Paleolithic (23-17000 years BP) and *Upper* layer – Late Upper Paleolithic (16-8000 years BP) (Rogachev & Anikovich 1984:179, 205, 221-222, 225). No comparisons or parallels were noted for industries from the site's *Lower* and *Middle* layers, while the *Upper* layer was discussed in the context of local transition to the Crimean "Azilian" by Anikovich. In this regard, it is strange to not see here the previously expressed opinion of A.N. Rogachev that the "*3rd layer of Kostenki I does not have more close similarity to any one of Eastern European sites*" as to Siuren I (Rogachev 1957:35). Rogachev did not mark a specific layer of Siuren I in this comparison, but according to his short description of the Siuren I materials obtained by Bonch-Osmolowski, which he personally studied in Leningrad in the early 1950s (e.g., presence of bladelets with alternate retouch, scaled tools, shell beads), it is clear that he is referring to the site's *Lower* layer. Later, Anikovich further specified his position on the Siuren I Upper Paleolithic after personal observation of its core and tool collections in 1987 (1992:223-225). The site's *Upper* layer was again considered in connection to Crimean "Azilian" sites (1992:223), while the chronological and, accordingly, archaeological, interpretations for the *Lower* and *Middle* layers, were completely revised. This occurred because Anikovich fully accepted the late date for the Siuren I Upper Paleolithic previously proposed by Ivanova (1983) – "*… the lower and middle horizons were close in time and date to a marked cold spell. ... it ... seems most likely that the lower and middle horizons date to the maximum cold of Upper Valdai (ca. 20000-18000 BP)*" (1992:223-224). Based on this chronology, he came to the decisive conclusion that "*the likely geological age of the lower and middle layers suggests that the Middle-Upper Paleolithic transition occurred in the Crimea much later than in most of Europe*" (1992:225). Touching on Anikovich's industrial interpretation of these Siuren I complexes, this is best illustrated by his descriptions of the artifacts from the *Lower* and *Middle* layers, where he did not classify even a single tool as an Aurignacian type (1992:224) and related these assemblages only very generally to an "*Aurignacian route*" of Upper Paleolithic development (1992:242).

Among Western specialists, only American archaeologists R. Klein and J.F. Hoffecker were actual supporters of Vekilova's interpretation of the Siuren I Upper Paleolithic, but they did not see, however, the lithic assemblages personally. R. Klein concluded "*from the text and illustrations of Vekilova, ... neither Aurignacian nor Perigordian may be properly used to designate any of the assemblages from Siuren I*", as well as "*while I have not explored the possibility of Caucasian affinities for Siuren I, such seems considerably more likely than French*" (1965:59). About thirty years later, during his analysis of the Early Upper Paleolithic in the European part of the USSR, J.F. Hoffecker, R. Klein's student, only mentioned Siuren I among a few other sites as having only "*isolated "Aurignacian elements" (e.g. carinated scrapers)*" and "*these assemblages differ significantly from the typical Aurignacian in both Western and Central Europe*" (1988:251). Because of this, he even wrote that "*the absence of the Aurignacian sets the European USSR apart from the rest of Europe and the Near East*" (1988:262). From the text of his article it is clearly seen that during his visit to Leningrad in 1986, J.F. Hoffecker saw neither Bonch-Osmolowski's publication nor studied the Siuren I lithics , based on his view solely on Vekilova's publication and personal communications with R. Klein and M.V. Anikovich.

Now let us turn to supporters of Bonch-Osmolowski's interpretation of the Siuren I *Lower* and *Middle* layers as being Aurignacian, naming only the most indicative and important individuals among them. As already noted, all are European specialists on the Western and Central European Upper Paleolithic. The first scientists simply repeated the Aurignacian affiliation of the Siuren I Upper Paleolithic on the basis of Bonch-Osmolowski's published data (e.g., Peyrony 1948:307, 328). The second series of specialists used both Bonch-Osmolowski's and Vekilova's publications for industrial attribution of the Siuren I Upper Paleolithic. H. Delporte discussed the Siuren I *Lower* and *Middle* layers in the context of the Aurignacian of Central Europe (1963a:124), and the site's *Lower* layer for analysis of Middle-Upper Paleolithic transition in Central Europe (1963b:42). It is worth noting here his comparison of the Siuren I *Lower* layer to Krems-Hundssteig and middle layers of Kostenki I complexes and use for the first time of the term "Dufour bladelets" (more than 200 pieces in the *Lower* layer) on the basis of Vekilova's published tool frequencies (1963b:42). Another well-known specialist for the European Upper Paleolithic, using Vekilova's published data G. Laplace has considered Siuren I as comparable to some Central European (Góra Pulawska II, Tincova) and Eastern European (Kostenki I, layers 2-3) sites, all belonging to an Eastern Aurignacian with "*lamelles à dos marginal*" of an evolved phase (Broglio & Laplace 1966:113; Laplace 1970:286).

But beyond all doubts we can state that the most valuable points of view on the *Lower* and *Middle* layers of Siuren I among European archaeologists have been expressed by J.K. Kozlowski and J. Hahn, both of whom were very familiar with Bonch-Osmolowski's and Vekilova's publications, personally studied in Leningrad the site's core and tool collections obtained during the 1920s excavations and have excellent knowledge of the European Upper Paleolithic. Studies by these two specialists led to the final establishment in European Paleolithic science that the Upper Paleolithic complexes of the *Lower* and *Middle* layers should be considered not only as Aurignacian, but namely as belonging to the Central and Eastern European Aurignacian of Krems-Dufour type. Kozlowski has discussed the Siuren I Aurignacian in a number of publications and, therefore, we will only be concerned with the main one in which his position was the most clearly expressed. First, he made a twofold subdivision of the "Aurignacian of Krems facies" where the first determinations were made on non-geometric microlith structures and the second determinations based on correlation between the main significant Upper Paleolithic tool categories. Respectively, in these classifications, initially, the Siuren I *Lower* and *Middle* layers' assemblages were grouped together with the Aurignacian of Tincova and Kostenki I, layers 2-3 because of the absence of Krems points and the presence of numerous Dufour and pseudo-Dufour bladelets and some Font-Yves points; and, then, the two Siuren I Aurignacian complexes were once again united with assemblages of Kostenki I, layer 3 and Góra Pulawska II mainly on the grounds of near equal representation of end-scrapers and burins, or a slight dominance of burins over end-scrapers, and an abundance of non-geometric microliths (Kozlowski 1965:38-39). No chronological suggestions for the Siuren I Aurignacian were proposed by Kozlowski in this publication. Later, in the general analytical analysis, Kozlowski included the Siuren I *Lower* and *Middle* layers in the European Aurignacian of Krems-Dufour type industries among such Central and Eastern European sites as Krems-Hundssteig, Zlutava, Tincova, Cosava, Romanesti-Dumbravita, Góra Pulawska II, Kostenki I and Muralowka considering its late stage (Kozlowski & Kozlowski 1975:160-164), but with no precisely made propositions about the Siuren I chronology discussing the site's Aurignacian of Krems-Dufour type complexes for the too great time period between 29000 and 20000 years BP (Kozlowski & Kozlowski 1979:30-39). J. Hahn's (1970, 1977) main contribution for understanding the Siuren I artifacts seems to consist in his own detailed typological classification of the tools from the *Lower* layer – the only such classification done for Siuren I since Vekilova's accounts, but here using Aurignacian tool definitions that allows comparison with other Central and Eastern European complexes of "*Dufourlamellen-Aurignacien*" classified by him using the same typological system.

Conclusions

The two entirely different interpretations of the Siuren I archaeological context is striking as both are based on the same dataset – the results of Bonch-Osmolowski's excavations at the site in the 1920s, while the much less numerous finds from Merejkowski's excavations in 1879-1880 were considered as of dubious value. Moreover, some adherents of both interpretations not only used Bonch-Osmolowski's and Vekilova's publications for understanding of Siuren I assemblages, but also additionally personally studied the collections in Leningrad. In this case, new observation of artifacts from the 1920s excavations would simply lead any scientist to joining the first or second interpretations, especially keeping in mind already existing detailed classifications of the materials as non-Aurignacian (Vekilova's) and Aurignacian (Hahn's). The presence of several Middle Paleolithic tool types in the *Lower* layer of Siuren I has also always drawn attention to the site's lower cultural deposits by any archaeological interpretation as containing an Early Upper Paleolithic industry. Particularly in this regard, the existence of several hearths/ashy lenses marking different occupational levels in the site's *Lower* layer could also be even interpreted (among many others) as containing a separate Middle Paleolithic level embedded among Upper Paleolithic levels and, respectively, promoting the reworking of Middle Paleolithic artifacts into Upper Paleolithic sediments or a Middle Paleolithic level possibly destroyed by some natural processes. Why not? Surely, more complete understanding of the Siuren I rock-shelter archaeological context would be also possible by radiocarbon dating on new charcoal and/or bone samples.

Thus, the existing Siuren I problems could only be resolved through the new excavations at the site, in the framework of complex multi-disciplinary analyses. As has been already noted in the Preface of this volume, new research on the Crimean Paleolithic, ongoing since the early 1990s, was strongly connected with the need for new excavations at Siuren I. The absence of new detailed data from this site would have made it impossible to develop any serious ideas about the nature of Middle-Upper Paleolithic transitional period in the Crimea. Such new investigations at Siuren I were finally realized by the Joint Ukrainian-Belgian project during the 1994-1997 excavations.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 19-25.

2 - SIUREN I: EXCAVATION STRATEGIES AND METHODOLOGIES

Alexandre I. YEVTUSHENKO†

The aim of the present chapter is to present past and new approaches applied during the different archaeological field investigations at Siuren I for better understanding of preceding excavations and the latest ones in the 1990s, as these had an impact on subsequent interpretations of the site.

Previous investigations

The Siuren I rock-shelter has been excavated several times since the late 19th century before our project. Strictly speaking, serious archaeological investigations of the site were carried out twice, by K.S. Merejkowski (1879-1880) and by G.A. Bonch-Osmolowski (1926-1929). More recently, very limited work was also done by L.M. Tarasov (1981-1982).

Merejkowski carried out his excavations in the central part of the rock-shelter in an area of ca. 60 sq. meters (see fig. 1 in Chapter 1). No information is available about his field strategy and methods employed at the site. However, Merejkowski (1887) briefly described the stratigraphic sequence as follows. Pleistocene deposits were covered by a layer of decayed excrement, ca. 0.15-0.20 m thick (Stratum 1); white limestone scree (product of roof collapse with no any clay present) was deposited below, ca. 0.7-0.75 m thick (Stratum 2); a brown layer of the scree with clay was deposited under the clear limestone layer, ca. 0.35 m thick (Stratum 3); and, finally, a layer of clear limestone scree was recognized as the lowest sediments, ca. 1.5 m thick (Stratum 4). Bedrock had not yet been reached. In the middle and lower parts of Stratum 3, Merejkowski observed two thin ashy streaks, which he identified as representing two Stone Age cultural layers (Merejkowski 1881, 1887; see also Vekilova 1957:237-238). Although Merejkowski only partially published the materials from his excavations at Siuren I, these publications were not quite scientifically valid and mainly just pointed out the importance of this large Stone Age rock-shelter in the Crimea.

Bonch-Osmolowski mainly concentrated his excavations in an area under the vertical rocky back wall in the north-western part of the rock-shelter, digging two trenches (1927 and 1929) in its central part, as well as a few test pits in its eastern part (1926) (fig. 1). Taking into account the maximum number of different excavation areas, Bonch-Osmolowski investigated ca. 120 sq. m. The site's entire stratigraphic sequence was composed of 9 m thick deposits in which he identified seven geological strata. He also noted the division of the site's sediments into two facies: those inside the rock-shelter and those on the slope platform in front of the rock-shelter. According to the stratigraphic descriptions of Bonch-Osmolowski and his assistant S.A. Trusova (Bonch-Osmolowski & Trusova 1928, 1929, 1930), and E.A. Vekilova (1957:242), the following sequence is recognized (see fig. 2 in Chapter 1):

- *Stratum 1*. Modern deposits of decayed excrements and ashes inside the rock-shelter and humus deposits on the slope. Ca. 0.2 m thick.
- *Stratum 2*. Gray limy sand with abundant limestone slabs and fragments inside the rock-shelter and brown clay with limestone slabs and fragments on the slope. The deposits contained several ashy lenses and streaks. 0.5 – 2.0 m thick.
- *Stratum 3*. Gray limy sand with abundant limestone slabs and fragments inside the rock-shelter and strong brown clay with limestone slabs on the slope. The deposits contained several ashy lenses and streaks. 0.5 – 2.0-3.0 m thick.
- *Stratum 4*. Dark gray limy sand with abundant limestone slabs and fragments inside the rock-shelter and dark yellowish sediment with limestone slabs on the slope. The deposits contained several ashy lenses and streaks. 3.0 – 5.0 m thick.
- *Stratum 5*. Friable sand between large limestone slabs and blocks. 1.2 – 1.35 m thick.
- *Stratum 6*. Dark yellowish damp clay with rare limestone slabs.
- *Stratum 7*. Yellowish damp clay with rare rounded large limestone pebbles and cobbles.

Strata 5-7 were only observed in one test pit (squares 13-В, Г) and the rock-shelter's bedrock was reached below Stratum 7 at depths of -8.17 m and -8.87 m (fig. 1).

The uppermost Stratum 1 contained only modern sediments with medieval finds and redeposited Upper Paleolithic flints. The middle Strata 2-4, with *in situ* Upper Paleolithic remains, are archaeologically significant. A few animal bones were found in Strata 5

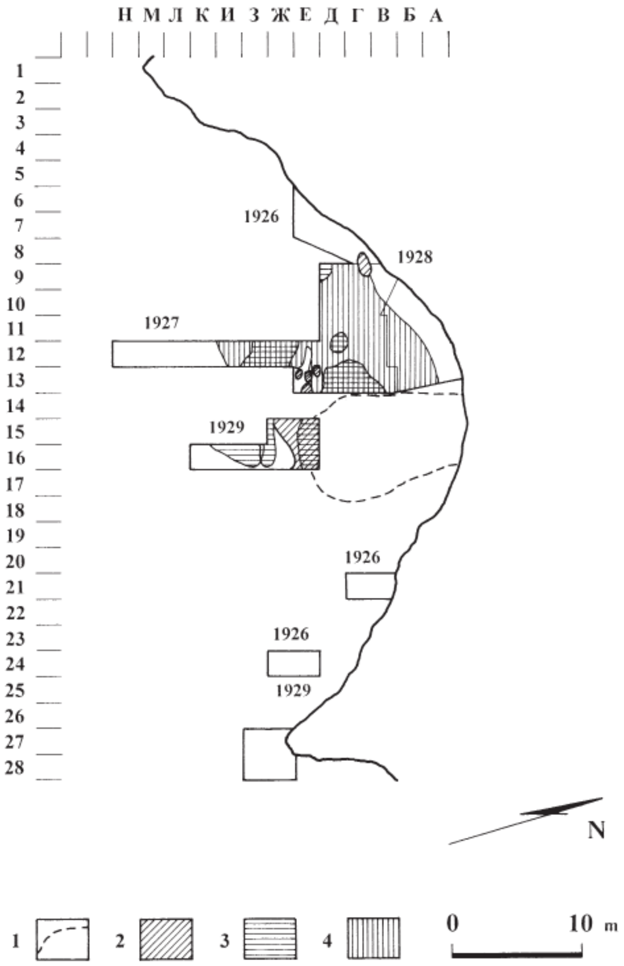

Figure 1 - Siuren I. Bonch-Osmolowski's map of the spatial distribution of the three cultural layers during the 1920s excavation (modified after Vekilova 1957: Figure 11 on p. 247). 1, Merejkowski's excavation area (1879-1880); 2, Bonch-Osmolowski's Upper archeological layer find distribution; 3, Bonch-Osmolowski's Lower archeological layer find distribution; 4, Bonch-Osmolowski's Middle archeological layer find distribution.

and 6, while lowermost Stratum 7 contained no archaeological material or faunal remains. While Bonch-Osmolowski distinguished several archaeological levels within Strata 2-4 on the basis of sediment thickness and the presence of hearths/ashy lenses at different depths, he combined all finds from each stratum together because of the rather homogeneous nature of the flint artifacts and his strong belief that deposition occurred rapidly.

Thus, Stratum 2, excavated in an area of ca. 120 sq. m, contained the *Upper cultural layer*, Stratum 3, in an area of ca. 95 sq. m, contained the *Middle cultural layer*, and Stratum 4, in an area of ca. 85 sq. m, contained the *Lower cultural layer* (fig. 1). The entire archaeological sequence was only observed in the main excavation area and in the 1926-1927 trench, while in the 1929 trench, only the Upper and Middle cultural layers were present, and test pits in the eastern part of the rock-shelter contained only the Upper cultural layer. However, it was noted that Strata 2-4, with respective cultural layers, were separated stratigraphically one from another by huge limestone blocks resulting from different episodes of rock fall from the rock-shelter's roof.

Bonch-Osmolowski and his colleagues during the Siuren I field seasons employed excavation methods that had also been used during their work at the Crimean Middle Paleolithic sites of Kiik-Koba and Chokurcha-I (Bonch-Osmolowski 1940; Ernst 1934; Vekilova 1957). The basis of the method was the excavation of Paleolithic cultural layers using thorough studies of both lithological strata and horizon positions and the application of a letter-figure grid and datum point system for all excavations at Paleolithic sites, as is well-illustrated by the Siuren I case (fig. 1). Stratigraphic sequences were drawn for each excavation square separately and then these profiles were united to create sections through parts of the site. One such Siuren I profile, for line "12", was published in the general review by Vekilova (1957:240) (see fig. 2 in Chapter 1). The high concentration of limestone slabs and huge blocks within the Siuren I deposits sometimes compelled excavators to use some very original excavation methods. For instance, some large limestone blocks were destroyed by explosion, but in the 1927 trench, a limestone block completely covered deposits of Strata 3 and 4 and the block was too huge even for dynamite. Therefore, the Middle and Lower cultural layers were excavated by tunneling in this part of the site and the tunnel was dug beneath the limestone block. This tunnel was preserved until our excavations in 1995.

The last archaeological work at Siuren I before ours was carried out by L.M. Tarasov in the early 1980s (Tarasov 1984). It

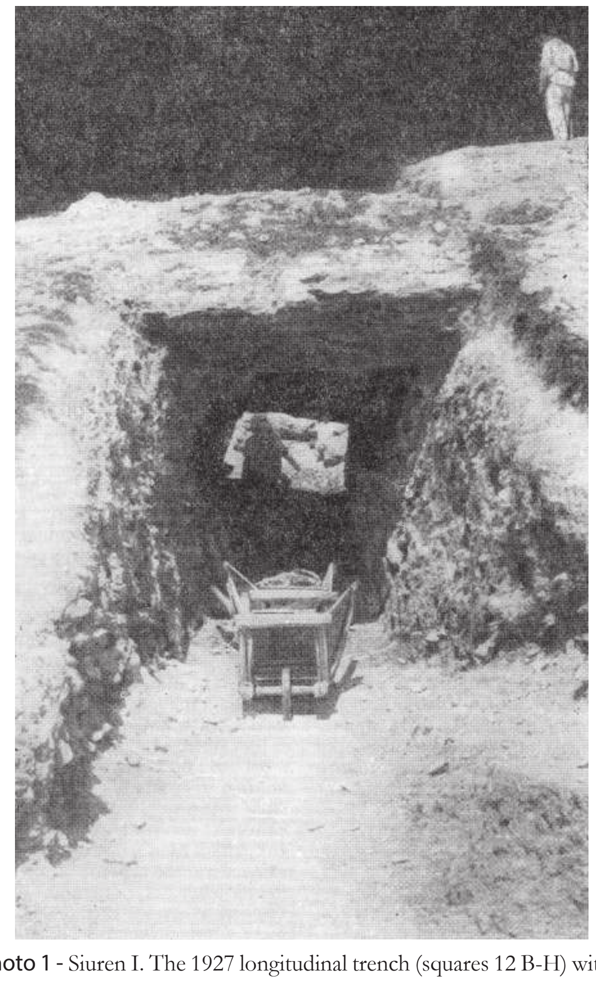

Photo 1 - Siuren I. The 1927 longitudinal trench (squares 12 В-Н) with a tunnel partially in square 12-Ж (after Vekilova 1957:249, fig. 12).

Photo 2 - Siuren I. View of the 1927 longitudinal trench (squares 12 B-H) with a tunnel partially in square 12-Ж during the 1994 field campaign.

should be noted here that the main research aim of Tarasov's work focused on the site of Siuren III, a Final Paleolithic site discovered by him some 200 m west of Siuren I. At Siuren I itself, Tarasov was trying to select an area for future excavations there. The very limited area excavated (4 sq. m) was located at a balk edge between Bonch-Osmolowski's trenches (see fig. 1 in Chapter 1). During these excavations, Tarasov was only able to investigate the site's upper cultural bearing deposits with rather few finds above a huge limestone slab located between the Upper and Middle cultural layers of the 1920s excavations.

Strategy of the 1994-1997 investigations

For the goals of our investigations at Siuren I, it was necessary to select an area for new excavations that would satisfy the following conditions: 1) to expose a maximum number of stratigraphic and archaeological sequences for the entire site, based on preceding research; 2) to recover representative samples of archaeological material for analyses of the complexes; 3) to obtain appropriate samples for absolute dating of the site.

Our field investigations at Siuren I involved several stages. The first stage occurred in 1994 when an area for excavations was selected. Based on Bonch-Osmolowski's data (fig. 1), the main Paleolithic concentrations and the most complete stratigraphic sequence were located in the north-western part of the rock-shelter in both his main excavation area and the longest longitudinal for the 1927 trench. The rock-shelter's central part near the Merejkowski's excavation block and the 1929 trench were known to contain the Upper and Middle cultural layers while artifacts from the Lower cultural layer were much less common. Thus, the most important area for new investigations was considered to be located near the 1926-1927 trench (sq. 12 B-H).

Since the 1920s excavations, the walls of the trench had been partially destroyed by weathering, but inside the tunnel both longitudinal profiles were preserved in rather good condition (Photos 1 and 2).

In the Archives Department of the Institute of History of Material Culture (St. Petersburg, Russia), the original field drawings

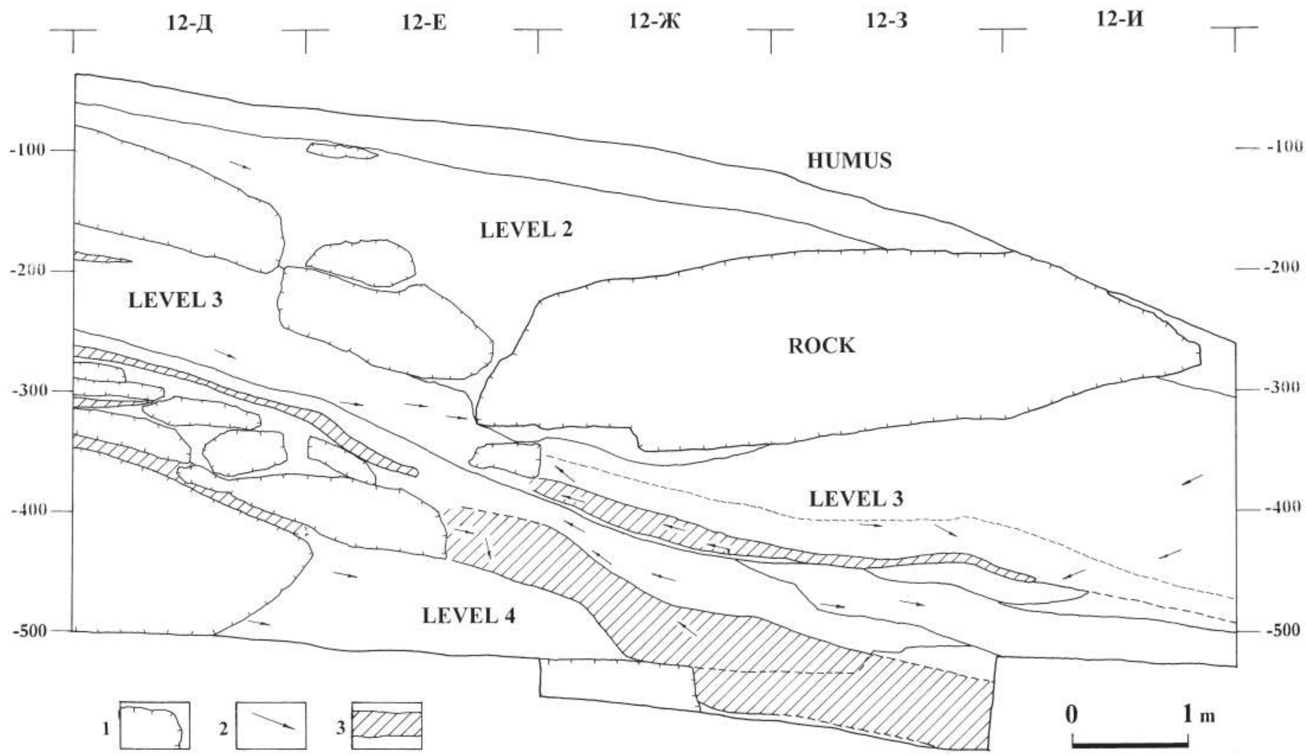

Figure 2 - Siuren I. Stratigraphic profile from Bonch-Osmolowski's 1926-1927 longitudinal trench (squares 12 Д-И), eastern side (modified after Bonch-Osmolowski and Trusova 1927 unpublished field report). 1, huge limestone blocks and slabs, representing different rock falls from the roof of the rock-shelter; 2, direction of fall of huge limestone blocks and slabs; 3, hearth/ash lenses.

of both longitudinal eastern (fig. 2) and western profiles (fig. 3) of the 1927 trench (Bonch-Osmolowski & Trusova 1928) were studied by S.V. Tatartsev. These drawing were used for correlations with the new fieldwork.

In the 1994 field season, the trench was re-opened, cleaned and studied. As a result, it was possible to correlate the new stratigraphic data for the eastern (profile I in our system) (fig. 4) and western (profile II) (fig. 5) sections of the trench with those of Bonch-Osmolowski.

Both Bonch-Osmolowski's drawings and field descriptions of the trench's stratigraphic sequences contained important information for new lithological and archaeological subdivisions of the 1994 profiles through comparisons with the results of previous investigations. All strata identified during the 1920s excavation and clear stratigraphic limits between the strata were marked on the old profiles.

Stratigraphic sequences observed on cleaned profiles I (fig. 4) and II (fig. 5) were subdivided into units and strata, based on sediment thickness, nature of the sediments and the presence of hearths/ashy lenses at different depths. Modern descriptions of the stratigraphic and archaeological sequences are presented in the next chapter of this volume. The stratigraphic sequences are more detailed than those described by Bonch-Osmolowski but on the whole, the basic features of his profiles are in good correspondence with the newly cleaned profiles.

Stratum 3 of our stratigraphic system correlates with modern sediments of Bonch-Osmolowski's Stratum 1. Our Strata 4-7 correlate with the 1920s Stratum 2, but on profile I, sediments comparable with Bonch-Osmolowski's Upper cultural layer are present above the huge limestone block (the tunnel's roof), while sediments of Strata 4-6 are completely absent in the sequence of profile II. The block marked as Stratum 8 is the border between the 1920s Upper and Middle cultural layers. Strata 9-12 with hearths/ashy lenses correspond to Bonch-Osmolowski's Stratum 3. Limestone slabs, noted in our profiles as Strata 13, mark the border between the 1920s Middle and Lower cultural layers. Strata 14-15 correlate to the 1920s Stratum 4 with the Lower cultural layer. Stratum 16 can be compared to the upper part of Stratum 5 in the 1920s, while the 1920s Strata 6-7 and bedrock are absent in the stratigraphic sequence of profiles I and II.

Finally, studies of profiles I and II enabled us to select the best area for new excavations. Sediment areas with all of the 1920s cultural layers were recognized behind profile I of the trench, but the area, located between the 1927 and 1929 trenches, is spatially limited. However, the 1920s Lower cultural layer is characterized by low artifact density and the absence of any hearths/ashes lenses. Moreover, based on Bonch-Osmolowski's data (fig. 1), there were no finds from the 1920s Lower cultural layer in the area of the 1929 trench. At the same time, profile II is characterized by high densities of both flint artifacts and animal bones, and hearths/ashy lenses within sediments of the 1920s Middle and Lower cultural layers. The same observation of a high concentration in the two layers was also seen in Bonch-Osmolowski's data. It is also worth noting that the 1920s Upper cultural layer is absent there. Thus, the most appropriate area for our excavations of the 1920s Middle and Lower cultural

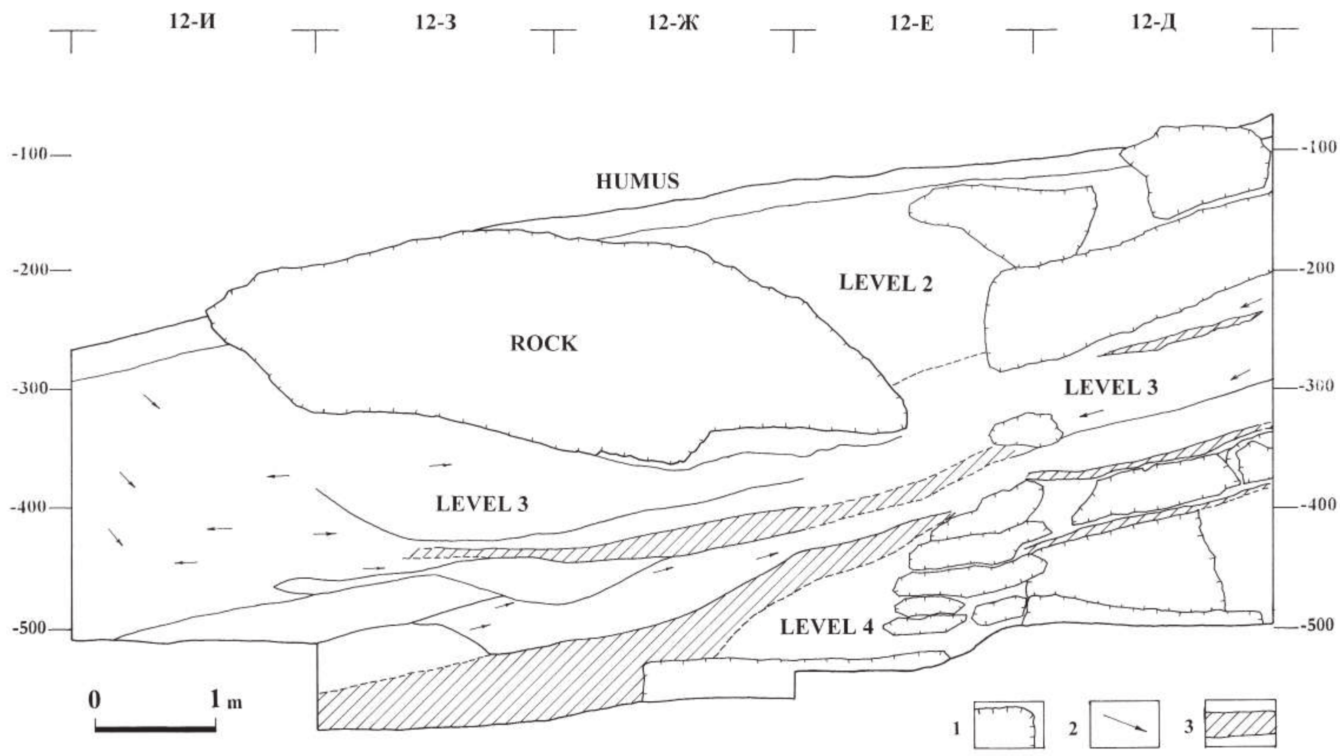

Figure 3 - Siuren I. Stratigraphic profile from Bonch-Osmolowski's 1926-1927 longitudinal trench (squares 12 Д-И), western side (modified after Bonch-Osmolowski and Trusova 1927 unpublished field report). 1, huge limestone blocks and slabs, representing different rock falls from the roof of the rock-shelter; 2, direction of fall of huge limestone blocks and slabs; 3, hearth/ash lenses.

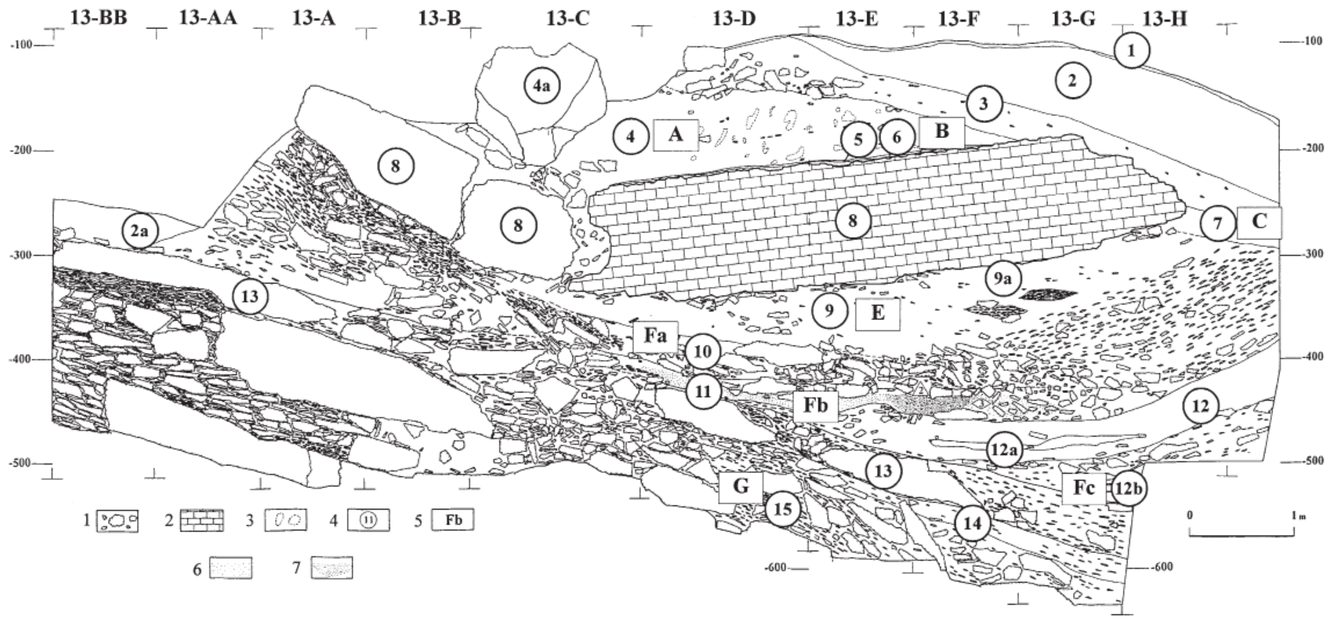

Figure 4 - Siuren I. Cleaned and redrawn in 1994 stratigraphic profile from Bonch-Osmolowski's 1926-1927 longitudinal trench (squares 12 Д-И), eastern side. 1, limestone slabs and éboulis; 2, huge limestone block separating the Upper and Middle archeological layers of the 1920s excavation (tunnel roof); 3, krotovinas; 4, lithological strata defined in 1994; 5, archeological units and levels defined in 1994; 6, charcoal pieces; 7, hearth/ash lenses.

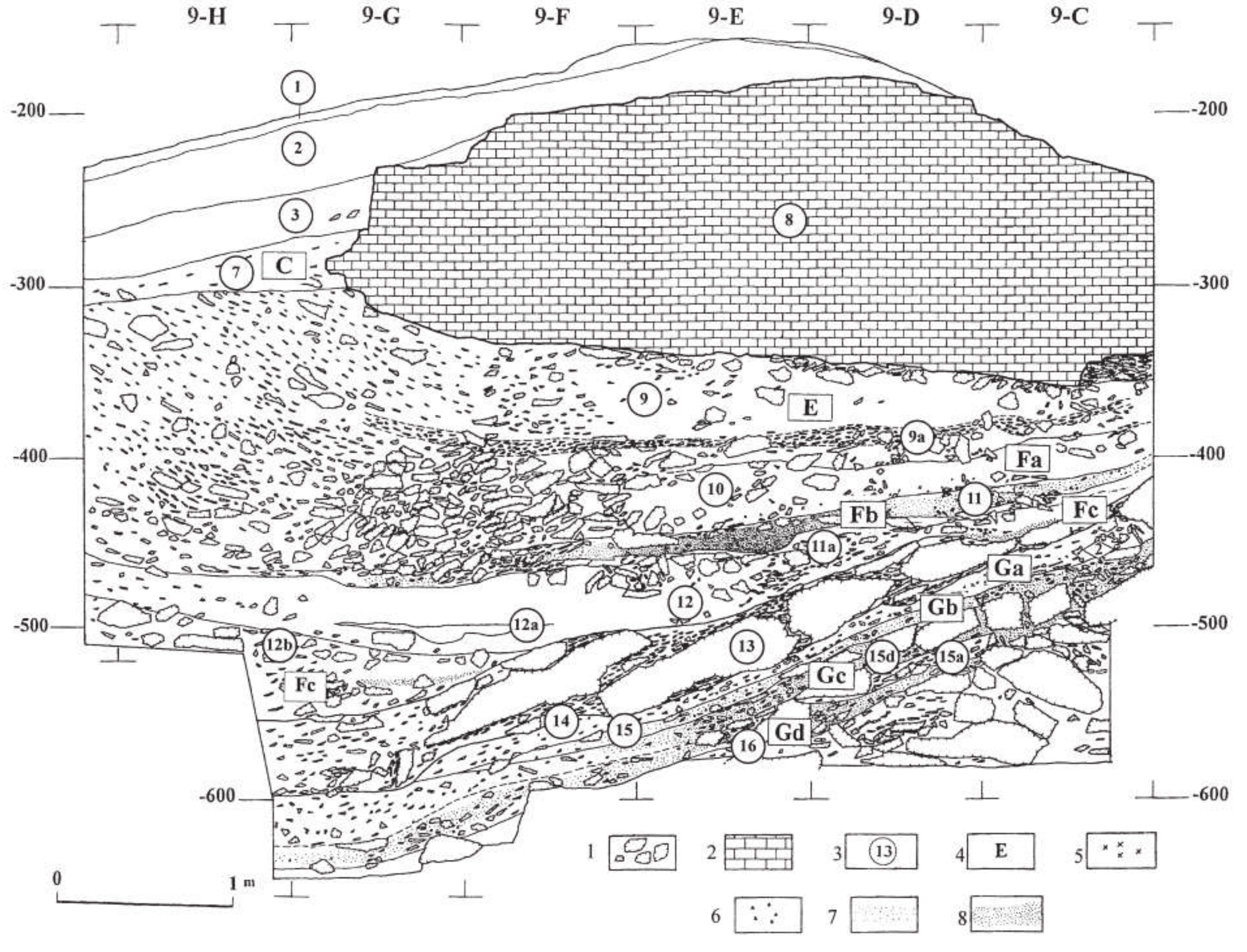

Figure 5 - Siuren I. Cleaned and redrawn in 1994 stratigraphic profile from Bonch-Osmolowski's 1926-1927 longitudinal trench (squares 12 И-Ж), western side. 1, limestone slabs and éboulis; 2, huge limestone block separating the Upper and Middle archeological layers of the 1920s excavation (tunnel roof); 3, lithological strata defined in 1994; 4, archeological units and levels defined in 1994; 5, flint artifacts; 6, animal bones; 7, charcoal pieces; 8, hearth/ash lenses.

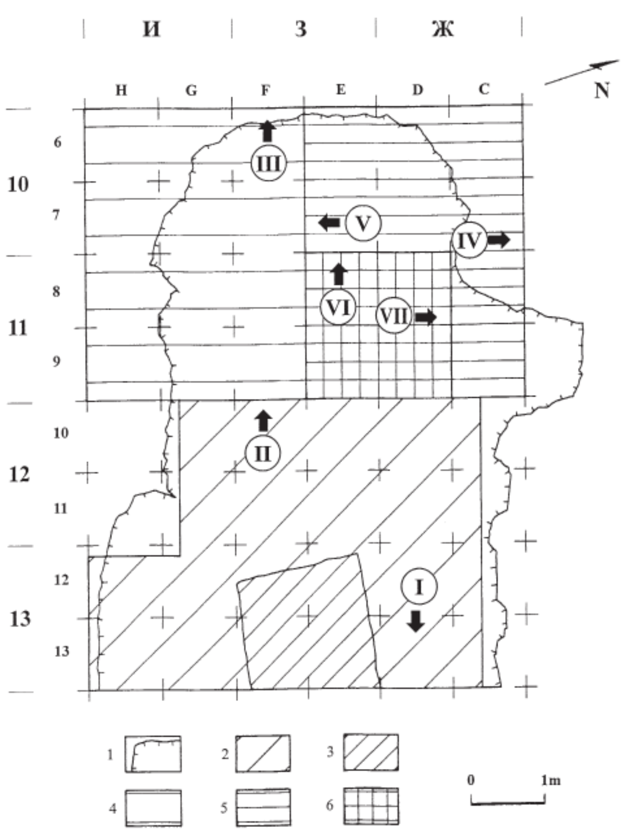

Figure 6 - Siuren I. Grid system of the 1920s (squares 10-13 – И-Ж) and the 1990s (squares E-D-C – 6-9) excavation areas with indications of the studied and drawn profiles during the 1990s field work. 1, location of a huge limestone slab ("tunnel roof"); 2, the 1920s excavated area; 3, the early 1980s sondage area; 4, unexcavated area; 5, the 1995-1997 excavation 12 m2 block; 6, the 1996 sondage area.

layers was located west of the 1926-1927 excavation trench re-examined in 1994, covered by a huge limestone block – the old tunnel's roof, while a possible area for excavation of the 1920s Upper cultural layer was a very small zone east of this trench. In total, the excavation area selected covered ca. 15 sq. m (fig. 6) and is located under the rock-shelter's modern drip line (see fig. 1 in Chapter 1).

In the 1995 field season, modern sediments above the huge limestone slab ("tunnel's roof") were excavated. Flint artifacts comparable to the 1920s Upper cultural layer were discovered in an area of ca. 3.5 sq. m in the eastern part of our excavations – the 1995 levels of Unit A (fig. 6 – see sq. E-F – 12-13), where rare flint artifacts were mainly in disturbed positions. Then, the decisive work for all our subsequent work at the site: the tunnel roof's slab was destroyed by a pneumatic jack-hammer. After that, excavations were done in the 1920s Middle cultural layer in an area of ca. 12 sq. m west of the trench (fig. 6 – see sq. E-D-C – 6-9). At the end of the 1995 field season, excavations of the Middle cultural layer were completed and the 1920s Lower cultural layer was tested in a small pit at the trench's edge (sq. C-9).

In 1996, excavations continued in the same area, squares E-D-C – 6-9. The 1995 test pit was expanded, focusing primarily on the archaeological levels of the 1920s Lower cultural layer. A new test pit, deeper than Bonch-Osmolowski's trench, was dug at the edge of the trench and our excavation area. A previously unknown archaeological level was discovered there (sq. E-D – 8-9).

In 1997, excavation of the 1920s Lower cultural layer and the newly discovered Unit H were completed across our entire excavation area, ca. 12 sq. m in all. All profiles were re-cleaned for precise stratigraphic positioning of each lithological stratum and archaeological units and levels. The excavation area was then protected by limestone slabs and covered with back dirt.

Methodology of the 1994-1997 excavations

The grid system and datum point of Bonch-Osmolowski's 1920s excavations were re-established by S.V. Tatartsev before beginning our 1990s investigations. Bonch-Osmolowski used a Cyrillic letter-figure grid system with 2x2 m excavation squares. We used 1x1 m excavation squares with Latin letters, although both grids are easy to correlate (fig. 6). The selected area for new research is located in squares 10, 11, – Ж, З of Bonch-Osmolowski's grid, and 6, 7, 8, 9 – C, D, E of our grid.

The techniques employed during our excavations of the Western Crimean Mousterian and Micoquian Middle Paleolithic sites of Kabazi II and Kabazi V were also used during fieldwork at Siuren I (see Chabai 1998; Yevtushenko 1998). Each lithological stratum was excavated by starting from an edge of the cleaned 1927 trench in order to clearly define the stratigraphic positions of archaeological levels and sub-levels through their placement within the stratigraphic sequence visible in profile II. Over the course of excavations, some archaeological levels seen in profile II were then subdivided into several sub-levels as quite often deposits became thicker to the west; clear sterile streaks, previously unknown in the trench, are represented here within unit and level deposits.

Two basic excavation methods were used. The *inclination angle excavation method* is based on the specific nature of sedimentary formation processes inside rock-shelters and near cliff slopes. The method is used for investigation of archaeological levels with few artifacts, rare faunal remains and no hearths, fireplaces and/or ashy lenses. The position of ancient living floors in these cases is determined through situation with lithological strata that typically contained a number of limestone slabs and *éboulis*. The limestone slabs and *éboulis* thus appear to serve as markers of ancient surfaces. The *dubbed carpet excavation method* is applied to clear and usually intensively occupied living floors, identified by the presence of good concentrations of artifacts, faunal remains, hearths, fireplaces and/or ashy clusters. Such find "carpets" are excavated according to the inclination angle of the geological stratum containing them. If such a carpet is rather thick and composed of several superimposed ashy and/or hearth/fireplace lenses, each of these concentrations is excavated as a separate sub-level. In this case, supplementary balks were left for better stratigraphic control. Archaeological features such as hearths and fireplaces were studied separately. As a rule, they were both mapped and profiled.

Finds in each level and sub-level were mapped at a 1:10 scale. Conventional symbols for find categories (bones, teeth, charcoal, etc.) and artifact typology were used in mapping. In addition, at least 10 depth measurements were taken for each excavated square. The separate mapping and labeling of each level from each unit enabled more detailed analysis of the artifacts found.

All sediments were then dry sieved using 5 mm and 1 mm screens. Subsequently, about one-half of all archaeological sediments were also floated to obtain microfauna and malacofauna samples.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 27-48.

3 - SIUREN I: STRATIGRAPHIC AND ARCHAEOLOGICAL SEQUENCES FOR THE 1990s EXCAVATIONS

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Stratigraphy

In the course of the 1994-1997 fieldwork at Siuren I, the site's stratigraphic sequence was analyzed using formal archaeological approaches; the strata and lenses of deposits were documented according to color, degree of scree content and superposition. In total, the Siuren I stratigraphy was studied on the basis of seven profiles (see fig. 6 in Chapter 2). The overall thickness of the deposits studied is more than 6 m from the present-day floor of the rock-shelter. Four longitudinal profiles of deposits (Profiles I, II, III, VI) and three transversal profiles of deposits (Profiles IV, V, VII) were exposed. A joint list of geological strata was used for stratigraphic description of all the profiles. Forty-five geological strata were recognized, the majority of which are lenses with limited spatial distribution and typically not present across the entire excavation area. The site's sedimentation in the area investigated is represented by two facies of deposits: cave sediments inside the rock-shelter and slope sediments on the platform in front of the rock-shelter. This is because our excavation area is situated under the rock-shelter's modern drip line. However, naturally, the rock-shelter's drip line changed position during the time span from Pleistocene to modern times, as the roof was continually collapsing and the rock-shelter's actual inner space was increasingly reduced. Thus, the stratigraphic situation is complex when one sedimentation type is transformed to another over a short distance in the same profiles. A high concentration of by-products from roof-fall in the sediments, such as limestone blocks, slabs, fragments and *éboulis* complicated excavations. On the other hand, the positions of these elements in the profiles clearly helped to subdivide the stratigraphic sequence in detail. Thus, the Siuren I depositional sequence is clearly separated by five levels of huge limestone blocks – the evidence of rock-fall from the roof. The *first rock-fall* was defined as Stratum 4a; the *second rock-fall* as Stratum 8; the *third rock-fall* as Stratum 13; the *fourth* as Stratum 15e; and the *fifth rock-fall* as Stratum 19.

Profile I (see fig. 4 in Chapter 2)

This is the longest profile that is actually the re-cleaned eastern profile of the trench dug by G.A. Bonch-Osmolowski in 1927. The trench was partly destroyed during the time after the 1920s fieldwork and as a result, Profile I is no longer straight after cleaning in 1994. Both cave deposit facies and slope deposit facies, as well as drip line deposits, are clearly represented. As common cave sediments, the southern part of the profile is characterized by a high concentration of limestone slabs, fragments and *éboulis* with a poor sandy component, while the northern part of the profile is contains clear silty-clay and/or clay components of the open-air slope. An unclear border between the deposition facies corresponds to the drip line of the rock-shelter and this is reflected in the central part of the profile. Sediments covered by huge limestone blocks are quite well-preserved and are clearly subdivided into different strata. The upper part of the deposits has a concave profile perhaps as a result of deformation after roof fall. Sediments of the cave deposition facies are separated by levels of rock-fall, but there are some difficulties in subdividing sediments between rock-fall levels, because of the high concentration of limestone slabs, fragments and éboulis of different sizes given the lack of sediments.

The stratigraphic sequence for Profile I can be summarized as follows:
Stratum 1. Modern humus covering back dirt of previous excavations.
Stratum 2. Mixed deposits-back dirt from previous excavations.
Stratum 2a. Mixed deposits-loamy dust with limestone fragments and historical/modern trash covering the Pleistocene deposits inside the rock-shelter. During previous archeological investigations at Siuren I, the 1920s Upper cultural layer, according to Bonch-Osmolowski's data, was excavated at this area.
Stratum 3. Humus deposited prior to previous excavations of the shelter.
Stratum 4. Yellowish-brown silty clay with rounded limestone *éboulis*.
Stratum 4a. Limestone block (*the first rock-fall level*).
Stratum 5. Dark-brown silty clay with root remains.
Stratum 6. Yellowish-gray carbonated sediments, the product of limestone weathering erosion.
Stratum 7. Humiferous silty clay loam with many angular and sub-

angular limestone pebbles and cobbles covered by carbonates.
Stratum 8. Limestone blocks (*the second rock-fall level*).
Stratum 8a. Yellowish-brown sandy clay loam with carbonated limestone slabs and *éboulis* of different size.
Stratum 9. Yellowish-brown silty clay loam with small uncarbonated *éboulis* below a huge limestone block from rock-fall covering this stratum, and with small carbonated *éboulis* on the slope. The different sized limestone slabs, fragments and *éboulis* under limestone blocks correspond to cave facies of the stratum.
Stratum 9a. A lens of unsorted small *éboulis*.
Stratum 10. Yellowish-brown silty clay with angular limestone slabs and *éboulis*.
Stratum 11. Light yellowish-brown granulated silt with sand and angular limestone *éboulis*.
Stratum 12. Yellowish-brown silty clay with rare *éboulis* of different size.
Stratum 12a. A lens of sorted and rounded small *éboulis* of sandstone, limestone, quartz, etc. These are alluvial sediments, probably from an ancient stream.
Stratum 12b. Yellowish-brown silty clay with limestone é*boulis* of different size.
Stratum 13. Limestone blocks (*the third rock-fall level*). The white carbonated sand with limestone é*boulis* and slab fragments is characteristic for the stratum in the slope deposit facies.
Stratum 14. Light yellowish sand with limestone *éboulis* of different size.
Stratum 15. Light brown sandy sediment with angular limestone slabs and é*boulis*.
Stratum 15b. Limestone blocks, found only in the cave deposit facies.
Stratum 15c. Densely deposited limestone slabs and blocks that correspond to Stratum 15 in the cave deposit facies.
Huge limestone slabs and blocks are exposed at the bottom of the trench. It is highly likely that these can be correlated with the rock-fall level of Stratum 15e in Profile IV.

Profile II (see fig. 5 in Chapter 2)

This is the western cleaned profile of the 1927 trench, in part of the tunnel. Today, Profile II is located beneath the modern drip line, but deposits represented here contain both cave and slope sediments. In many basic details, Profile II is comparable to the stratigraphic sequence of Profile I, although some strata are absent here.
Stratum 1. Modern humus.
Stratum 2. Mixed deposits-back dirt from previous excavations.
Stratum 3. Humus.
Stratum 7. Humiferous silty clay loam with a number of angular and sub-angular limestone pebbles and cobbles covered by carbonates.
Stratum 8. Limestone blocks (*the second rock-fall level*).
Stratum 9. Yellowish-brown silty clay loam with small uncarbonated *éboulis* under a rock-fall block covering this stratum and with small carbonated *éboulis* in the slope deposit facies.
Stratum 9a. A lens of unsorted small *éboulis*.
Stratum 10. Yellowish-brown silty clay with angular limestone slabs and *éboulis*.
Stratum 11. Light yellowish-brown granulated silt with sand and angular limestone *éboulis*.
Stratum 12. Yellowish-brown silty clay with rare *éboulis* of different size.
Stratum 12a. A lens of sorted and rounded small *éboulis* of sandstone, limestone, quartz, etc. These are alluvial sediments, probably from an ancient stream.
Stratum 12b. Yellowish-brown silty clay with limestone é*boulis* of different size.
Stratum 13. Limestone blocks (*the third rock-fall level*). White carbonated sand with limestone é*boulis* and slab fragments correspond to this stratum in the slope deposit facies.
Stratum 14. Light yellowish sand with limestone *éboulis* of different size.
Stratum 14a. Lens of white sand.
Stratum 15. Light brown sandy sediment with a number of limestone angular slabs and é*boulis*.
Stratum 15a. A lens of unsorted *éboulis* of different size.
Stratum 16. Light yellowish sandy sediment with a number of slabs and *éboulis* of different size.

Profile III (fig. 1)

This is the western profile of our excavation area. In the main details, its stratigraphic sequence corresponds well to the sequences of Profiles I and II, but there are some additional strata and lenses, while some sediments of the upper part of the sequence (Strata 4-6) are absent.

The stratigraphic sequence of Profile III is as follows (fig. 1, profile III is combined, to the right, with profile 4 in a cabinet projection system):
Stratum 1. Modern humus covering the back dirt from previous excavations.
Stratum 2. Mixed deposits-back dirt from previous excavations.
Stratum 3. Humus.
Stratum 4a. Limestone blocks (*the first rock-fall level*).
Stratum 7. Humiferous silty clay loam with angular and sub-angular limestone pebbles and cobbles covered by carbonates.
Stratum 8. Limestone blocks (*the second rock-fall level*).
Stratum 8a. Yellowish-brown sandy clay loam with carbonated limestone slabs and *éboulis* of different size.
Stratum 9. Yellowish-brown carbonated silty clay loam with small *éboulis.*
Stratum 9b. A lens of sorted and rounded *éboulis*. This stratum corresponds to Stratum 9a, but also contains unsorted and unrounded *éboulis*.
Stratum 9c. Yellowish-brown silty clay loam with uncarbonated limestone *éboulis* of different size.
Stratum 9d. Yellowish-brown sandy clay with limestone block, slabs and uncarbonated *éboulis.* Sediment in this stratum probably corresponds to deposition processes of Stratum 9 in the cave facies in Profile I.
Stratum 9e. A lens of sorted and rounded small *éboulis* underlying Stratum 9d.
Stratum 10. Yellowish-brown silty clay with angular limestone slabs and *éboulis*.
Stratum 10a. A lens of sorted and rounded small *éboulis*.
Stratum 11. Light yellowish-brown granulated silt with sand and angular limestone *éboulis*.

Stratum 11a. Light yellowish-brown loamy sand with *éboulis* of different size.
Stratum 12. Yellowish-brown silty clay with rare *éboulis* of different size.
Stratum 12b. Yellowish-brown silty clay with limestone é*boulis* of different size.
Stratum 12c. A lens of sorted and rounded small *éboulis*.
Stratum 13. Limestone blocks (*the third rock-fall level*).
Stratum 13a. White sand with *éboulis* of different size.
Stratum 14. Light yellowish sand with limestone *éboulis* of different size.
Stratum 14a. Lens of white sand.
Stratum 15. Light brown sandy sediment with angular limestone slabs and é*boulis*.
Stratum 15d. Brown sandy sediment with different-sized limestone slabs and *éboulis*.
Stratum 16. Light yellowish sandy sediment with limestone slabs and *éboulis*.
Stratum 16b. Light sandy sediment contains many *éboulis*.
Stratum 17. Dark yellowish-brown clay with rare limestone *éboulis*.
Stratum 18. Yellowish-brown sandy sediment reached by limestone slabs and *éboulis*.
Stratum 19. Limestone blocks (*the fifth rock-fall level*).

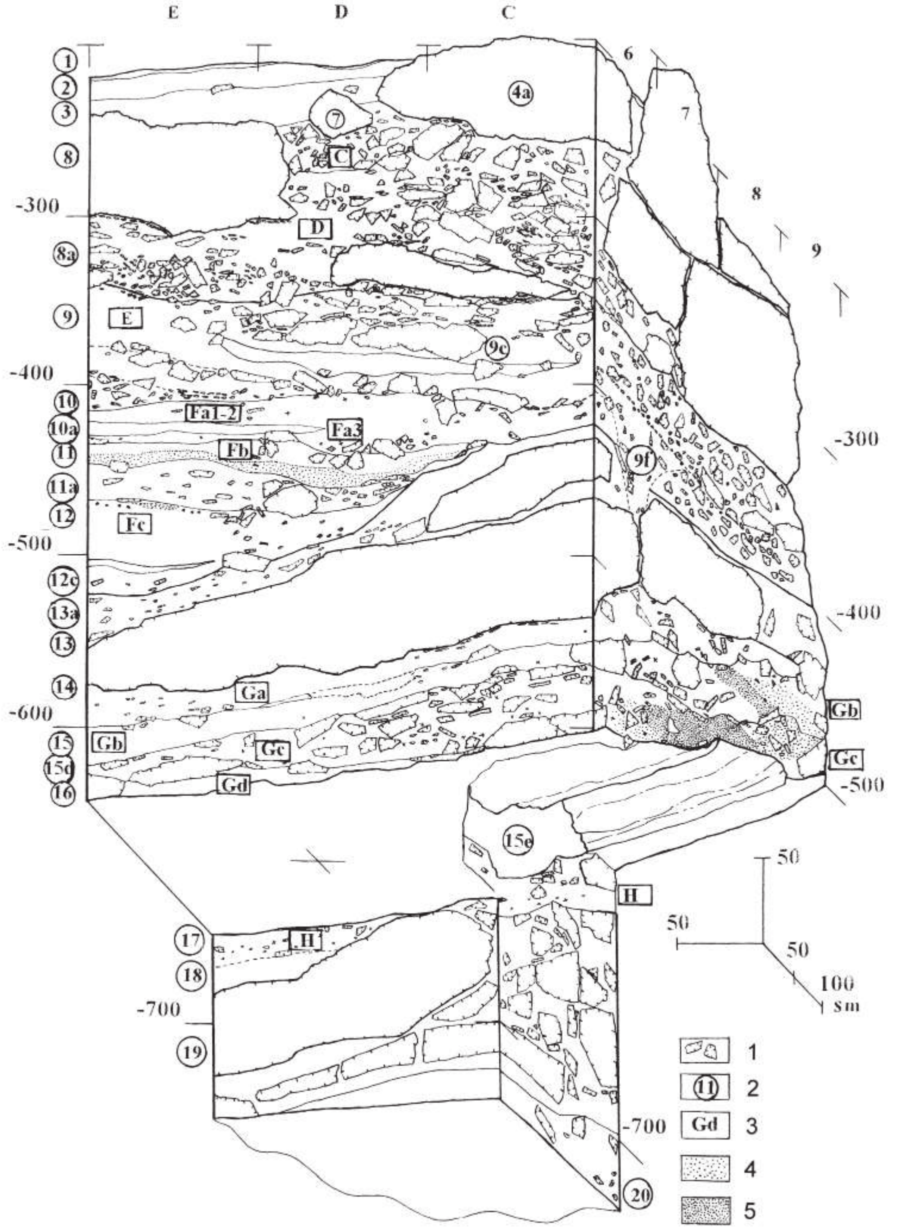

Figure 1 - Siuren I. Combined Profiles III and IV of the 1990s excavations. 1, limestone slabs and éboulis; 2, lithological strata defined in the 1990s; 3, archeological units and levels defined in the 1990s; 4, charcoal pieces; 5, hearth/ashy lenses.

Profile IV (fig. 2)

This is the northern profile of our excavation area, located directly under the modern drip line of the rock-shelter. The sequence is clearly represented by sediments which are characteristic for both drip line deposition and cave deposition, but slope sediments are absent.

The stratigraphic sequence of Profile IV is as follows (fig. 2):
Stratum 1. Modern humus.
Stratum 4a. Limestone blocks (the first rock-fall level).
Stratum 8. Limestone blocks (*the second rock-fall level*).
Stratum 8a. Yellowish-brown sandy clay loam with carbonated limestone slabs and *éboulis* of different size.
Stratum 9. Yellowish-brown silty clay loam with small carbonated *éboulis* on the border with profile III and uncarbonated sediments closer to the trench.
Stratum 9f. Lens of yellowish-brown clay sediment with *éboulis* of different size.
Stratum 10. Yellowish-brown silty clay with angular limestone slabs and *éboulis*.
Stratum 11. Light yellowish-brown granulated silt with sand and angular limestone *éboulis*.
Stratum 12. Yellowish-brown silty clay with rare *éboulis* of different size.
Stratum 13. Limestone blocks (*the third rock-fall level*).
Stratum 13a. White sand with *éboulis* of different size.
Stratum 14. Light yellowish sand with limestone *éboulis* of different size.
Stratum 15. Light brown sediment with angular limestone slabs and é*boulis*.
Stratum 15d. Brown sandy sediment with different-sized limestone slabs and *éboulis*.
Stratum 15e. Limestone blocks (*the fourth rock-fall level*).
Stratum 16. Light yellowish sandy sediment with slabs and *éboulis*.
Stratum 17. Dark yellowish-brown clay with rare limestone *éboulis*.
Stratum 18. Yellowish-brown sandy sediment.
Stratum 19. Limestone blocks (*the fifth rock-fall level*).

Profile V (fig. 3)

This is the southern profile of our excavation area. The upper part of the deposits (above Stratum 10) was excavated in a wider square than the area under investigation and is absent in this stratigraphic profile. The sediment sequence of Profile V is represented by drip line and cave deposition, while slope deposition is not represented. Strata 18 through 20 are known only from the 1996 test pit in squares.8, 9-E. It is very important that sequence deposits of Profile V are strictly connected to Profiles II and III.
Stratum 10. Yellowish-brown silty clay with angular limestone slabs and *éboulis*.
Stratum 10a. A lens of sorted and rounded small *éboulis*.
Stratum 11. Light yellowish-brown granulated silt with sand and angular limestone *éboulis*.
Stratum 11a. Light yellowish-brown loamy sand with *éboulis* of different size.
Stratum 12. Yellowish-brown silty clay with rare *éboulis* of different size.
Stratum 12a. A lens of sorted and rounded small *éboulis* of sandstone, limestone, quartz, etc. These are alluvial sediments, probably from an ancient stream.
Stratum 12b. Yellowish-brown silty clay with limestone é*boulis* of different size.
Stratum 12c. A lens of sorted and rounded small *éboulis*.
Stratum 13. Limestone blocks (*the third rock-fall level*).
Stratum 13a. White sand with *éboulis* of different size.
Stratum 14. Light yellowish sand with limestone *éboulis* of different size.
Stratum 14a. Lens of white sand.
Stratum 15. Light brown sediment with angular limestone slabs and é*boulis*.
Stratum 15d. Brown sandy sediment with different-sized limestone slabs and *éboulis*.
Stratum 16. Light yellowish sandy sediment with slabs and *éboulis*.
Stratum 16a. Lens of light yellowish sandy sediment with sorted small *éboulis* within stratum 16.
Stratum 16b. Light sandy sediment reached by *éboulis*.
Stratum 17. Dark yellowish-brown clay with rare limestone *éboulis*.
Stratum 18. Yellowish-brown sandy sediment.
Stratum 19. Limestone blocks (*the fifth rock-fall level*).
Stratum 19a. White sandy sediment with number *éboulis* and fragments.
Stratum 19b. Lens of yellowish brown silty clay with *éboulis*.
Stratum 20. Brown clay with rounded *éboulis* and pebbles. The sediment of this stratum is very similar to the alluvial terrace of the Belbek River.

Profile VI (fig. 4A)

This is the western profile of the test pit dug in squares 8, 9-E during the 1996 field season from the surface of Stratum 16. In 1997, Strata 16 and 17, preserved in the other part of the excavation area, were completely excavated here.

Sediments from the lower part of the depositional sequence are represented as follows on Profile VI:
Stratum 18. Yellowish-brown sandy sediment.
Stratum 19. Limestone blocks (*the fifth rock-fall level*).
Stratum 19b. Lens of yellowish brown silty clay with *éboulis*.

Profile VII (fig. 4B)

This is the northern profile of the 1996 test pit. Only the lower strata of the stratigraphic sequence with cave sediments are represented here, while Stratum 20 is connected to alluvial deposits of the Belbek River.

The stratigraphic sequence of Profile VII is as follows:
Stratum 18. Yellowish-brown sandy sediment.
Stratum 19. Limestone blocks (*the fifth rock-fall level*).
Stratum 19a. White sandy sediment with *éboulis* and fragments.
Stratum 19b. Lens of yellowish brown silty clay with *éboulis*.
Stratum 20. Brown clay with rounded *éboulis* and pebbles.

Archaeological sequence

A specific system, based on the site's stratigraphy, was used for labeling the archaeological sequence. Humiferous sediments

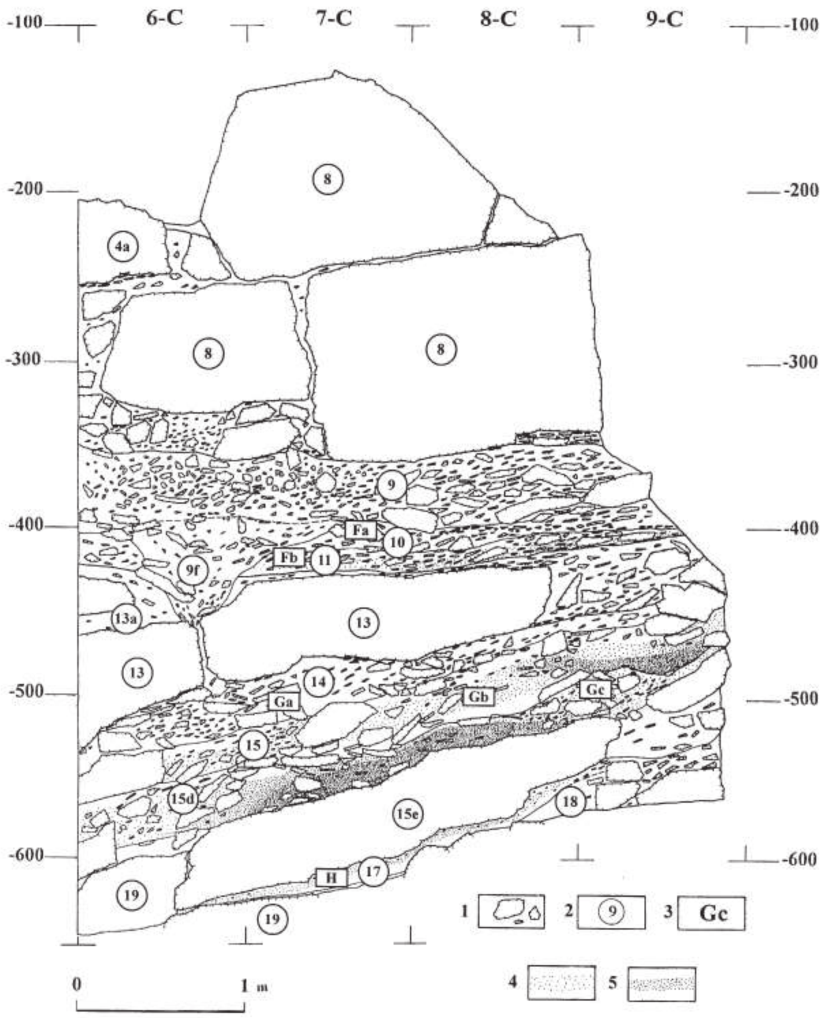

Figure 2 - Siuren I. Profile IV of the 1990s excavations. 1, limestone slabs and éboulis; 2, lithological strata defined in the 1990s; 3, archeological units and levels defined in the 1990s; 4, charcoal pieces; 5, hearth/ashy lenses.

of Stratum 3 contained pottery fragments from human activity in the rock-shelter during the 18th and 19th centuries as well as some redeposited Upper Paleolithic flint artifacts. The Paleolithic archaeological levels identified during our excavations were grouped into several units based on their position between the defined rock-fall levels. Units A, B, C and D contain disturbed levels with no real evidence of living floors between the *first* and *second rock-fall levels*. However, Units E, F, G and H were composed of a series of living floors and partially dispersed finds. Levels in Units E and F are clearly located between the *second* and the *third rock-fall levels*. Moreover, there are sterile sediments in the lower part of Stratum 9 separating the dispersed finds of Unit E from the uppermost levels in Unit F. Levels in Unit G are located between the *third* and the *fourth rock-fall levels*, while the single level of Unit H was discovered below the *fourth* and above the *fifth rock-fall levels*. No artifacts, bones, hearths, or other evidence of human activity were found below the *fifth rock-fall level*.

Thus, a total of eight archaeological Paleolithic units were studied at Siuren I during the 1990s excavations: Units A through H (from top to bottom).

Unit A was defined in Stratum 4 in an area of ca. 3.5 sq. m. The unit was subdivided into four levels, each with an average thickness of ca. 10 cm. Faunal remains were not found. The majority of artifacts, as well as limestone *éboulis*, were mostly found in vertical position. Some lithics were also found in rodent burrows. These clearly indicate that both Unit A and Stratum 4 are in disturbed stratigraphic context.

Unit B is located in Stratum 6 directly above the *second rock-fall level* of Stratum 8 and contained only some dispersed charcoal. No lithic artifacts or fauna were discovered. The thickness of Unit B is ca. 3 cm.

Unit C is represented by a single redeposited flint artifact in humiferous sediment of Stratum 7.

Unit D was defined in the upper part of Stratum 8a. Rare lithic artifacts were dispersed throughout the unit, which also filled open-work gaps in the *second rock-fall level* of Stratum 8.

Unit E was defined directly below the *second rock-fall level* of Stratum 8. A few flint artifacts were excavated from the upper

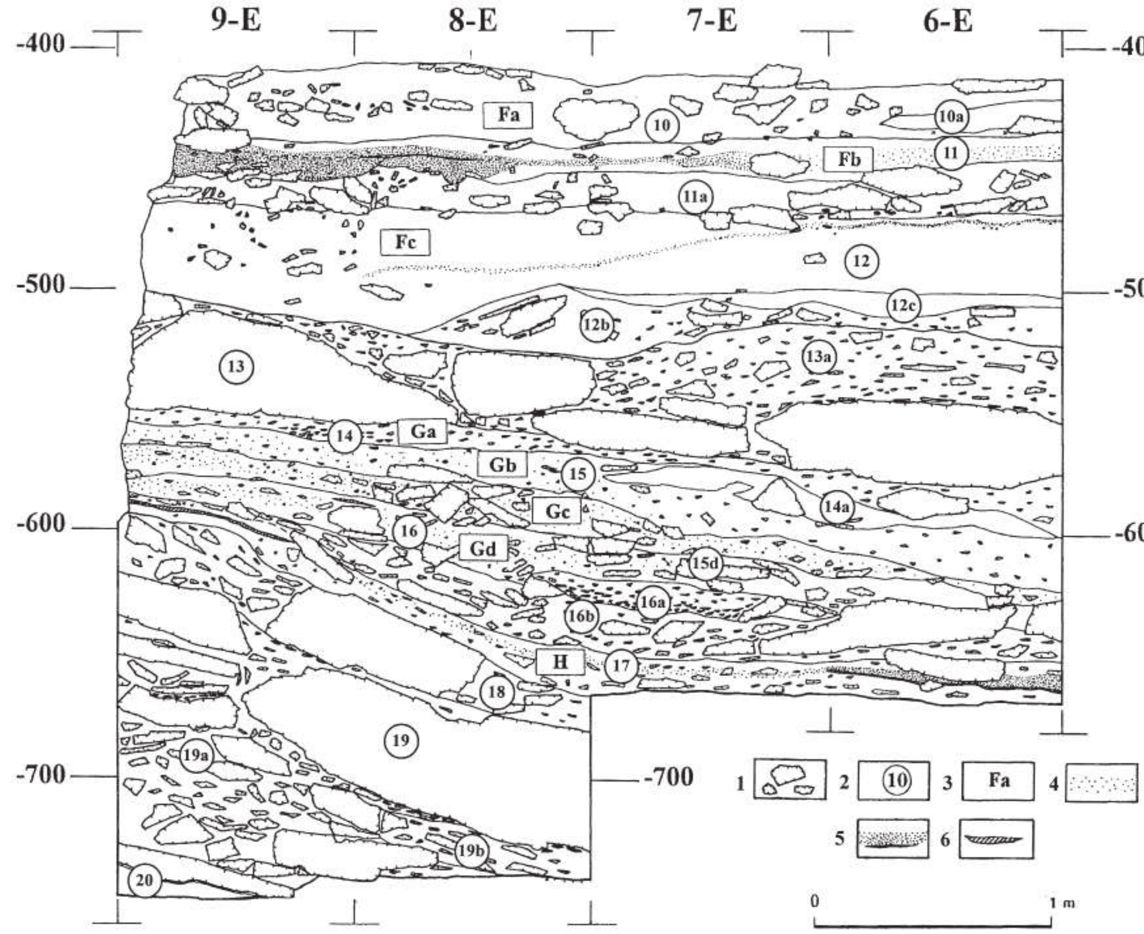

Figure 3 - Siuren I. Profile V of the 1990s excavations. 1, limestone slabs and éboulis; 2, lithological strata defined in the 1990s; 3, archeological units and levels defined in the 1990s; 4, charcoal pieces; 5, hearth/ashy lenses with burnt lower areas; 6, distinct hearth and/or fireplaces.

part of Stratum 9 and a few unidentifiable bone fragments were also found.

Unit F was subdivided into four basic archaeological levels: Fa1-Fa2, Fa3, Fb1-Fb2 and Fc. The majority of these levels are represented by carpets of artifacts, faunal remains and concentrations of charcoal and ash, deposited along the inclination angle of the strata in which they were found.

Level Fa1-Fa2 was defined in the upper part of Stratum 10. It contained rare flint artifacts and animal bones, usually deposited at different depths and frequently vertically oriented. Sub-levels Fa1 and Fa2 were defined according to depths of the finds and the inclination angle of sediments. The thickness of each sub-level is ca. 10 cm.

Level Fa3 is located directly below Stratum 10a in the lower part of Stratum 10. The level is 5-10 cm thick with finds distributed across the entire excavated area.

Level Fb1-Fb2 is associated with the middle and lower parts of Stratum 11. The difference between sub-levels Fb1 (upper) and Fb2 (lower) is the color of the sediments. Sub-level Fb2 has a more grayish color, due to the high amount of charcoal and burnt bones. Several refits of artifacts from these sub-levels, however, indicate the homogeneous nature of level Fb1-Fb2. The average thickness of this level is ca. 5-10 cm.

Level Fc is found in the upper part of Stratum 12. The thickness of this level is no more than 3 cm.

Unit G. A total of four levels belong to this unit.

Level Ga was defined in Stratum 14, directly below the limestone block of the *third rock-fall level* (Stratum 13). It is highly likely that Stratum 14 results from the dissolution of the limestone blocks from the *third rock-fall level*. If so, the finds within Stratum 14 are not a separate archaeological level, but rather the top of level Gb1-Gb2 which lies directly below. The average thickness of this level is 5-10 cm.

Level Gb1-Gb2 was observed in Stratum 15. The level is represented by two sub-levels: Gb1 (upper part of the level) and Gb2 (lower part of the level). Both consist of ashy lenses. In the north-western and central parts of the excavation area in about three squares, these sub-levels were separated by limestone slabs. Apart from this, there were no lithological markers in the rest of the excavation area suitable for subdividing the level. Therefore, sub-levels Gb1 and Gb2 could be separate living floors which accumulated without a clear sterile horizon

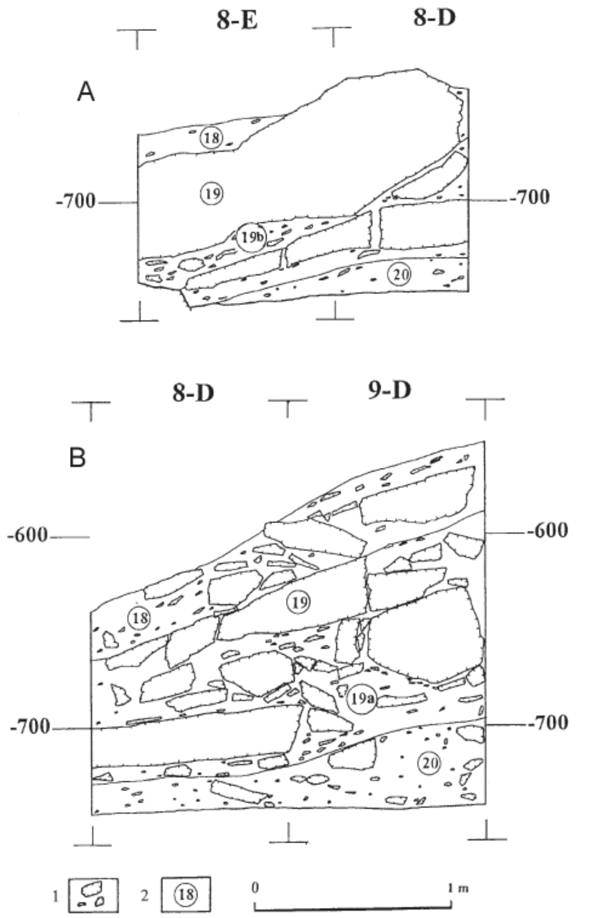

Figure 4 - Siuren I. Profiles VI (A) and VII (B) of the 1990s excavations. 1, limestone slabs and éboulis; 2, lithological strata defined in the 1990s.

between them. The thickness of sub-level Gb1 is 10-15 cm, while sub-level Gb2 is ca. 10 cm.

Level Gc1-Gc2 is located within Stratum 15d and subdivided into three sub-levels: Gc1 (upper part of the level), Gc2 and Gc2a (lower part of the level).

Level Gd is associated with the contact between Strata 16 and 16b. The average thickness of this level is ca. 5-7 cm.

Unit H is associated with Stratum 17 and is represented by a single archaeological level. The average thickness of this level is no more than 10 cm.

Our new stratigraphic classification enables us to correlate new archaeological units with Bonch-Osmolowski's "*cultural layers*". Units A-D correspond to Bonch-Osmolowski's *Upper cultural layer*, Unit F corresponds to his *Middle cultural layer* and Unit G is the analog of the *Lower cultural layer*. Unit E was not defined during the 1920s investigations as an independent cultural component. The sediments deposited directly below huge limestone blocks and slabs (i.e., the clear stratigraphic position of Unit E) were identified by Bonch-Osmolowski as the upper part of the *Middle cultural layer*, according to his archive reports (see fig. 3 in Chapter 2). But at the same time, some of the sediments excavated under the same level of blocks in the main excavation area were recognized by him as the lower part of the *Upper cultural layer*. Therefore, it is highly probable that Bonch-Osmolowski partly mixed finds from two layers that are actually independent. The presence of a few Aurignacian tools typical of the *Middle cultural layer* within the assemblage from the *Upper cultural layer* may be considered as an illustration of this likelihood.

Unit H was not discovered by Bonch-Osmolowski in his main excavation area, as he terminated his main excavations above this level at the top of limestone blocks representing our *fourth rock-fall level* of Stratum 15e. Yet he recognized that the brown silty-clay sediments (his Stratum 6) contained a few flint artifacts and saiga bones in a deep test pit in squares 13-B, Г, although these finds were not used to define a new cultural layer in his sequence. It is quite likely, however, that these finds correspond to Unit H, defined in the same brown sediments of Stratum 17 in the 1990s excavation area.

Planigraphy

Archaeological materials from Units A, B, C, and D were discovered in reworked contexts in limited excavated areas, no more 3.5-4.0 sq. m. Artifacts from Unit E are not common and did not form a spatial cluster. Much more representative materials were found in levels from Units F, G and H, but the area of our excavations (ca. 12 sq. m) did not give us an opportunity for complete estimation of artifact distribution in all site levels. However, there are specific archaeological features in most of the discovered living floors which are of define interest for describing the complexes of the site in addition to artifact descriptions. Among such features are *pits* and *evidence of fire*.

Pits are relatively simple features, while for evidence of Paleolithic fires a special classification system was used based on attributes of concentrations of fire remains and unique structural aspects of such features. Evidence of fire is subdivided into *hearths, fireplaces and ashy clusters.*

Hearths are characterized by the presence of specially prepared structures such as pits, stone borders or both. The fire remains are represented by thick lenses of ash, charcoal and/or bone coal which is sometimes possible to divide into lens zones. In general, the bottom of pits or enclosed places showed clear evidence of burned ground. Obviously, hearths were artificial constructions and used continuously during occupation.

Fireplaces are characterized by the absence of any structural details and the presence of a spatially defined ash/coal concentration and traces of burned sediment below fire remains. Ash and coal could sometimes be absent, but a zone of burned sediment neatly marked the place of an ancient fire. Fireplaces reflect a relatively discontinuous use of fire. Perhaps such features correspond to bone fires.

Ashy clusters are characterized by small concentrations of fire remains (ash, charcoal, bone coal) with no any structural details or traces of burned sediments. It is possible that some of the ashy clusters could reflect short-term bonfires and/or the use the easy fuel such as grass or small branches which did not leave deep evidence of burned sediment. Another aspect of such features is connected to occasional weathering concentrations of ash in natural falls at the base of the site, in puddles or around stones, among others.

Planigraphic observations and descriptions of specific archaeological features are presented below for the archaeological levels in Units F, G and H.

Level Fa1-Fa2. Artifacts and bones from level Fa1-Fa2 were spread across the eastern part of the excavated area, while the western part was covered by a lens of small rounded *éboulis* (Stratum 10a) (fig. 5). The sediments with artifacts had slight traces of ashy remains. No clusters of artifacts and bones or hearths were found.

Level Fa3 was defined within sediments containing abundant ashy remains. This level is represented by a carpet of finds across the entire excavated area (fig. 6). There are three features in this level.

Feature 1 is the *fireplace* in square 8-D. It has an elongated irregular shape 0.6 m long and 0.25 m wide. The lens of ashy-coal is 2-3 cm thick in the center. The thickness of burned sediment under ash is 0.5-1.0 cm. Some fragments of burned bones were recovered from within the fireplace.

Feature 2 is the *ashy cluster* in square 8-D not far from Feature 1. The ashy zone has an ovoid shape in 0.10-0.12 m in diameter. The ashy lens contains abundant small fragments of bone coal and is around 1 cm thick in the center.

Feature 3 is the *ashy cluster* in square 8-E. It has an elongated ovoid shape 0.47 m long and 0.3 m wide. The ashy lens contains abundant small fragments of both charcoal and bone coal. The lens is around 1 cm thick in the center and is covered by a limestone slab.

Level Fb1-Fb2 was investigated through two excavation sublevels (fig. 7). The upper part of the level (Fb1) is full of ash and is distributed almost throughout the entire excavation area. The lower part of the level (Fb2) is represented by a high concentration of ash and charcoal/bone coal within sediments. There are eleven features stratigraphically associated with the Fb2 sublevel: three hearths, three fireplaces, three ashy clusters and two pits. Two clear concentrations of artifacts and faunal remains are noted in the spatial distribution of materials from this level. The richest concentration is situated in the south-eastern part of the excavation area and corresponds spatially to several fires located here. The other artifact concentration is situated in the south-western part of the excavation area and is associated with a large ashy cluster. It should be noted that artifact distribution is strongly associated with the distribution of ash within the sediments. There are no any finds outside the ashy borders.

In the south-eastern corner of the excavation area, five fire features (1-5) in sub-level Fb2 show a complete sequence of use that was determined by micro-stratigraphic observations on supplementary balks preserved at the main ashy zones (figs. 8 and 9).

Feature 1 is a huge *ashy cluster* (figs. 8, 9: a, b, c) located in the south-eastern part of the excavation area in squares 7, 8, 9-D, E. Most of the ashy cluster was not excavated as it continues outside the excavated area. The ashy cluster likely had an ovoid shape. In any case, its maximal length is 2.1 m and maximal width is 1.5 m. The maximal thickness of the ashy lens is 5 cm. The lens contains ash, charcoal and small fragments of burned bones. Thin streaks of yellow silty clay were found in the lower part of the ash lens. This ashy cluster directly overlaid Features 2-5.

Feature 2 is the *fireplace* located in square 8-E and has an elongated sub-ovoid shape 0.36 m long and 0.31 m wide. The lens of ashy-coal is 10 cm thick in the center. Specific structural details were not observed, but the feature is situated in natural fall. The limestone slabs, discovered at the bottom of the fire, had clear traces of burned surfaces.

Feature 3 is the *hearth* located in the southern part of square 8, 9-E. The construction of the hearth is represented by an artificial pit 14 cm deep. The shape of the hearth is unknown because most of it is outside of the excavation area. Its maximal length is ca. 0.7 m along Profile V where the hearth's cross-section is represented. The pit fill contains ash, charcoal, bone coal and tiny fragments of reddish ochre. The thickness of burned sediment under the lens is greater than 1 cm. The southwestern part of Feature 3 cuts the edge of Feature 4.

Feature 4 is the *hearth* located in square 8-E and partly in square 9-E. The hearth zone has an ovoid shape 0.6 m long and 0.55 m wide, although its southern end is outside the excavation area. The artificial pit is 9 cm deep and the concave bottom of the pit is uneven. The pit fill contained ash and charcoal. A streak of burned sediment 0.7-1.0cm thick at the bottom of the pit was noted in the central part of the hearth. Transversal cross sections of the hearth are represented in Profile V and its longitudinal section was observed in the supplementary balk that goes along Features 4 and 5.

Feature 5 is the *hearth* found mainly in square 8-E and partly in squares 9-E, 8-D and 9-D. It has an elongated ovoid shape 0.7 m long and 0.5 m wide. The structure is represented by the artificial pit 16-20 cm deep with concave bottom and the stone border of 13 limestone slab fragments. The stone border can be seen around the pit from west and south. Some stones were in vertical position. The pit fill consists of two lenses. The upper plano-convex lens 4-8 cm thick contained light gray ash. The lower concave-convex lens over 12 cm thick contained dark gray ash with small fragments of black charcoal. The lenses are separated by a streak of burned sediment 2-3 mm thick and thin lenses of small-sized limestone *éboulis*, no more than 3 cm in size. The bottom of the pit is burned sand 2-5cm deep. The southern part of the hearth was destroyed by the pit of Feature 4. Cross sections of the hearth are visible on the respective drawings.

Feature 6 is the small *ashy cluster* in square 8-C and has a sub-ovoid shape ca. 0.16 m in diameter. The ash lens is 1 cm thick (fig. 8).

Feature 7 is the *fire place* represented by a zone of burned sediment 1 cm thick with no ash located mostly in the south-eastern part of square 7-C with the southern part of the zone in square 7-D. It has an elongated ovoid shape 0.38 cm long and 0.28 cm wide (fig. 8).

Feature 8 is the *fireplace* of elongated irregular, close to sub-ovoid shape 0.7 m long and 0.4 m wide. It is located mostly in the south-western part of square 8-C but also partly in squares 7, 8-D and 7-C. The dark gray ashy lens is more than 1.5 cm thick in the center. The burned sediment under the lens is 1 cm thick. It is possible that Features 7 and 8 actually represent a single Paleolithic fireplace, but there is now a clear border between their burned zones (fig. 8).

Feature 9 is a large *ashy cluster* located in squares 6, 7-D, E with an irregular shape with a maximum length of 1.1 m and maximum width of 0.6 m. The gray ashy lens is 4 cm thick. The northern

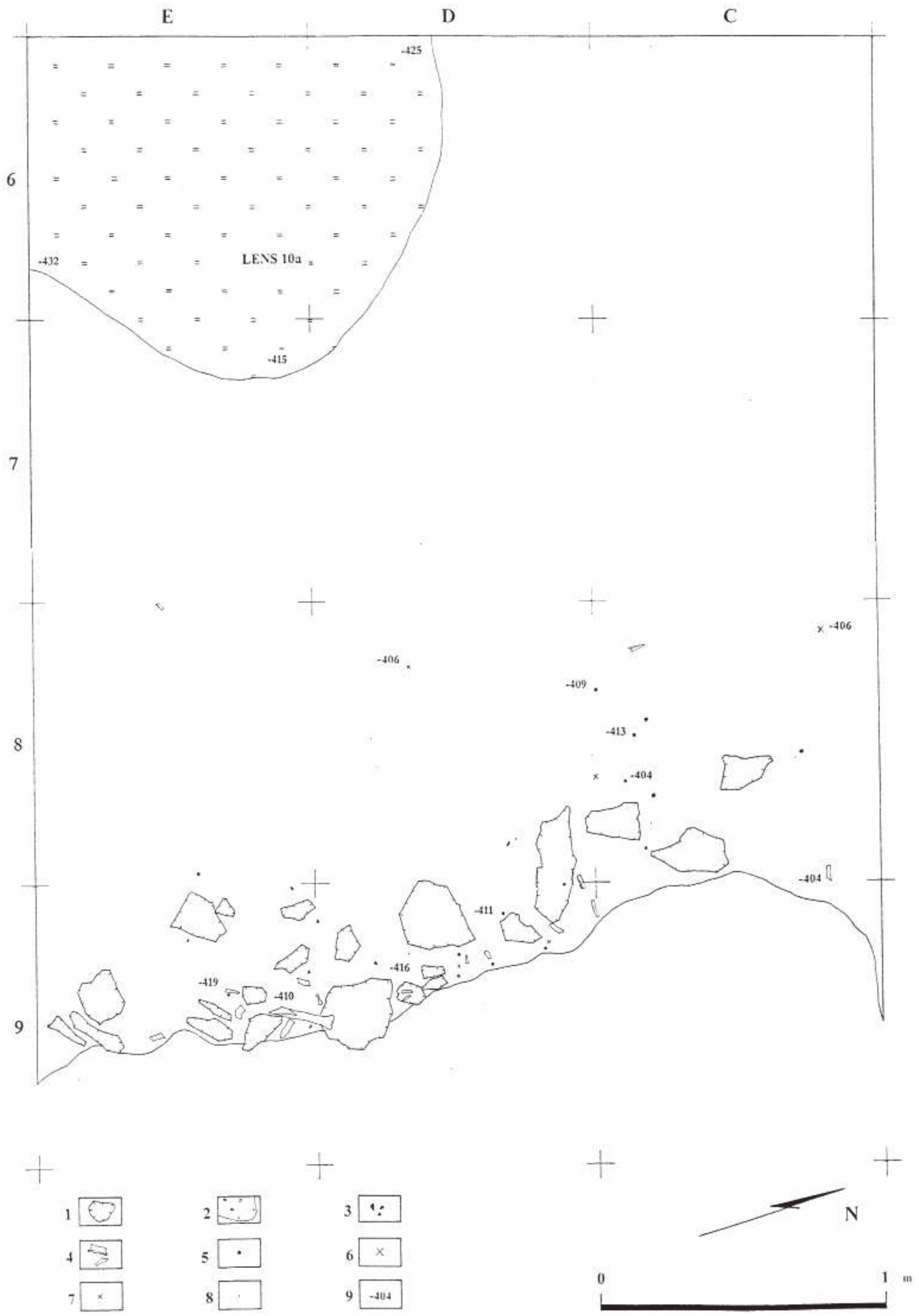

Figure 5 - Siuren I. The 1990s excavation plan of the level Fa1-Fa2 living floor. 1, limestone slabs; 2, lens of small rounded éboulis; 3, charcoal pieces; 4, animal bones; 5, flake; 6, blade; 7, bladelet; 8, chip; 9, elevation mark below datum point.

part of the zone is darker colored than its southern part (fig. 8; fig. 9: d).

Two pits – Features 10 and 11 (fig. 8; fig. 9: e) – are found at the southern part of Feature 9 in square 7-E under the ashy lens.

Feature 10 is an elongated ovoid *pit* 22 cm long and 12 cm wide. The bottom of the pit is uneven, sloping from east to west. in the western part, the pit is 9 cm deep from the base of sub-level Fb2. The pit fill contains dark gray ash and small fragments of charcoal, as well as some artifacts and bone. The artifacts

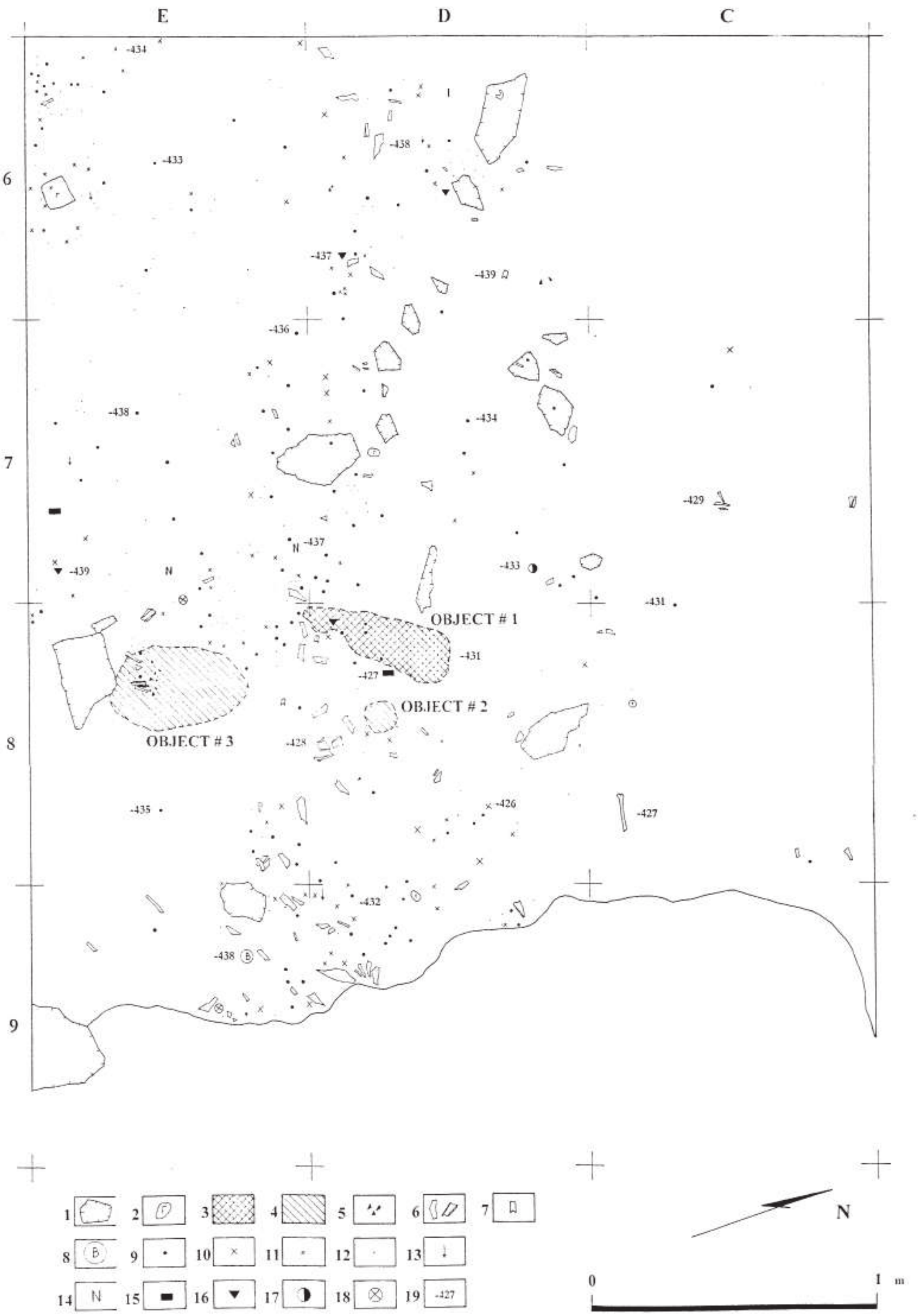

Figure 6 - Siuren I. The 1990s excavation plan of the level Fa3 living floor. 1, limestone slabs; 2, pebble; 3, fireplace; 4, ashy cluster; 5, charcoal pieces; 6, animal bones; 7, animal tooth; 8, bone tool; 9, flake; 10, blade; 11, bladelet; 12– chip; 13, burin spall; 14, core-like piece; 15, end-scraper; 16, burin; 17, composite tool; 18, retouched flake; 19, elevation mark below datum point.

Figure 7 - Siuren I. The 1990s excavation plan of the level Fb1-Fb2 living floors. 1, limestone slabs; 2, pebble; 3, spatial distribution of different object; 4, charcoal pieces; 5, animal bones; 6, animal tooth; 7, bone tool; 8, ochre; 9, flake; 10, blade; 11, bladelet; 12, chip; 13, burin spall; 14, core-like piece; 15, end-scraper; 16, burin; 17, retouched blade; 18, retouched microlith; 19, composite tool; 20, retouched flake; 21, elevation mark below datum point.

Figure 8 - Siuren I. The 1990s excavation plan of the level Fb1-Fb2 living floors. 1, limestone slabs; 2, pebble; 3, hearth indications; 4, fireplace indications; 5, ashy cluster; 6, distribution of the level Fb1-Fb2 living floors; 7, charcoal pieces; 8, spatial distribution of different objects; 9, animal bones; 10, core-like piece; 11, flake; 12, blade; 13, bladelet; 14, chip.

include a core, a bladelet and some chips. It should to be noted that a core was found in vertical position near the northern inner edge of the pit.

Feature 11 is an ovoid *pit* 23 cm long, 16 cm wide and 6 cm deep from the base of sub-level Fb2. The bottom of the pit is concave. The pit fill contains light gray ash and small fragments of charcoal, as well as some artifacts, including a blade, a flake and two bladelets.

The stratigraphic observations of the groups of Features 1 through 5 enable reconstruction of the sequence of their use in Level Fb1-Fb2 (fig. 9). The clearest part of the sequence can be seen for three of the hearths. Feature 5 was the earliest to be made. It was partly destroyed by the pit of Feature 4. At the same time, Feature 4 was destroyed by the pit of Feature 3. It is likely that Feature 2 is synchronous to Feature 4. The huge ashy cluster (Feature 1) covers all the other fire features. Thus, this group of Paleolithic fires reflects a relatively long period of use by the human occupants of level Fb1-Fb2 at Siuren I that allows us to consider the possibility that this level represented a continuous settlement.

Level Fc was identified within the sediments with some ash. Rare artifacts and faunal remains were mainly distributed relatively irregularly in squares 7, 8-C, D, E, while no other material was present in other parts of the excavation area (fig. 10). There are three features in the level – one fireplace and two ashy clusters.

Feature 1 is the *fireplace* at the border of squares 8-C and 8-D. The fireplace has an ovoid shape 0.48 m long and 0.33 m wide. The dark gray ash lens with small fragments of charcoal is more than 2 cm thick. The thickness of burned sand under the ash lens is 0.5 cm deep.

Feature 2 is the *small ashy cluster* at the border of squares 8-C and 9-C near Feature 1. It has an irregular shape 0.15 m long and 0.1 m wide. The thickness of the lens is 0.5 cm in the center of the zone.

Feature 3 is the *ashy lens* partly located in square 6-E. The rest of the cluster is outside of the excavation area and can be seen in stratigraphic Profiles III and V. The ashy cluster is 1.0 m long and 0.7 m wide, with a maximum thickness of 1 cm.

Level Ga is present in the eastern part of the excavation area (fig. 11). Artifacts and faunal remains were distributed relatively regularly in squares 8, 9-C, D, E, while a few finds were also found in the central and western parts. There are no features in this level.

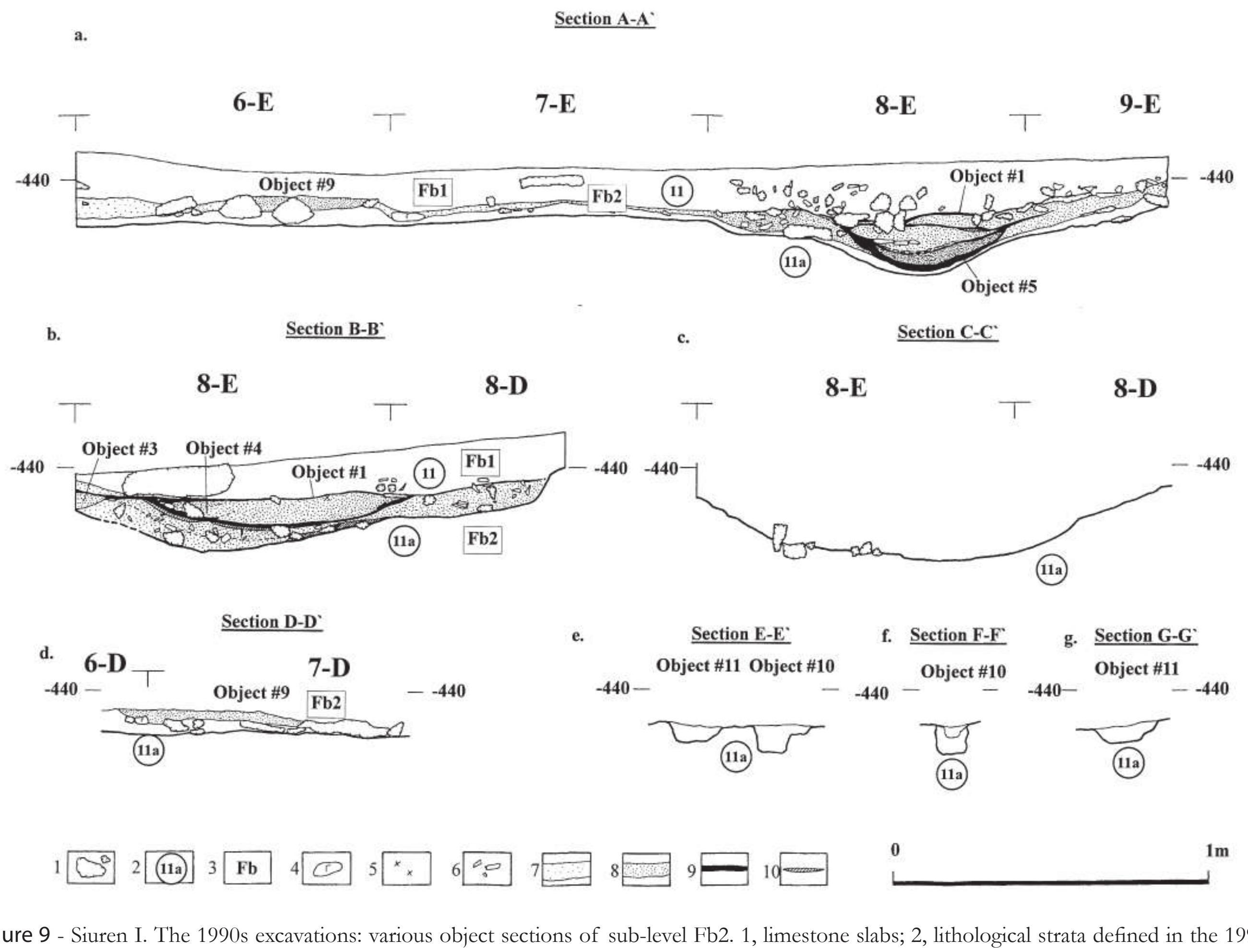

Figure 9 - Siuren I. The 1990s excavations: various object sections of sub-level Fb2. 1, limestone slabs; 2, lithological strata defined in the 1990s; 3, archeological sub-levels defined in the 1990s; 4, pebble; 5, flint artifacts; 6, animal bones; 7, charcoal pieces; 8, ashy lenses; 9, black ashy-charcoal lenses; 10, burnt sediment.

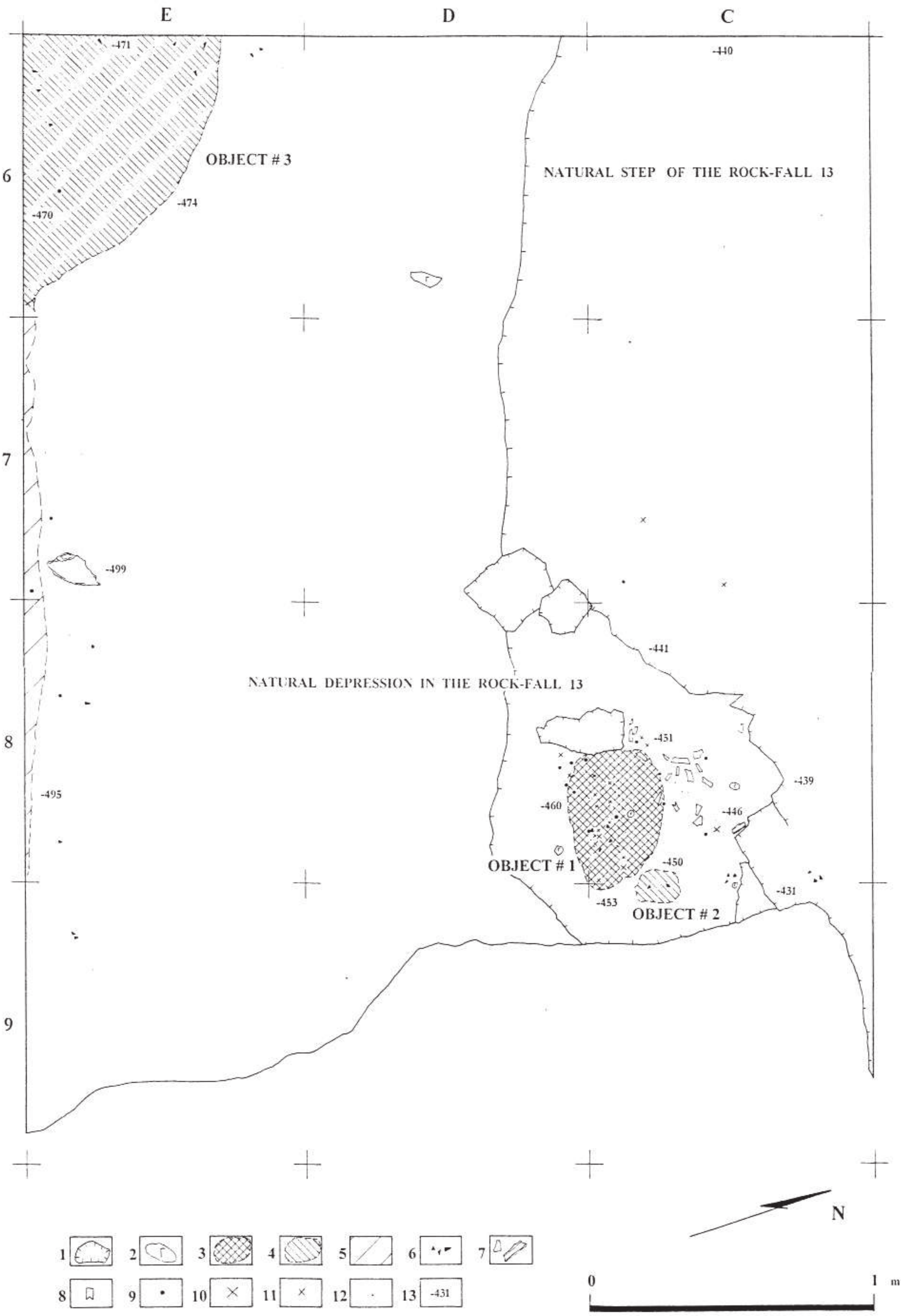

Figure 10 - Siuren I. The 1990s excavation plan of the level Fc living floor. 1, limestone slabs; 2, pebble; 3, fireplace indications; 4, ashy cluster; 5, ashy lens; 6, charcoal pieces; 7, animal bones; 8, animal tooth; 9, flake; 10, blade; 11, bladelet; 12, chip; 13, elevation mark below datum point.

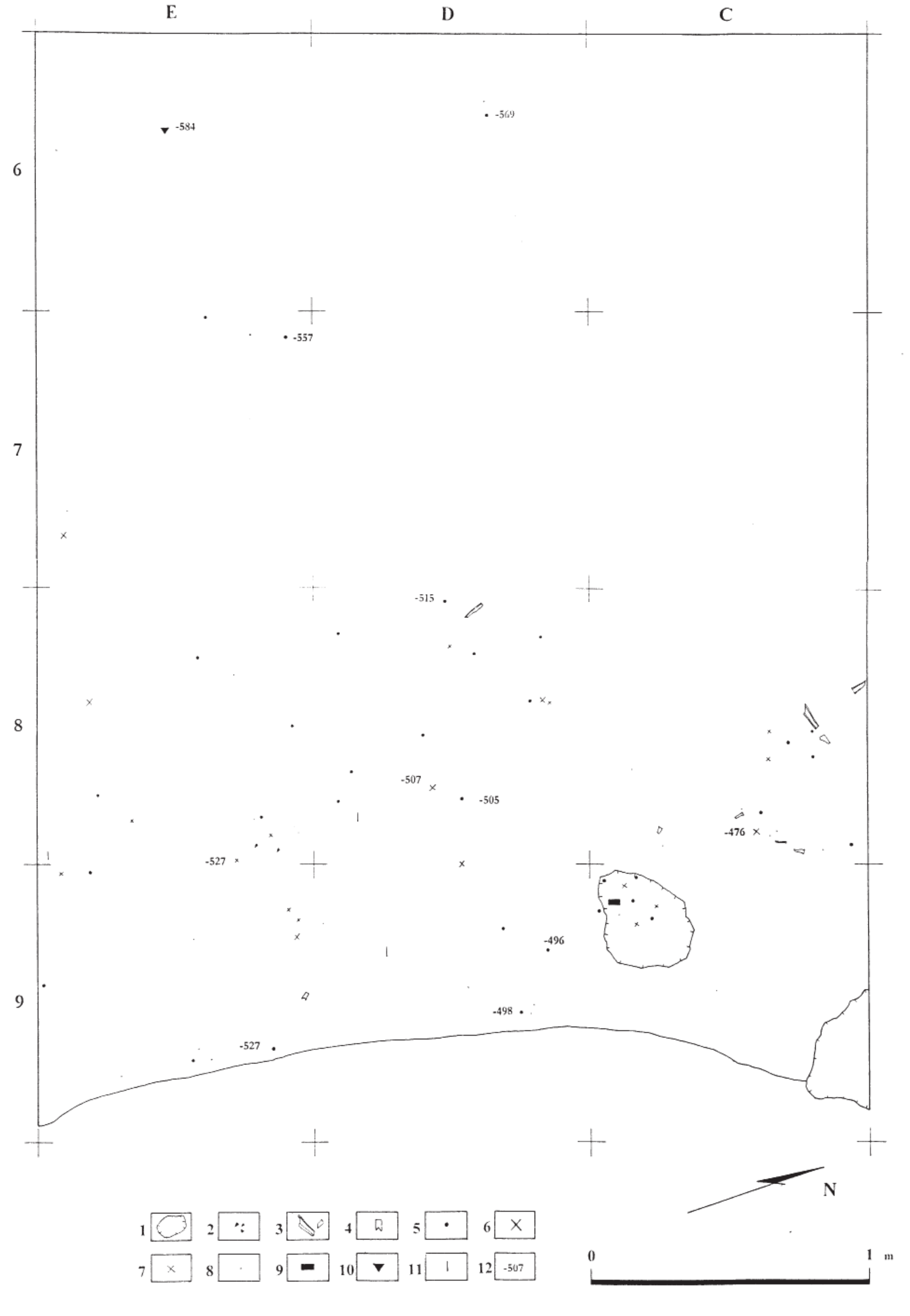

Figure 11 - Siuren I. The 1990s excavation plan of level Ga. 1, limestone slab; 2, charcoal pieces; 3, animal bones; 4, animal tooth; 5, flake; 6, blade; 7, bladelet; 8, chip; 9, end-scraper; 10, burin; 11, retouched microlith; 12, elevation mark below datum point.

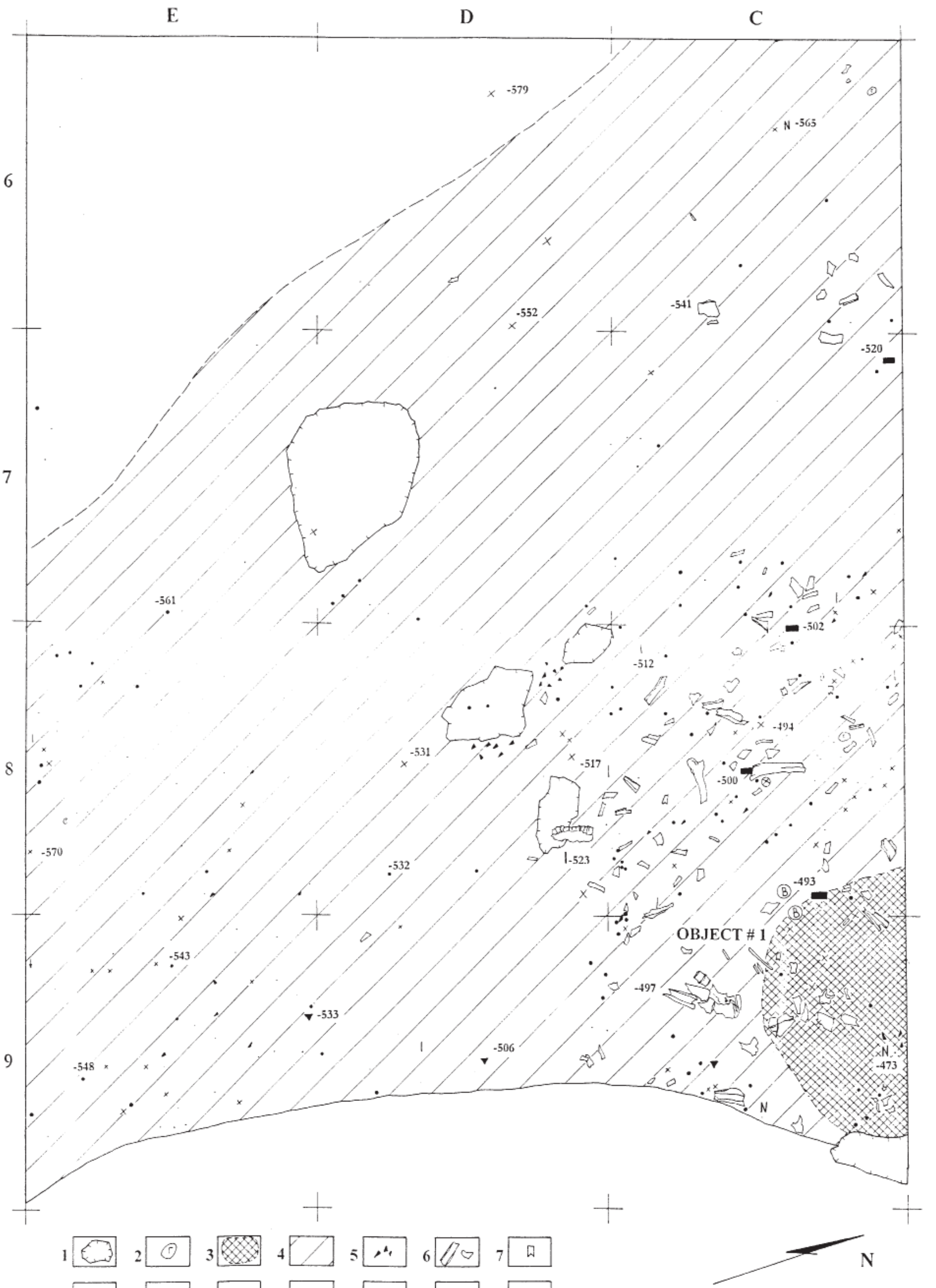

Figure 12 - Siuren I. The 1990s excavation plan of the sub-level Gb1 living floor. 1, limestone slabs; 2, pebble; 3, fireplace indication; 4, spatial distribution of the sub-level finds; 5, charcoal pieces; 6, animal bones; 7, animal tooth; 8, bone tool; 9, flake; 10, blade; 11, bladelet; 12, chip; 13, burin spall; 14, core-like piece; 15, end-scraper; 16, burin; 17, retouched blade; 18, retouched microlith; 19, retouched flake; 20, elevation mark below datum point.

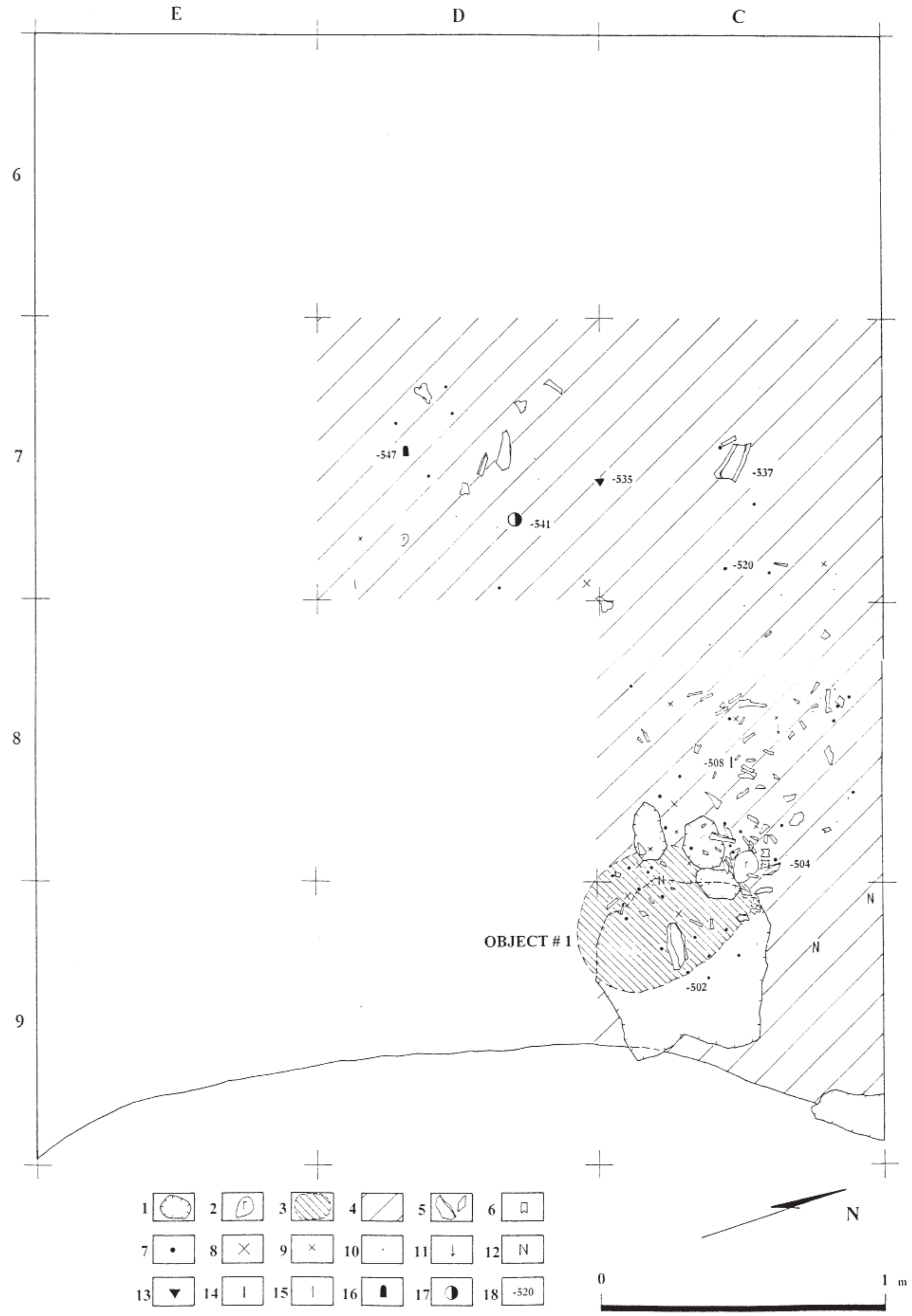

Figure 13 - Siuren I. The 1990s excavation plan of the sub-level Gb2 living floor. 1, limestone slabs; 2, pebble; 3, ashy cluster; 4, spatial distribution of the sub-level finds; 5, animal bones; 6, animal tooth; 7, flake; 8, blade; 9, bladelet; 10, chip; 11, burin spall; 12, core-like piece; 13, end-scraper; 14, retouched blade; 15, retouched microlith; 16, side-scraper; 17, composite tool; 18, elevation mark below datum point.

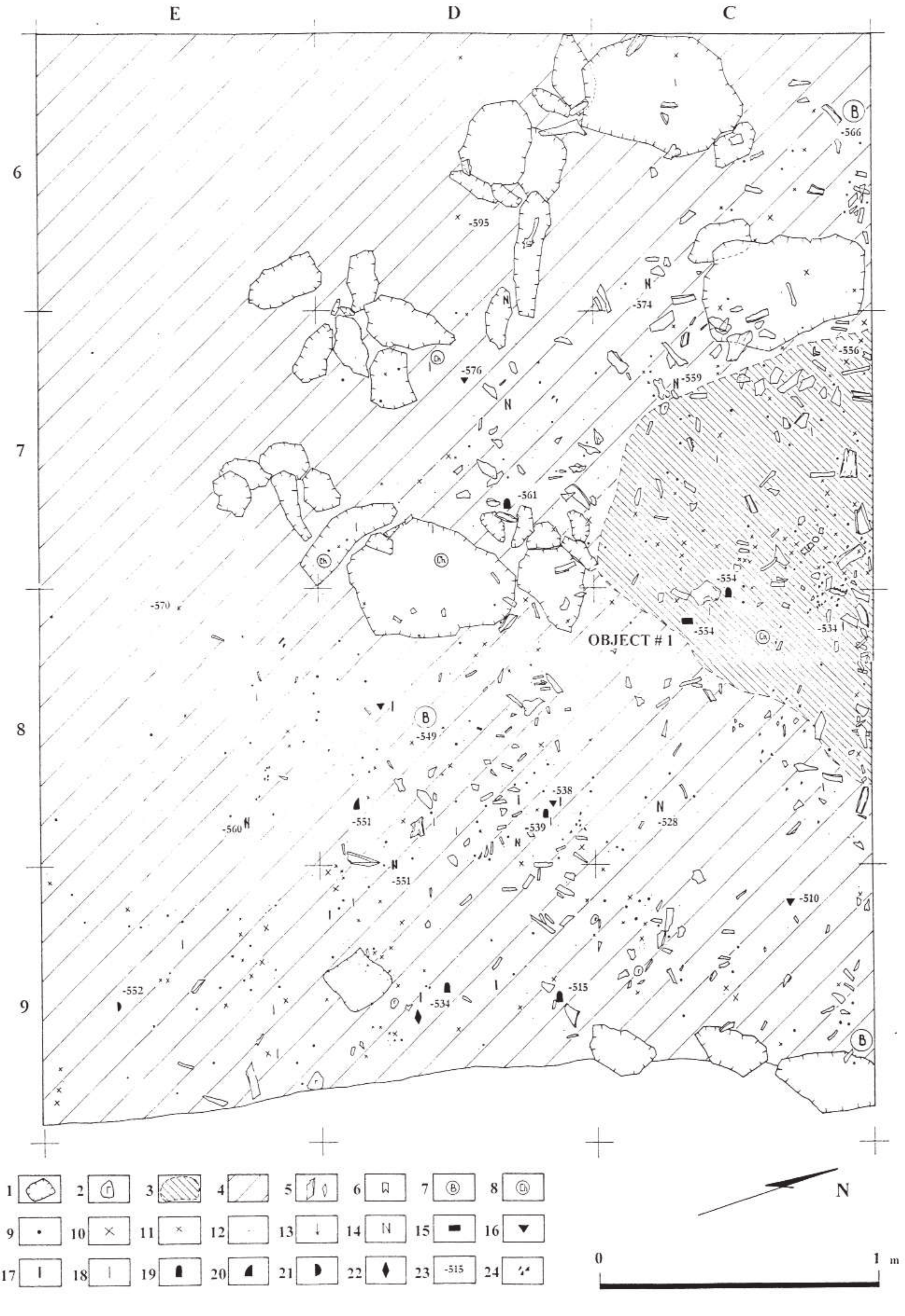

Figure 14 - Siuren I. The 1990s excavation plan of the sub-level Gc1 living floor. 1, limestone slabs; 2, pebble; 3, ashy cluster; 4, spatial distribution of the sub-level finds; 5, animal bones; 6, animal tooth; 7, bone tools; 8, ochre; 9, flake; 10, blade; 11, bladelet; 12, chip; 13, burin spall; 14, core-like piece; 15, end-scraper; 16, burin; 17, retouched blade; 18, retouched microlith; 19, side-scraper; 20, convergent tool; 21, notched tool; 22, bifacial tool; 23, elevation mark below datum point; 24, charcoal pieces.

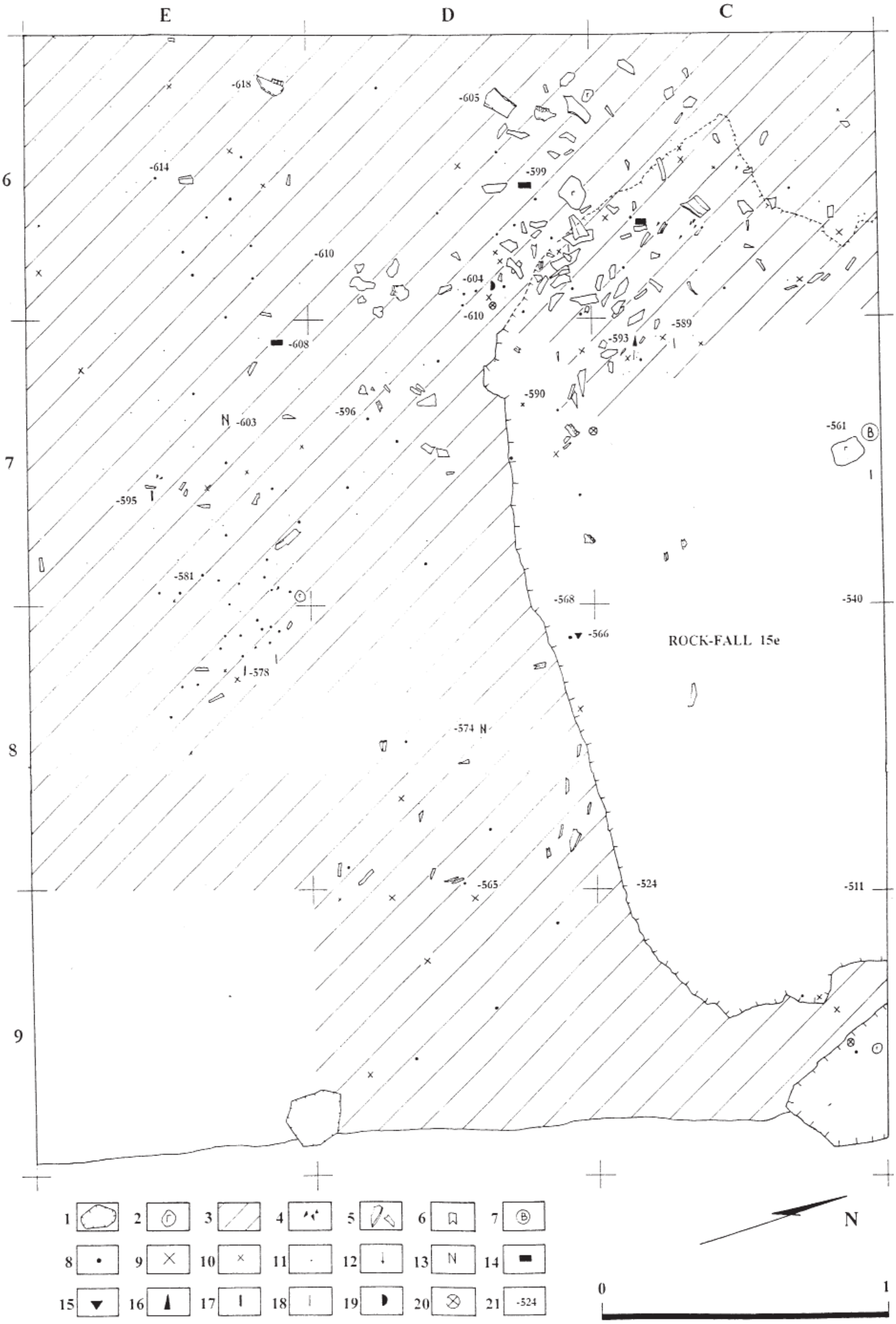

Figure 15 - Siuren I. The 1990s excavation plan of the livng floors of sub-levels Gc2-Gc2a. 1, limestone slabs and éboulis; 2, pebble; 3, spatial distribution of the sub-level finds; 4, charcoal pieces; 5, animal bones; 6, animal tooth; 7, bone tools; 8, flake; 9, blade; 10, bladelet; 11, chip; 12, burin spall; 13, core-like piece; 14, end-scraper; 15, burin; 16, perforator; 17, retouched blade; 18, retouched microlith; 19, notched tool; 20, retouched flake; 21, elevation mark below datum point.

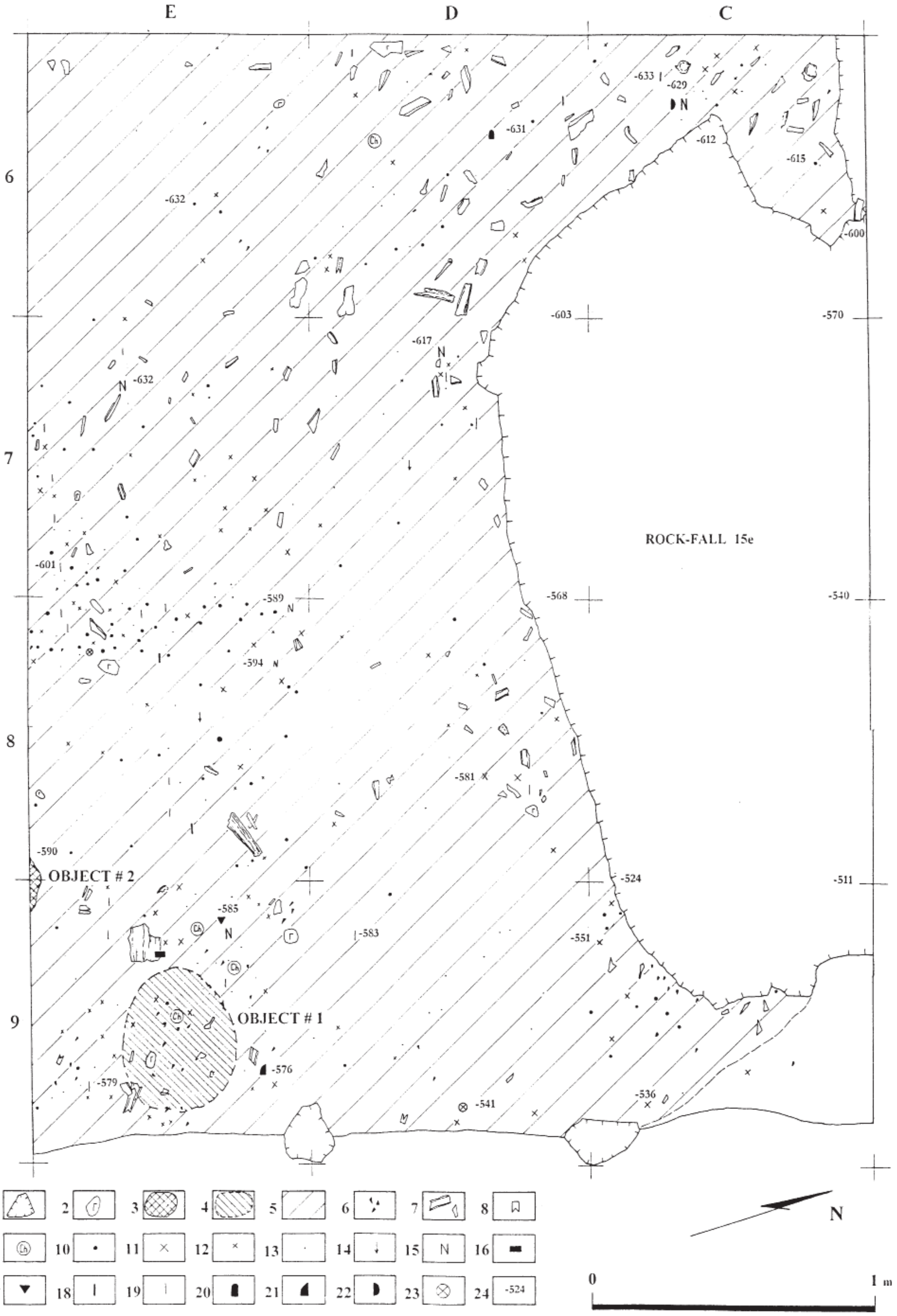

Figure 16 - Siuren I. The 1990s excavation plan of the level Gd living floor. 1, limestone slabs; 2, pebble; 3, fireplace indication; 4, ashy cluster; 5, spatial distribution of the level finds; 6, charcoal pieces; 7, animal bones; 8, animal tooth; 9, ochre; 10, flake; 11, blade; 12, bladelet; 13, chip; 14, burin spall; 15, core-like piece; 16, end-scraper; 17, burin; 18, retouched blade; 19, retouched microlith; 20, side-scraper; 21, convergent tool; 22, notched tool; 23, retouched flake; 24, elevation mark below datum point.

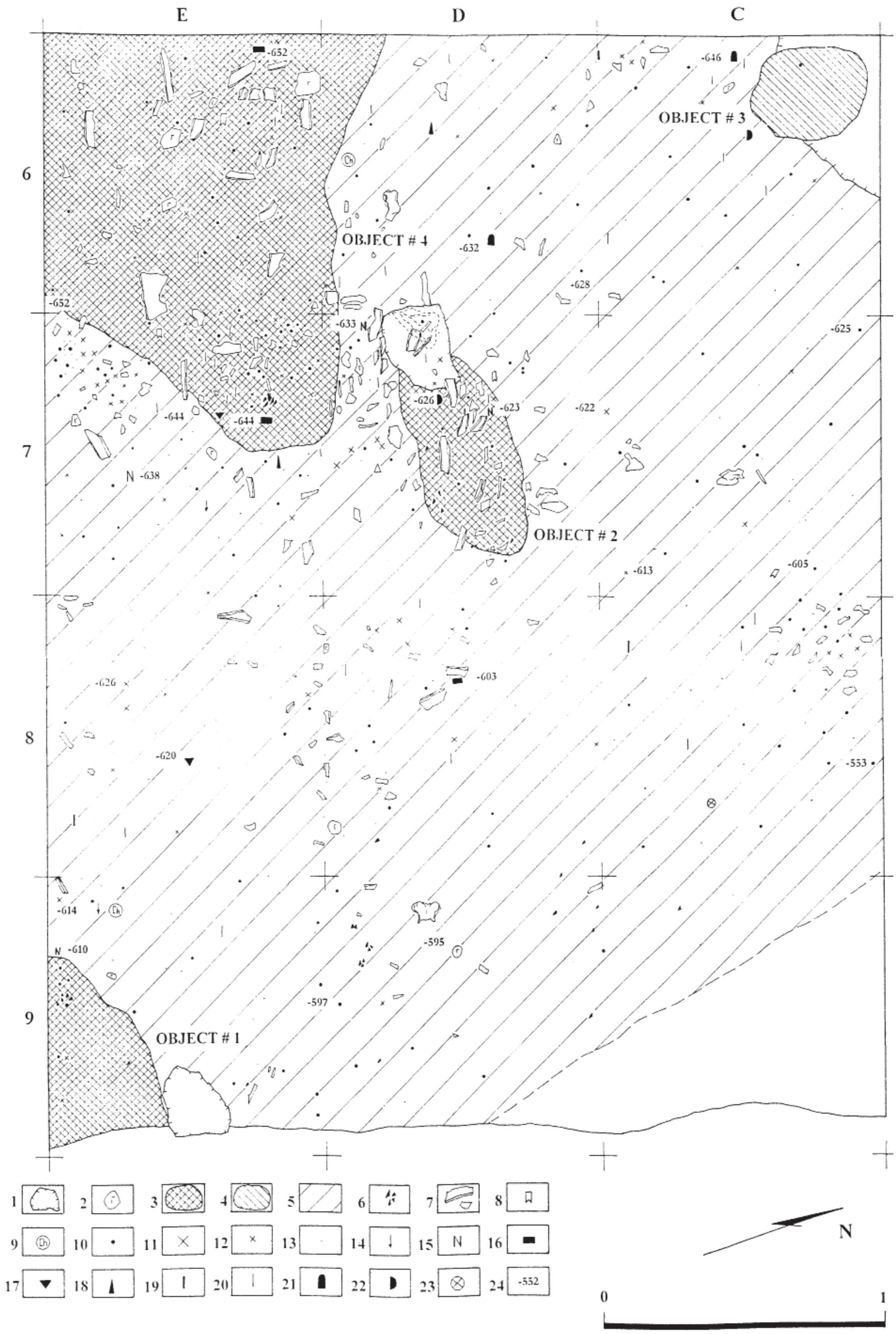

Figure 17 - Siuren I. The 1990s excavation plan of the Unit H living floor. 1, limestone slabs; 2, pebble; 3, fireplace indication; 4, ashy cluster; 5, spatial distribution of the level finds; 6, charcoal pieces; 7, animal bones; 8, animal tooth; 9, ochre; 10, flake; 11, blade; 12, bladelet; 13, chip; 14, burin spall; 15, core-like piece; 16, end-scraper; 17, burin; 18, perforator; 19, retouched blade; 20, retouched microlith; 21, side-scraper; 22, notched tool; 23, retouched flake; 24, elevation mark below datum point.

Sub-level Gb1 is found in the north-eastern part of the excavation area in squares 7, 8, 9-C, D. Only a few artifacts and bones were found outside these squares (fig. 12). There is one feature in the sub-level.

Feature 1 is the large *fireplace* partly located in squares 8, 9-C, the rest outside of the excavation area. The observed part of the fireplace has a semi-ovoid shape 0.92 m long (see Profile IV) and 0.47 m wide. The thickness of the ashy lens is 8 cm. The bottom is concave. The burned sediment is 8 cm thick under the ash.

Sub-level Gb2 is present in the same area as sub-level Gb1, but below it (fig. 13). There is one feature in this sub-level.

Feature 1 is the *ashy cluster* at the border of squares 8, 9-C, D. It has an elongated sub-ovoid shape 0.66 m long and 0.45 m wide. The cluster is naturally limited from the north-west and west by several small limestone slabs. The ashy lens is more than 3 cm thick.

Sub-level Gc1 covered most of the excavation area (fig. 14). The distribution of artifacts is associated with sediments containing abundant ash. There is one feature in this sub-level.

Feature 1 is the *ashy cluster* partly situated in squares 6, 7-C, while the rest is outside the excavation area. The observed part of the zone has a semi-ovoid shape 1.65 m long (see Profile IV) and 0.98 m wide. The ashy lens is 10-15 cm thick.

Sub-level Gc2 is present mostly in the north-western part of the excavation area above the huge limestone slab of the *fourth rock-fall level* (Strata 15e), while **Sub-level Gc2a** is occurred near this slab from south (fig. 15). Both sub-levels are associated with easy ashy sediments, but there are no any special features there.

Level Gd is present around a huge limestone slab and is clearly below level Gc1-Gc2 (fig. 16). The artifacts and faunal remains covered the entire area near the base of the slab. There are two features in this level.

Feature 1 is the *ashy cluster* in square 9-E with an ovoid shape 0.48 m long and 0.4 m wide. The gray ashy lens is 0.5 cm thick.

Feature 2 is the fireplace visible in stratigraphic Profile V at the border of squares 8-E and 9-E. The observed lens of reddish burned sediment in profile is 0.17 m long and more than 1 cm thick.

Level H covered nearly the entire excavation area. There are three features in this level (fig. 17).

Feature 1 is the *fireplace* partly located in the south-eastern corner of the excavation area (square 9-E), continuing into the unexcavated part of the site. As seen in Profile V, the fireplace is represented by a lens of strongly burned reddish clay sediment over 2 cm thick with some small charcoal fragments. Its cross section is visible in Profile V.

Feature 2 is the *fireplace* in square 7-D and has an elongated ovoid shape 0.78 m long and 0.33 m wide. The ashy lens is more than 3 cm thick. The reddish burned clay under the ashy lens is 1 cm thick.

Feature 3 is the *ashy cluster* located in the north-western corner of the excavation area in square 6-C. The ashy zone has an ovoid shape 0.4 m long and 0.34 m wide and 3 cm thick.

Feature 4 is the *fireplace* in the south-western corner of the excavation area in squares 6, 7-D, E, continuing outside of the excavation area. The ashy zone has an irregular shape with a maximum length of 1.5 m and maximum width of 1.25 m. The gray ashy lens is 7 cm thick. The reddish burned clay under the ashy lens is 1 cm thick. Two cross sections of the fireplace are visible in Profiles III and V.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 49-53.

4 - RADIOCARBON DATES FOR THE SIUREN I SEQUENCE

Yuri E. DEMIDENKO & Pierre NOIRET

Twenty-seven charcoal and bone samples from Units F, G and H in Siuren I were sent by members of the 1990s excavation team to different C14 laboratories (Louvain-la-Neuve, Oxford, Groningen and Beta Analytic Inc.) in the 1990s and 2000s. Table 1 gives the results obtained (in stratigraphic order from top to bottom), while table 2 shows the (long) series of samples that failed, with laboratory comments.

Charcoal samples

The dating process of the Siuren I lower (Units H-G) and middle (Unit F) parts of the archaeological sequence began immediately with the site's new excavations undertaken from 1994-1997. During wall cleaning of Bonch-Osmolowski's 1926-1927 trench (sq. 12 B-H) in 1994, three charcoal samples and three ungulate bones were selected for dating of different levels in Units F and G (see Demidenko *et al.* 1998:377). The charcoal samples were sent by M. Otte to the Louvain-la-Neuve laboratory (Belgium) where two dates were obtained: 10,520 ± 150 BP (Lv-2131) for sub-level Fb2 of level Fb1-Fb2 (tabl. 1, #1) and 250 ± 60 BP (Lv-2132) for level Ga (tabl. 1, #5), while the third sample was not dated and sent back to Liège, with the following comment (translated): "*very nice charcoal, but less than 0.5 gr; see AMS*" (letter from Ét. Gilot, Université catholique de Louvain, Unité de Chimie inorganique, analytique et nucléaire, 17 December 1994) (see tabl. 2, #14a). This sample was then sent to Oxford, but with no better result, due to unusual δ^{13}C (-27.1‰) (Clare Owen, fax from the Oxford University Radiocarbon Accelerator Unit, 25 February 1998) (see tabl. 2, #14b).

The dates on charcoal have been considered as being certainly too young for any Upper Paleolithic. They are likely due to the presence of modern plant roots along the 1920s trench walls.

Bone samples

The three ungulate bones were sent by M. Otte to the Oxford laboratory (United Kingdom) and two of the bones contained enough collagen for AMS dating. As a result, the bone sample from sub-level Fb2 of level Fb1-Fb2 yielded the result of 29,950 ± 700 BP (OxA-5155) (tabl. 1, #3) and the bone sample from level Ga was dated to 28,450 ± 600 BP (OxA-5154) (tabl. 1, #6). The bone sample from level Fb2, west section, "*was not dated because the bone gave an unusual δ^{13}C when we combusted it, which implies some sort of contamination or degradation of the collagen. Rather than have an unreliable radiocarbon, we decide to abandon the analysis*" (letter from R.E.M. Hedges, Oxford University Radiocarbon Accelerator Unit, 20 June 1995) (see tabl. 2, #15).

Due to the very unsuccessful attempts in charcoal sample dating, it was been then decided to use ungulate bone samples only for any new AMS dates at Siuren I. The lowermost archaeological subdivision of the site (Unit H) was dated in the late 1990s on an ungulate bone, again by Oxford; the result obtained very similar to the two previous ones: 28,200 ± 440 BP (OxA-8249) (tabl. 1, #12). But the four other samples sent to Oxford at the same time for Units G and H "*all failed to produce dates. A report from the Chemistry laboratory indicates that all of these samples failed to yield sufficient collagen to date*" (letter from D. Jenkins, Oxford University Radiocarbon Accelerator Unit, 12 January 1999) (see tabl. 2, #17, 20, 21 and 25).

State-of-the-art in the late 1990s

On the basis of the three statistically identical Oxford AMS dates, additionally taking into consideration the very rapid sedimentation processes that took place in the rock-shelter during the deposition of these cultural bearing sediments (Bonch-Osmolowski 1934; Gromov 1948; Ivanova 1969, 1983; Chabai 2000, 2004; Demidenko 2000), and the fauna, microfauna and malacofauna data (López Bayón 1998; Markova, this volume; Mikhailesku, this volume), the following geochronological positions have been proposed for the two Paleolithic find complexes from Units H-G and from Unit F (Demidenko 2000, 2002b).

The 1990s Units H-G (corresponding to the 1920s Lower layer) with several successive visits to the rock-shelter by Neandertals of Crimean Micoquian Tradition (with a few finds) and by Early/Archaic Aurignacian of Krems-Dufour *Homo sapiens* (identified through very numerous artifacts), were considered as belonging to Arcy Interstadial (*ca.* 31,000-30,000 BP). The 1990s Unit F (corresponding to the 1920s Middle layer) contains occupations only by *Homo sapiens* of the Late/Evolved Aurignacian of Krems-Dufour type tradition, either at the end of the Arcy Interstadial (ca. 30,000 BP), or, more likely, during the Maisières Interstadial (ca. 29,000-28,000 BP).

After such geochronological interpretations, members of the Siuren I 1990s excavation team continued to accept them (e.g. Demidenko & Otte 2007; Demidenko 2008a, 2008b; Chabai 2004a) being aware, at the same time, of doubts by some colleagues regarding both industrial and geochronological interpretations. On one hand, some Russian and Ukrainian colleagues (e.g. Anikovich 2003; Sapozhnikov 2002, 2005) continued to consider the Siuren I Early/Archaic and Late/Evolved Aurignacian of Krems-Dufour type finds complexes as either uncertain Aurignacoid or Gravettoid-Epi-Aurignacian and Aurignacoid-Epigravettian ones, absolutely rejecting their Aurignacian *sensu stricto* attribution and placing them geochronologically in different sub-periods of the Last Glacial Maximum (22,000-18,000 BP). None of our arguments based on the Siuren I 1990s excavation data (e.g. Chabai 2004a: 27-30; Demidenko 2000, 2002b, 2008a, 2008b; Demidenko & Nuzhnyi 2003-2004) were taken into consideration by the ex-USSR colleagues and it was quite impossible to imagine what else we could do to convince them.

Only the opinions of Western colleagues might help in future to change this "Eastern problem". However, at the moment, most of our Western colleagues either remain silent on the Siuren I Upper Paleolithic complexes after the 1990s excavations in their European Aurignacian-related publications, or actually support some strange interpretations proposed by Anikovich and Sapozhnikov, like the following: "*Siuren 1 (Crimea) (Vekilova 1957; Otte et al., 1996). Level Fb1 = late Aurignacian = 29 550 BP (?) or mixed Mousterian – Epigravettian layer (?)*" (Djindjian *et al.* 2003:42). The "Western problem" is connected to the proposed Siuren I Archaic Aurignacian geochronology. Often verbally accepting the proposed Aurignacian archaeological definitions for Siuren I during different conference paper presentations, including those for the 1990s Units H-G, Early/Archaic Aurignacian of Krems-Dufour type being an actual equivalent for the more common terms such as Aurignacian 0/Archaic Aurignacian/Proto-Aurignacian with Dufour microliths of Dufour sub-type, the vast majority of our Western colleagues were usually not able to agree with our geochronology for these Siuren I Aurignacian finds (Arcy Interstadial and the 1990s two AMS OxA dates around 28,000 years BP). Such a negative opinion is, to some extent, understandable as most of the Proto-Aurignacian assemblages in Western Europe are now usually radiocarbon dated to a period of 37,000-36,000 to 34,000-33,000 BP. Therefore, the Arcy Interstadial time period for the Siuren I Proto-Aurignacian is still "too late" for most of our Western colleagues.

What was (and is) still possible to say regarding the geochronological issue?

The simple answer is that the 30,000-28,000 years BP period is still within the Aurignacian time span and not part of the much younger LGM, as was previously suggested by some Eastern European colleagues. Therefore, it cannot be excluded that *Homo sapiens* with the so-called European Proto-Aurignacian did indeed penetrate into the south of Eastern Europe after their occupation of the southern and middle territories of Western and Central Europe, which could explain why their best-represented site in Eastern Europe, Siuren I, would contain such "late" archaeological levels. Moreover, the vast territories of Eastern Europe certainly have a poor representation of Aurignacian *sensu stricto*, whether *in situ* sites or find spots with abundant and industrially very clear flint assemblages (Demidenko 2004b, 2009), that makes it difficult to evaluate the directions of Aurignacian *Homo sapiens* movements into Eastern Europe.

Unfortunately, the Siuren I Proto-Aurignacian geochronological problem has also automatically led to an almost complete silence on the Siuren I Late/Evolved Aurignacian and its great importance for the entire European Late/Evolved/Recent Aurignacian. Although the most complete understanding at present of this Aurignacian industrial and geochronological stage (ca. 32,000-28,000) has been made on the basis of Western European materials (e.g. Demars 1992; Demars & Laurent 1989; Djindjian 1993a, 1993b, Rigaud 1983, 1993, 2000; Bordes 2005), the Siuren I related Unit F flint finds not only fit perfectly into the French Late/Evolved/Recent Aurignacian data with its "whole carinated piece package" (bladelet "carinated" cores and both carinated end-scrapers and burins), but also with the single 1990s OxA AMS date around 29,000 BP. The Siuren I Unit F Late/Evolved Aurignacian is also characterized by the largest sample of Dufour and pseudo-Dufour microblades of Roc-de-Combe sub-type (68 specimens) for all of Europe. Additional technological studies of the Siuren I materials should contribute significantly to understanding of the European Late/Evolved Aurignacian.

All in all, the Aurignacian data obtained from the Siuren I 1990s excavations have not been much accepted as such by most of our colleagues, either in the East or in the West. Therefore, a new dating program was undertaken. At the end of the 2000s, new possibilities opened to obtain absolute dates, specifically AMS, for Units H-G and F.

Bone artifacts

Bone artifacts are present in both Units F and G (the Unit H assemblage lacks bone artifacts), with five items in F and eight items in G, including two retouchers about which it has been argued (after the site's 1990s excavations; e.g. Demidenko 2000) that they actually belong to Middle Paleolithic (Micoquian) Neandertal occupations, while the other items (five points and an awl) are associated with Upper Paleolithic (Archaic Aurignacian) *Homo sapiens* occupations during the rapid depositional processes of Unit G. As a result, with the dating of these bone artifacts, there was a chance to obtain, not only dates for Unit G, but possibly *separate* dates for the Micoquian and Archaic Aurignacian occupations for Siuren I, Unit G. It was also hoped that if new AMS dates for Unit F were older, even slightly older (ca. 32,000 BP), than the ones from Unit G, this would directly point out to a series of problems with collagen preservation for the Unit G ungulate bones, which we suspected.

The possibility of direct AMS dating of the Siuren I bone artifacts resulted from an agreement with Ph. Nigst (then at the

Max Planck Institute for Evolutionary Anthropology, Leipzig). In December 2009, S. Talamo, a specialist in AMS dating, took samples from five bone artifacts from Unit G and three from Unit F, after use-wear analysis was concluded (see Demidenko & Akhmetgaleeva 2008). Bone sample pretreatment was conducted by her at the Max Planck Institute, with treated samples to be sent later to Oxford for AMS dating. The pretreatment analysis was absolutely disappointing for Unit G: none of the five samples had enough collagen for radiocarbon dating (mail from Ph. Nigst, 12 October 2010). On the other hand, all three samples from Unit F bone tools had both good quantities of collagen and very good C/N ratios, so their "final samples" were sent to Oxford for dating. Results will be published by Demidenko, Nigst and Talamo, and cannot be reproduced here, but fall within the interval of ca. 28,500-26,500 BP (Ph. Nigst, pers. comm.).

More bone samples

In addition to the dating program on bone artifacts, new attempts were done on ungulate bones untreated by Paleolithic humans from Units H, G and F. Most of the fauna from Units H, G and F from the rock-shelter's 1990s excavations was in Paris for zooarchaeological analysis by M. Patou-Mathis, while a few bones from Units H, G and F were also stored at the University of Liège, specifically selected during and immediately after the 1995-1997 excavations for future AMS dating.

So, initially for new dating, eight bones from Paris were sent by M. Otte to Beta Analytic Inc. (Florida, USA) in the first half of 2009 and two bones were determined to having sufficient collagen. The two uncalibrated AMS dates obtained are associated with the rock-shelter's lower cultural bearing sediments: 28,070 ± 190 BP (Beta-260919) for sub-level Gb1 and 30,490 ± 220 BP (Beta-260924) for Unit H. These Beta dates are again in accordance with the previously obtained AMS dates for Siuren I lower and middle cultural bearing sediments.

The six samples that were not dated "*did not yield any separable collagen and cannot at that time be dated*" (mail from Chris Patrick, Beta Analytic Inc, 10 July 2009) (tabl. 2, #16, 18, 22-24 and 26). They came from Units F to H, with four belonging to Unit G.

Bone cross-samples

Next, new dating attempts were made on bones from Liège with the following idea: to obtain two sets of dates in Groningen (the Netherlands) and Oxford, on six samples from three ungulate bones, for Units F, G and H. The three bones were each cut into two parts by P. Haesaerts in December 2009.

Half of the bone from sub-level Fb2 was sent by P. Noiret to Groningen, while the other half was brought by Ph. Nigst to Leipzig (Max Planck Institute) for pretreatment, before being sent to Oxford. For this specific sample, the two dates obtained are almost identical: 30,910 ± 240 BP in Groningen (GrA-46552; C/N: 3.6) (tabl. 1, #4) and close to 30,300 in Oxford (Ph. Nigst, pers. comm.; to be published by Demidenklo, Nigst and Talamo). And Haesaerts's comment about the cutting process was that only this bone from Unit F "smelled good", indicating (1) that its organic component was well preserved and (2) that the two other bones (not "smelling") were less well preserved, probably mineralized. And, indeed, no better results than previously were obtained for Units G and H…

Pretreatment in Leipzig for the bones from Units G and H indicates "*too few collagen preserved*" (mail from Ph. Nigst, Max Planck Institute for Evolutionary Anthropology in Leipzig, 9 August 2010), whereas Noiret sent the other parts of these two bones to Groningen. The bone from sub-level Gb2 "*did not contain enough carbon and could not be measured*" (letter from J. van der Plicht, Rijksuniversiteit Groningen, Centrum voor IsotopenOnderzoek, 1 June 2010). The bone from Unit H gave a result, but it certainly indicates too young an age: 22,040 ± 120 BP (GrA-46553) (tabl. 1, #11). Having not had a "good smell" during the cutting process could indicate a low collagen content for these samples from Units G and H. We also have to say that J. van der Plicht "*can not find anything wrong with the 22k date. It is simply measured like this. So either it is truly that old, or it is contaminated somehow, or the association is wrong.*" And when asked about the C/N ratio, van der Plicht added: "*We do not have Nitrogen numbers for this bone; we had used all collagen for the C isotopes (incl. dating). The C content (C%) is not great but acceptable, according to experience. But not enough for nitrogen, hence we do not have C/N. Perhaps that is a bad sign and the bone indeed is not well preserved […]. We only have the complete analysis for the [Fb2] sample, which appears to be the only acceptable sample for this Siuren series*" (mail from J. van der Plicht, 27 January 2011). And the words "not well preserved" means that "*the organic yield was lower than for a 'normal' bone*" (mail from J. van der Plicht, 22 March 2011).

Considering the two results of 29,000-30,000 BP obtained at that time for Unit F, it is not possible to consider that the Unit G could be "truly that old" (*i.e.* 22,000 BP). Considering the consistency of the lithics and the amount of failed samples for Unit G and Unit H due to low collagen content (see tabl. 2), it is quite unlikely that the association is wrong. So, van der Plicht's third explanation is our favorite: the samples are themselves problematic, contaminated one way or another, probably poorly preserved in both Units G and H, and with contamination not successfully removed during pretreatment, as we suspect when considering the last series of bone samples described below.

"Last" bone samples

Finally, a last (almost desperate) attempt to obtain results took place in 2011. P. Noiret sent another set of five bone samples (stored in Liège since the 1990s excavations) to Beta Analytic, which yielded four results, but no clear solution to the question of the age of Siuren I's industries. The sample from sub-level Fb2 provided the following result: 29,440 ± 200 BP (Beta-293364) (tabl. 1, # 3), in remarkable accordance with the other results obtained earlier for this sub-level.

But the three samples from sub-unit Gb2 all gave younger ages: 13,020 ± 70 BP (Beta-293363), 19,680 ± 100 BP (Beta-293661) and 22,220 ± 120 BP (Beta-293362) (tabl. 1, # 7-9). The comment from Beta for these four samples says, surprisingly, that "*they each provided plenty of carbon for accurate measurements and all the analyses proceeded normally*" (letter from D. Hood, Beta Analytic

Inc., 10 March 2011). And the fifth sample (sub-unit H; tabl. 2, #27) again "*did not yield any separable collagen and cannot at this time be dated*" (mail from Chr. Patrick, Beta Analytic Inc., 25 February 2011). This last attempt thus provided no reliable data for Units G and H.

Discussion

It is still possible to continue dating other ungulate bones from Units G and H at Siuren I, but is it worth it? We can, at any rate, discuss the series of existing dates for Unit F, on one hand, and Units G and H, on the other hand.

The Unit F AMS dates can be presented in stratigraphic order from top to bottom of the archaeological level sequence (tabl. 1), remembering that some artifacts were subject to vertical movement within the unit, as shown by refitting of the Unit F flints by Demidenko. So, all of the AMS dates for the Unit F sequence are between ca. 31,000 and 26,500 uncal BP, and it is probably possible to narrow this range to ca. 31,000-28,000 BP if we consider only sub-level Fb2. These dates are fully in accordance with the known Western European Late/Evolved/Recent Aurignacian, when, of course, the dates of such are reliable.

The AMS dates for the site's lower cultural bearing sediments (Units H and G) are less consistent, but still merit consideration. The dates, when considered from the bottom to the top of the sequence, show the following two-fold results. On one hand, the dates are virtually the same as those in Unit F, being between 30,000 and 28,000 uncal BP; thus, the already postulated rapid sedimentation processes at Siuren I rock-shelter for Units H through F might have further support.

On the other hand, it is worth recalling that the five bone artifacts from Unit G had insufficient collagen for AMS dating, whereas all of the Unit F bone artifacts had sufficient collagen for dating. Similarly, only two bones from the faunal remains gave no results for Unit F, while this was the case for eight bones from Unit G and three from Unit H (see tabl. 2). This may indicate overall poor bone preservation in the Units H and G deposits in terms of collagen content, which is why the AMS dates obtained may be too young. If this is true, then indeed the Siuren I Proto-Aurignacian find complexes should be older, perhaps as in Western Europe, somewhere between 37,000-36,000 to 34,000-33,000 BP.

The stratigraphy of the Siuren I/Units H-F sediments allows us to put forward a hypothesis on such AMS dating results for Unit F, on one hand, and Units H-G, on the other hand. It is possible that some difference in the presence of limestone *éboulis* influenced bone preservation throughout the Siuren I archaeological sequence (Yevtushenko, this volume). The Unit F deposits, excavated in the 1990s in a 12 sq.m. area, are characterized by medium to low occurrences of angular limestone *éboulis* within varying silty clayey and loamy sandy loose sediments (lithological strata 10 through 12). In contrast, Unit G deposits (lithological strata 14 through 16) for the same 12 sq.m excavated in the 1990s, are mainly characterized by the presence of very numerous angular limestone *éboulis* within different sandy sediments. Accordingly, limestone *éboulis* are much more common within Unit G deposits than in Unit F and may have had some influence on ungulate bones. At the same time, the single archaeological level (lithological stratum 17) in Unit H is separated from the overlying Unit G sediments by a thick and solid limestone block, and seems much more similar to the Unit F sediments than to Unit G, identified within a dark yellowish-brown clay with rare limestone *éboulis*. Thus, the "bad" limestone *éboulis* might play some role for Unit G dating, but not for Unit H.

Final considerations

Of course, there is a question – what can be done to make the absolute chronology for Siuren I, Units H and G clearer? It is quite probable that we should change the datable material, which is not at all a simple solution, as we will see below.

First, there was some discussion between Yu. Demidenko and D. Richter (Max Planck Institute for Evolutionary Anthropology, Leipzig) about the possibility of using TL dating at Siuren I. The TL solution, however, cannot be applied as thick burnt flints are virtually absent in assemblages from Units H and G. At best, only a couple of flints have a maximum thickness of about 5 mm. Possible future excavations at Siuren I, which would be in a very limited area (*ca*. 2-3 sq.m.), would probably not recover thick burnt flints there, given their absence in the 1990s 12 sq.m excavations.

Second, these possible future and limited excavations might lead us to find samples of material that was in the 1990s the "good datable material" – charcoal. Most of the 1990s archaeological levels in both Unit F and Units H-G contain fireplaces and/or hearths, in addition to some ashy clusters, although, most important for this subject, only hearths in level Fb1-Fb2 (actually, in sub-level Fb2) contained definite charcoal pieces, while, aside from only one fireplace in Unit H (object #1) with some small charcoal fragments, the hearths and fireplaces in the levels of Units H and G lacked charcoal, having only ashy fill. Accordingly, both dating of ash and chances of finding good charcoal pieces in hearths/fireplaces during any new limited excavations at the site do not seem to be very realistic. The possibility to have in the future two sets of AMS dates – on charcoal and bone samples – for the site's lower cultural bearing sediments for comparison appears to be unlikely.

Third, the 1990s excavation find complexes of Units H through F also contain, aside from beads of fossil marine shells *Apporhais pes pelicani* in Unit G, some shell beads of freshwater river mollusks, terrestrial snails and/or marine mollusks that were contemporaneous with Palaeolithic human occupations during sedimentation processes of these archaeological units. These shell beads can be directly AMS dated. Such an attempt is worth trying for Siuren I as it is not reliant on new excavations at the rock-shelter; some very new shell AMS dates show very promising results (see Douka, in press, for level IX of Ksar Akil, Lebanon).

#	Unit	Level	Year excav.	Square	Material	Date BP	Sigma	Laboratory	Year process.	δ 13C (0/00)
1	F	Fb2	1994	profile II of trench 1927	charcoal	10520	150	Lv-2131	1995	unknown
2	F	Fb2	1995	8E	bone	29540	200	Beta-293364	2011	-19,1
3	F	Fb2	1994	profile I of trench 1927	bone	29950	700	OxA-5155	1995	-19,2
4	F	Fb2	1995	8E	bone	30910	240	GrA-46552	2010	-19,64
5	G	Ga	1994	profile I of trench 1927	charcoal	250	60	Lv-2132	1995	unknown
6	G	Ga	1994	profile II of trench 1927	bone	28450	600	OxA-5154	1995	-19,2
7	G	Gb1	1995	8C	bone	28070	190	Beta-260919	2009	-20,0
8	G	Gb2	1995	8C	bone	13020	70	Beta-293363	2011	-20,0
9	G	Gb2	1995	8C	bone	19680	100	Beta-293361	2011	-19,6
10	G	Gb2	1995	8C	bone	22220	120	Beta 293362	2011	-20,6
11	H	H	1997	6E	bone	22040	120	GrA-46553	2010	-20,0
12	H	H	1997	6D	bone	28200	440	OxA-8249	1998	-17,8
13	H	H	1997	6D	bone	30490	220	Beta-260924	2009	-17,7

Table 1 - Siuren I. Radiocarbon datings.

#	Unit	Level	Year excav.	Square	Material	Laboratory	Year process.	Comment
14a	F	Fb1	1994	profile I of trench 1927	charcoal	Louvain	1995	too small
14b	F	Fb1	1994	profile I of trench 1927	charcoal	Oxford	1995	OxA-6987 ; δ 13C = -27,1
15	F	Fb2	1994	profile II of trench 1927	bone	Oxford	1995	unusual δ 13C
16	F	Fb2	1995	8C	bone	Beta	2009	not any separable collagen
17	G	Gb2	1996	6C	bone	Oxford	1998	low collagen
18	G	Gb2	1996	7C	bone	Beta	2009	not any separable collagen
19	G	Gb2	1995	8C	bone	Groningen	2010	not enough carbon
20	G	Gc1	1996	8C	bone	Oxford	1998	low collagen
21	G	Gc1	1996	8D	bone	Oxford	1998	low collagen
22	G	Gc1	1996	8D	bone	Beta	2009	not any separable collagen
23	G	Gc2a	1996	7D	bone	Beta	2009	not any separable collagen
24	G	Gd	1996	6D	bone	Beta	2009	not any separable collagen
25	H	H	1996	9D	bone	Oxford	1998	low collagen
26	H	H	1997	6D	bone	Beta	2009	not any separable collagen
27	H	H	1997	6E	bone	Beta	2011	not any separable collagen

Table 2 - Siuren I. Unsuccessfull samples.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 55-63.

5 - ZOOARCHAEOLOGICAL ANALYSIS OF THE FAUNAL ASSEMBLAGES FROM SIUREN I, CRIMEA (UKRAINE)

Jessica MASSÉ & Marylène PATOU-MATHIS

Résumé

L'abri de Siuren-I, situé en Crimée (Ukraine), démontre une longue séquence archéologique. Les analyses technologiques et typologiques des artéfacts lithiques découverts dans les Unités F, G et H confirment la présence en Europe orientale de deux industries aurignaciennes différentes, réalisée par les Hommes anatomiquement modernes autour de 28500 ans BP. La faible proportion d'outils micoquiens, ayant pour artisans les Néanderthaliens, trouvée dans les unités G et H, suggère une alternance d'occupations par des Néanderthaliennes et des Hommes anatomiquement modernes (Demidenko 2000). Les informations qu'offre le site de Siuren-I sont donc de première importance en ce qui concerne la possible coexistence de deux groupes humains auteurs d'industries différentes, lors de la période de transition entre le Paléolithique moyen et le Paléolithique supérieur. Les analyses des restes fauniques, d'abord taphonomiques, attestent d'une accumulation anthropique des vestiges osseux et suggèrent une alternance relativement rapide des occupations humaines. Les études archéozoologiques suggèrent une acquisition opportuniste des proies dans un environnement qui devient plus forestier vers le haut de la séquence et un traitement différentiel des carcasses selon la taille de l'animal, et ce, quelle que soit l'Unité archéologique. Le site semble avoir servi à plusieurs reprises de campements temporaires. La continuité dans les stratégies de subsistance suggère une homogénéité comportementale entre les Préhistoriques du Paléolithique moyen et ceux du Paléolithique supérieur.

Mots-clés : Archéozoologie, Micoquien, Aurignacien, *Saiga tatarica.*

Abstract

Siuren-I is a stratified rockshelter situated in Crimea (Ukraine) with a long archaeological sequence. Technological and typological analyses of the lithic artefacts discovered in units F, G and H confirm the presence of two different Aurignacian assemblages, produced by anatomically Modern Humans, around 28 500 yrs BP in Eastern Europe. The small proportion of Micoquian tools, attributed to Neanderthals, found in units G and H, suggests a succession of Neanderthal and modern human occupations (Demidenko 2000). The information that the site of Siuren-I can provide is important to answer the questions raised by the possible coexistance of the two authors of those different industries, in the transitional period between the Middle and Upper Palaeolithic in Europe. The analysis of the faunal remains, beginning with taphonomic analyses, attests to the anthropic nature of their accumulation and suggests a relatively fast alternation of the human occupations. The archaeozoological studies propose an opportunistic acquisition of prey and a differential treatment of the carcasses according to their size, and this, throughout the archaeological sequence. The site seems to have been used, more than once, as temporary camp. Continuity in the strategies of subsistence suggests a behavioral homogeneity between the Middle Palaeolithic people and Upper Palaeolithic people.

Keywords : Archaeozoology, Micoquian, Aurignacian, *Saiga tatarica*

Introduction

Archaeological data concerning the Middle to Upper Paleolithic transition, around 30,000 BP in the Crimea (Ukraine) suggest a sporadic occupation by anatomically modern humans. Indeed, while 34 Neandertal sites have been discovered, only two stratified sites, Buran-Kaya III and Siuren I, show the presence of AMH in the Crimea (Chabai 1998) (fig. 1). Their study is thus of critical importance to understand the behavior of the last Neandertals and the first anatomically modern humans in Eastern Europe and their possible co-existence.

The ultimate goal of this study is to demonstrate the differences and/or similarities between the last Neandertals and the first Homo sapiens behavior by using the the zooarchaeological analyses. We present here the results obtained from the faunal material of Siuren I, a site in southwest Crimea. Discovered in 1879-1880, this rock shelter was excavated several times: from 1926 to 1929; 1981-1982 and in 1994 and 1997. The final season revealed three in situ Units, separated by limestone-rich horizons, evidence of roof-fall. Within a thickness of about one meter, nine levels have been identified: four in Unit F (Fa1 and 2, Fa3, Fb1 and 2 and Fc), four in Unit G (Ga, Gb1 and 2, Gc1

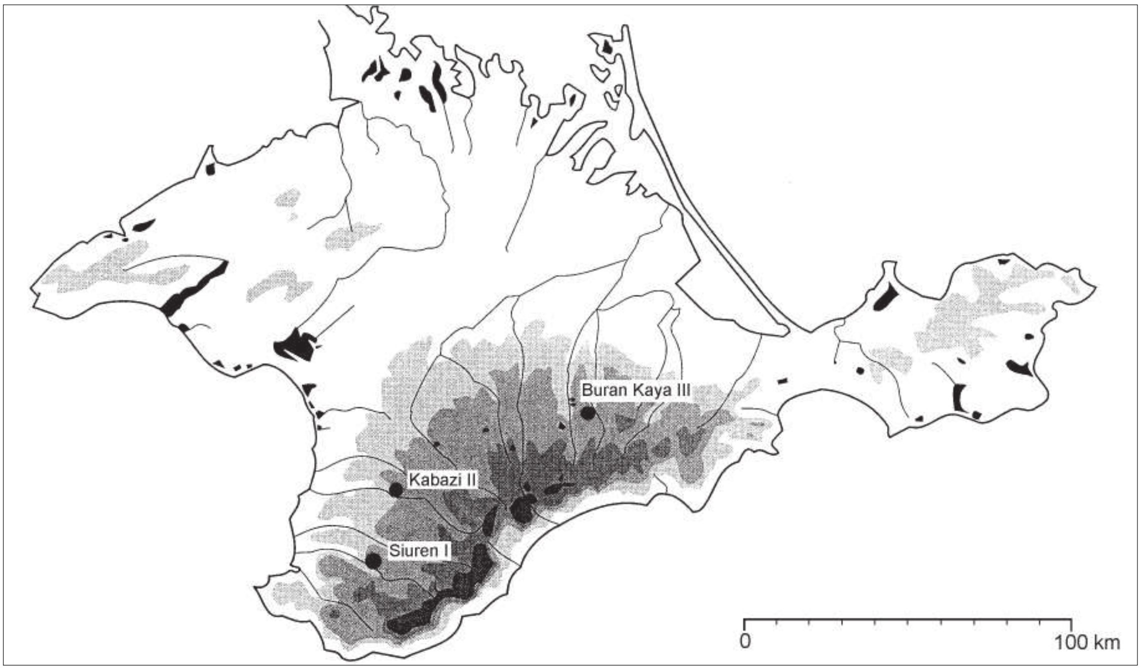

Figure 1 - Upper Paleolithic sites in the Crimea (Ukraine) (in Chabai 2000).

and 2, Gd) and one in Unit H. Radiometric dates place these different occupations between 31,500 and 27,000 BP, during the Arcy (Unit G) and the Maisières (Unit F) Interstadials. The lithological strata indicate a rapid sedimentation rate, with three meters of deposits accumulating over a period of 2-4000 years (Pettit 1998, 1999 in Demidenko & Otte 2000-2001) (tabl. I). Taphonomic analyses of the faunal material from Units F, G and H have enabled reconstruction of the paleoecological context in which Neandertals and modern humans evolved during this transition period and have confirmed the anthropic nature of the faunal accumulations. In addition, paleoethnographic analysis has led to the formulation of hypotheses related to subsistence behavior, acquisition and treatment of prey, and to site function.

The site of Siuren I is located at the crossroads of two topographically distinct regions: the foothills of the Crimean Mountains and the steppe. The diversity of species present in Units F, G and H also attest to a mosaic environment. While the presence of horse (*Equus caballus*), saiga antelope (*Saiga tatarica*) and bison (*Bison priscus*) confirm the proximity of open areas, red deer (*Cervus elaphus*) and megaloceros (*Megaloceros giganteus*) (discovered in levels Ga, Gb1-Gb2 and Gc1-Gc2) show evidence of a wooded environment. In addition, the lack of Cervidae in level Gd and Unit H, and the increase of red fox (*Vulpes vulpes*) in relation to arctic fox (*Alopex lagopus*) starting with level Gb1-Gb2, suggest climatic warming toward the top of the sequence (level Ga and Unit F) (fig. 2). Unit H, based on dates, was probably formed during the stadial phase preceding the Arcy Interstadial.

Results of taphonomic analysis

The faunal material from the three Units is represented by more than 14,000 bones, of which more than 85% are Indeterminate fragments (tabl. II).

Unit F

It is important to mention that a preliminary analysis of the faunal assemblage from Unit F was carried out by López Bayón in 1996 and 1998. For the present study, few bones belong to this Unit (NR = 175), which limits data interpretation. However, the analysis of bone surfaces revealed taphonomic differences between each level.

The fauna from the assemblages in sub-horizon Fa3 and level Fb1-Fb2 are highly fragmented. In fact, around 75% of the fragments are less than 20 mm long. For level Fc, around 60% of the bones have a maximum length between 20 and 50 mm. Having only 19 preserved bones, this level is extremely poor. (tabl. III). Only the fauna discovered in level Fb1-Fb2 show evidence of weathering. The combination of crackling, desquamation and scaling correspond to stage 2 as defined by Behrensmeyer (1978) and involves burial after a relatively short

Units	Levels	Square meters excavated	Thickness (cm)	Soil composition
F	a1-a2			
	a3		10	Clay, éboulis
	b1-b2	10	10	Silt, sand and éboulis
	c	2	3	Clay, limestone, sandstone, quartz and éboulis
G	a	12	10	Sand, limestone
	b1-b2	12	25	Limestone,éboulis
	c1-c2	12		Limestone
	d	12	7	Sand, éboulis
H		12	4	Clay

Table I - Summary of chronostratigraphic and lithological contexts of Siuren I.

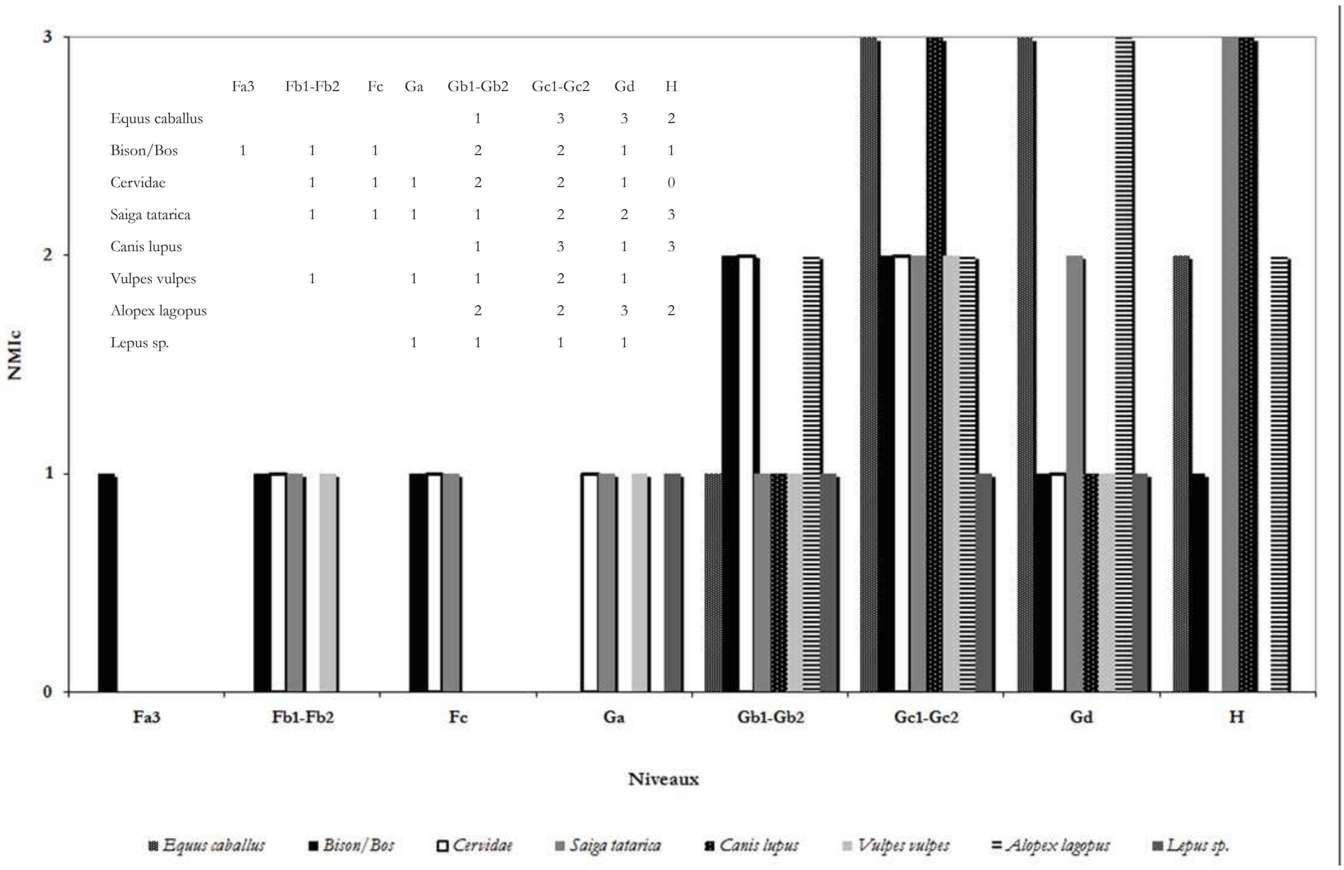

Figure 2 - Minimum number of some species for Units F, G and H at Siuren I.

period exposed to open air. These remains are also the only ones to show biological alterations. Vermiculations resulting from the action of plant rootlets have been identified which suggests a humid climate during the formation of this level (Auguste 1994). The fauna from level Fc, in turn, present so many dissolution pits that observation of other alterations is impossible (fig. 3).

Unit G

The faunal remains from the different levels in Unit G are well preserved and their surfaces have few alterations. However, the degree of fragmentation is important with more than 60% of the bones having a length under or equal to 20 mm (tabl. III). Weathering traces are relatively rare.

Concerning the bones from levels Ga and Gb1-Gb2, the combination of crackling, desquamation and scaling correspond to stage 2, suggesting a fairly rapid burial. For levels Gc1-Gc2 and Gd, the proportion of traces linked to climato-edaphic phenomena is relatively low, reflecting less intense action and shorter length of exposure to air than for the preceding two levels. The high proportion of remains with traces of dissolution and percolation (deposits of manganese and iron oxides), especially for level Gc1-Gc2, indicate a fairly humid environment (Auguste 1994) (fig. 4). The vermiculations left by plant rootlets are more common in level Gd and in square meters 8E and 9E. Evidence of carnivore activity was observed on only 15 bones, four of which are from level Gb1-Gb2 (on the root of an upper wolf canine, a saiga antelope phalange, and a tibia and diaphysis of a long bone of unidentified large mammal). Nine other traces were discovered on bones in level Gc1-Gc2 (on a tooth, a first and a second saiga antelope phalanges, three metatarsal fragments, a humerus and a second phalange of bovines, as well as on a diaphysis of a long bone of an unidentified large mammal). Finally, in level Gd, two marks left by carnivores were

	F					G						H	
	Fa3	Fb1-Fb2	Fc	F	%	Ga	Gb1-Gb2	Gc1-Gc2	Gd	G	%	H	%
NRDt	1	105	9	**115**	**65,71**	20	396	560	354	**1330**	**11,67**	**280**	**10,35**
NRDa		2		**2**	**1,14**	4	12	186	57	**259**	**2,27**	**146**	**5,4**
NRI	43	5	10	**58**	**33,14**	236	1805	5583	2186	**9810**	**86,06**	**2278**	**84,25**
NRT	**44**	**112**	**19**	**175**	**100**	**260**	**2213**	**6329**	**2597**	**11399**	**100**	**2704**	**100**

Table II - Composition of the faunal assemblages from Units F, G and H at Siuren-I. NRT: Total Number of Remains; NRI: Number of Indeterminate Remains; NRDa: Number of Anatomically Determinate Remains; NRDt: Number of totally Determinate Remains.

Figure 3 - Right cubonavicular of saiga antelope with traces of dissolution, level Fc at Siuren I Unit G.

Figure 4. Unidentifiable bone splinters showing evidence of percolation, level Gc1-Gc2 at Siuren-I Unit H.

identified on a red fox tibia and an ulna of indeterminate fox. Moreover, traces of ochre were observed on eight bones: two from level Ga (on saiga antelope cranial fragments), one from Gb1-Gb2 (on a diaphysis of a long bone from unidentifiable large mammal), one from Gc1-Gc2 (on a medium-sized mammal rib) and four from Gd (on ribs of a hare, a bovine, and a medium and a large mammals).

Unit H

As in Unit G, the fragmentation of bones in Unit H is important. Nearly 70% of the bones have a maximum length of less than 20 mm and more than 96% less than 50 mm (tabl. III). Few bones show climate-edaphic alterations, exposure to open air was even shorter than for the material in Unit G. The main alteration agent is water, in a proportion similar to that in Unit G. Regarding biological agents, plants altered a quarter of the material while no traces of carnivores were found. Wear due to movement is sporadic. Traces of ochre were observed on a rib of a large mammal.

Prey acquisition

The taxonomic determination and quantification of faunal remains have enabled us to estimate the minimum number of individuals present at the site (MNI), as well as the population structure (age, sex and seasonality at death). The results of these analyses show that the occupants of Siuren I hunted a limited number of individuals belonging to seven different species. A limited exploitation of the surrounding resources suggests that, in each level, this site was either a location of recurrent short occupations or a base camp for a reduced number of people.

Unit F

As mentioned above, a preliminary analysis of part of the faunal assemblage from Unit F was carried out by López Bayón. Having only raw quantitative results available for NRT (Total Number of Remains; Fa=310; Fb1-Fb2=1980; Fc=41), only our results were considered for interpretations (tabl. IV). The small size of the sample clearly limits data interpretation. Indeed, only a single bovine tibia could be identified in Fa3. Levels Fb1-Fb2 and Fc yielded remains of saiga antelopes, bovines and red deer. In addition, red fox was identified in Fb1-Fb2 (Tabl. V). The rarity of data concerning the taxa and the population structure prevents any formulation of hypotheses related to the subsistence behavior of the occupants of Unit F.

Unit G

Levels Ga and Gb1-Gb2, combined because of the difficulty in isolating them, have yielded 15 individuals (aside from rodents and birds; tabl. V). Based on population structure, preservation of the anatomical elements and human traces, it seems that two saiga antelopes (an adult and a mature adult), a megaloceros (a mature adult), two bovines (a sub-adult and an adult sensu lato) and an arctic fox (an adult) were hunted. A horse (an adult, likely a pregnant female given the presence of two fetal bones), a bovine and a cervid (an adult sensu lato), were also hunted or scavenged. As for the wolf, red fox, arctic fox and hare, it could

	F						G								H	
	Fa3		Fb1-Fb2		Fc		Ga		Gb1-Gb2		Gc1-Gc2		Gd			
Classes	NRT	%	NRT	%	NRT	%	NRT	%	NRT	%	NRT	%	NRT	%	NRT	%
>10mm	27	61,36	63	56,25	1	5,26	82	31,66	796	36,38	1842	29,15	877	33,14	874	34,05
10>20mm	12	27,27	22	19,64	3	15,79	127	49,03	762	34,83	2185	34,58	855	32,31	914	35,61
20>50mm	4	9,09	17	15,18	11	57,89	48	18,53	558	25,5	2035	32,21	823	31,1	679	26,45
50>100mm			8	7,14	3	15,79	2	0,77	66	3,02	240	3,8	89	3,36	92	3,58
>100mm	1	2,27	2	1,79	1	5,26			6	0,27	16	0,25	2	0,08	8	0,31
TOTAL	44	100	112	100	19	100	259	100	2188	100	6318	100	2646	100	2567	100

Table III - Distribution of the faunal assemblages from Units F, G and H at Siuren-I according to the maximum length (in Massé, 2008). NRT: Total Number of Remains.

not be determined whether their presence was intrusive or anthropic. In Gc1-Gc2, the presence of 19 individuals was calculated (aside from rodents and birds; Table V). Animals likely hunted include: two saiga antelopes (an adult and a mature adult male), three horses (a juvenile, one 5-7 years old and one 9-10 years old), two bovines (a juveniles and an adult sensu lato), a megaloceros (a sub-adult), a red fox, an arctic fox and a hare. The presence of two bones from a fetus aged between 230-300 days indicate that one of the adult horse, killed during winter, was a pregnant female (fig. 5). A red deer (adult *sensu lato*) was either hunted or scavenged. Foxes are likely intrusive, as is a small carnivore (mustelid?). The origin could not be determined for the three wolves (a juvenile and two adults, including one female). Finally, for Gd, 13 individuals were estimated (aside from rodents and birds; tabl. V). Two saiga antelopes (an adult and a mature adult), a bovine (adult sensu lato) and an arctic fox (adult female) were probably hunted. Three horses (one 3-4 years old, one 5-6 years old and one around 10 years old) and a cervid (very young adult) were either hunted or scavenged. The origins of the wolf, red fox, two arctic foxes and the hare remain unidentified.

Unit H

Of the 12 individuals in Unit H (aside from rodents and birds; tabl. VI), three saiga antelopes (a juvenile, an adult and a mature adult), a bovine (an adult sensu lato), and an arctic fox (an adult) were probably hunted. Two horses (a juvenile and an adult) were either hunted or scavenged. The two other arctic foxes and the three wolves seem intrusive.

Prey processing

During analysis of the fauna from the different levels of Siuren I, a differential representation of anatomical elements according to species, particularly by species size, was observed. At an archaeological site, an important deficit may result be due to several factors: differential preservation, the action of climato-edaphic

Figure 5 - Diaphysis of a femur of an equid fetus, level Gc1-Gc2 at Siuren-I.

agents, the arrival of carnivores after a human occupation, as well as the human occupants themselves. Statistical tests on the remains of saiga antelopes (Massé, 2008), the most abundant species in Units G and H, show the lack of correlation between the percentage of UAM and mineral density of the bone (Lyman 1994). Thus, the frequency of the different anatomical elements present in levels Gb1- Gb2, Gc1-Gc2 and Gd, as well as in Unit H do not result from differential preservation. In addition, taphonomic analyses have shown that the most important agent of climato-edaphic alteration was percolating water and that disturbance of the site by carnivores was minor (the rock shelter was not used as a den). By contrast, we observed, in each level, traces of human origin: butchery striae, fracture impacts, and evidence of burning. The faunal assemblages of Units G and H are incontestably of human origin; therefore hypotheses concerning carcass treatment for most of the herbivores, some of the foxes and a few hares could be proposed.

Unit F

Traces due to human breakage of the bones were identified on a few fragments belonging to each of the three levels in Unit F. In addition, nearly all of the bones in level Fa3 are calcined. These observations provide further support for the human origin of Unit F, however, the rarity of faunal material studied limits the analysis related to patterns of prey treatment.

	Fa3			Fb1-Fb2			Fc		
TAXA	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Bovinae(Bison/Bos)	1	1	1	2	2	1	1	1	1
Cervus elaphus				99	7	1	1	1	1
Cervidae				2	2				
Saiga tatarica				1	1	1	9	9	1
Sub-Total Ungulates	**1**	**1**	**1**	**105**	**12**	**3**	**11**	**11**	**3**
Vulpes vulpes				1	1	1			
Sub-Total Carnivores				**1**	**1**	**1**			
TOTAL	**1**	**1**	**1**	**106**	**13**	**4**	**11**	**11**	**3**
Artiodactyla				1					
Large Mammals				1					
TOTAL	**1**	**1**	**1**	**107**	**13**	**4**	**11**	**11**	**3**
NRI	**43**			**5**			**8**		
NRT	**44**			**112**			**19**		

Table IV - Minimum number of identified elements and individuals in the faunal assemblages from Unit F at Siuren-I (in Massé 2008). NR: Number of Remains; MNE: Minimum Number of Elements; MNIc: Minimum Number of Individuals by Combination; NRT: Total Number of Remains; NRI: Number of Indeterminate Remains; NRDa: Number of Anatomically Determinate Remains.

	Ga			Gb1-Gb2			Gc1-Gc2			Gd		
TAXA	NR	MNE	MNIc	NR	MNE	MNIc	NR	MNE	MNIc	NR	MNE	MNIc
Equus caballus				6	5	1	44	23	3	23	9	3
Bison/Bos				121	26	2	25	11	2	24	12	1
Megaloceros giganteus				91	8	1	34	19	1			
Cervus elaphus				27	3	1	4	3	1			
Cervidae	3	2	1							2	2	1
Bovinae/*Megaloceros*							3	1				
Saiga tatarica	11	9	1	67	28	1	176	93	2	170	52	2
Sub-Total Ungulates	14	11	2	312	70	6	286	150	9	219	75	7
Canis lupus				5	5	1	50	38	3	5	5	1
Vulpes vulpes	1	1	1	3	3	1	21	18	2	6	5	1
Alopex lagopus				12	12	2	46	42	2	59	41	3
Vulpinae	1	1		31	16		111	33	1	44	13	
Carnivores							1	1	1			
Sub-Total Carnivores	2	2	1	51	36	4	229	132	9	114	64	5
Lepus sp.	1	1	1	1	1	1	12	11	1	9	7	1
Lepus/Vulpinae							3	2		37	15	
TOTAL	17	13	4	364	107	11	530	295	19	333	161	13
Artiodactyla	1	1					13	1				
Large Mammals	2	2		5			72			23		
Medium Mammals				1			75			13		
Small Mammals	1	1					17			18		
Indeterminate Mammals				6	2		9	7		3		
NRDa	4	4		12	2		186	8		57		
TOTAL Mammals (aside from rodents)	21	17	4	376	109	11	716	303	19	390		13
Rodents	2	2	1	8	8	1	10	9	2	8	7	1
Birds	1	1	1	24	12	2	20	14	3	13	9	1
TOTAL	24	20	6	408	129	14	746	326	24	411	177	15
NRI	236			1805			5583			2186		
NRT	260			2213			6329			2597		

Table V - Minimum number of identified elements and individuals in the faunal assemblages of Unit G at Siuren-I. NR: Number of Remains; MNE: Minimum Number of Elements; MMIc: Minimum Number of Individuals by Combination; NRT: Total Number of Remains; NRI: Number of Indeterminate Remains; NRDa: Number of Anatomically Determinate Remains.

Unit G

In levels Ga and Gb1-Gb2, butchery striae were identified on five bones. They reflect the disarticulation of a posterior horse limb, an anterior bovine limb, an extremity of a posterior cervid limb and a saiga antelope carpal (fig. 6). A skinning striation was observed on an arctic fox tibia (fig. 7). At least 21 ungulate long bones, from medium to large size, including two belonging to the horse, five to the bovines, two to the cervids and two to the saiga antelopes, were split open in order to obtain the marrow. The saiga antelopes were probably transported whole to the rock shelter (presence of the axial skeleton) and skinned outside. Only certain parts of the carcasses of megaloceros, bovines and horse were brought back to the site (fig. 8). Regarding red deer, the exclusive presence of cranial remains suggests that antlers were sought out. (Antlers were not found in the material). The principal area for carcass treatment is found in squares 8C and 7C.

In Gc1-Gc2, 35 bones show butchery marks produced, for the most part, during carcass disarticulation. A posterior horse limb, an anterior bovine limb, an anterior megaloceros limb, a red fox, an arctic fox and a hare were all disarticulated. The long bones of medium and large ungulates were cracked to reach the marrow. Among the diaphyses with marks reflecting such breakage, five belong to the horses (including three tibias), seven to the bovines (including six metapodials), eight to the cervids (including seven metapodials) and 15 to the saiga antelopes (including all bone types). As in level Gb1-Gb2, the saiga antelopes were probably transported whole (presence of costal cartilage) and skinned outside the shelter. All stages of the treatment process are attested by the presence of striae. The differential representation of anatomical units suggests a different treatment for the larger species. In fact, horses, bovines and cervids seem to have been dismembered, and perhaps partially consumed, at the kill site (fig. 8). The principal area for carcass treatment is in squares 6D and 7C. Concerning the wolf, the simultaneous presence of numerous metapodials, phalanges, coccygeal vertebrae and canines may suggest the presence of a skin having preserved the paws, tail and skull of the animal.

Finally, level Gd yielded 14 bones with butchery marks, of which four disarticulation marks belong to the saiga antelopes. A skinning mark was observed on an anterior arctic fox limb. Nine bones from medium-sized mammals confirm the reali-

TAXA	NR	NME	NMIc
Equus caballus	38	14	2
Bovinae (Bison/Bos)	25	14	1
Saiga tatarica	89	52	3
Sub-Total Ungulates	**152**	**80**	**6**
Canis lupus	9	9	3
Alopex lagopus	11	9	2
Vulpinae	89	63	1
Sub-Total Carnivores	**109**	**81**	**6**
TOTAL	**261**	**161**	**12**
Large Mammals	54		
Medium Mammals	49		
Small Mammals	40		
Indeterminate Mammals	3		
NRDa	**146**		
TOTAL Mammals (aside from rodents)	**407**	**161**	**12**
Rodents	5	3	1
Birds	14	9	1
NRI	**2278**		
NRT	**2704**		

Table VI - Minimum number of identified elements and individuals in the faunal assemblage of Unit H at Siuren-I. NR: Number of Remains; MNE: Minimum Number of Elements; MNIc: Minimum Number of Individuals by Combination; NRT: Total Number of Remains; NRI: Number of Indeterminate Remains; NRDa: Number of Anatomically Determinate Remains.

zation of all stages of the butchery process. At least 23 long bones with marrow from medium and large herbivores, including bovine (3), cervid (2 metacarpals) and saiga antelopes (3) were cracked and processed at the site. The largest ungulates, for their part, underwent differential transport, in which certain parts were either consumed at the kill site or, after having been brought back to the site, were then transported to another place (fig. 8). Squares 6D and 6C were probably the principal area for carcass treatment.

Figure 6 - Saiga antelope pyramidal with disarticulation striae, level Gb1-Gb2 at Siuren-I.

Figure 7 - Polar fox tibia with skinning striae, level Gb1-Gb2 at Siuren-I.

Unit H

In Unit H, the 11 bones with butchery marks belong to the saiga antelopes (disarticulation marks on three bones), the horses (two extremities of posterior limb show disarticulation marks), the undetermined fox (skinning mark), the large mammals (disarticulation marks on four bones and meat removal on one) and the medium-sized mammals (one unidentified). The intentional breakage of 13 long bones, including one belonging to a horse and six to a bovine, is attested. As in Unit G, differential transport depending on animal size can be proposed. Horses and bovine were likely dismembered at the kill site and

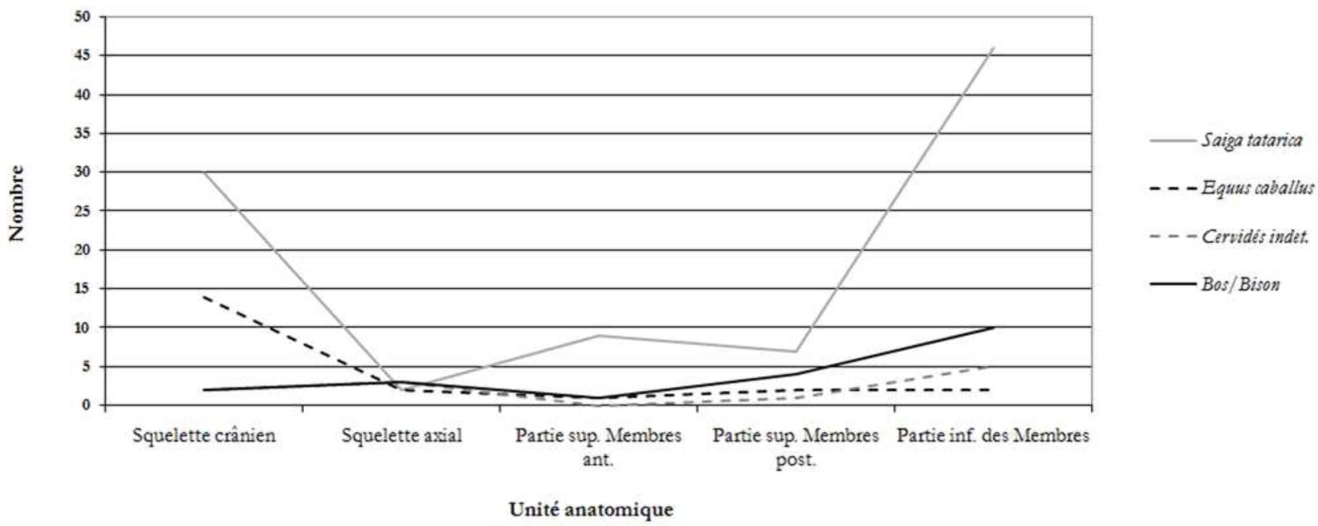

Figure 8 - Representation of anatomic units of the taxa of Unit G at Siuren I, susceptible to have been subject to differential transport based on the MNE (in Massé 2008).

some particularly nutritious parts brought to the site (O'Connell *et al.* 2002: in Klein *et al.* 1999) (fig. 10). Square 6E appears to have been privileged for carcass treatment. The presence of two wolf canines, the only cranial elements, may have resulted from deliberate collection by humans.

Discussion

Taphonomic analysis of the faunal remains from Unit F shows that the alteration visible on bone surfaces in Fb1-Fb2 was due to minor weathering, suggesting relatively rapid burial. Non-human biological agents did not significantly affect the bones. Indeed, only plant activity, after burial of the bones for level Fb1-Fb2, was observed, indicating the presence of vegetal cover and thus a fairly humid climate. Despite the small amount of material and the lack of intentional cut marks, evidence of fresh bone breakage, a high proportion of burned bones, the discovery of lithic artifacts and hearths (three in Fa3, five in Fb1-Fb2, and traces of at least one in Fc, Otte *et al.* 1996) confirm human activity in Unit F. In addition, several pieces of hard animal material were discovered: three points and an awl found during the 1920s, as well as two points, three awls and a perforated canine from level Fb1-Fb2 found during the 1990s (Demidenko & Otte 2000-2011). The rarity of bone material prevents us from proposing a hypothesis regarding the acquisition strategies or the prey treatment by the occupants of Unit F.

Taphonomic analysis of the fauna from Unit G revealed that the four levels seem to have been formed by a relatively rapid accumulation rates with a shorter exposure period for the first two levels (Ga and Gb1-Gb2). Vegetation is the most important non-human biological agent affecting the material. Carnivore marks are rare and even absent in certain levels. Therefore, humans were the principal agent responsible for these faunal assemblages. This fact is also supported by the discovery of many bones showing striae, evidence of long bone breakage and burning. Bone tools were also found. The 1920s collection (Lower layer) contains five points and 45 awls. One point and five awls were recovered during the 1990s excavations (in levels Gb1-Gb2 and Gc1-Gc2). Eight marine shell beads (*Aporrhais pespelecani*) and another river shell bead (*Taeodoxus fluviatilis*) were discovered in the Lower layer (1920s excavations) and in level Gc1-Gc2 (1990s excavations) (Demidenko & Otte 2000-2001). Analysis of the taxa distribution from the Unit G assemblages shows that most of the species are recurrent throughout the sequence. It also demonstrates the acquisition of species of different size, from fox to megaloceros. While arctic fox dominate the assemblage in terms of the number of individuals, it is probably intrusive in nature. Therefore, the saiga antelope is the dominant species in terms of MNE (Minimum Number of Elements) (tabl. IV, V and VI). The other large mammal species (*Equus caballus*, *Bos/Bison*, *Cervus elaphus* et *Megaloceros giganteus*) are represented by low numbers of individuals (one or two) per level, except for the horse which is represented by three individuals in levels Gb1-Gb2 and Gc1-Gc2 (fig. 2). Avifauna and indeterminate small mammals are present in each level; the lack of anthropic marks suggests that they are probably intrusive.

Figure 9 - Diaphysis of a large mammal long bone with evidence of breakage of fresh bone to obtain the marrow, level Gd at Siuren-I.

The small number of individuals, combined with the relative diversity of species recovered at Siuren I, reflects opportunistic hunting in a steppe environment and along forest edges (Farizy & David 1989). The discovery, in level Gc1-Gc2, of a fetal bone showing relatively advanced development suggests the killing of a pregnant mare between December and March, excluding definitively the spring season (A. Burke, pers. comm.). Hypotheses regarding the processing of each species can be propose by the representation of skeletal elements present in Unit G. Small species – fox and hare – seem to have been brought to the site whole. Human-made striae on their bones suggest principally skinning activity. Saiga antelope was also brought to the site whole: the different cut marks observed represent all stages of processing. The differential representation of anatomical units of the largest ungulates suggests a different strategy than that used for antelope. Horses, bovines and cervids would have been dismembered at the kill site and certain parts, notably the most nutritious, would have been consumed at Siuren I or further transported to another sites. This hypothesis is supported by the rarity of dismembering marks, compared with disarticulation and defleshing marks.

Finally, the taphonomic study of the faunal remains from Unit H has shown that climato-edaphic agents moderately affected the assemblage. By contrast, water runoff (prior to burial) and infiltration, mainly percolation (after burial), significantly affected the assemblage. Vegetation altered a non-negligible amount of material. Carnivores, however, left no traces on the bones. As in the other two units, humans seem to have been the only ones responsible for this faunal assemblage. Unit H presents a narrower range of taxonomic variability than in the Unit G levels, but saiga antelope and horse remain the two dominant species. The absence of human-made cut marks on the wolf, avifauna and small rodent remains would suggest their intrusive origin.

Conclusion

The rapid burial of faunal material ensured a good state of preservation of the bones. Carnivores played only a minor role, posterior to the human occupations. The faunal assemblages of the three Units are of human origin. The hunting of a limited number of individuals belonging to different forest species (red deer and megaloceros) in the upper levels of Unit G, steppe species (horse, bovines and saiga antelope) and ubiquitous species (foxes) in the three Units, appears to have been relatively

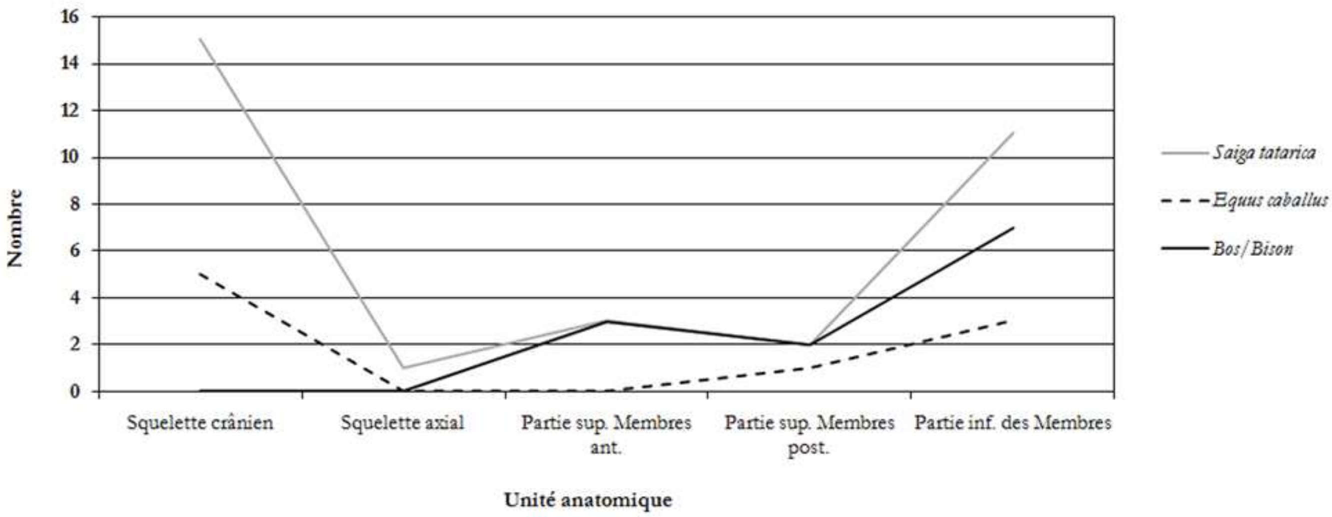

Figure 10 - Representation of anatomic units of the taxa of Unit H at Siuren-I, susceptible to have been subject to differential transport based on the MNE (in Massé 2008).

opportunistic. Moreover, the scavenging of large mammals cannot be excluded. The preservation of saiga antelope bones uncorrelated to their density shows that differential representation of anatomical units is the result of human activity. Prey processing strategies therefore appears to have been conditioned by the size of the species hunted. The smallest (saiga antelope, fox and hare) appear to have been brought to the site whole and the largest (horse, bovines, deer and megaloceros) quartered. The results of zooarchaeological analyses suggest the practice of several butchering activities, including skinning, disarticulation, defleshing, bone marrow extraction and meat consumption. The presence of many hearths, butchery areas and bone tools, as well as flintknapping activities, reflects the practice of different economic and technological activities at the site (Demidenko & Otte 2000-2001; Otte *et al.* 1996). The Siuren I rock shelter, based on the diversity of activities and the relatively low density of fauna and lithic material, likely served as a repeatedly used short-term camp (in winter for level Gc1-Gc2). Our zooarchaeological interpretations corroborate the stratigraphic and lithic data indicating behavioral homogeneity throughout the sequence and this, despite paleoecological changes. Unfortunately, they do not allow differentiation between the Neandertals or the anatomically modern humans that occupied the site over time.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 65-71.

6 - SMALL MAMMALS FROM PALEOLITHIC SITE SIUREN I

Anastasia K. MARKOVA

The Paleolithic site of Siuren I is located near the village of Tankovoe, 13 kilometers south of the town of Bakhchisarai (44^0 58' N; 34^0 08' E). The site is located in a rock-shelter about 43 m in width, 15 m in length and 9-10 m in height (Demidenko 2000).

Before the 1990s fieldwork, the site had previously been excavated twice, in 1879-1880 by K.S. Merejkowski and in 1926-1929 by G.A. Bonch-Osmolowski (see Merejkowski 1881; Bonch-Osmolowski 1934, 1940; Vekilova 1957; Rogachev & Anikovich 1984). In 1994-1997, new excavations were carried out by a joint Ukrainian-Belgian team under the direction of V.P. Chabai and M. Otte (see Demidenko 1999, 2000; Demidenko *et al*. 1998; Demidenko & Otte 2000-2001, 2004). Analyses of new data with the use of information from earlier studies of the site enabled Demidenko to establish the following archaeological and chronological sequence (Demidenko 2000): 1) Final Paleolithic with Shan-Koba industry, dated between 11800 and 10800 BP (the "spots" of the 1st and 2nd horizons of the Upper Layer of the 1920s excavations); 2) Upper Paleolithic episode with Epigravettian industry, dated between 20000 and 15000 BP (2nd horizon of the Upper Layer of the 1920s excavations and some artifacts from level A and the "humus" deposits of the 1990s excavations); 3) Upper Paleolithic episode with Gravettian industry (~24000-20000 BP) (3rd horizon of the Upper Layer of the 1920s excavations and artifacts from level D of the 1990s excavations); 4) Upper Paleolithic episode with Late Aurignacian industry (~27000 BP), correlated with the lower finds from 3rd horizon of the Upper Layer of the 1920s excavations and artifacts from horizon E of the 1990s excavations); 5) the Middle Layer of the 1920s excavation and the Unit F from the 1990s excavation with Late Aurignacian industry (29950 ± 700 BP, OxA-5155 for horizons Fb1-Fb2); 6) the Lower layer of the 1920s excavation and Units G and H from the 1990s excavation include abundant Upper Paleolithic pieces as well as some separate Middle Paleolithic artifacts. The latter are absent only in the uppermost level of Unit G (Ga), based on the 1990s excavations. Most of the archeological material from Units H and G were considered Upper Paleolithic and attributed to the European Early Aurignacian of Krems-Dufour industry type. Demidenko explains the mixture of numerous Upper Paleolithic and some Middle Paleolithic finds in the 1920s Lower layer / the 1990s Units H and G through alternate visits of the rock-shelter by Aurignacian modern *Homo sapiens* and Micoquian Neandertals, in which rich Aurignacian levels enveloped rare Micoquian finds as a result of rapid sedimentation processes (Demidenko 2000). Level Ga has been dated by AMS to 28450 ± 600 BP (OxA-5154) and Unit H by AMS to 28200 ± 400 BP (OxA-8249).

The small mammals assemblage

The small mammals analyzed were found with by sieving and washing during the 1990s excavations. The bones are well-preserved. The angles of teeth were not broken and many mandibles with teeth have been found. Most of the material appears to have been deposited without movement, possibly in burrows. The color of bones is light yellow. The density of the bones in the deposits is rather low. Eleven species belonging to Lagomorpha (one species) and Rodentia (10 species) have been identified (tabl. 1). Unfortunately, rather poor materials from Siuren I present only a very small portion of fossil fauna so conclusions remain very general.

In the lowest level Gd for Unit G, the bones of four species were found, including steppe pika *Ochotona pusilla tanaitica*, pygmy suslik *Spermophilus pygmaeus*, gray dwarf hamster *Cricetulus migratorius* (fig. 1:1), and Altayan vole *Microtus obscurus* (fig. 2). All are typical of open landscapes. The remains of steppe pika belonged to a rather large specimen that permits it to be attributed to subspecies *Ochotona pusilla tanaitica* (fig. 1:2). This subspecies has been described by materials from Crimean sites (Erbaeva 1988). Modern steppe pika inhabits dry steppes and semi-deserts, although it sometimes also inhabits grasslands near rivers. Its current range is located east of the Volga River. During the Pleistocene, the range of steppe pika was significantly broader: steppe pika remains have been found in many sites on the Russian Plain and in the Crimea. During the last glaciation when open periglacial landscapes were widely distributed, *Ochotona pusilla* expanded even to Western Europe (Markova & Kolfschoten 2008). In the Crimea, steppe pika remains have also been recovered from the Upper Paleolithic site of Adzhi-Koba and the Mesolithic rock-shelter of Alimovski.

Species	Levels							
	Fa1	Fb1	Fb2	Ga (sq. 8C)	Gb1	Gb2	Gb1-Gb2	Gd
Lagomorpha								
Ochotona pusilla tanaitica Erbaeva -steppe pika								1
Rodentia								
Spermophilus pygmaeus Pallas pygmy suslik	6				4	1	1	1
Allactaga major Kerr great jerboa		3	1		2		1	
Stylodipus telum Lichtenstein thick-tailed three-toed Jerboa	1							
Apodemus (Sylvaticus) flavicollis Melch yellow-necked mouse				10	2			
Cricetulus migratorius Pallas - gray dwarf hamster								2
Cricetus cricetus L. European hamster			3		2			
Ellobius talpinus Pallas northern mole-vole							2	
Arvicola terrestris L. water vole			3					
Eolagurus luteus Eversmann yellow steppe lemming	2							
Microtus obscurus Eversmann Altayan vole			11	4	4	4	3	1
Microtus sp. vole	3							
Total species	4	1	4	2	5	2	4	4

Table 1 - Species composition of small mammals from Siuren I. Note: Level Fb2 has been dated to 29950 ± 700 BP, OxA-5155 (for level Fb1-Fb2) and level Ga (sq. 8C) to 28450 ± 600 BP, OxA-5154.

The preferred habitats for the dwarf suslik *Spermophilus pygmaeus* are the different kinds of semi-deserts (sand, clay-sand and loess semi-deserts) and dry arid steppes with wormwood, but is also present in deserts. Little suslik habitats are also found in the low mountain steppes belt, but do not extend higher than 400-500 m above sea level.

Cricetulus migratorius now inhabits forest-steppes, steppes and semi-deserts. Its range covered the central and southern parts of Eastern Europe, Caucasus, Middle Asia and Kazakhstan. It also inhabits the Crimea (Flint *et al.* 1970). The Altayan vole *Microtus obscurus* prefers the meadow-steppes.

Thus, all four species described from level Gd indicate open very arid landscapes near the site during the deposition of level Gd. This level could possibly be correlated with the Huneborg stadial of Stage 3, which preceded the Denekamp (Bryansk) interstadial. However, the number of recovered species is undoubtedly incomplete and additional materials could change this interpretation.

In level Gb1-Gb2, five species of rodents have been identified, including little suslik *Spermophilus pygmaeus*, great jerboa *Allactaga major*, East European hamster *Cricetus cricetus*, northern mole vole *Ellobius talpinus* (fig. 3), yellow-necked mouse *Apodemus (Sylvaemus) flavicollis* (fig. 4:1), Altayan vole *Microtus obscurus* (fig. 4:2; fig. 5 and 6). The preferred habitats of four of these species (*Spermophilus pygmaeus, Allactaga major* (fig. 7:2), *Cricetus cricetus* (fig. 7:1), *Ellobius talpinus*) are open steppe-like landscapes.

The great jerboa is a typical representative of arid steppes and semi-desert landscapes. It prefers biogeocoenosis with solid (dense) soils with thin vegetation. It sometimes extends to forest-steppes, using the dry open slopes with thin grass cover. Present-day *Allactaga major* inhabits the Crimean open landscapes. Remains of great jerboa have been found in interglacial and also glacial Pleistocene faunas on the Russian Plain (Markova *et al.* 1995). The East European hamster *Cricetus cricetus* is common today in forest-steppe and in forbs steppe. In the southern part of its range, it prefers areas that are not very dry. In the southern steppe zone of the Russian Plain, the East European hamster inhabits floodplains and wet depressions. The modern range of *Cricetus cricetus* includes the Crimea.

The yellow-necked mouse *Apodemus flavicollis* prefers broadleaf forests of plains and mountains. In the southern part of its range, the yellow-necked mouse sometimes lives in bushed areas. This species lives today in the Crimea. During the Valdai

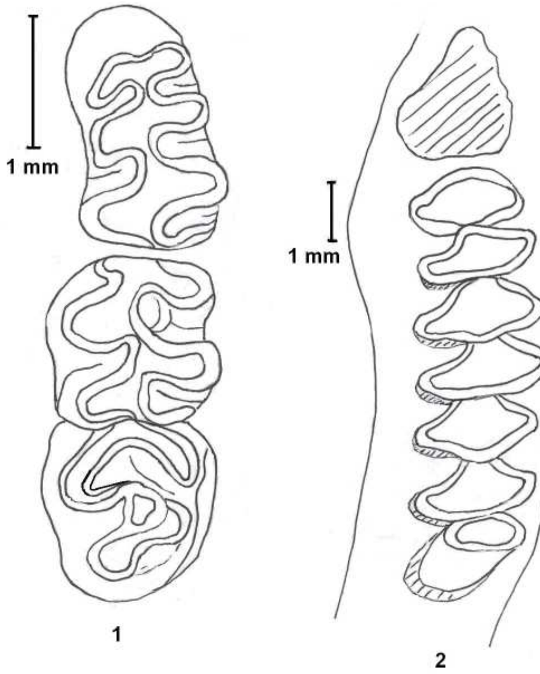

Figure 1 - Small mammal remains from level Gd. 1, lower mandible of *Cricetulus migratorius* with m1, m2, m3; 2, upper mandible of *Ochotona pusilla tanaitica* with M/1-M/3.

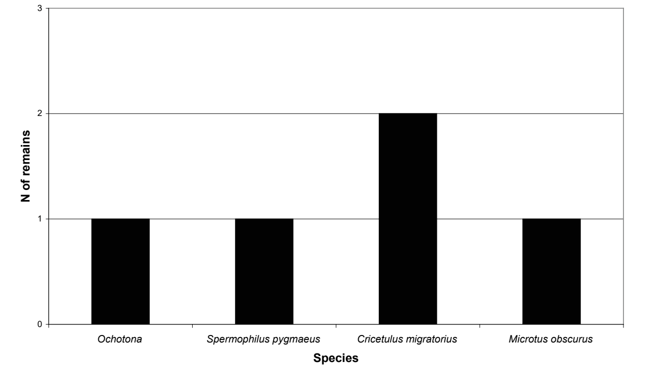

Figure 2 - Small mammals from level Gd.

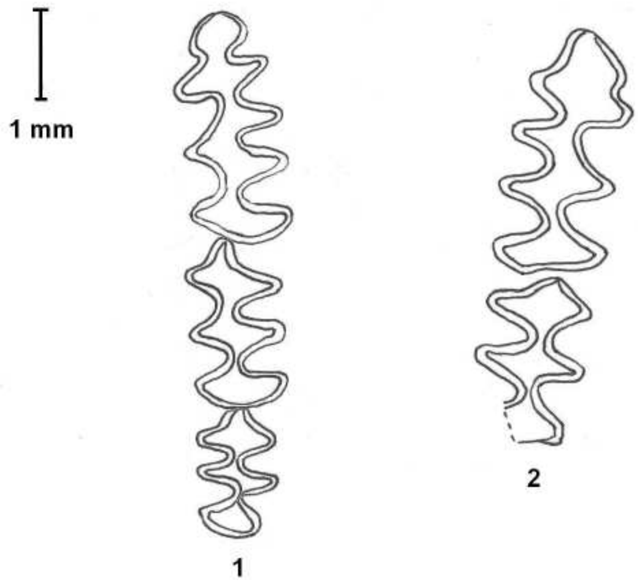

Figure 3 - Small mammal remains from level Gb1-Gb2. 1, lower mandible of *Ellobius talpinus* with m1, m2, m3; 2, lower mandible of *Ellobius talpinus* with m1 and m2.

Maximum Glaciation, it disappeared from the Russian Plain because of the absence of a forest zone. The mountains with their many local habitats were the refuges for many forest animals during the glacial period, so the Crimean Mountains with some forest and bush vegetation were suitable for *Apodemus flavicollis* (Markova et al. 1995; Markova 1999, 2004a, 2004b, 2004c, 2004d, 2005, 2007).

The Altayan vole *Microtus obscurus* prefers the open meadow-steppe. It is currently distributed in the Crimea and Caucasus Mountains, the Volga River basin and the Urals (Malygin 1983; Zagaradniuk 1991; Markova 2000).

The mammalian materials from level Gb1-Gb2 permit reconstruction of mosaic landscapes near the site. Open steppe-like areas were present on the south slopes; broadleaf forested, bushed and meadow-like environment existed near streams and in depressions. Indicators of cold climate have not been found in this level. In comparison with the fauna from level Gd, it appears that more moderate climate existed during level Gb1-Gb2 (Denekamp Interstadial?).

Only two species were found in level Ga (sq. 8C): Altayan vole *Microtus obscurus* (fig. 8:1; fig 9) and yellow-necked mouse *Apodemus flavicollis* (fig. 8:2-3). The ecology of both species indicates the presence of rather moderate environments near the site with forested or bushed local areas and open meadow-steppe landscapes. The ^{14}C date for this horizon indicates the Denekamp (Bryansk) Interstadial: 28450±600 BP (OxA-5154).

T small mammals from levels and sub-levels of Unit F are described below.

In sub-level Fb2 of level Fb1-Fb2, four species have been identified (tabl. 1; fig. 10; fig. 15). The remains of great jerboa *Allactaga major* (fig. 11:3), East European hamster *Cricetus cricetus* (fig. 12:1), water vole *Arvicola terrestris* (fig. 11:1) and *Microtus obscurus* (fig. 11:2) and *Allactaga major* (fig. 12:2) were found there. All of the species apart from the water vole indicate the prevalence of open landscapes. The water vole *Arvicola terrestris* inhabits the banks of the rivers, and other water reservoirs in the broad areas of Europe from the steppe zone to forest-tundra. It is absent only in tundra and arctic zones today. Thus, the presence of this animal indicates close proximity of a stream near the site.

Only one species was identified in the materials from sub-level Fb1 of level Fb1-Fb2: *Allactaga major*. The ecological habitat of the great jerboa indicates open landscapes (tabl. 1).

The youngest small mammal fauna from the 1990s site were found in sub-level Fa1 of level Fa1-Fa2. Four small mammals were identified in this assemblage (tabl. 1; fig. 13). Little suslik *Spermophilus pygmaeus* (fig. 14:1), thick-tailed jerboa *Stylodipus telum* (fig. 14:2), vole *Microtus* sp. and yellow steppe lemming *Eolagurus luteus* inhabit different types of open landscapes. Yellow steppe

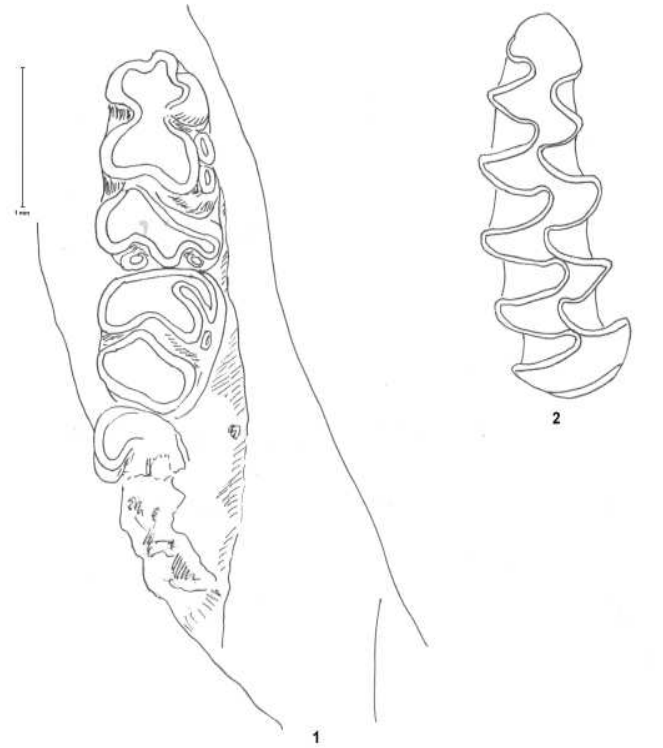

Figure 4 - Small mammal remains from sub-level Gb1. 1, lower mandible with m1, m2 and fragment of m3 of *Apodemus flavicollis*; 2, m1 of *Microtus obscurus*.

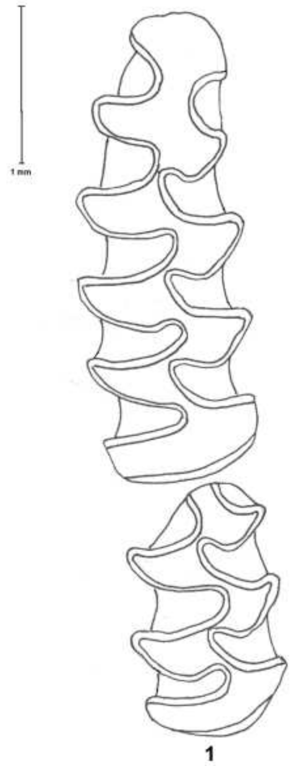

Figure 5 - Small mammal remains from sub-level Gb2. 1, lower mandible with m1 and m2 of *Microtus obscurus*.

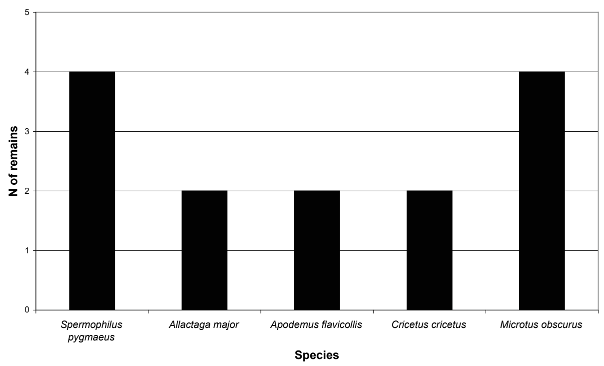

Figure 6 - Small mammals from level Gb1.

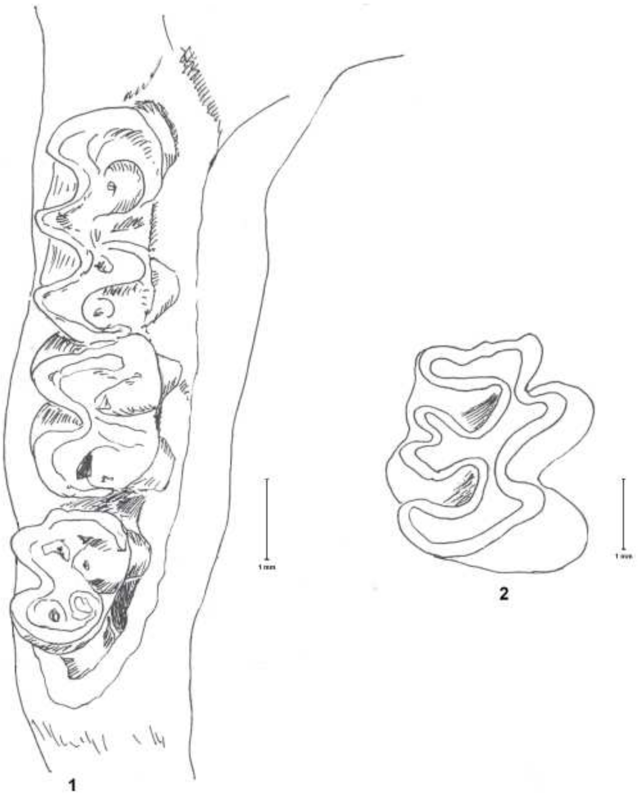

Figure 7 - Small mammal remains from sub-level Gb1. 1, lower mandible with m1-m3 of *Cricetus cricetus*; 2, m2 of *Allactaga major*.

lemming *Eolagurus luteus* is now distributed only in Middle Asia and Mongolia. Recently yellow steppe lemming inhabits semi-deserts, dry steppes and even deserts. During the Valdai Glacial period, the range of *Eolagurus luteus* included the Central and Southern Russian Plain and the Crimea. Yellow steppe lemming was one of the "non-analog" periglacial faunas, and was also typical for steppe interglacial periods. The range of *Eolagurus* is still rather widespread during the Holocene and even in the 19th century, yellow steppe lemming was present in the Lower Volga River drainage basin and in the Kazakhstan deserts.

The modern distribution of thick-tailed jerboa *Stylodipus telum* is found in deserts and desert steppes of different types. It often inhabits old and modern dunes and sandy steppes.

Thus, the presence of the remains of these animals in sub-level Fa1 (the uppermost level of Unit F) shows, first of all, the presence of arid open landscapes near the site. The remains of forest animals were not found in this sub-level, suggesting some aridization during the deposition of this layer.

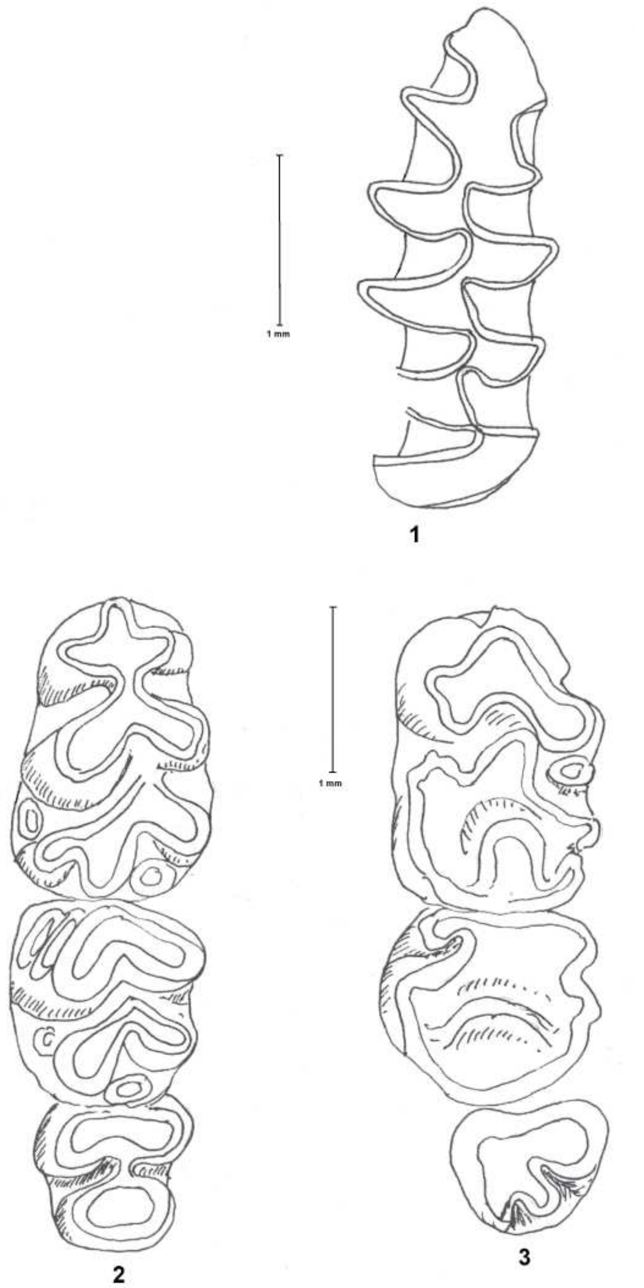

Figure 8 - Small mammal remains from level Ga. 1, m1 of Microtus obscurus; 2, lower mandible with m1-m3 of Apodemus flavicollis; 3, upper mandible with M1-M3 of Apodemus flavicollis.

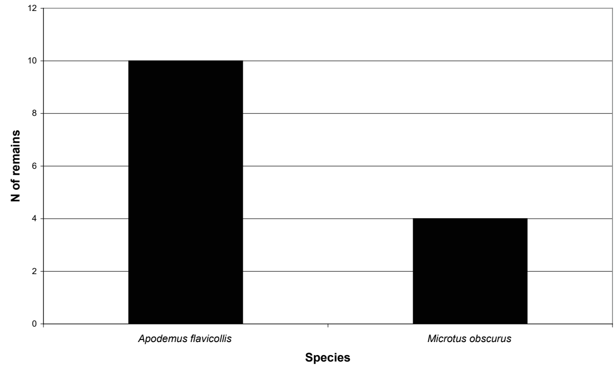

Figure 9 - Small mammals from level Ga (sq. 8C).

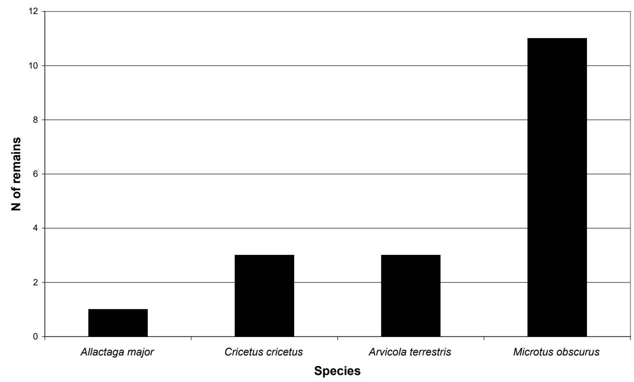

Figure10 - Small mammals from sub-level Fb2.

Conclusions

The small mammals found in the different levels at Siuren I indicate environmental changes during the deposition of levels Gd through Fa, although Unit H, lowermost in the sequence, and level Gc1-Gc2, the richest in archeological finds, contained no small mammal remain. The sequence analyzed is thus unfortunately incomplete.

Species of small mammals from level Gd are now distributed in open arid environments. Forest, subaquatic and cold-adapted animals are not documented in this level. Level Gd could potentially be correlated to the Hüneborg stadial of marine isotope Stage 3 (ca. 36-33 ky BP) (figs. 15, 16).

Small mammals from different ecological niches were found in the sub-levels of level Gb1-Gb2. The species range indicates rather moderate conditions during the deposition of this level. The theriological materials indicate forest-steppes and meadow-steppes near the site. Level Gb1-Gb2 could possibly be attributed to the Bryansk (Denekamp) interstadial. The uppermost part of horizon G (Ga) has been dated by AMS to 28450±600 BP (OxA-5154), which is consistent with the Bryansk interstadial (figs. 15, 16).

Later, during the formation of the Unit F levels, forest mammals disappear. Most of the species found in these levels indicate arid environments near the site, resembling dry steppes or even semi-deserts (figs. 15, 16). The fauna of Unit F reflect climatic aridization, but the Oxford AMS date of 29000 BP for level Fb1-Fb2 is also coherent with the Bryansk interstadial. The absence of forest mammal remains may be explained by the rather low quantity of small mammal remains found.

In sum, then, the small mammals enable reconstruction of the general environmental conditions near Siuren I during the different phases of deposition in the archaeological sequence. It is quite significant that cold-adapted species are absent in all of the levels in Units G and F. This indicates that the climatic and environmental conditions during human occupations were rather moderate, which may be explained by the more southerly position of the Crimea. Such conditions were comfortable for Palaeolithic humans and mammalian fauna. Like the small mammal species composition at other Crimean Palaeolithic sites (Kabazi II and V, Buran Kaya III, Karabi Tamchin, Starosele, Chokurcha I), the fauna at Siuren I includes only steppe, semi-desert, forest (in low quantity) and sub-aquatic small mammals. The analysis of small mammal fauna from the Crimean Middle and Upper Paleolithic sites suggests that the Crimean Mountains were a refuge during the Late Pleistocene. The influence of ice sheets was rather minor at these latitudes and was resulted mostly in aridization of the landscapes during cold phases (stadials) of the last glaciation.

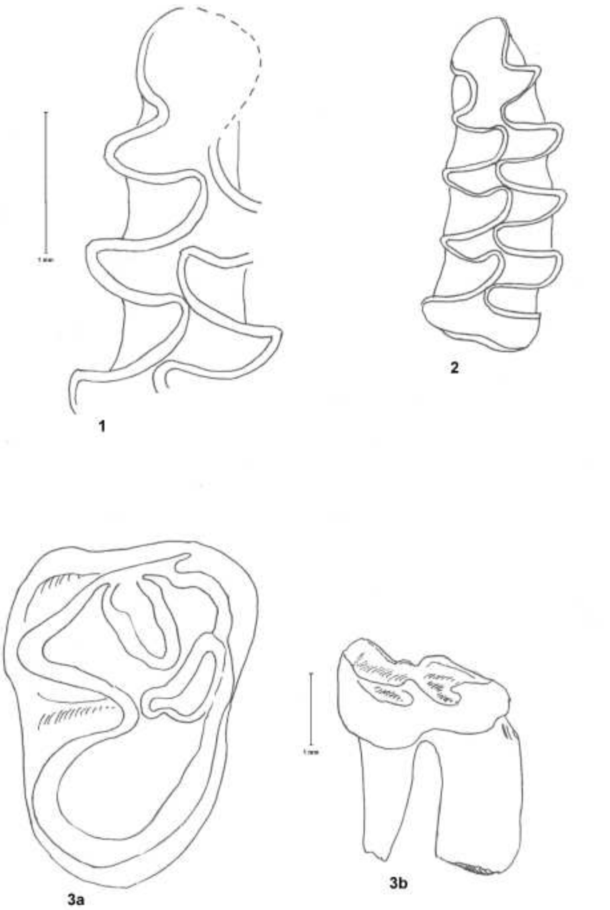

Figure 11 - Small mammal remains from sub-level Fb2. 1, m1 of *Arvicola terrestris*; 2, m1 of *Microtus obscurus*; 3a and 3b, m3 of *Allactaga major*.

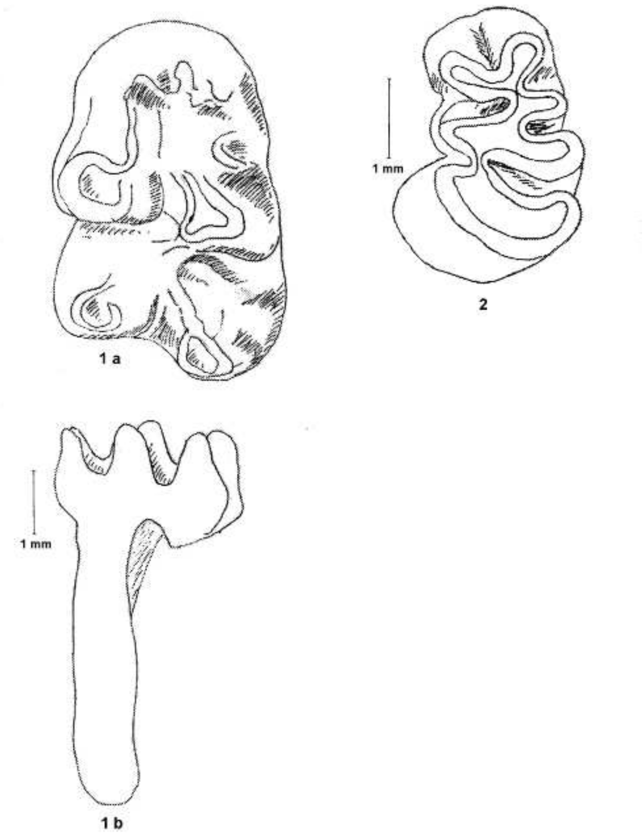

Figure 12 - Small mammal remains from sub-level Fb2. 1a and 1b, m/1 *Cricetus cricetus*; 2, m1 of *Allactaga major*.

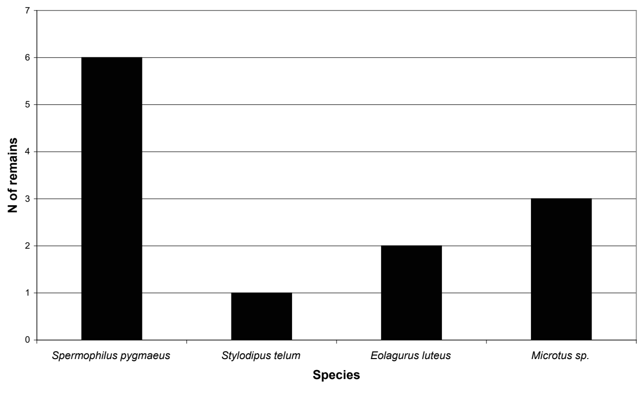

Figure 13 - Small mammals from sub-level Fa1.

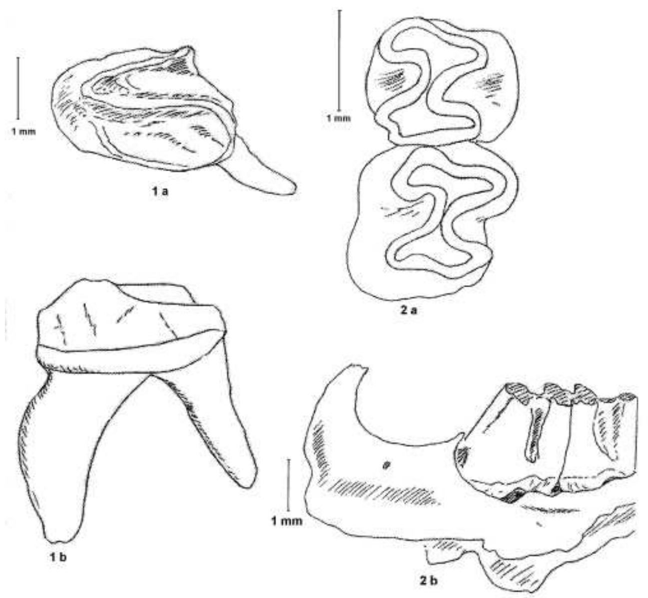

Figure 14 - Small mammal remains from sub-levels Fa1. 1a and 1b, M2 of *Spermophilus pygmaeus*; 2a and 2b, lower mandible with m1 and m2 of *Stylodipus telum*.

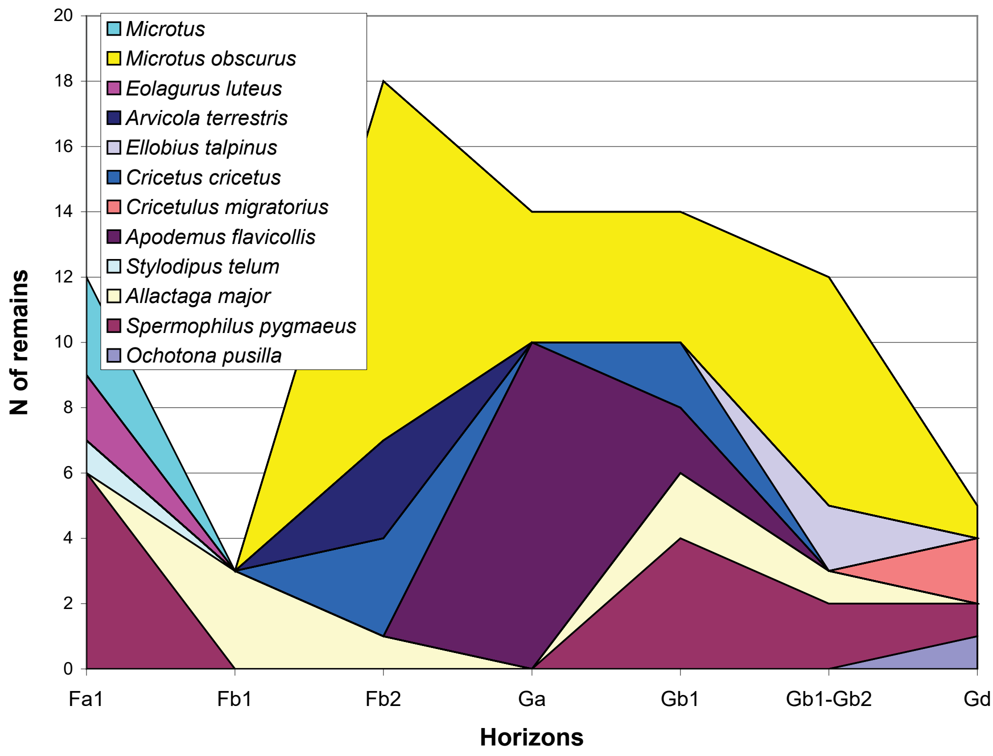

Figure 15 - Species composition of small mammals from Siuren I.

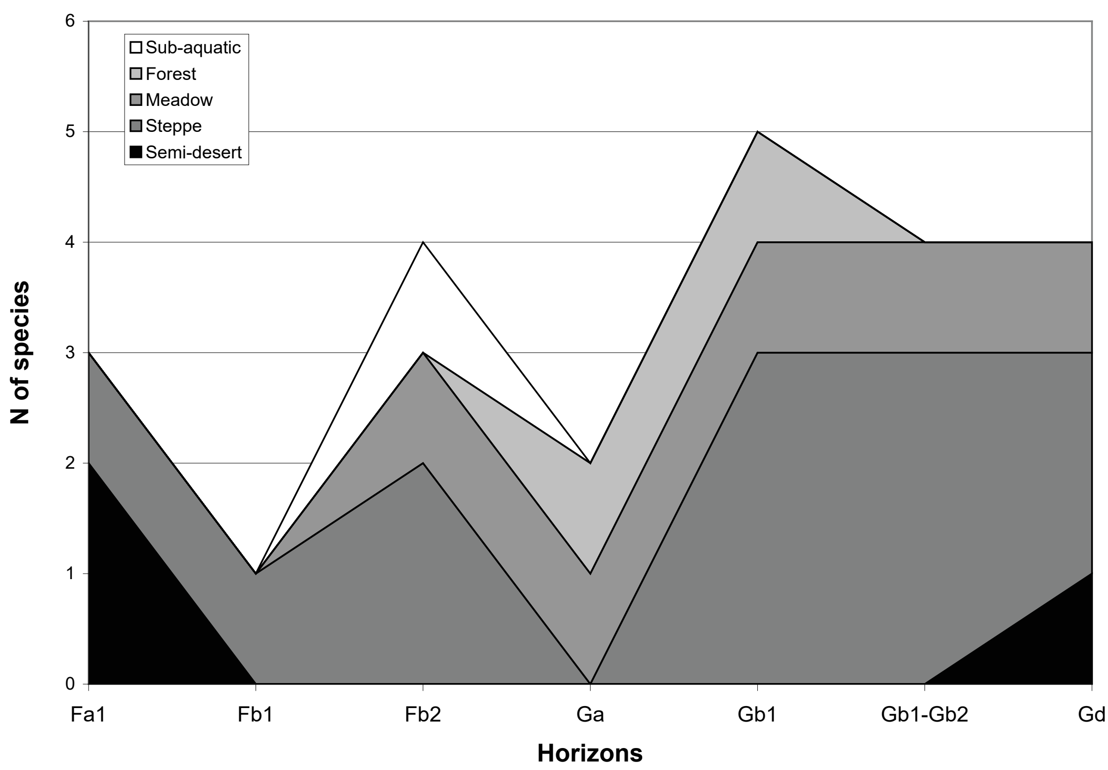

Figure 16 - Ecological groups of small mammals in the different levels of Siuren I.

7 - SNAIL FAUNA DATA FROM SIUREN I

Constantine MIKHAILESKU

Introduction

Traditional methods of snail sample selection were used on sediments from the archaeological levels at Siuren I. Sample selection began with preliminary screening of nearly all sediments through 5 mm sieves. The selected fraction was then screened through 1.5 mm sieves; and the resulting fraction (between 1.5 and 5 mm in size) was washed using the same sieves of 1.5 mm. Occasionally, if shells smaller than 1.5 mm were found, a 1 mm screen was also used. This occurred in certain levels at Siuren I containing very small shells of *Caecilioides acicula*, *Caecilioides raddei* and *Columella edentula*. After the resulting sediments were washed and dried, the snail remnants were selected. Because the snail shells are very fragile, most of them were selected directly from the sieve during dry or wet screening. A smaller portion of cockleshells and fragments was later selected from the washed and dried residue.

The archaeologists studying the site (Dr. Victor P. Chabai, Dr. Alexander I. Yevtushenko, Dr. Yuri E. Demidenko and Sergei V. Tatartsev) collected a significant portion of the malacological assemblages at Siuren I. During the 1995-1996 fieldwork at Siuren I, the author was greatly aided by an assistant, post-graduate Vladimir Telinov (Institute of Geography, Moldavian Academy of Sciences) and also by the Crimean archaeologists, to whom I express my sincere appreciation for the very difficult and accurate work in sample collecting.

Details of the sampling methods and the principal ecological groups of Western Crimean snails, as well as the environmental and morphometric parameters of the identified species, have been previously published by the present author (Mikhailesku 1999).

Siuren I snail fauna data

Thirteen samples were selected from the site, including four samples during the excavations in 1995 and nine samples in 1996. As seen in table 1, the snail fauna at Siuren I are not very dense, but are still fairly diverse. They include 337 shells of 31 specimens belonging to 8 ecological groups (fig. 1).

For Siuren I, the specific presence of four species of freshwater and three species of marine mollusks is of importance. While the presence of the first group may be partially explained by the proximity of the site to Belbek River, Paleolithic humans evidently introduced the shells of the second group to the site. 32 shells have clear perforations in them and evidently served as decorative objects, amulets or necklaces. In general, the preservation of all fossil shells is very good and enables identification without difficulty. Despite the fact that the most samples are not very large, the range of ecological groups is represented, so environmental diagrams were created for each level studied (fig. 1). These diagrams are used to demonstrate the main changes in ecological composition of the assemblages at ecological groups (habitats) and specimen levels. This allows elucidation of the main environmental changes caused preponderantly by climatic fluctuations.

Some species of mollusks are ecologically very specialized and occur only in certain habitats. This species group includes mostly freshwater mollusks and hydrophilic species of snails, as well as some rocky and soil species. Being dependent mostly on presence of a water source, they usually have an intrazonal distribution.

From archaeological Unit H one sample was collected consisting of only two shells of *Helix lucorum taurica*. This species typically occupies relatively warm ecosystems of mesophile or meadow steppes, and also prefer floodplains and open landscapes with bushes, shrubs and small trees.

From archaeological Unit G six samples were collected, corresponding to levels Gd, Gc1-Gc2, Gb1-Gb2 and Ga.

In level Gd, *Helix vulgaris* (1) and *Chondrus bidens natio pygmea* (1) were found in addition to *Helix lucorum taurica*. All of these species indicate that the same type of meadow steppe landscapes with bushes and shrubs continue to predominate during the deposition of level Gd. At the same time, the appearance of *Chondrus bidens natio pygmea*, a typical inhabitant of xerophile steppes and semideserts, indicates that the climate became slightly drier, compared to the deposition phase for Unit H.

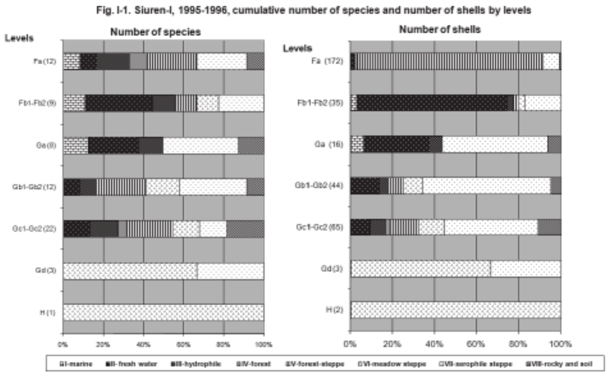

Figure 1 - Siuren-I, 1995-1996, cumulative number of species and number of shells by levels

The presence of two species of *Helix* (*H. lucorum taurica* and *H. vulgaris*) serves as a good indication of the interstadial nature of this assemblage. For the Crimean snail assemblages, both species are considered to be warm and relatively humid elements and are specific only to the warm interglacials and interstadials of Upper Pleistocene, being absent in the faunas coming from stadials.

From level Gc1-Gc2, two samples were collected, one from each sub-level (Gc1 and Gc2). From sub-level Gc2, 10 fossil shells were collected. Four of them appertain to the freshwater forms *Theodoxus fluviatilis* (3) and *Th. transversalis* (1), another four - to xerophiles *Helicella dejecta* (3) and *H. krynickii* (1), one more - to mesophile *Helix vulgaris* and the last one - to *Oxychilus diaphanellus*, which is a forest-steppe habitant. This sample is

SITE	Ecological Group	SIUREN I													
YEARS		1995				1996									Total
Name of species / Samples		Fa1	Fa2	Fb1	Fb2	Fb1	Fb2	Ga	Gb1	Gb2	Gc1	Gc2	Gd	H	
Helicella (*Helicopsis*) *dejecta* Cr. et J.	Xerophile steppe	2	3					2	4	1	3	3			18
H. (*H.*) *striata* (Mull.)	Xerophile steppe							1	2						3
H. (*H.*) *retowski* Clessin.	Xerophile steppe								1		3				4
H. (*Xeropicta*) *Krynickii* (Kryn.)	Xerophile steppe	4	2		2	3		5	12	7	19	1			55
Chondrus (*Buliminus*) *bidens* (Kryn.)	Xerophile steppe	1	1			1									3
Ch. (*B.*) *bidens natio pygmaea* (Kryn.)	Xerophile steppe												1		1
Helix (*Helicogena*) *lucorum taurica* (Kryn.)	Meadow steppe								1	1	2		1	2	7
H. (*H.*) *vulgaris* Rossm.	Meadow steppe								1	1	2	1	1		6
Chondrula tridens Mull.	Meadow steppe				1						3				4
Oxychilus diaphanellus (Kryn.)	Forest-steppe									1	2	1			4
Vitrea pygmaea Bttg.	Forest-steppe										1				1
V. diaphana (Stud.)	Forest-steppe								1		1				2
Clausilia (*Mentissa*) *gracilicosta* (Rssm.)	Forest-steppe		116			1			1		2				120
Cl. (*M.*) *canalifera* (Rssm.)	Forest-steppe		18								2				20
Clausilia (*M.*) sp.	Forest-steppe	3	16												19
Euconulus fulvus Mull.	Forest areas	1									1				2
Pyramidula rupestris (Drap.)	Rocky and soil										3				3
Pupilla muscorum L.	Rocky and soil										1				1
P. triplicata (Stud.)	Rocky and soil								2		1				3
Caecilioides raddei (Bttg.)	Rocky and soil	1													1
C. acicula Mull.	Rocky and soil							1			2				3
Columella edentula (Drap.)	Hydrophile										1				1
Vallonia costata Mull.	Hydrophile								2		2				4
Succinea oblonga Drap.	Hydrophile	1		1				1			2				5
Lithoglyphus naticoides C. Pff.	Fresh water				3	3					1				7
Theodoxus transversalis (L.)	Fresh water				4	2		2				1			9
Theodoxus fluviatilis (L.)	Fresh water		1	2	8	3		3	2	4	1	3			27
Valvata piscinalis Mull.	Fresh water	1													1
Cerastoderma glaucum Reeve*	Marine						1								1
Apporhais pespelicani L.	Marine							1							1
Gibbula maga albida (Gm.).	Marine		1												1
Total number of shells		14	158	3	18	13	1	16	29	15	55	10	3	2	337

Table 1 - Siuren I Fossil Snails

not representative but, as well as the previous sample, it also appears to be an interstadial type of assemblage. Although it does not contain very many warm elements (*Helix lucorum taurica* is absent), this sample may correspond to the same interstadial, when the climate was relatively humid but probably not as warm as during earlier stages.

Much richer and diverse is the sample from level Gc1 with 55 shells of 21 species, representing seven ecological groups of mollusks. The most common are steppic xerophiles (25 shells), followed by forest-steppe (8), rocky and soil fauna (7), meadow steppes (7), hydrophiles (5) and forest areas (1). Two shells of freshwater *Lithoglyphus naticoides* (1) and *Theodoxus fluviatilis* (1) with human-made perforations in them were also found. This is clearly an interstadial type of mollusk assemblage, which suggests that floodplain meadow steppe and forest-steppe landscapes predominated around the site and the small river was still active.

The diagrams indicate that forest and forest-steppe landscapes predominated around the site during the depositional phase of level Gc1-Gc2 and that the climate was slightly colder, but relatively more humid than today. The presence of one shell of cold-loving *Columella edentula* in sub-level Gc1 and a sufficiently high number of hydrophiles and rocky and soil elements confirm this hypothesis.

From level Gb1-Gb2, two samples were collected, one from each sub-level. The sample from sub-level Gb2 includes 15 shells. In this assemblage the inhabitants of xerophile steppes predominate: *Helicella krynickii* and *H. dejecta* (8), as well as the freshwater *Theodoxus fluviatilis* (4). In the minority, forest-steppe (*Oxycillus deilus* -1) and meadow steppe species (*Helix lucorum taurica* - 1 and *H. vulgaris* -1) are also present.

The sample from sub-level Gb1 is much more numerous, including 29 shells from six ecological groups. This appears to be an interstadial assemblage, given its diversity and the presence of some hydrophiles and sufficient warm rocky and soil elements. The inhabitants of xerophile steppes and semi-deserts (19) predominate, constituting about 70% of the total sample. Compared with the previous samples, the hydrophile *Vallonia costata* (2) and the rocky and soil form *Pupilla triplicata* (2) appear in this sub-level for the first time. Both of these species prefer humid zones near water basins. The number of freshwater forms (*Theodoxus fluviatilis* - 2) decreases, but forest-steppe forms (2) increase slightly. The presence of *Clausilia gracilicosta*, which prefers to live on small *Juniperus* trees, should be mentioned.

As seen in the diagrams (fig. 1), compared with the previous sample, the open areas of meadow and xerophile steppes slightly increase, but the hydrophiles, forest-steppe and rocky and soil elements remain high, constituting about 30% of the total number of shells. In its composition, this assemblage is very similar to the previous one from level Gc1-Gc2) and both of them may correspond to different stages of a single interstadial.

From level Ga, one sample was collected, including 16 shells of eight species. 50% of cockleshells appertain to *Helicidae*, the typical inhabitants of xerophile steppes and semi-deserts. The hydrophile *Succinea oblonga* (1), the rocky and soil inhabitant *Caecilioides acicula* (1), the freshwater *Theodoxus fluviatilis* (3), *Th. transversalis* (2) and the marine mollusk *Apporhais pes pelicani* (1) are also present. Such a range indicates that open landscapes predominated and a small river flowed near the site. The presence of *Caecilioides acicula* suggests that the underground water level was very close to the surface. All shells of the freshwater and marine mollusks have human-made perforations in them, used as necklaces. The shell of *Apporhais pes pelicani* is very important, which was introduced to the site by Paleolithic humans from the Black Sea side where the shells are preserved in older sediments. This is a very warm and stenogaline form, preferring basins with salinity of more than 30 promilles. *Apporhais* is more specific to the Mediterranean Sea than to the Black Sea. Because of the very low salinity of the Black Sea, during the Quaternary this form only once penetrated into the Black Sea basin, during the Last Interglacial, when the Karangatian transgression of the Black Sea had its maximal high level. The stratigraphic and paleontological records from the Black Sea shelf and Upper Pleistocene terraces and shorelines indicate that the Bosphorus channel was opened that time and the basin's level reached about +8 meters (Mikhailesku 1990). During this transgression, the salinity of the Black Sea highly increased and *Apporhais* was able to survive not only in the southern part of the basin, but also along the northern coast of the Black Sea. As a confirmation of this hypothesis, similar shells of *Apporhais pes pelicani* the author found in the sediments of the key outcrops of Carangatian terrace: Kape Karangat, Kape Tschauda, Elitigen, Lake Uzunlar and Sudak. With the exception of the last outcrop (Sudak), all other sites are located in Eastern Crimea, fairly far from the area investigated. It should be also mentioned that some shells of *Apporhais pes pelicani* were found at Siuren I during the 1920s excavations (see Bonch-Osmolowski 1934; Vekilova 1957).

According to the diagrams (fig. 1), during the deposition of level Ga, the proportion of xerophile elements decreased and hydrophiles, rocky and soil and freshwater mollusks increased. But such changes may be considered only as an indication since the sample is very small.

Summarizing the malacofauna data from the site's lower cultural bearing deposits (archaeological Units H-G), it should be mentioned that two kinds of snail assemblages are represented. The first one is typical of open landscapes, preponderantly meadow steppe. This is represented by the very small assemblages from Unit H and level Gd of Unit G. The assemblage from level Gd that is the oldest sample for Unit G, is very interesting and appears to be more comparable to the malacofauna from Unit H than to the other levels of Unit G. The sample diagram indicates a slightly drier climate compared with the conditions for Unit H. But again, it should be remembered that such climate reconstructions are only indicative, as both samples (Unit H and level Gd) are very small and not representative enough.

The specimens and ecological group compositions for the other three assemblages of Unit G are fairly similar. Such similarity allowed us to suggest that most of Unit G involves a short time frame and less significant climate fluctuations may be observed here. High proportions of warm and humid elements suggest that all three assemblages represent an interstadial type of fauna and may represent different stages of snail evolution within a single interstadial. All of these assemblages (from levels Gc1-Gc2, Gb1-Gb2 and Ga) are characterized by a large range of mollusk ecological groups. As seen in the diagrams (fig. 1), the assemblages from these levels indicate the existence of very diverse ecological niches around the site, such as those preferred by hydrophiles, rocky and soil, forest and forest-steppe associations. Compared with the previous samples from Unit H and level Gd, areas of steppe landscapes evidently decrease and those of forest, forest-steppe and floodplains increase. The increasing number of hydrophiles and rocky and soil humid elements are also in good agreement with the larger proportion of freshwater mollusks.

The malacofauna data for archaeological Unit F, or the site's middle cultural bearing deposits, come from the following levels (from bottom to top): level Fb1-Fb2 with two sub-levels (Fb1 and Fb2) and level Fa1-Fa2 with two sub-levels (Fa1 and Fa2). However, two other levels of Unit F (Fc and Fa3) did not have any snail shells.

From level Fb1-Fb2, four samples were collected. Since Unit F was excavated during 1995 and 1996, two separate samples from each sub-level were collected (tabl. 1). In sub-level Fb2, 19 shells of six species of four ecological groups were found. Freshwater forms predominate, represented by *Theodoxus fluviatilis* (8), *Th. transversalis* (4) and *Lithoglyphus naticoides* (3). Most of these shells have human-made perforations. Snails are represented only by xerophile steppe inhabitants *Helicella krynickii* (2) and *Chondrula tridens* (1). One shell of marine mollusk *Cerastoderma glaucum* was also collected from this sub-level. This shell is not perforated and we consider that humans introduced it to the site from the Black Sea side. This form is much more common than *Apporhais*. It penetrated repeatedly (at least 3-4 times, during the highest Quaternary transgressions) into the Black Sea from the Mediterranean. The first penetration of *Cerastoderma glaucum* in the Black Sea basin occurred by the end of Early Pleistocene and later became a major component of the marine faunas, specific for all Black Sea transgressions during the Middle - Late Pleistocene and also in the Holocene (Nevesskaya 1965). It is necessary to mention some interesting facts that refer not only to the evolution of this specimen in the region, but also to the level and salinity evolution of the Black Sea basin during the Quaternary. It has been clearly established that from the Early Pleistocene till the Holocene *Ceroastoderma glaucum* was not a permanent inhabitant of the Black Sea (Mikhailesku, 1990). The salinity parameters of this specimen are from 10-12 parts per thousand to 30-35 parts per thousand, such that during the deepest regressions of the Black Sea, when the sea level decreases below the level of the Bosphorus (-36 meters), water salinity also significantly decreases, (sometimes lower than 5-7 parts per thousand) and all marine mollusks disappeared, including *Cerastoderma glaucum*. For example, the last such very deep regression took place during the New-Euxinian stage of the Black Sea basin evolution. According to numerous records of absolute dating, the deepest level of this regression (about -90-100 meters lower than the actual level of the Black Sea) was reached about 20-18,000 years ago. The water salinity during the New-Euxinian stage of the Black Sea evolution decreases below 5 parts per thousand, which is why *Cerastoderma glaucum* as well as other marine mollusks disappeared at this time. This specimen again appeared in the Black Sea basin about 7,000 years ago, when the increasing level of the Mediterranean Sea rose higher than the Bosphorus level and the marine fauna penetrated the Black Sea.

The assemblage from sub-level Fb1 includes 16 shells of seven species of four ecological groups. The same species of freshwater mollusks predominate (10). In the minority are xerophile (4), forest-steppe (1) and hydrophile (1) inhabitants.

The richest sample for the entire site is from sub-level Fa2 with 158 shells of eight species of four ecological groups. From its composition, it is clearly an interstadial type of snail assemblage indicating warm and relatively humid climatic conditions. Specific for this sample is the absolute predominance of forest-steppe species of *Clausiliidae* (150), followed by inhabitants of xerophile steppes and semi-deserts (6) and only two shells appertain to the water forms. Between the latter *Gibbulla maga albida* should be mentioned, which, like *Apporhais pes pelicani*, is a worm marine stenogaline. In the Black Sea region, both species are specific only for sediments of the Karangatian basin. Their shells have also been found in many boreholes on the shelf, including the northwestern part of the Black Sea, and in sediments of the Last Interglacial terrace on the Crimean and Caucasian sides (Mikhailesku 1990).

The sample from sub-level Fa1 includes 14 shells of eight species of seven ecological groups. In this assemblage, xerophiles (50% of the sample) predominate. The proportion of forest and forest-steppe forms is relatively high (25%). These are all specific for modern Crimean fauna that indicate conditions similar to the present climate. One shell of hydrophiles *Succinea oblonga*, one rocky and soil *Caecilioides acicula* and one freshwater form *Valvata piscinalis* were also found. The latter species is a freshwater stagnophile that prefers slow currents and lakes or other standing water basins. All of these species indicate that there was a water basin close to the site. The general composition of the sample enables us to reconstruct an intrazonal type of forest-steppe landscapes, specific for floodplains or river valleys of semi-arid zones.

Summarizing the malacofauna data of Unit F in the middle of the sequence, it should be mentioned that both assemblages analyzed can be attributed to the interstadial type because they include a broad enough diversity of specimens and ecological groups (tabl. 1 and fig. 1). Strong similarity in the composition of the Unit F assemblages suggests that both represent short time periods and probably reflect different stages of faunal evolution within a single interstadial.

Perforated shells

As mentioned, many shells from Units H, G and F at Siuren I were perforated by humans. A special analysis of the perforations was conducted to identify similarities and differences in hole-making techniques and in use of snails by different Aurignacian groups for making ornaments. The Aurignacian people preferred to work with the shells of marine and freshwater mollusks, which are thicker and harder in comparison with the shells of the snails. From 32 shells with perforations, 28 are freshwater mollusks (*Theodoxus transversalis*, *Th. fluviatilis* and *Lithoglyphus naticoides*), two belong to marine species (*Apporhais pes pelicani* and *Gibbula maga albida*) and another two are snails (*Helix lucorum taurica* and *Helicella dejecta*). Most of these shells were used as necklaces, usually involving one, and more rarely, two small perforations. Bonch-Osmolowski (1934) and Vekilova (1957) also found similar shells of marine and freshwater mollusks with perforations.

Archaeological Units H and G include five modified (drilled) shells, which belong to *Theodoxus transversalis* (2), *Apporhais pespelicani* (1), *Helix lucorum taurica* (1) and *Helicella dejecta* (1). The *Apporhais* shell is the biggest in the assemblage (height 3.4 cm, including shell height 2.8 cm and aperture 0.6 mm, and width 2.2 cm); it has one large perforation (4 x 3 mm). It is clear that piercing and rubbing, mainly from the internal part of the shell, created this perforation, because the external margins of the hole are sharper and rough. The internal margins of the perforation are very fine, well-smoothed, serving as a good indicator that the shell was used as a necklace (or amulet?) for a long time, possibly being hung on a narrow skin belt. The perforations in *Theodoxus* shells were made in the same way. There are two perforations in each shell and both of them are much smaller (2 x 1.5 mm) than the *Apporhais* shell. It should be also noted that the exterior of both shells of *Theodoxus* are very finely smoothed and has a small slip of red ochre. It is difficult to identify the real origin of the perforation in the snail shells. It is quite possible that these perforations are natural, since the shells of continental mollusks such as *Helix* and *Helicella* are very fragile and sometimes natural factors (for example, wind or water streams) can also cause their breakage. The margins of these perforations are more pointed, sharp and acute, without any evidence of rubbing or smoothing.

Archaeological Unit F includes 27 modified shells. The most interesting of these is clearly is the shell of marine mollusk *Gibbula maga albida*, found in sub-level Fa2 and containing two small perforations each about 2 x 2 mm. The shell's exterior surface is very finely smoothed and colored red by ochre. The *Gibbula* shell also retains its initial natural linear form and pattern, making it a very beautiful ornament, considered one of the most attractive marine mollusks of the Black Sea. All of the other modified *Theodoxus* and *Lithoglyphus* shells from Unit F have one or two small perforations (usually not larger than 2 x 1.5 mm) and some are also colored by ochre. A few freshwater shells were found in the fireplaces, which is why they are black and also very fragile. The same technique of drilling and piercing from the interior part of the shell, with subsequent rubbing and extending the initial perforation from the exterior part of the shell, was used. In general, the hole-making technique for both archeological units are very similar and it is impossible to distinguish any significant differences, partially because the initial margins of the holes were latter worn smooth by the skin belt or the rope of the necklace. It should be also noted that among the mollusks species at Siuren I, none are edible and thus none of the species, including those with modified shells, were used as food sources.

Correlations and conclusions

Despite the fact that in some samples of snails from Siuren I, the proportion of xerophitic elements is high or even predominant, they does not necessarily indicate the predominance of xerophitic steppes near the site. When reconstructing paleolandscapes on the basis of snail fauna, it should be taken into consideration that xerophile species are the most productive among snails. Their strong shell ensures good preservation and very abundant representation in the fossil faunas. Due to both these factors, xerophile species usually constitutes the basis of many fossil assemblages, but much more informative are the other ecological groups of snails which are usually in the minority, but better reflect the real state of the surrounding landscape. Being rarely widespread, they are also in the minority in modern landscapes. Most inhabitants of hydrophiles, forest, forest-steppe, rocky and soil ecological groups of snails have a very fragile shell and are thus less well-represented in the fossil assemblages. These groups are very important for evaluation of sediment age and regional correlations.

As seen in the diagrams (fig. 1), the specimen composition of the mollusk assemblages of Unit F differs significantly from those of Units H and G. Compared with the highly uniform steppe assemblages of Unit H and the lower part of Unit G (level Gd), proportions of forest-steppe and fresh water forms clearly increase and the proportion of xerophiles and meadow steppe species decreases in the fauna of Unit F. These differences suggest that these units were deposited under different climatic conditions. There are two possible versions for this hypothesis: a) these assemblages may correspond to two different interstadials; and b) they represent different stages of faunal evolution within a single interstadial. It is clearly shown that warm species predominate in all samples and in most samples cold-loving species are absent. Only one such species was found (*Columella edentula* - 1) in the sample from sub-level Gc1 of Unit G.

Comparison of the snail assemblages from Siuren I with other fossil fauna samples in the Crimean region demonstrates that the fauna from Siuren I is younger than those from Karabi-Tamchin and Starosele (Mikhailesku 1999, figs 5-1, 5-2, 5-3 and 5-4, p. 109). The malacofauna assemblages and the diagram structure of Siuren I do not correlate with the diagrams constructed for the Karabi-Tamchin and Starosele samples, because they represent different ages and partially different groups of mollusks. The snails from Units H and G-H of Siuren I are in part comparable by their evolutionary level and assemblage structure with the youngest fauna from Kabazi II, Unit II (Mikhailesku 1999:105-106). Among all of the fossil snail faunas studied in the Crimean region, these assemblages are evolutionarily closer one to another, but are not equivalent. It is probable that they reflect two neighboring stages of snail evolution during the Last Glacial, but they are also not very similar in ecological aspect. These faunas reflect different ecological niches and evidently different climatic conditions. Representing a stadial type of fauna, the assemblage from Unit II at Kabazi II is much older and colder than the assemblages from Units H and G at Siuren I, which is an interstadial type of fauna, reflecting warmer and more humid conditions. The differences in the ecological structure of these faunas, including more xerophitic elements in the Kabazi II fauna, can be explained by drier climatic conditions, higher hypsometric position and sunny slope exposition at Kabazi II.

As seen in the diagrams (fig. 1), the mollusk assemblages from Siuren I indicate the predominance of forest- steppe and meadows landscapes around the site, also in good agreement with the palynological data of pollen zone XIII from archeological horizon -195 at Kabazi II. Pollen zone XIII indicates the gradual expansion of arboreal vegetation from refugia, including the expansion of hornbeam, and later oak and other broadleaved trees (Gerasimenko 1999:134). The predominance of forest-steppe and meadow landscape inhabitants in many snail assemblages at Siuren I serve as a good indicator that the main sequences of this site correspond to interstadial periods and were deposited in favorable environmental conditions, with a relatively warm and humid climate. The forest-steppe landscape is common in the Crimean foothills during the Arcy and Maisières interstadials and absent in the preceding and subsequent stadials of the Würm Interpleniglacial with cold and arid steppe landscapes (Gerasimenko 1999:138-139).

In general, the malacofauna records are in good agreement with the micro- and macro-mammal fauna data for Siuren I (López Bayón 1998; A.K. Markova pers. comm. 2002), as well as with stratigraphic, chronological and archaeological data; they confirm correlations of Siuren I with the Arcy (ca. 30000 years BP) and Maisières (ca. 29-28000 years BP) interstadials of the Last Glacial (Demidenko & Otte 2000-2001:139). Taking into consideration the significant differences in the composition of the mollusk assemblages for Units H-G and F, it is quite possible that both of these interstadials may be represented. It is hoped that further analyses and data obtained by other methods, including absolute dating, geological data, pollen, micro- and macro-mammals data will clarify this hypothesis.

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Liège, ERAUL 129, 2012, p. 79-90.

8 - THE WORKED BONE ARTIFACTS FROM THE SIUREN I ROCK-SHELTER (CRIMEA): THE 1990S EXCAVATION

Natalia B. AKHMETGALEEVA

Introduction

During the new excavations at Siuren I during the 1990s, a joint Ukrainian-Belgian project directed by V.P. Chabai, a series of worked bone artifacts was recovered from the lower and middle deposition units. These units are geochronologically situated during between 31/30-28000 BP, a period that includes the Arcy and Maisières interstadials (Demidenko & Otte 2000-2001).

As has been shown (see Chapter 1), several different and often opposing interpretations of the geochronology and industrial attributions of the Siuren I deposits have been proposed. However, the worked bone artifacts were never studied, especially with respect to chronological and cultural comparisons, despite awareness of very efficient methods and analyses (e.g. Gvozdover 1953, 1995; Clark & Thompson 1953; Clark 1977; Hahn 1977; Olsen 1979; Knecht 1993; D´Errico *et al.* 2003; Khlopatchev 2000-2001). It is the aim of the present study to fill this information gap for the material recovered in the 1990s. This chapter presents descriptions of technological manufacture, morphology and use-wear traces for the Siuren I worked bone artifacts.

These analyses are based on samples of technological and use-wear traces obtained during many of my own experiments, applying methods from the Saint-Petersburg Use-Wear Lab (Institute of History of Material Culture, Russian Academy of Sciences) (Semenov 1957; Filippov 1983; Schelinsky 1983; Korobkova & Schelisky 1996; Korobkova & Sharovskaya 2001) and those used by French colleagues at the CNRS (mastered during "TEHNOS-2006", my probation in France under the direction of A. Averbuch and M. Kristensen). An MBS-2 binocular microscope (magnification to 84x) was used for the use-wear analyses and an "Epson Perfection 2480 PHOTO" scanner (resolution to 12800) for the macro photos.

Archeological context of the bone artifacts

The stratigraphic sequence of Siuren I has been described in detail in the present volume. Here we note only certain details relevant to analysis of the bone artifacts.

The 1990s excavations showed that Lower and Middle archeological layers of Bonch-Osmolowski's 1920s excavation (Bonch-Osmolowski 1934; Vekilova 1957) correspond to the 1990s units with several levels.

The 1920s Lower layer corresponds to the 1990s Unit G, which contains the following four levels from bottom to top: Gd, Gc1-Gc2, Gb1-Gb2 and Ga. The three lower levels (except level Ga) contain abundant Upper Paleolithic and a few Middle Paleolithic artifacts. Moreover, levels Gc1-Gc2 and Gb1-Gb2 are additionally respectively divided into three and two sub-levels. All three levels contain hearths/fireplaces and/or ashy lenses, showing intensive exploitation of the rock-shelter by its human visitors.

The 1920s Middle layer corresponds to 1990s Unit F, again with four levels from bottom to top: Fc, Fb1-Fb2, Fa3 and Fa1-Fa2. All Unit F finds are attributed to the Upper Paleolithic. Again, as for Unit G, two levels (Fb1-Fb2 and Fa1-Fa2) also have complex sub-level structures.

Thus, Units G and F contain different Paleolithic assemblages. Unit G is characterized by Archaic Aurignacian/Aurignacian 0 and Micoquian lithics, while Unit F contains only Upper Paleolithic, Late/Evolved Aurignacian lithics (see Demidenko *et al.* 1998; Demidenko & Otte 2000-2001). Critical review shows that these data are also in accordance with the 1920s excavation data.

The Units G and F sediments are mainly composed of very numerous limestone *éboulis* with sandy, silty-clay and/or clay components depending upon particular location in the rock-shelter.

The 1990s excavation revealed 13 pieces of worked bone, which came only from Units G and F. As these units are the most informative for the site, regarding their find contexts, analysis of these artifacts is of interest. Unit G contains eight artifacts, seven of which were found in different sub-levels of level Gc1-Gc2 and one in sub-level Gb1 of level Gb1-Gb2. Another 5 worked bone pieces come from two levels of Unit F: 4 from different sub-levels of level Fb1-Fb2 and one from sub-level Fa2 of level Fa1-Fa2.

It is also important to point out the similarity in the hunted ungulate species fauna from both Units G and F (see López Bayón 1998), as ungulate bones were used for production and/or use of the worked bone artifacts. The fauna spectrum is dominated by saiga (*Saiga tatarica*), variable presence of horse (*Equus* sp.), bovids (*Bos* sp.), red deer (*Cervus elaphus*), deer (*Cervus* sp.) and giant deer (*Cervus megaceros*). The only noticeable difference is the occurrence of two identifiable wild boar bones (*Sus scrofa*) in level Fb1-Fb2 of Unit F. An arctic fox (*Alopex lagopus*) canine pendant (paleontological determination by M. Patou-Mathis in 2007) originates from sub-level Fb2 of level Fb1-Fb2. Other than this, no true cold-loving species have been found in the faunal, microfaunal and malacofaunal assemblages from Units G and F (see López Bayón 1998; see Massé & Patou-Mathis, Markova, Mikhailesku, this volume).

Description of worked bone artifacts from Unit G

Taphonomy

The eight bone items (2 retouchers, 5 points and an awl) (figs. 1-9C) have the following specific taphonomic features.

First, some taphonomic changes of bony tissue caused by biotic and abiotic factors have been observed. The biotic effect for bones was actually minimal for the artifacts studied. Some plant root damage is noted on a small point (fig. 5:A). Also, some microorganism effects can be seen on the surface of the awl (fig. 9). At the same time, the influence of abiotic factors is more variable. The surface of one of the retouchers (sub-level Gc2a, square 6-D) is weathered, clearly indicated by the presence of both small and large longitudinal cracks with uneven edges and some exfoliation of the upper surface of bone tissue (fig. 2). Some shiny spots 0.5 cm in diameter, of a chemical origin, can be seen on the surface of the second retoucher (fig. 1:B). The other bone artifacts from Unit G have some trowelled surfaces that create in some cases a shining dense crust; such damage is the result of prolonged presence of the artifacts within moist sediments. Some tiny dark-brownish and rarely black specks on light-brownish and whitish surfaces can be observed on these artifacts. Some are also mineralized, including a retoucher from sub-level Gc2 (square 7-C) (fig. 1), a shouldered awl with a long tip from sub-level Gc1 (square 9-C) (fig. 9) and a short point with a needle-shaped tip from sub-level Gc2a (square 9-D) (fig. 5). All are nearly completely covered with dark-brownish spots and their internal structure is denser with a brownish color. At the same time, the independence of the kind of taphonomic changes observed on the types of tools and the fact that bone artifacts have been found in the different archaeological substrata should be stressed.

Common techno-morphological and use-wear characteristics for the worked bone artifacts

Both retouchers are of the same type. Fragments of large ungulate tubular bones were deliberately selected for to ~~use~~ them. The bones were splintered for marrow extraction.

Measurements for the first retoucher (sub-level Gc2, square 7-C) are as follows: length 7.1 cm, width 2.8 cm, thickness of the bone side 1.8 cm (fig. 1). All breakage observed on the retoucher occurred during the Paleolithic and was fresh bone breakage. The bone fragment was perhaps selected for use as a retoucher because it had a natural pointed protuberance that could be used as a handle. Such a possible location of the bone held in a human hand is suggested by the direction of retoucher striking traces on its surface. A clear ovoid area (1.5 x 1.3 cm) with intensive retoucher wear traces including small depressions and incisions is clearly visible on the piece's external surface (fig. 1:A). These are traces of bone use during impact retouching actions that are evident by both the zone location of wear traces in the center of the bone and groove depths of different direction, forming the concave surface of the wear trace zone. Namely, some scars of pulled up bone tissue is typical because of impact retouching that differs, for example, from use as an anvil in which incisions are pressed into the bone surface. Another indication of use as a retoucher is the presence of long and curved scratches that go outside of the retouching zone.

The second retoucher from sub-level Gc2a (square 6-D) is 6.8 cm long, 3.8 cm wide, and 0.8 cm thick. Most breakages of the piece are of fresh bone occurring in the past, but there is also modern breakage at the narrow ends of the piece. Rare battering depressions from retouching actions are present for a 1.3 x 0.6 cm area in the central part of the piece on its external surface (figs. 2).

The other six worked bone pieces from Unit G are five points and an awl, all produced from the sides of ungulate tubular bones (fig. 3).

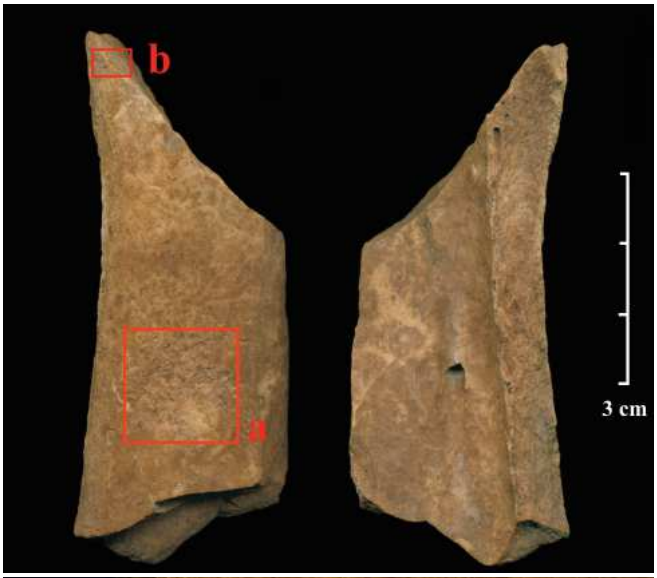
Four of the five points are flat.

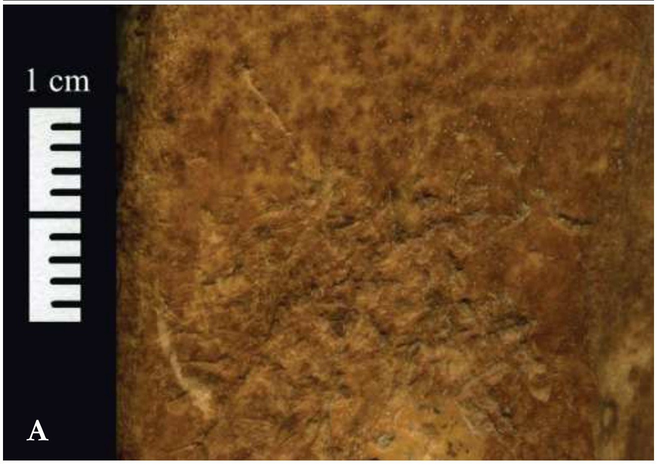
Two points are short with a needle-shaped tip (fig. 3:2-3), one found in square 7-C in sub-level Gc2 and the other from square 9-D in sub-level Gc2a.

Technologically, both points were manufactured in the same way. Surface leveling traces can only be identified along one side edge in both cases and it therefore seems high likely that the points were produced by treatment of longitudinal bone fragments. Surfaces are not smoothed. Evidence of formation of the needle-shaped tips by scraping-slicing actions in the direction from base to tip is also observed.

The first point (sub-level Gc2, square 7-C) is 2.75 cm long, 0.5 cm wide and 0.13 cm thick (fig. 4). Its tip is smoothed as a result of point penetration into soft tissue (fig. 4:A). Polishing of the tip is a shiny, abrasive and surface. Technological traces in a contact zone are scratched and not visible. Because of significant taphonomic changes, it is not possible to precisely determine a contact tissue, but the wear traces on the point's tip are most similar to penetration traces into plant tissue.

The second point (sub-level Gc2a, square 9-D) is 2.6 cm long, 0.8 cm wide and 0.2 cm thick (fig. 5). The point's tip was broken recently and wear traces are not visible at all (fig. 5:A). The point's base was also recently fragmented.





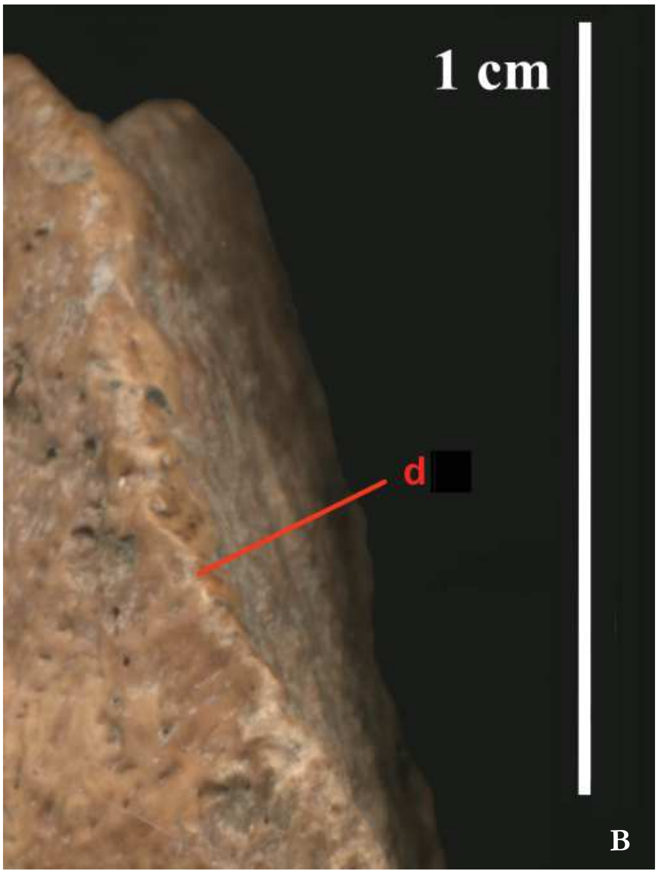


Figure 1 - Bone retoucher. Sub-level “Gc2”, sq. 7-C. General view. A, macrophoto of use-wear traces on the retoucher; B, macrophoto: shiny spots of chemical origin on the retoucher.

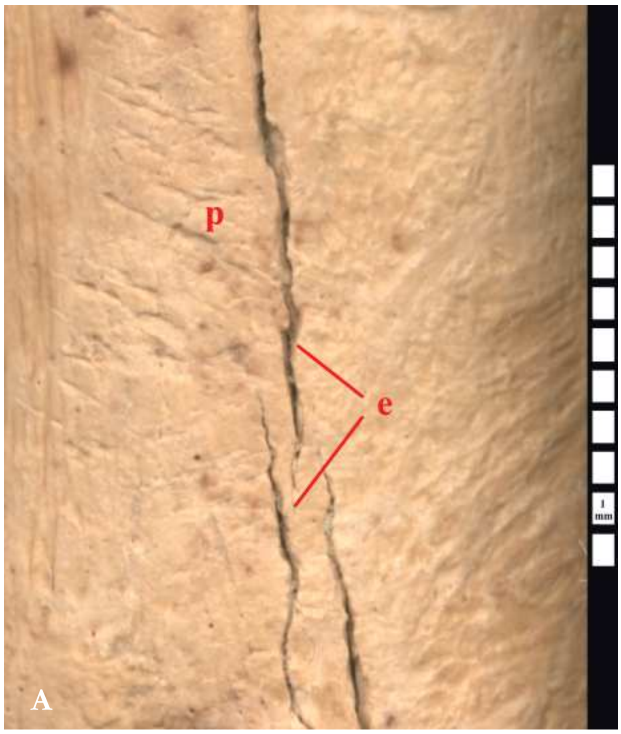


Figure 2 - Bone retoucher. Sub-level “Gc2a”, sq. 6-D. General view. A, macrophoto: *p*-usewear-traces on the retoucher; *e*-weathering cracks on the retoucher.

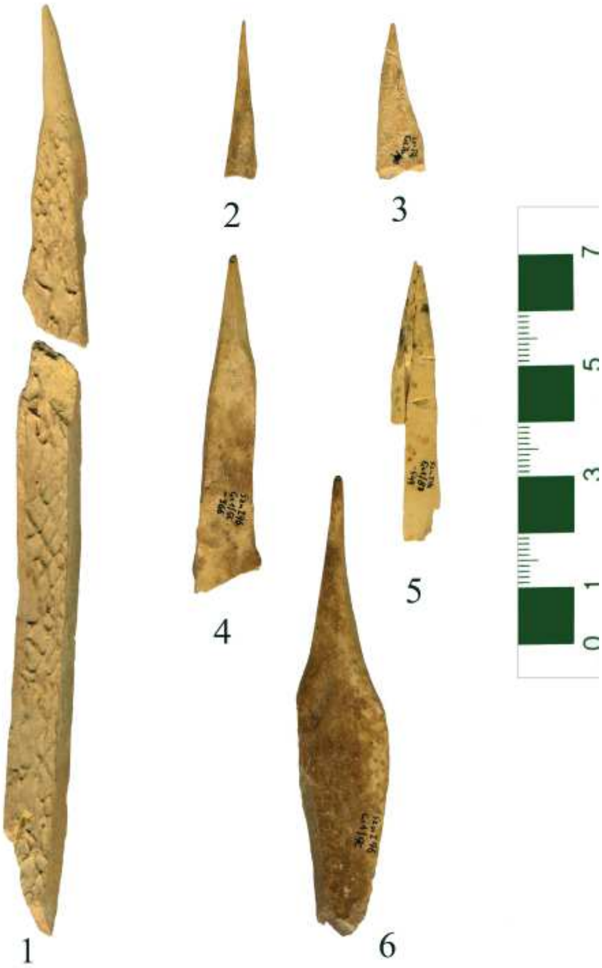


Figure 3 - Bone points (1-5) and an awl (6) of Unit G.

Two other flat points were made in the same manner as these points, but are larger and identified as long points (fig. 3:1, 4).

One of these long and flat points (sub-level Gc1, square 6-C) is 6.0 cm long, 1.15 cm wide and 0.4 cm thick (fig. 6). The point's tip was shaped through definite slicing actions, but was broken during the Paleolithic (fig. 6:A).

Another long and flat point is the longest (16.2 cm) and is also 1.0 cm wide and 0.5 cm thick (fig. 7), discovered in square 8-E of sub-level Gb1. The point is composed of two fragments. The point's tip was made by scraping and slicing methods and its very end has a modern break (fig. 7:A). No wear traces were identified on it. The point, however, has an area with some polished surface on its wide sided lateral break (fig. 7:B). This is exactly the case when it is possible to say for certain that the longitudinal cutting technique was applied here, but instead irregularities of the lateral breakage were simply cut off. Some tiny ochre pieces in micropits are preserved in the point's wide sided lateral break.

Finally, the last point from Unit G (sub-level Gc1, square 8-D) is characterized by very poor preservation. It is 5.0 cm long, 0.8 cm wide and 0.3 cm thick (fig. 8). The piece was sliced from the side of a tubular bone. Recently broken due to bone tissue fragility, the several fragments have been refitted and glued. It is not possible to record the point's section data, but there is a complete piece with the same morphological characteristics discovered in the 1920s Lower layer which is ovoid in section. It should also be mentioned that the point from sub-level Gc1 was also both longitudinally fragmented and laminated during the Paleolithic (during its fossilization?). Some slicing manufac-

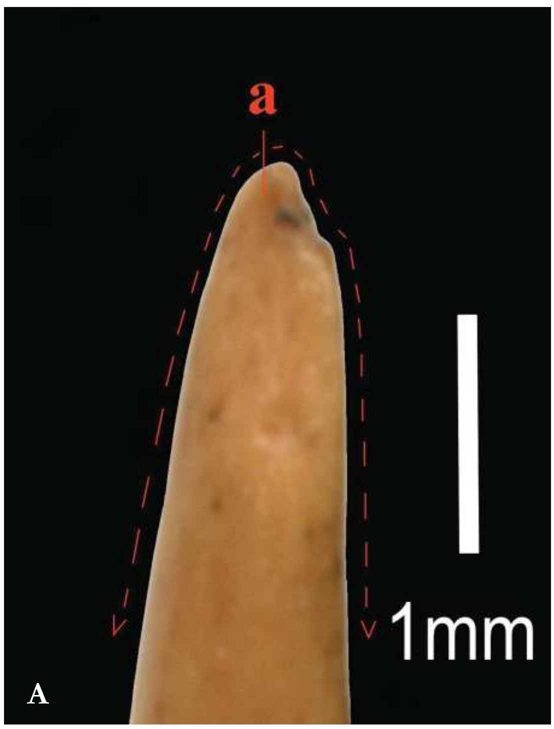
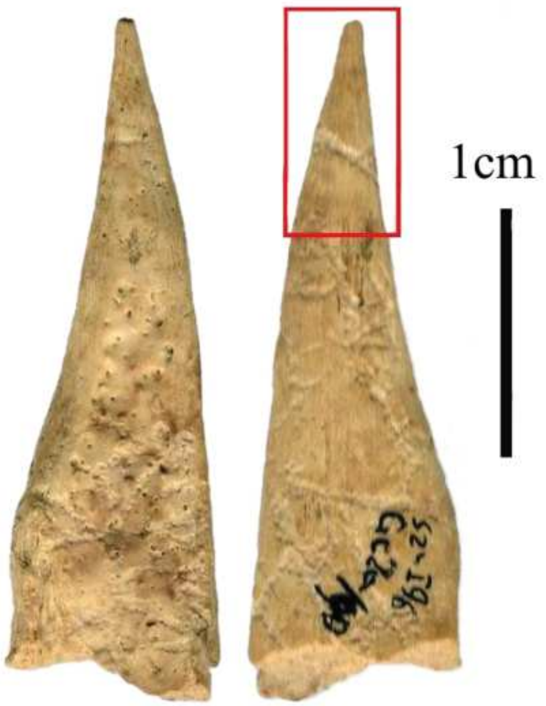
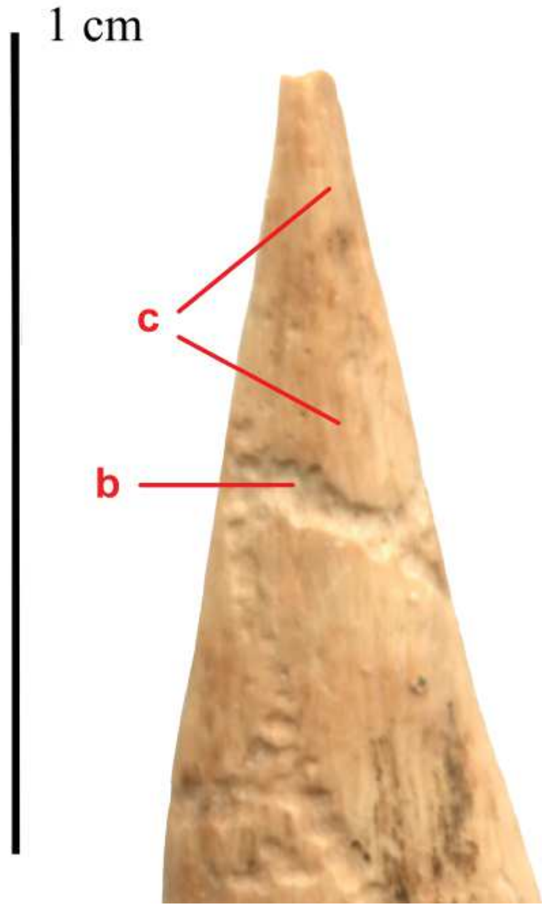


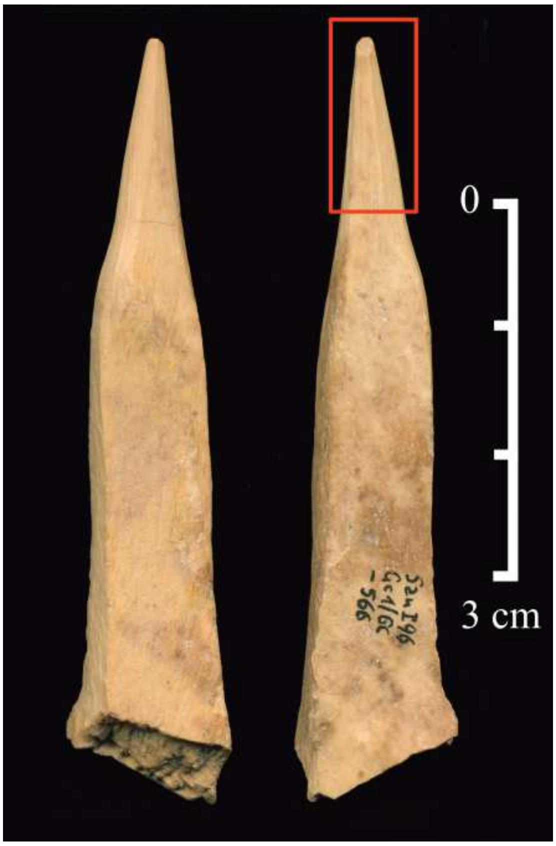
Figure 4 - Bone short flat point. Sub-level "Gc2", sq. 7-C. General view. A, macrophoto: a-puncturing polishing on the point's working zone.

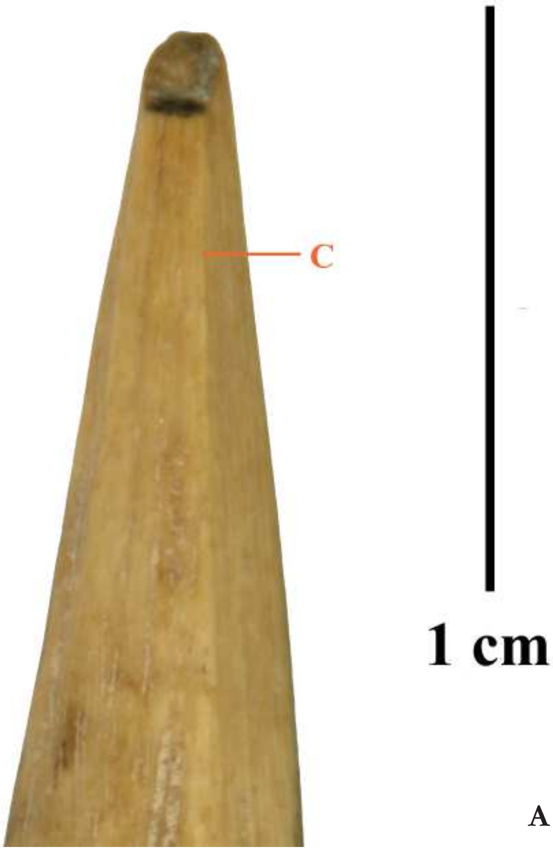




A

Figure 5 - Bone short flat point. Sub-level “Gc2a”, sq. 9-D. General view. A, macrophoto of the point’s tip: c-scraping-slicing treatment traces; b-plant root traces.





A

Figure 6 - Bone long flat point. Sub-level “Gc1”, sq. 6-C. General view. A, macrophoto of the point’s tip: c-slicing treatment traces.

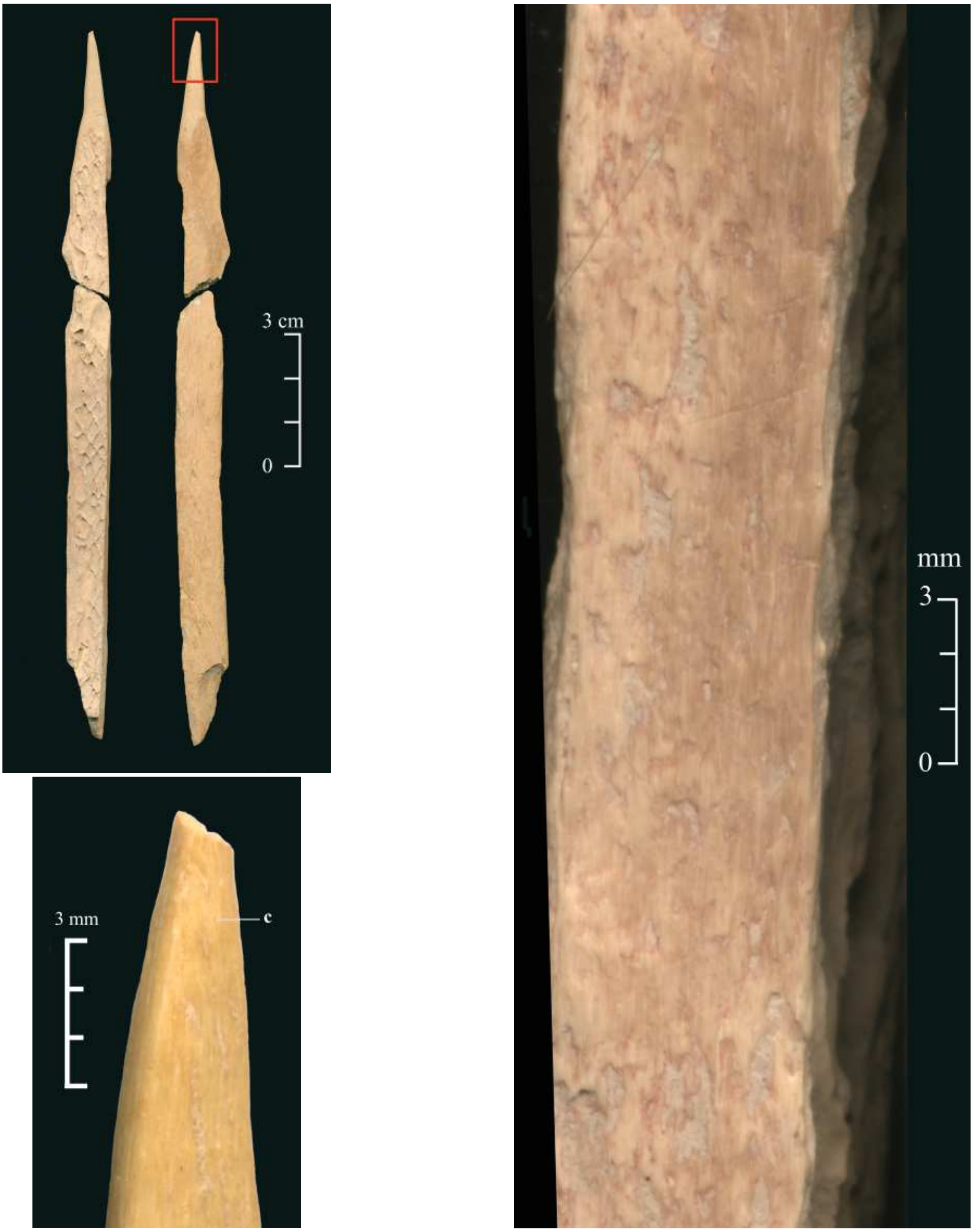


Figure 7 - Bone long flat point. Sub-level "Gb1", sq. 8-E. General view. A, macrophoto of the point's tip: c-scraping-slicing treatment traces; B, macrophoto of the point's side edge with shaping traces.

turing traces are preserved on its surface, but use-wear traces are absent.

The only awl in the Unit G collection is a shouldered one with long tip from square 9-C in sub-level Gc1. It is 8.0 cm long, 1.7 cm wide and 0.9 cm thick (fig. 9). Like the points, the awl was made from the side of an ungulate tubular bone. The edges of the awl's base are not shaped. Although the awl was manufactured similar to the points, a scraping with pressure technique from base to tip was also used during production (fig. 9:A). The awl's shoulders are plain and very definite. Scraping traces on the shoulders' surfaces are clearly observed. The tip's length is about 3.5 cm. It is heavily polished due to taphonomic changes, making it impossible to discuss possible use-wear traces, despite the "chamfered" breakage's edges (fig. 9:B). The awl's very tip has technological scratches and scraping traces were also preserved. Taking into consideration all of the problems with the piece, puncturing by the awl of a rather soft material cannot

Figure 8 - Bone point. Sub-level "Gc1", sq. 8-D. General view.

be excluded. The awl's basal fragmentation is modern and is crescent in section.

Description of worked bone artifacts from Unit F

Taphonomy

As noted above, four artifacts were found in level Fb1-Fb2 and only one in sub-level Fa2 of level Fa1-Fa2 (fig. 10). They are all light-brownish in color with some small brown spots. The following specific taphonomic features have been observed.

1. Bone weathering is easily identified by the lighter, whitish shade for the bone tissue. Varying degrees of weathering are shown by the presence of smaller and bigger longitudinal cracks with uneven edges and lamination of the upper layer of the bone tissue. Different degrees of weathering have been recorded for all of the Unit F bone artifacts, except for the heavily burnt point from sub-level Fb1, square 8-E (fig. 10:2).

2. Surface erosion was also observed on the pieces as a result of natural chemical processes. This has been identified on items with the least amount of secondary treatment - the actual waste products from production of the pieces (sub-level Fb1, square 8-E and sub-level Fa2, square 8-E) (fig. 10:4-5).

3. Damage caused by plant roots and microorganisms is present on the only pendant in the collection, from sub-level Fb2, square 7-E (fig. 10:3).

Some of these pieces are transversally fragmented on their edges or were damaged during excavations, again caused by bone tissue fragility. The most altered pieces were found in and around the hearth in square 8-E of sub-level Fb1.

Common techno-morphological and use-wear characteristics for the bone worked pieces

The Unit F worked bone artifacts are represented by two debitage items/waste products from artifact production, two points and a pendant.

The two debitage items are very poorly preserved. They are heavily weathered, damaged by plant roots and eroded. Such items are possibly underrepresented in the collection but, at the same time, the flaking technique for the creation of a bone tool is very hard to identify. Along with this, these debitage items differ from the usual bone "kitchen waste" by different blow direction, morphological parameters or the presence of intentional breaks on bones not conducive to marrow extraction. Characteristics of the debitage items are as follows.

One is a fragment of longitudinally splintered tubular bone of a medium ungulate with part of one epiphysis preserved (fig. 10:4). It is 6.5 cm long, 1.7 cm wide and 0.4 cm thick and was discovered in square 8-E of sub-level Fa2. Characteristics of the splintered epiphysis surface and their directions suggest that longitudinal splintering of the bone may have been specifically aimed at the creation of a blank for a bone tool.

The second is a pointed fragment of a large ungulate tubular bone (sub-level Fb1, square 8-E) 8.5 cm long, 1.8 cm wide and 0.6 cm thick (fig. 10:5, fig. 11).

The only finished bone tools in Unit F are two points and both belong to the same type - ovoid in section points (fig. 10:1-2).

The first point (sub-level Fb2, square 7-E) was made from an antler and is 5.5 cm long with a maximal diameter of 1.0 cm (fig. 10:1, fig. 12). Manufacturing traces were removed during surface treatment by a hard abrasive material (a stone?) (fig. 12:A). The tool's base was broken during the Paleolithic. Surface and breakage edges of the point are similar to traces of "projectile damage" on known bone points.

The second point is 2.8 cm long with a maximal diameter of 0.65 cm (fig. 10:2). The piece is composed of two fragments found in the square 8-E hearth of sub-level Fb1. Its preservation state is very poor as it is heavily burnt, making it impossible to identify kind of bone used.

The only non-utilitarian bone object is a pendant made of an arctic fox canine with a perforation in its root, found in square 7-E of sub-level Fb2 (fig. 13). The perforation was first drilled by circular motions for half of its diameter from both sides (transversally in relation to the tooth's axis), then the hole was completed by chiseling of the remaining dental tissue. Some barely visible longitudinal scratches can be seen on one side of the canine around the perforation; these are actually preliminary markings and/or initial scraping of the future perforation (fig.

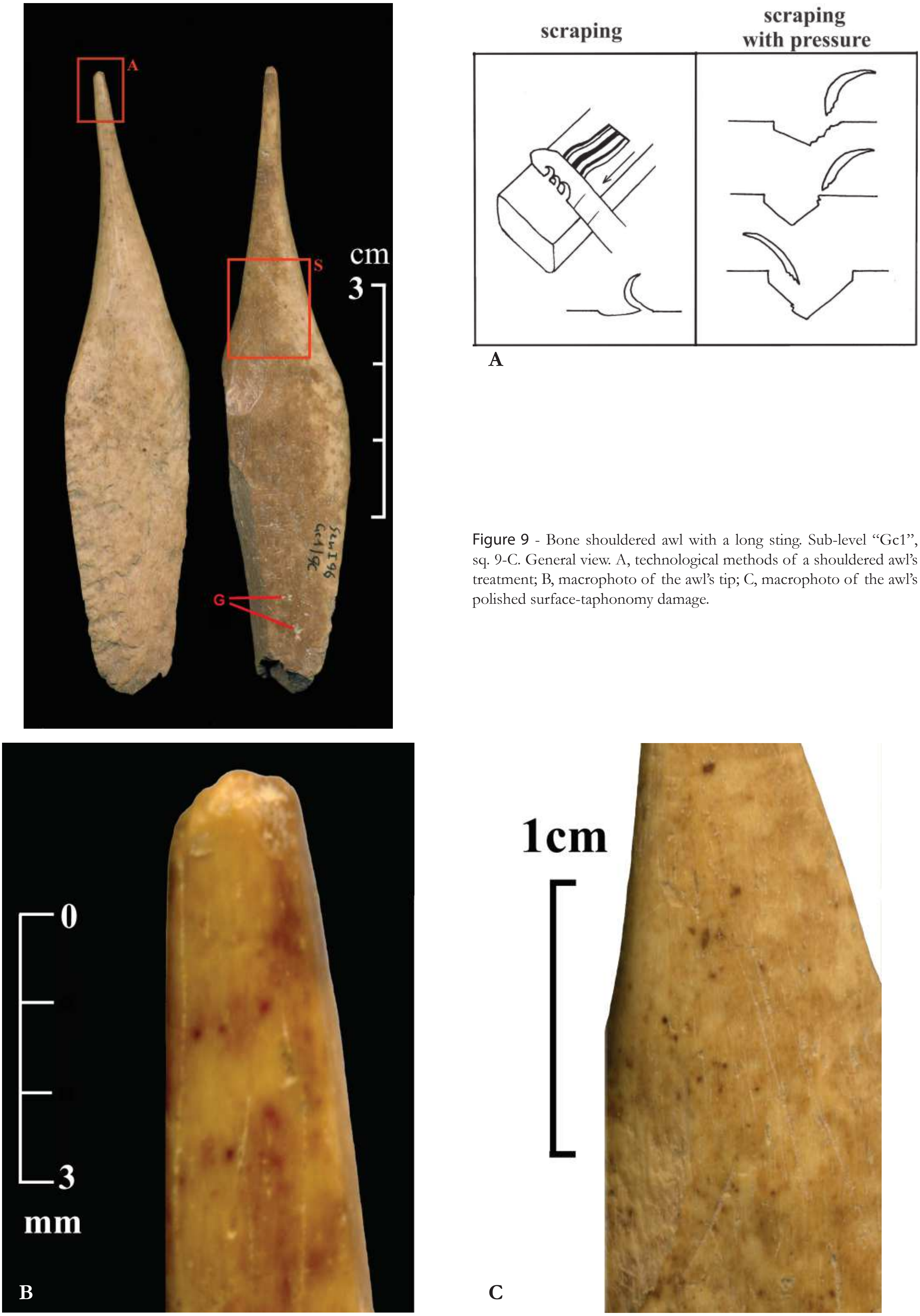


Figure 9 - Bone shouldered awl with a long sting. Sub-level "Gc1", sq. 9-C. General view. A, technological methods of a shouldered awl's treatment; B, macrophoto of the awl's tip; C, macrophoto of the awl's polished surface-taphonomy damage.

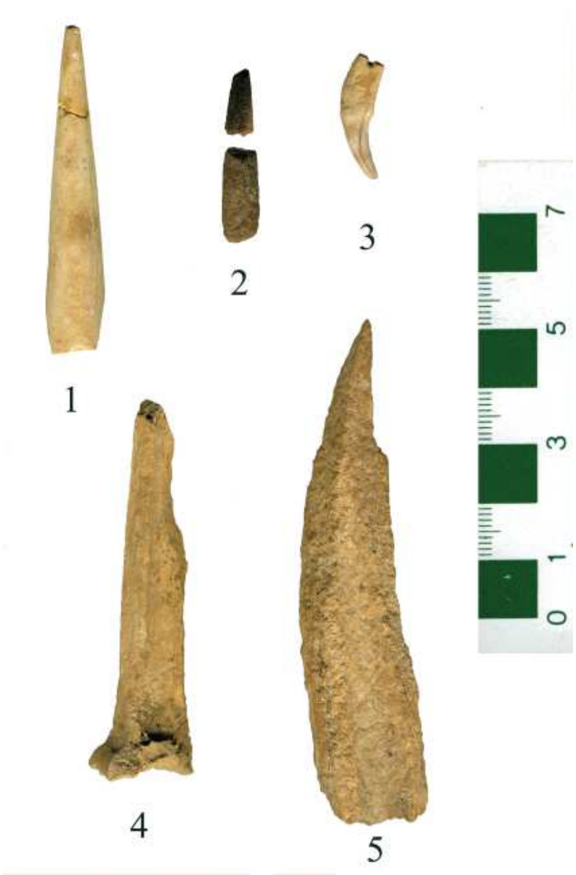


Figure 10 - Bone worked pieces of Unit F. 1-2-points, 3-arctic fox canine pendant, 4-5-debitage pieces.

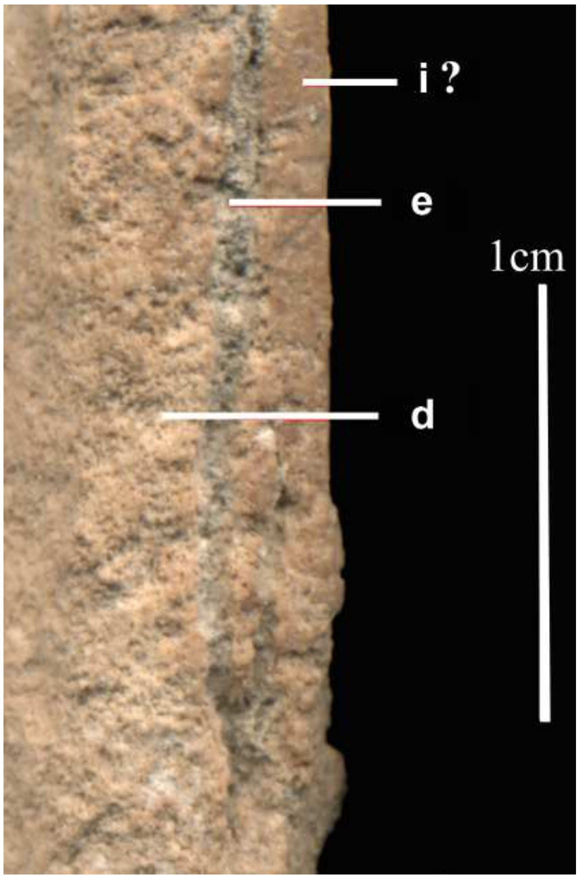
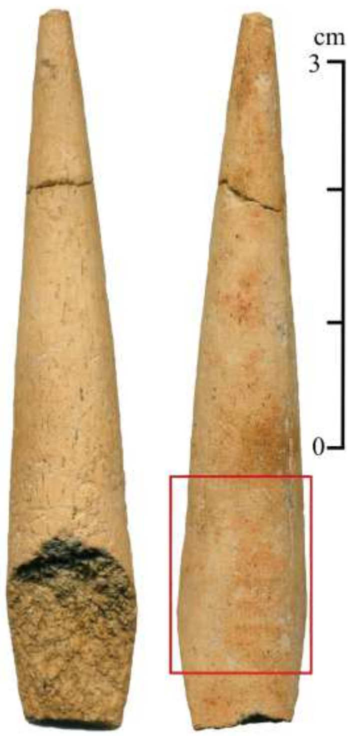


Figure 11 - Bone debitage item. Sub-level "Fb1", sq. 8-E. Macrophoto of the piece's side edge (fig. 10:5): i-secondary treatment traces (?), e-weathering, d-erosion.



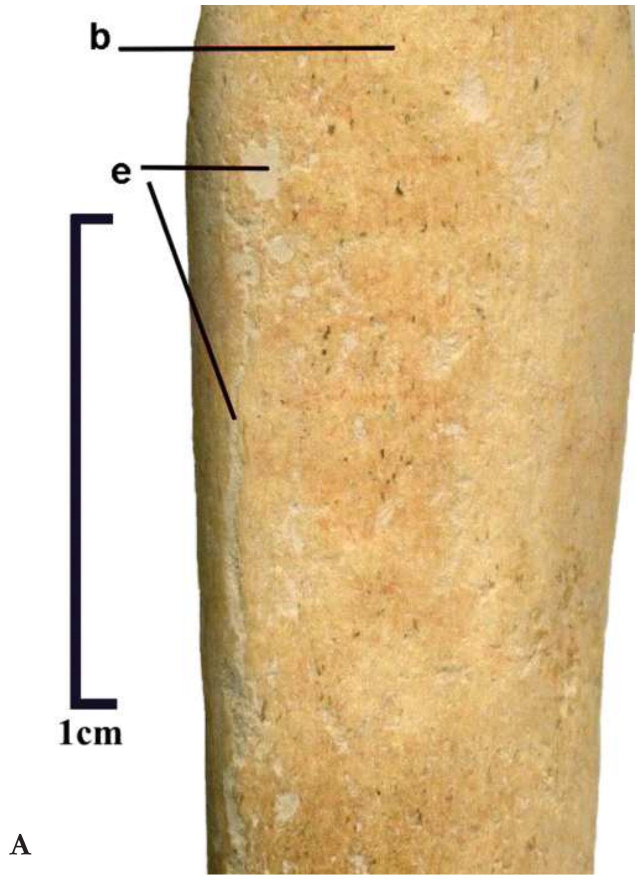


Figure 12 - Bone ovoid in section point. Sub-level "Fb2", sq. 7-E. General view. A, macrophoto of the point's part: b-abrasion secondary treatment, e-effect done by microorganisms.

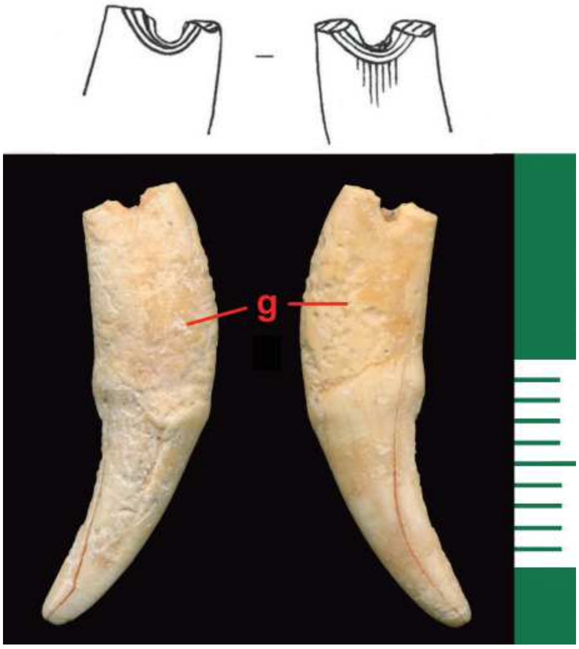


Figure 13 - Arctic fox canine pendant. Sub-level "Fb2", sq. 7-E. g-effect done by microorganisms. A, macrophoto of the pendant's perforation.

13:A). The perforation on the pendant is located very close to the end of the canine's root, which probably led to the pendant's breaking during use. Using 24x binocular magnification, some specks of red ochre and a black pigment within micro pits of the perforation can be seen.

Comparative analysis between worked bone artifacts from Units G and F

It should first be noted that the worked bone artifacts from Units G and F are quite rare and strictly speaking do not constitute an absolutely objective database for unambiguous cultural and chronological conclusions. Nevertheless, it is still possible to make the following observations.

Different point types for Units G and F were identified. It is also possible that the range of methods used for primary bone treatment differed.

Humans responsible for the Unit G occupations used natural bone fragments that were suitable for Aurignacian bone tool production, according to their shape. Then, if necessary, the bones were shaped and reshaped to create the form needed for the future tool. The basic technological techniques for bone treatment were slicing-scraping. There were no clear tendencies for the creation of any strict symmetrical form for points or for complete modification of a bone blank. The Unit G flat points and shouldered awl made from the side of tubular bones are known in many Upper Paleolithic assemblages. At the same time, it should be noted that the Unit G bone tools and their technological indications are well known in the Aurignacian, for example in the geochronologically and industrially similar Aurignacian find complex with Dufour bladelets of Dufour sub-type in layer VII of Arcy-sur-Cure in France (d´Errico *et al.* 2003). Retouchers on the sides of tubular bones, not specially shaped, are also well-known in the European Paleolithic, but mainly in Middle Plaleolithic assemblages (Bonch-Osmolowski 1934, 1940; Taute 1965; Schelinskiy 1983; Chase 1990; Filippov & Lyubin 1994; Chabai 2004a). Also, retouchers are sometimes present in different Early Upper Paleolithic assemblages, including Aurignacian ones (see Tartar 2003).

Regarding the Siuren I retouchers, it should be acknowledged that, by all morphological and metric parameters, they are identical to the numerous and well-known bone retouchers from various Crimean Middle Paleolithic Micoquian assemblages, because there is a good technological correlation between bone retouchers and bifacial tools and various unifacial convergent tools with stepped retouch (see Bonch-Osmolowski 1934; Yevtushenko 1998; Chabai 2004a, 2004b; Veselskiy 2008). Demidenko concludes that the Siuren I bone retouchers belong to occupations at the rock-shelter attributed to the Kiik-Koba industry type of the Crimean Micoquian Tradition, along with some Micoquian lithic artifacts from levels Gd, Gc1-Gc2 and Gb1-Gb2 (Demidenko 2000). At the same time, some bone retouchers occur only in those industrially variable European Early Upper Paleolithic assemblages in which very intensive lithic tool treatment and retreatment processes were used and many tools have stepped retouch (Demidenko, pers. comm.). Turning back to the presence of bone retouchers in Aurignacian assemblages in Western Europe, he again points out their occurrence just in those assemblages containing serial Aurignacian blades with heavy stepped retouch. This is a serious argument as there are no such Aurignacian blades in Unit G at Siuren I and, at the same time, serial Micoquian bifacial tools and unifacial convergent tools with stepped retouch are present. Recently, my own experiments on lithic artifact retouching with bone retouchers have repeatedly shown the high productivity of bone retouchers for blade shaping and reshaping with stepped retouch. All in all, it is now quite logical to attribute the studied two Siuren I, level Gc1-Gc2 bone retouchers to the Crimean Micoquian find complex, together with the associated Micoquian lithics.

Thus, the Unit G worked bone artifacts confirm the twofold industrial component for the rock-shelter's lower cultural bearing sediments as put forward by Demidenko in 2000.

At the same time, Unit F, containing only Upper Paleolithic material and, namely, Aurignacian worked bone artifacts, is very different from the Aurignacian ones from Unit G. First, they are characterized by a broader spectrum of technological methods for their manufacture and, possibly, even by the presence of a special initial treatment stage for splintering bones for the creation of tool blanks. The most culturally and chronologically indicative pieces are Aurignacian bone points for this Siuren I find complex. Points with ovoid section and abrasive treatments are well-known in the Western European Late/Evolved "Aurignacian IV", still following the Peyrony classification (Peyrony 1933, 1936). At the same time, the specific abrasive treatments for the Unit F bone points occur very rarely in later Upper Paleolithic assemblages in Eastern Europe.

The only non-utilitarian bone artifact from Unit F (an arctic fox canine pendant), with chiseling technology to finish the perforation in small carnivore canines/teeth after initial drilling is very characteristic for the Early Upper Paleolithic and particularly in Aurignacian assemblages (see White 2002; Goutas 2004). Some cases of the joint occurrence of ovoid in section bone points and the same pendants on small carnivore canines/teeth very similar to the Unit F artifacts, are also known, such as at the Late/Evolved Aurignacian find complex with Dufour bladelets of Roc de Combe sub-type from Beneito Cave, levels B9-B8 in Spain (Iturbe *et al.* 1993). The latter distant, but striking, parallel once again points out the special Late/Evolved Aurignacian status for the Siuren I, Unit F artifacts.

The comparative data for worked bone artifacts from Units G and F, excavated in the 1990s at Siuren I, can also be compared with data from the Lower and Middle layer bone artifacts, excavated in the 1920s.

After the 1920s excavations at the rock-shelter, all of the Siuren I fauna and bone artifact data were published as together one complex for the three defined archeological layers (Bonch-Osmolowski 1934:153). Regarding the worked bone artifacts, Bonch-Osmolowski noted that the total collection numbered several points and 50 awls. In the early 1950s, Vekilova initiated "a detailed restudy of fauna remains with precise counting of both number of remains and individuals for each particular layer," conducted by N.K. Vereschagin and I.M. Gromov (Vekilova 1957:252). As a result of this faunal analysis, Vekilova published detailed fauna data and morphological descriptions of worked bone artifacts for the collections from each archeological layer (Vekilova 1957:253-257, 293-303).

Four bone tools and 18 bone fragments with cut marks were identified from the 1920s Middle layer (stratigraphic analog of the 1990s Unit F) but, unfortunately, none of these pieces was illustrated in her article (Vekilova 1957:301). 11 retouchers, 5 points, 45 awls and more than 200 bones with cut marks from the 1920s Lower layer were also identified (stratigraphic analog of the 1990s Unit G) (Vekilova 1957:293-301). Of all of these bone artifacts, only two retouchers, seven flat points and two awls on horse accessory metapodia were illustrated (Vekilova 1957: fig. 26 on p. 295).

The present author conducted a brief examination of the 1920s worked bone artifacts at Kunstkamera Museum (St.-Petersburg, Russia) with the aim of comparing them with the 1990s bone artifact data.

It was possible to identify three bone fragments with short transversal cuts in the Middle layer collection. There is also an ovoid in section point, but with a heavily eroded surface. By morphological and metric data, this point is identical to the 1990s Unit F ovoid points. The worked bone artifacts from the Lower layer turned out to be more representative and informative. A series of bones with cut marks related to ungulate dismembering and fragments of tubular bones with spiral-bayonet fractures was identified. There are also no less than 10 long bone fragments with nearly parallel edges that might be the result of additional special blows on epiphyses of unsplintered bones for marrow extraction or longitudinal bone splinting with a wedge application, when a blow direction goes from the center of an epiphysis articulation surface longitudinal to the bone axis. This technique for initial tool blank production is also known for bone pieces from Unit F. D'Errico and colleagues have recognized wide usage of this particular bone treatment technique for Chatelperronian and Aurignacian levels at Arcy-sur-Cure (d'Errico *et al.* 2003), again confirming a rather early geochronological and industrial status for the Siuren I Aurignacian materials in the Upper Paleolithic period. About 10 small fragments of tubular bones and ribs with cut marks might be a result of their use as stands. There is no data on the longitudinal bone cutting technique for tool blank production. The technique of bone blank production using the slicing-scraping treatment method along the bone side edges, noted for Unit G, had a broad distribution, as a basic technique, again during the Early Upper Paleolithic.

Thus, the 1920s bone artifacts from the Lower and Middle layers have clear analogies with the worked bone artifacts from the 1990s Units G and F. It is also worth noting that no new artifact types and treatment methods were noted for the 1920s materials.

Concluding Remarks

The techno-morphological and use-wear data for the worked bone artifacts from Units G and F presented here allow us to make the following conclusions.

The artifacts from Units G and F belong to different typological and technological complexes. At the same time, while the Unit F materials are clearly homogeneous, the Unit G artifacts represent two different cultural complexes.

The data on the worked bone artifacts also definitely correspond well to the proposals previously made by Demidenko concerning from lithic material analyses: that the Unit G artifacts represent two different complexes - one Upper Paleolithic Early Aurignacian with Dufour bladelets of Dufour sub-type and one Middle Paleolithic Micoquian, while the Unit F artifacts represent only the Upper Paleolithic, but a different Late/ Evolved Aurignacian complex with Dufour bladelets of Roc de Combe sub-type.

Acknowledgements
I am very thankful to Yuri E. Demidenko for the possibility to work with the 1990s bone artifacts, for all of his consultations and for initial translation of this chapter's text from Russian to English. Many thanks also go to Gennadiy A. Khlopachev for the opportunity to work with the 1920s bone artifacts at Kunstkamera Museum (St.-Petersburg, Russia).

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 91-107.

9 - THE CLASSIFICATION AND ATTRIBUTE ANALYSIS SYSTEM APPLIED TO THE SIUREN I LITHIC ASSEMBLAGES

Yuri E. DEMIDENKO

Introduction

The choice of a classification system for the analysis of Paleolithic stone artifacts should not be abstract and *ad hoc*, but rather highly related to the key techno-typological traits of lithics which need to be classified and then discussed analytically. Therefore, we first note here the industrial attributions of the flint artifact assemblages recovered during the 1990s excavations at Siuren I. Even during excavation, it became clear that the Siuren I assemblages relate to the following three Paleolithic industrial technocomplexes:

1) Most flint artifacts from Units H-G and all lithics from Units F, E and C can be attributed to the *Aurignacian of Krems-Dufour type*. Moreover, purely numerically, these Aurignacian finds comprise more than 90% of all lithics from the 1990s excavations at Siuren I.
2) Stratigraphically lower Units H and G also contain a series of *Middle Paleolithic* tools and distinctive retouch flakes/chips from secondary treatment processes.
3) Stratigraphically upper Units D and A, as well as some out of context finds from humus deposits, can be attributed to *non-Aurignacian, Gravettian and Epigravettian* industries. Consideraing that this artifact group contain less than a dozen cores and tools, they are excluded from classification, but will be simply described using typological definitions and attribute analysis.

Thus, our classification and attribute analysis system for the Siuren I lithic assemblages is a kind of "symbiosis" of both Middle and Upper Paleolithic techno-typological data. The most appropriate method for constructing this system is as follows.

We start with typological classification. The presence of morphologically prominent Middle Paleolithic tool types and their retouch by-products, typologically comparable to other assemblages of Crimean Micoquian tradition, leads us to use our classification system (Chabai & Demidenko 1998), recently developed and applied to the description and analysis of variability in Crimean Middle Paleolithic industries (e.g. Marks & Chabai 1998; Chabai et al. 2004). Crimean Micoquian Tradition types pieces from both Siuren I and other Crimean Middle Paleolithic/Micoquian sites will thus be described using the same system, facilitating typological comparisons. Description of much more common Upper Paleolithic assemblages, particularly the Aurignacian cores and tools, constitutes another a second part of the typological classification. Here, we apply the Upper Paleolithic type-lists typically used for artifact analyses of European and Near Eastern Aurignacian complexes (e.g. Sonneville-Bordes & Perrot 1954-1956; Hours 1974; Besancon et al. 1975-1977). Indeed, using these type-lists as a basis, and also typological improvements relating to Aurignacian tool classification (e.g. Kozlowski 1965; Kozlowski & Kozlowski 1975; Movius *et al*. 1968; Movius & Brooks 1971; Hahn 1977; Demars 1982, 1990; Demars & Laurent 1989; Marks 1976a) would seem to be sufficient for description and analysis of the Siuren I Aurignacian lithics using a traditional approach. Howver, for a complete analysis, technological classification should be done as well (see, for example, Bergman 1987 for the on Aurignacian at Ksar Akil). Principally, if we had techno-typologically homogeneous Aurignacian industries at Siuren I, we would probably limit our analysis to traditional typological description of tools, unretouched artifacts and cores, with quantitative subdivision of some categories, such as the core data, indicating the number of striking platforms and inferred blanks produced (flakes, blades, bladelets), and the main by-products. But the Siuren I Aurignacian assemblages cannot "boast" such industrial homogeneity, showing instead many techno-typological differences between the assemblages from Units H-G and the Unit F assemblage, although these are in the range of European Aurignacian of Krems-Dufour type, recognized during the 1996 excavations (Demidenko et al. 1998). In this case, traditional typological descriptions alone would simply "hide" many of these differences. In such a situation, it is crucial to complement typological identifications with technological data. Before presenting this, application of technological and typological classifications for Upper Paleolithic assemblages is briefly summarized.

A complicating factor lies in the fact that it is not yet standard practice for Upper Paleolithic studies in Europe to carry out very detailed technological and/or morphological analysis for core-like and debitage pieces, including tool blanks. This is particularly true for Upper Paleolithic research in Western Europe where most work focuses on typological analyses with almost no data documented for core-like and debitage pieces (e.g. Brooks 1995 on the Aurignacian from Abri Pataud). A good example of the situation can be well illustrated by F. Harrold's attempts to technologically compare the French Early Aurignacian and Chatelperronian industries. One of his most demonstrative conclusions on the matter is as follows:

"*In terms of blank production technology, both industries are broadly characterized by blades; however, more detailed information on lithic reduction practices is nearly nonexistent. Even laminal indices (the percentages of blades among all tools or all blanks) of early Aurignacian assemblages, are surprisingly difficult to obtain in the literature. More subtle issues, such as whether the two industries are characterized by any systematic differences in techniques of blank production and modification, cannot yet be resolved*" (Harrold 1988:162).

Although new approaches to technological analyses of the Early Upper Paleolithic have been developed (see Pelegrin 1990, 1995; Bicho 1992), detailed technological analysis of core-like and debitage pieces for the Western European Upper Paleolithic is not yet common and sometimes only used to examine specific kinds of artifacts (e.g. Lucas 1997; Bordes & Lenoble 2002 for Dufour bladelets and; Hays & Lucas 2000 for carinated pieces).

On the other hand, technological studies of Upper Paleolithic assemblages were and still are common for Central European archaeologists, where initially many workshop sites, usually with only a few tools and many pre-cores, cores, reduction products and waste, have been analyzed (e.g. Krukowski 1939-1948; Schild 1969, 1980; Ginter 1974; Ginter & Kozlowski 1990; Svoboda 1980; Sobczyk 1993); this approach was later expanded to analyze "regular" or non-workshop sites (e.g. Svoboda 1987; Hromada & Kozlowski 1995; Drobniewicz *et al*. 1992).

Regarding Upper Paleolithic studies in the former Soviet Union on East European materials, we also note that the main focus was on typological analyses (very similar to recent Western European approaches) with usually, if at all, only very general technological information (e.g. Rogachev & Anikovich 1984; Anikovich 1992, 2001-2002).

Apart from European approaches to description and analysis Upper Paleolithic assemblages, beginning in the mid-1970s, Upper Paleolithic research on Near Eastern materials began to concentrate on technological analyses. A retrospective look at the reasoning behind the application of detailed morphological classification and attribute analysis systems for the Upper Paleolithic shows that this was principally caused by the need to have detailed and real comparisons to identify the subdivisions of Middle and Upper Paleolithic industries. Here we note the technological approaches of A.E. Marks and his associates (e.g. Marks 1976a, 1976b; Marks & Ferring 1976; Marks & Kaufman 1983; Marks & Volkman 1983; Ferring 1980, 1988). Significantly, the technological data (Marks 1981; Marks & Ferring 1988) did much to strengthen the twofold industrial subdivision of the Near Eastern Early Upper Paleolithic into the Ahmarian and Aurignacian traditions, initially proposed on the basis of mainly typological criteria (Gilead 1981). These technological approaches were then intensified by K. Ohnuma and C. Bergman for studies of different Initial and Early Upper Paleolithic assemblages, including Aurignacian, from Ksar Akil (Lebanon) (Ohnuma 1988; Bergman 1987; Ohnuma & Bergman 1990). These studies were highly useful for understanding the different Ksar Akil assemblages from levels XXV-VI and their more minute subdivision into different industrial phases.

We can thus conclude that when technological analyses are done, Upper Paleolithic assemblages can be understood in much more detail. The question here is how to carry out such analyses for the Siuren I assemblages. All successfully conducted Upper Paleolithic technological studies in Central Europe and the Near East were based primarily upon the identification of many morphological attributes for core-like pieces, core maintenance products and debitage pieces/blanks. The only exception is refitting studies (e.g. Volkman 1983, 1989; Usik 1989), but a large-scale refitting project is not always possible, which is the case for the assemblages recovered from the 12 sq. m. zone excavated in the 1990s. This leaves using an attribute analysis system for technological study of the Siuren I assemblages. Such a system can be constructed using the attribute analysis used for Crimean Middle Paleolithic artifact classification as a basis (Chabai & Demidenko 1998:47-51). Using Middle Paleolithic attribute analysis for the mainly Aurignacian Siuren I lithics is not at all a strange choice because most of these attributes are universal to lithic artifacts for the entire Paleolithic, although some more specific Upper Paleolithic attributes have been added, taken from the listed publications.

In sum, then, using the Crimean Middle Paleolithic classification and attribute analysis system supplemented with techno-typological additions proper to the Upper Paleolithic/Aurignacian will help us "to kill two hares with one bullet": to have described Crimean Middle Paleolithic industries and both Middle and Upper Paleolithic components from Siuren I using the same range of methodological principles and, accordingly, to have a good basis for understanding similarities and differences between industries in the context of the Middle-Upper Paleolithic transition in the Crimea.

General assemblage structure by artifact classes

The major artifact classes, based on morphological features, are the following: core-like pieces, core maintenance products, debitage, tools, waste from production and rejuvenation of tools and debris. Each of these major classes has different technological and typological significance. They result from different processes of reduction and use and variability in their frequencies is critical for understanding these processes. Each of these classes are is subdivided into several sub-categories, making clear their internal structure.

Classification system employed

Core-like pieces

These are subdivided into three sub-categories: pre-cores, cores and core fragments.

Pre-Cores

First defined by S. Krukowski (1939-1948) on Polish materials, pre-cores became a standard sub-category of core-like pieces in descriptions of Paleolithic industries by Central and Eastern European archaeologists, reflecting the initial stages of primary reduction processes and clarifying different technological practices for initial preparation of primary reduction objects for subsequent intentional reduction/blank production (e.g. Schild 1969, 1980; Gladilin 1976; Svoboda 1980, 1987; Gladilin & Demidenko 1989; Usik 1989; Ginter & Kozlowski 1990; Sobczyk 1993; Girya 1997).

For Siuren I, we define as pre-cores the three following types. The *first type* is simply initially tested flint plaquettes or nodules/chunks with no prepared striking platform and with just one or two unsuccessful heavily hinged removal scars that make these pieces unsuitable for further preparation or real systematic reduction. The *second type* differs from the first by the presence of prepared striking platform(s) but again with only one or two unsuccessful removals, either heavily hinged or too short, leading to spoiling of the flaking surface(s). The *third type* is rare, noted only for a single example from level Fa3 and identified by us as a single-platform narrow flaked bladelet pre-core/"carinated burin". This type is morphologically intermediate between "carinated" bladelet cores and carinated burins, which will be discussed in more detail below, and has been defined as a pre-core due to hinge fracture terminations of the bladelet removal scars from a wider platform/edge than for carinated burins. Thus, the three pre-core types evidence different "on-site" stages, ways of preparing "possible future cores" and attempts at real reduction. It is also worth noting that all pre-cores lack the platform abrasion found systematicly on Siuren I cores: an additional piece of evidence of their preparatory technological function.

Cores

This sub-category of core-like pieces is, of course, defined through traditional definitions such as Tixier's: "*block of raw material from which flakes, blades, or bladelets are detached*" (1974:14), although some unique specifications are also pointed out here. First, cores, as the main object of primary flaking processes, are characterized by the serial production of blanks destined for use as tools, which is not at all the case for pre-cores. Morphologically, cores also have prepared striking platform(s) with abrasion and clear planar morphology, and several removal scars on the flaking surface(s).

Core classification is done here through both traditional and non-traditional (Gladilin 1976) approaches. By traditional, we mean basic core identification based on the kind of blank produced and the number of striking platforms. Most colleagues identify Upper Paleolithic cores in this way and we are also sure that some specific debitage types (especially bladelets *sensu lato*) are strongly connected to the respective core types; the number of striking platforms is important for more detailed understanding of core reduction processes. These are the two characteristics used for basic core descriptions, if subdivision by shape (prismatic, pyramidal, globular, etc.) is not taken into account. In Gladilin's hierarchical classification, additional stress is placed on the analysis of combinations for number, arrangement and correlation of striking platform(s) and flaking surface(s) for cores. Other colleagues also carry out similar analyses (e.g. Drobniewicz *et al.* 1992; Sobczyk 1993; Hromada & Kozlowski 1995), but Gladilin's principle considers all the morphological features of cores together in hierarchical order. Thus, the following core types are defined among the 1990s Siuren I assemblages, starting with the Aurignacian complexes from Units H, G and F.

At the *first classification level*, *blade, blade/bladelet, bladelet, flake/blade, flake/bladelet* and *flake* cores are defined. Most of the *blade, blade/bladelet* and *bladelet* cores have clearly observable systematic reduction that easily enables their further typological subdivision. However, cores defined as *flake/blade, flake/bladelet* and *flake* have mostly non-systematic/amorphous multiplatform characteristics indicating that these objects of primary reduction have gone through multiple reduction processes. Accordingly, it is often impossible to determine actual flaking processes.

At the *second classification level, single-platform*, *double-platform*, *triple-platform* and *multiplatform* cores are defined. *Triple-platform* cores are represented by a single *flake/bladelet* example from level Fb1-Fb2, on which final reduction techniques on one flaking surface can be identified, although it is certainly quite exhausted, very close morphologically to multiplatform non-systematic/amorphous cores.

At the *third classification level*, single- and double-platform cores are subdivided based on the interrelationship of striking platform(s) and flaking surface(s). All *single-platform* cores have unidirectional removal scars on a single flaking surface. *Double-platform* cores are characteristized by more complex reduction processes, although all are defined as leaving bidirectional and orthogonal removal scars. These are subdivided into *true* bidirectional cores with two opposed striking platforms and one flaking surface where removal scars from two striking platforms "meet" each other and *complex* bidirectional and orthogonal cores with two striking platforms and two flaking surfaces. The former are termed bidirectional, while the latter are named depending on the disposition of the two flaking surfaces. Principally, these *complex* bidirectional and orthogonal cores are in fact different variations of two single-platform unidirectional independent reduction processes on a single core. The following variants are present for the Siuren I Upper Paleolithic and Aurignacian complexes:

Bidirectional-Adjacent. Two opposed striking platforms where two flaking surfaces are adjacent.
Bidirectional-Alternate. Two opposed striking platforms, but on two opposite flaking surfaces.
Bidirectional-Perpendicular. Two opposed striking platforms and two flaking surfaces connected by distal terminations of removal scars perpendicular in general profile in relation to the position of the flaking surfaces.
Orthogonal-Adjacent. Very similar to common orthogonal cores with two striking platforms on a core's adjacent edges about 90° one to another, but also with two adjacent flaking surfaces.

The importance of the typological subdivision of double-platform cores is explained by the fact that only a single core (from level Fb1-Fb2) out of all double-platform cores for Units H, G, F and E is a *true* bidirectional core, while all the other double-platform cores from these mainly Aurignacian units can be classified as one of the more complex variants; these actually reflect two single-platform unidirectional independent reductions on each core. However, both cores from Gravettian Unit D are double-platform *true* bidirectional cores. Thus, through this more detailed classification of double-platform cores, we have much more objective characteristics for reduction processes on these cores, furthermore supporting our observation of the overall dominance of single-platform unidirectional reduction for Aurignacian industries and the much more important role of double-platform *true* bidirectional reduction for Gravettian and Epi-Gravettian industries in Europe.

At the *fourth classification level*, cores are subdivided by shape of flaking surface: (1) *non-volumetric* (flattened) flaking surface (ovoid, rectangular, narrow flaked) and (2) *volumetric* flaking surface (sub-cylindrical, cylindrical, sub-pyramidal, pyramidal).

The undersurface features of Siuren I cores are not defined because, apart for one core from Unit A with a unilateral crested ridge on its back, no other cores show any evidence of specific undersurface preparation; they are instead simply naturally flat and convex.

Some Siuren I cores were additionally described as *"exhausted"* and others defined simply as *"unidentifiable"*. The term *exhausted* was used for cores with unsuccessfully removed thick core tablets that made their striking platforms' too concave and unsuitable for further reduction. *Unidentifiable* cores are those for which a final heavily overpassed removal took off almost all of the flaking surface, leaving just a single wide and very concave scar. This circumstance clearly caused abandonment of these cores for further reduction and made it impossible to determine the reduction technique used prior to the last removal. Purely formally, these still complete cores should be classified as flake cores, but this would not reflect their real reduction.

Finally, we note that all bladelet cores have also been subdivided into "regular" and "carinated" cores. In our opinion, this is a very important typological approach for Aurignacian complexes and will be further discussed below in the analysis of the Siuren I "carinated pieces" and discussion of their internal typological structure in the view of recognizing several distinct types.

Core Fragments

These are heavily fragmented cores, usually small, for which objective identification of the reduction techniques used and morphological features is impossible.

Core Maintenance Products

Artifacts in this class are directly connected to initial preparation and renewal processes before and during the reduction of core-like pieces and are thus discussed immediately after them. The internal subdivision and description of the Siuren I core maintenance products proposed here are based on elaborations on this matter by associates and followers of J.K. Kozlowski and A.E. Marks (Sobczyk 1993; Ferring 1980, 1988; Bergman 1987; Ohnuma 1988; Bicho 1992).

All core maintenance products are subdivided into three sub-categories: crested pieces, core tablets and core trimming elements. Each of these sub-categories are of different technological importance.

Crested pieces (flakes, blades, bladelets, microblades)

These are products of the *"lame à crête technique"* applied, first, for initial preparation of the flaking surface of a pre-core/core forming a wholly crested ridge and, second, for subsequent re-preparation (re-cresting) of a core's flaking surface after systematic reduction forming a partially crested ridge (e.g. Demidenko & Usik 1993b). Taking into consideration such application of the *"lame à crête technique"* during the Upper Paleolithic, the following types of crested pieces are defined.

Primary crested pieces are products on initially prepared crested ridges removed from the flaking surfaces of pre-cores/cores. They generally show wholly crested preparation, but sometimes partially crested bilateral or unilateral preparation. With a unilateral crested ridge, the other side of the dorsal surface for this crested piece is either dorsal-plain or cortical showing the absence of systematic reduction prior to removal of the crested piece.

Secondary crested pieces are products on additional removals when a primary crested piece did not strike off the entire length of a crested ridge on a the core's surface; for the start of systematic parallel reduction, the remainder of such a crested ridge should be removed first. Secondary crested pieces are assumed to have been removed directly after such unsuccessfully removed primary crested pieces. They are morphologically distinguished by evidence of partially unilateral/bilateral crested preparation only at the medial or distal sections, with just one removal scar at the proximal section and not a series of scars as traces of previous systematic reduction.

Truly secondary crested pieces are products of the initial systematic parallel reduction of cores immediately after primary and secondary crested pieces, which have already completely removed the top of a crested ridge on a core's flaking surface, have been struck. They are morphologically defined by the lack of tops of crested ridges on their dorsal surfaces but, at the same time, show traces of these crested ridges by distal parts of small removal scars that formed these crested ridges. Dorsal surfaces of truly secondary crested pieces can already be identified by a series of removal scars from systematic core reduction expressed, for instance, by intensive unidirectional or bidirectional scar patterns, typical of Upper Paleolithic primary flaking processes.

Re-crested pieces are products resulting from the preparation (re-cresting) of the flaking surfaces of cores after a phase of systematic parallel reduction, in the aim of "repairing" these flaking surfaces, for example, to remove hinge fractures and creation of new convexities for further reduction. During such re-preparation processes, a new crested ridge is often partially formed on the flaking surfaces. In other cases, this can sometimes reflect wholly crested preparation when this was applied along the length of a core's ridge on its flaking surface. In both cases, however, parts of dorsal surfaces with no crested treatment for re-crested pieces have many removal scars from systematic cores flaking prior to re-cresting processes; this is the main morphologically distinctive feature of these pieces.

Identification and description of these four different types of crested pieces (flakes, blades, bladelets, microblades) can provide many details of both "on-site" pre-core and core preparation and re-preparation processes and, on the whole, technological data for the analysis of Upper Paleolithic primary reduction techniques.

While it is fairly easy to identify crested flakes and blades, it is more difficult to identify crested bladelets and microblades. When an Upper Paleolithic assemblage includes both intensive primary bladelet reduction and burin manufacture and rejuvenation through the detachment of many burin spalls, it is quite hard to morphologically separate crested bladelets and microblades from primary burin spalls with some cresting. For the Siuren I Aurignacian artifacts from Units H, G, and especially F, the following morphological distinctions for these pieces, which also seem to be suitable for other Upper Paleolithic industries, were applied. First, all bladelets and microblades with bilateral crested preparation are considered only as crested pieces. This is explained by the fact that primary burin spalls are usually struck from the lateral edge of a burin blank (a debitage piece) and one of its sides will have a dorsal-plain scar pattern: part of the blank's ventral surface. So, only items with lateral crested preparation actually constitute a problem. We propose to differentiate these pieces according to characteristics of the preparation/retouching of the lateral crested ridges. Crested bladelets and microblades are characteristized by "rough" scalar or stepped lateral retouch, while primary burin spalls on bladelets and microblades usually have either fine marginal lateral retouch or, much more rarely, very regular retouch indicating the transformation of a tool's retouched edge into a burin. These preparation/retouch characteristics play a decisive role in the morphological distinction between primary unilateral crested bladelets and microblades at Siuren I, and primary burin spalls with a unilateral cresting/retouch.

Core tablets

This is a well-known sub-category of core maintenance products. They are obtained by the radical rejuvenation of striking platforms on cores, when these platforms are exhausted, by a perpendicular blow slightly below the intersection of the core's flaking surface and striking platform to remove the top of the platform.

We distinguish two types of core tablets-*primary* and *secondary*. *Primary core tablets* are the most common which are produced as described above. *Secondary core tablets* differ from primary ones by the absence of the very top of a core's striking platform with clear percussion points from removals. Such secondary core tablets are removed immediately after a primary tablet when the first tablet was insufficient to create an adequate new striking platform, and it was clear to an Upper Paleolithic knapper that the core could no longer be reduced.

Core tablets usually occur on flakes. This is quite understandable when we are dealing with rejuvenation of flake and blade cores with mainly ovoid and quadrangular striking platforms. A different situation, however, occurs when applying the *"core tablet rejuvenation technique"* to bladelet cores which often have narrow and rather long striking platforms; this leads to removal of core tablets that resemble blades or even bladelets (see, for instance, data on this subject for a Gravettian industry from Kostienki-21, lower layer [Middle Don region, Russia]-Ivanova 1987). The core tablets on blades and on a sole bladelet discussed are also noted for the Siuren I Aurignacian complexes from Units H, G, and especially F, and should thus be specifically defined here in order to retain this technological trait due to the rejuvenation of bladelet core striking platforms. Core tablets on flakes, blades and bladelets will thus be defined.

The presence of only a few cores with flaking occurring around their entire striking platform edge (cylindrical and pyramidal cores in overall shape) leads to the virtual absence of so-called "true complete core tablets" with an entire circle of scars on the flaked surface. It was thus decided to additionally subdivide core tablets based on the location of remnants of the cores' striking platform: on the butt, on one lateral edge, on the butt and one lateral edge, on the butt and two lateral edges. The analysis of such morphological features may help to specify some technological processes for the rejuvenation of core striking platforms.

Core trimming elements

It is a common practice that "*all artifacts which exhibit evidence of previous core preparation, except for core tablets*" are defined as crested pieces (Marks 1976a:375). This is basically true, but there are always items among core maintenance products in Upper Paleolithic industries which occupy an intermediate morphological position between core tablets and crested pieces. Such pieces at Siuren I have a transversal location of crested ridges on their dorsal surfaces in relation to the axis of removal direction of these pieces. These "transversal crested pieces" generally reflect a unilateral partially crested preparation, although bilateral and entirely crested preparation are also attested. Their technological meaning seems to be related to both the initial formation of pre-cores and to the rather radical re-preparation of cores during reduction processes when changing from one striking platform and flaking surface to another and some crested ridges on the core's body needed to be removed, although, for instance, K. Sobczyk (1993:25 and Pl. XVI, 5-6, 8-9) prefers to consider morphologically similar pieces as "*flakes removing prepared pre-striking platform*". We propose to term such "transversal crested pieces" as *core trimming elements*. Among Siuren I artifacts, they occur only on flakes and their morphological description is limited to the unilateral/bilateral and partial/entire crested preparation of crested ridges.

Concluding the description of the classification method for Siuren I core maintenance products, an additional characteristic morphological feature that once again emphasizes their function in core preparation and re-preparation and, at the same time, that these are not deliberately produced debitage/tool blanks, should be mentioned. None of the primary and secondary crested pieces, core tablets and core trimming elements show any evidence of butt abrasion; pieces which do are most often products of systematic serial primary core reduction. On the other hand, some re-crested pieces and many of the truly secondary crested pieces with no preserved crested ridges' tops show butt abrasion that additionally confirms their detachment during systematic primary flaking processes.

Debitage

General structure of debitage pieces and tool blanks of debitage nature

At Siuren I, this general artifact category is composed of *flakes*, *blades*, *bladelets* and *microblades*. Usually Upper Paleolithic pieces of debitage nature are subdivided into flakes, blades and bladelets, although unretouched bladelets are sometimes analyzed within blades with no particular separation, while, at the same time, special typological analysis of retouched bladelets is quite common (e.g., Drobniewicz *et al*. 1992; Hromada & Kozlowski 1995). In our view, it is very important to separately define and analyze bladelets in Upper Paleolithic industries with pronounced bladelet primary reduction and this has been done for Siuren I. Moreover, we go much further and have also decided to separately define microblades within bladelets as well. This is the result of a contrast between different characteristics for the bladelets from Siuren I Units H and G, on one hand, and those from Siuren I Unit F, on the other, consisting in a prevalence of "wide" bladelets in H and G and in a prevalence of "narrow" bladelets in F.

Flakes

These are artifacts (whole or broken with identifiable characteristics) with an "on-axis" length less than twice their maximum width and larger than 1.5 cm in any of their dimensions including diagonal measurement for these pieces. As an aside, two lower size limits for flakes of Upper Paleolithic complexes have been established-more than 1.5 cm (e.g., Marks 1976a; Kozlowski *et al*. 1982) and more than 2.5 cm (e.g., Olszewski & Dibble 1994; Kuhn & Stiner 1998). We prefer the former approach, taking into consideration the great number of small-sized debitage pieces-bladelets and microblades in Siuren I Units H, G and especially F, often used for tool manufacture ("non-geometric microliths"), where using a lower limit of 2.5 cm would certainly "mask" the technological roles of flakes in Upper Paleolithic industries with pronounced primary bladelet reduction.

Blades

These are all pieces (whole or broken with identifiable characteristics) with an "on-axis" length of more than twice their maximum width and with a width equal or more than 1.2 cm. Thus, we use the *sensu lato* definition of blades, leaving aside the *sensu stricto* "true blades" definition that accepts as blades only those pieces with blady metric proportions having a non-cortical dorsal surface with parallel removal scars and characteristic parallel lateral edges. The *sensu lato* blades definition is our standard for blade identification in Paleolithic industries (Chabai & Demidenko 1998), but is additionally demanded by the Siuren I assemblages where quite a few blades from Units H, G and especially F have some cortex and non-parallel edges and their possible exclusion from the blades category would make significantly lower their numerical importance and, accordingly, the technological role of blade production processes for these lithic assemblages. In addition, these non-"true blady characteristics" of some of the Siuren I blades are a common feature for blades in many European and Levantine Aurignacian complexes.

Bladelets and microblades

The well-known general definition for bladelets consists of the following two conditions-"*1st: length twice or more than twice the width; 2nd: width less than 1.2 cm*" (Tixier 1974:7), a definition also accepted here. However, the differences in width for bladelets from Siuren I Units H-G and Unit F forces us to additionally subdivide them into bladelets *sensu lato*, bladelets *sensu stricto* and microblades. As against the broad scientific acceptance of the Tixier's bladelets definition, there are actually few, if any, morphological and/or metric elaborations nor a clear definition for microblades in the archaeological literature, mainly because this has not been needed by most of our colleagues in their studies of unretouched debitage pieces from Paleolithic complexes where separation of bladelets alone is sufficient. Principally, we know of only Amirkhanov's microblade definition, used by him for description and analysis of Upper Paleolithic complexes from the Northern Caucasus in Russia (Amirkhanov 1986). He distinguished microblades as blady pieces with a width less than 0.7 cm, while Tixier's definition of bladelets was restricted to blady items with a width between 0.7 cm and less than 1.2 cm (Amirkhanov 1986: 7). Purely statistically, Amirkhanov's differentiation of width parameters for bladelets and microblades is correct in terms of absolutely equal ranges of 0.5 cm for each, not taking into account, of course, widths less than 0.2 cm since such narrow microblades do not really occur. After such statistical checking of Amirkhanov's "width border" of 0.7 cm for bladelets and microblades, we decided to accept this metric approach and apply it to separate the Siuren I bladelets *sensu stricto* and microblades. Their definitions can be represented as follows.

Bladelets are all pieces (whole or broken with identifiable characteristics) with an "on-axis" length of more than twice their maximum width where width is greater than or equal to 0.7 cm and less than 1.2 cm.

Microblades are all pieces (whole or broken with identifiable characteristics) with an "on-axis" length of more than twice their maximum width and with a width less than 0.7 cm.

It is worth noting that no length limits for bladelets or microblades are set.

Separating bladelets and microblades one from another does not, however, mean separate primary reduction sequences for each of these sub-categories, which are simply products of general primary bladelet flaking processes with different technological characteristics leading to a more important role of either bladelets or microblades in the Siuren I Aurignacian assemblages.

Tools

All lithic artifacts with any kind of retouch or burin facet are referred to as tools. Three major tool groups have been defined for the Siuren I tool-kits: *indicative tool types, retouched pieces* and *non-geometric microliths*, as well as two more tool groups of secondary typological importance: *unidentifiable tool fragments* and *non-flint tools*. The internal composition of each of these tool groups is discussed below.

Indicative tool types

These are all pieces with regular well-made continuous retouch or a burin facet on flakes, blades and even chunks, including broken pieces, but not on bladelets *sensu lato* (bladelets *sensu stricto* and microblades). Thus, no *retouched pieces* or *non-geometric microliths* are included in this tool group. At the same time, structurally, *indicative tool types* are also subdivided into three more groups: *indicative Upper Paleolithic tool types*, *neutral tool types* and *Middle Paleolithic tool types*. All of these tool types differ from one from another by the representation of specific types and secondary treatment characteristics, and are therefore analyzed separately.

Indicative Upper Paleolithic tool types

These are composed of end-scrapers, burins, composite tools, truncations, retouched blades, perforators and scaled tools. Before description in our classification system of *Indicative Upper Paleolithic Tool Types*, the definition of "*carinated pieces*" will be discussed and particular principles of their typological attribution to one or another core and tool type because such pieces are found among cores, end-scrapers, burins and composite tools.

"*Carinated pieces*". Their identification has a long history in Upper Paleolithic industries and they still pose typological problems for their attribution, as reflected in many publications, of which we would mention only the main ones (Sonneville-Bordes & Perrot 1954-1956; Pradel 1962; Ronen 1964; Movius & Brooks 1971; Perpère 1972; Hahn 1977; Demars 1982; Bergman 1987). Without presenting a detailed discussion of all of the differents points of view expressed on this typological problem, we instead propose our own typological system for their classification, which is mainly based on general concensus on the matter.

In the de Sonneville-Bordes and Perrot type-list (1954-1956), the following tool types are usually referred to as "*carinated tools*": carinated end-scrapers (N 11), carinated atypical end-scrapers (N 12), thick nosed end-scrapers (N 13), core-shaped end-scrapers (N 15), rabots (N 16) and carinated/busked burins (N 32). Namely, all discussions are set around these types. Moreover, aside from strictly tools, it is also common for some archaeologists to define "*carinated cores*" in the Upper Paleolithic, especially in Aurignacian complexes (e.g. Marks & Ferring 1976). We must admit here that the most convincing and successful use of the term "*carinated cores*" was by E. Sachse-Kozlowska (1978,1983) for classification of Polish Aurignacian complexes. At the same time, there are no clearly proposed typological criteria for the separation of "*carinated cores*" from "*carinated tools*" and their selection is mainly based on similarity to carinated end-scrapers, but with a more core-like overall shape and treatment. So, "*carinated cores and tools*" should be discussed and we offer the following criteria and definitions for their identification.

We starting with <u>*carinated end-scrapers*</u> as the most typical carinated form. In addition to its classical characteristics (Sonneville-Bordes & Perrot 1954:332; Movius & Brooks 1971:255), *a carinated end-scraper* should always have in its typical form a front-edge scraper width greater than the length of *lamellar* (bladelets *sensu lato*) retouch facets which created this front-edge.

<u>*A carinated core*</u> should, first of all, also have exclusively bladelet *sensu lato* removal scars at its flaking surface because this is the obligatory morphological feature for all typical *carinated pieces* and, respectively, no blade and blade/bladelet cores can be considered as *carinated cores* at all. Then, a bladelet "*carinated*" core, opposite to a *carinated end-scrapers*, should always have bladelet removal scars longer than the width of the core's striking platform from which the bladelet removals were struck off. The only allowable exception, when the length of bladelet removal scars from a bladelet "*carinated*" core is shorter than the striking platform's width, is when edges of the striking platform are clearly quite irregular and rough in a way that is not consistent with end-scraper morphology. But where is "a morphological border" between "regular" bladelet cores and "*carinated*" bladelet cores? It is important because the lack of such criteria can lead to either their mixing or to identification of only "*carinated*" bladelet cores in Aurignacian complexes. "*Carinated*" bladelet cores are morphologically distinguished from "regular" bladelet cores by the following features: (1) bladelet removal scars on "regular" cores are at least twice as long as the width of the core striking platform; (2) a flaking surface of "regular" cores is more or less flat/non-volumetric or, if convex/volumetric, has bladelet removal scars more than twice as long as the width of the core striking platform; (3) "*carinated*" cores tend to have only volumetric convex or twisted flaking surfaces with the only exception being bladelet single-platform narrow flaked cores/"carinated burins" which will be described for the analysis of carinated burins; (4) "*carinated*" cores also tend to be characterized by a sub-cylindrical or a sub-pyramidal shape and only quite rarely by a wholly volumetric coring processes-a cylindrical or a pyramidal shape that we prefer to term "*advanced carinated*" bladelet cores.

<u>*Carinated burins*</u> are differentiated from *carinated end-scrapers* by the width of their working edge, which should not to exceed 1 cm, as proposed by F. Hours for Near Eastern assemblages (Bergman 1987:12). This does not apply to very specific narrow-nosed end-scrapers, well-defined by M. Oliva as a unique Lhotka type in some Moravian Epi-Aurignacian complexes (Oliva 1987: p. 78 and fig. 40, 7-10, 16-17 on p. 82; Oliva 1993: fig. 4, 13-15 on p. 42 and p. 49); these are not, however, represented at Siuren I at all. Differences between *carinated burins* and "regular" bladelet cores again consist in a narrow working edge (less than 1 cm), and usually infrequent, well-developed bladelet removal scars on their surfaces for burins. Practical ap-

plication of the criteria for differentiation of *carinated burins* and "regular" bladelet cores for the Siuren I artifacts confirms their importance with one exception. There are several pieces in the Units F and E assemblages which correspond to our *carinated burins* definition, but the width of the working edges is between 1.0 and 2.0 cm. Thus, according to formal metric data of our own criteria, such pieces should be classified as single-platform non-volumetric narrow flaked bladelet cores and we did so. But additionally, we have also decided to apply the "*carinated burins*" definition to them as well, emphasizing their intermediate morphological and metric position between "true cores" and "true burins". Finally, we should also touch on a problem in the definition of *carinated burins* related to their frequent attribution as a busked *type*. Recalling the classical definition of a busked *bur*in (Sonneville-Bordes & Perrot 1956:410), we accept this particular burin type in a twofold way as being a dihedral asymmetric item with one multifaceted verge on which more than three bladelet *sensu lato* removal scars terminate either by a characteristic retouched notch (busked *type sensu stricto*) or the unretouched edge of a blank (*carinated type sensu stricto*). There are no very typical *busked burins* among Siuren I flints, although one composite tool (a simple end-scraper/carinated burin) of level Fb1-Fb2 and one double carinated burin of Unit C have weakly-developed but still retouched notches to terminate the *carinated burin*. Taking into account the presence of just two examples of busked *burins* in the 1990s finds at Siuren I, and the presence of only one in Bonch-Osmolowski's 1920s assemblages, we define them as carinated (buskoid) burins, methodically similar to what some of our colleagues did (e.g., Marks & Ferring 1976). Concluding the *carinated*/busked *burins* discussion, we must note that the rarity of busked *burins* at Siuren I is in accordance with their overall scarcity in Central and Eastern European Aurignacian complexes being instead mostly represented by a *carinated* type with no characteristic lateral notch (e.g. Hahn 1977). It could be said that there are two approaches in discussions of these dihedral asymmetric multifaceted burins. The first one consists in considering the busked *burin* type as a discrete burin type made intentionally and typical of only some very local Aurignacian complexes. Let us just cite here the opinions of two of the most well-known archaeologists for the Western European Paleolithic on this matter. "*Outside of France, I do not know of any true* busked *burins*" (Bordes 1968:369) and "*... there are no typical buskeds burins in this part of Europe* (Yu. D. – i.e., Central and Eastern Europe) *just as there are none in Spain and Belgium*" (Sonneville-Bordes 1968:384) where the latter authority proposed to call such burins with no notch as *"burins carénés"* (Sonneville-Bordes 1968:383). During the many years that have passed since these opinions were published, it is now known that busked *burins* are not restricted to just the French Aurignacian as, for instance, M. Otte (1983: Pl. V, 4, 7-9 on p. 74) has convincingly shown their presence in the Aurignacian of Belgium. The second approach, which we support, considers some morphological differences between busked and *carinated* burins as the result of different intensity in their manufacture and use where for more reduction, a notch was simply added to the busked type for better control and limitation of bladelets *sensu lato* removed.

After establishing the typological criteria for the main "*carinated pieces*" types (bladelet "carinated" cores, carinated end-scrapers, carinated burins), their traditionally defined types are discussed.

Carinated atypical end-scrapers are defined using the classical definition (Sonneville-Bordes & Perrot 1954:332; Movius & Brooks 1971:255) with an emphasis on *non-lamellar* removal scars for their still thick front-edges. *Non-lamellar* treatment characteristics are recognized by us for those cases when the length of removal scars is less than four times their maximum width, a metric criterion used by A. Leroi-Gourhan for blade identification (Leroi-Gourhan *et al.* 1966).

Thick nosed end-scrapers or "*grattoirs épais à museau*" (Sonneville-Bordes & Perrot 1954:332; Movius & Brooks 1971:255) are subdivided into thick shouldered and nosed end-scrapers (e.g. Movius & Brooks 1971; Marks & Ferring 1976; Bergman 1987). As known from the publications, thick shouldered/nosed end-scrapers are technologically very similar to typical forms of *carinated end-scrapers* due to *lamellar (*bladelet *sensu lato*) secondary treatment and thick blanks with the only morphological difference between them the presence of one or two side notches delimiting a supposed front-edge scraper.

Core-shaped end-scrapers and *rabots* (Sonneville-Bordes & Perrot 1954:332; Movius & Brooks 1971:255) are proposed to be eliminated from both the tools type-list and "*carinated pieces*" types, although they are sometimes still defined (e.g. Demars 1982; 1992). Our decision is in accordance with the following considerations of such specialists. F. Bordes has underlined that "*... either the piece is a core or a scraper, not both. I believe it is impossible to distinguish core-scrapers from cores and suggest we remove grattoir nucléiforme from the type-list*" (Bergman 1987:12). C.A. Bergman later emphasized that "*... there is no way to tell what is retouch and what is simply preparation of the edge of a platform on a core*" and further also suggested that "*... a carinated tool must always be made on a flake or blade and never on a "chunk" or block of raw material. The latter are always regarded as cores because it is impossible using morphological attributes to determine if they served as tools*" (Bergman 1987:12). Indeed, the abrasion treatment of core striking platforms is very often indistinguishable from slight scalar retouch and, therefore, instead of morphological criteria, we use metric criteria to differentiate "*carinated cores*" and "*carinated tools*".

So, Siuren I "*carinated pieces*" are subdivided into "*carinated cores*" ("carinated" single-and double-platform sub-cylindrical and sub-pyramidal bladelet cores, "advanced carinated" single-platform pyramidal bladelet cores and single-platform narrow flaked bladelet cores/"carinated burins") and "*carinated tool*" types (carinated end-scrapers, carinated atypical end-scrapers, thick shouldered/nosed end-scrapers and carinated, including buskoid, burins). It is worth noting here that we make no suggestions regarding actual functional use during the Paleolithic for "*carinated pieces*" at Siuren I and this is intentional. Like many of our colleagues (e.g. Rigaud 1993:183), we consider that "*carinated pieces*" are mainly different technological variations of bladelet cores, although many Aurignacian assemblages with "*carinated pieces*" lack retouched bladelets and microblades. This fact may indeed point out that at least some types of "*carinated pieces*" also served as tools. We therefore subdivide the Siuren I "*carinated pieces*" into the different types to show their morphological and metric variability that, in our opinion, may in fact help to typologically differentiate various Aurignacian complexes. Because of these reasons, we do not support the position of C.A. Bergman (1987) on this matter when he made no such subdivision for the Northern Levantine Aurignacian "*carinated pieces*" at the Ksar Akil rock-shelter (Lebanon), although he was inclined to agree on the separation of such unique Levantine Aurignacian carinated type as "*lateral carinated end-scrapers*" (Bergman 1987:12-13).

Now, after this rather long discussion of "carinated pieces", let us return to the internal structure of the indicative Upper Paleolithic tool types at Siuren I.

As is clear, all "carinated" bladelet cores are placed in the core-like pieces category and all "carinated tools" are distributed among end-scrapers, burins and composite tools of indicative Upper Paleolithic tool types. The following specific types are recognized.

End-scrapers are also composed of *simple*, *atypical*, *double on retouched pieces*, *ogival*, *simple on retouched pieces*, *unilateral/flake*, *circular* and *flat shouldered* types. All of these types are classified using the classical definitions (Sonneville-Bordes & Perrot 1954:328-332) which certainly do not need to be repeated here. We add only that flat shouldered end-scrapers in conjunction with all carinated end-scraper types create a group of Aurignacian end-scraper types within the Siuren I lithic assemblages. However, as proposed by Demars (1990), the general subdivision of all end-scrapers into "*grattoirs minces*" (our non-carinated types) and "*grattoirs épais*" (our carinated types) is also worth recalling to observe the possible interrelations between"flat"/"*mince*" and "carinated"/"*épais*" end-scrapers. Finally, *fragments of flat end-scrapers' fronts* were also defined as a separate group. With respect to additional attribute, we have also included important secondary treatment characteristics of the font edges of end-scrapers: *lamellar/non-lamellar* and *convergent/non-convergent* (see Movius & Brooks 1971:264-266; Brooks 1995:207-211).

Burins include *single and double dihedral symmetric* and *asymmetric*, *single* and *double angle*, *on different truncations*, *on lateral preparation* and *transversal on natural surface* types and only one piece of *double mixed type*: *on truncation + angle*. A group of "*broken burins*" was also defined, with missing terminations from which burin spalls were struck off and having only the lower parts of burin spall scars on their lateral edges. The "*burin plan*" type (see N 44 in the type-list of Sonneville-Bordes & Perrot 1956:412) is not defined for the Siuren I burins, although when a burin has a *plan facet*, it is noted as one of its characteristic attributes and not as the basis for identification of a specific type; a comparable approach was used by A.E. Marks (1976a:379) for classification of the Negev (Israel) Paleolithic materials. All burin types identified at Siuren I are also classified by their classical definitions (N 27-31 and 34-41 in Sonneville-Bordes and Perrot 1956:408-412; Movius *et al*. 1968:20-22; Hours 1974:4-6) and, of course, should to be structured into several type groups.

There are, however, some methodological differences in grouping burin types in Paleolithic archaeology. In the ex-Soviet Union, it is typical to represent proportional numbers and percentages of different kinds of dihedral, angle and on truncation burins and to use their varying frequencies to compare Upper Paleolithic industries. In Western Europe, since the proposal of typological indices by D. de Sonneville-Bordes and J. Perrot (1953:326-327), the internal subdivision of burins has been based on the calculation of dihedral burins (all dihedral and angle types) and burins on truncation (all variations on truncation) with an additional separate evaluation of busked burins if present. So, in the latter approach, there is a mixing of dihedral and angle burins under "a single typological umbrella" as the general dihedral type. Recently, Demars has convincingly pointed out that such an approach to the structural subdivision of burins does not correctly reflect their true typological features, instead uniting all burins into three groups: dihedral (all dihedral and all carinated/busked types), angle (all on break and on natural surface types) and on truncation (all on truncation variations) for Aurignacian tool-kits (Demars 1990); this enabled him to demonstrate certain typological differences within the Early Aurignacian in the Périgord (France) (Demars 1992). As seen, Demars' approach is very similar to that used in ex-Soviet Union Paleolithic archaeology and we certainly prefer it for our own descriptions and analyses of the Siuren I burins. This is explained by the following comments. We believe that carinated and busked burin types are strongly connected technologically to dihedral burins, being their more reduced and used variants in Aurignacian complexes; their separation from all other "non-dihedral" burins is one of the most indicative Aurignacian typological features. We add only burins on lateral preparation and transversal burins on natural surface to the burin types used for these calculations. So, in this case, we have the following general burin groups: dihedral (all dihedral ones), carinated (all carinated and buskoid), angle (all angle on break and natural surface ones + transversal on natural surface) and on truncation (all on truncation ones + on lateral preparation), taking into account burin terminations. All dihedral and carinated/buskoid types will be additionally calculated together to obtain the general total of all "dihedrally" treated burin types. For Siuren I in particular and for other Upper Paleolithic complexes with small tool-kits or simply burins, it appears useful to add each termination of one type double and mixed types double and multiple burins and composite tools to the four main burin groups for more detailed and complete analysis of all burins, similar to what Demars proposed (1992).

Composite tools are represented by the following tool categories and type combinations at Siuren I: a *simple end-scraper/dihedral asymmetric burin*, *simple end-scraper/carinated (buskoid) burin*, *end scraper on a retouched piece/broken burin*, *perforator/angle burin* and *scaled tool/burin on a concave truncation*. The latter combination is very unexpected, usually missing in traditional Upper Paleolithic type-lists and in known Upper Paleolithic assemblages, but is represented by a single example in level Gb1-Gb2 at Siuren I and will be specially noted during description of the Unit G lithic assemblages. The rest of the composite tools occur quite regularly in Upper Paleolithic industries and will be described according to the specific tool types identified for each of their terminations.

Truncations are analyzed through retouch characteristics and relationship of the angle of the truncated edge and shape to the axis of removal direction for a used blank: straight, oblique, convex or concave (e.g., N 60-64 in the type-list of Sonneville-Bordes & Perrot 1956:548-550), as well as the placement of truncated edge on blank surfaces: dorsal, ventral or alternate.

Retouched blades are only those blades which have continuous and regular non-backed retouch of any kind except marginal. They are also subdivided into two internal sub-groups: *retouched blades* and *blades with Aurignacian-like heavy* retouch, numbers 65-67 in the type-list of D. de Sonneville-Bordes & J. Perrot (1956:550-552). The only significant difference of *blades with Aurignacian-like heavy retouch* from other *retouched blades* consists in the presence of more invasive scalar and stepped, usually semi-steep retouch for the former. We use the Aurignacian-like definition instead of simply Aurignacian because of the presence of only one such tool among the Siuren I 1990s finds and another (a simple end-scraper on an Aurignacian blade) among the 1920s artifacts; this obvious rarity prevents us from using a "stronger typological tone" for this definition. The description system of all *Retouched blades* is based on identification of retouch position (dorsal and ventral), retouch type (scalar, sub-parallel, parallel and stepped), retouch angles (flat and semi-steep), and above all, the number of retouched edges (unilateral and bilateral). *Aurignacian "pointed blades"* and *"strangled blades"* are absent at Siuren I.

Scaled tools or more commonly as *pièces esquillées* (N 76 in the type-list of Sonneville-Bordes & Perrot 1956:552) occur only in level Gb1-Gb2 from the 1990s finds. As is usually done in traditional typological descriptions (e.g., Marks & Ferring 1976; Kozlowski *et al.* 1982), we describe *scaled tools* based on their bifacially scaled extremities/poles location and number for each piece.

Perforators are represented by only two items among the 1990s finds: a perforator from Unit A and one on a composite tool (perforator/angle burin) from level Gc1-Gc2. They are identified and described using the classical definitions (Sonneville-Bordes & Perrot 1955:76-79).

Neutral tool types

These are *denticulated* and *notched pieces* and their separation as "*neutral types*" is explained by both the "simple" secondary treatment of these tools and their occurrence throughout the entire Paleolithic span with no significant morphological changes.

Notched pieces are classified by the presence of clear notches formed by regular, well-made (non-marginal) retouch according to their number and placement on edges: lateral and distal, dorsal and ventral.

Denticulated pieces are represented among these "*neutral types*" by a single example of a simple lateral straight piece with alternate retouch in level Fb1-Fb2, while another denticulated piece from level Gb1-Gb2 has been included in *Middle Paleolithic tool types* based on its secondary treatment, as discussed below.

Middle Paleolithic tool types

These types are represented by unifacial and bifacial points and scrapers, and the denticulated pieces mentioned above number in total 20. Their description is based on Gladilin's (1976) classification principles used for the analyses of Crimean Middle Paleolithic assemblages (Chabai & Demidenko 1998). The Siuren I Middle Paleolithic tool types have strict typological similarities to tool-kits from the Crimean Micoquian Tradition complexes and here our classification choice is obvious. Along with this, however, each of these tools is also additionally identified according to Bordes' (1961) Middle Paleolithic tool type definitions to make clearer their attributions for our colleagues who are not familiar with Gladilin's classification or do not feel comfortable with it.

So, all these tools, which come only from the lower cultural bearing deposits (Units H and G), are first classified as unifacial and bifacial. They are then classified into points and scrapers, noting as well whether they are complete or broken. Description then includes overall shape (e.g. simple, leaf-shaped, sub-trapezoidal, triangular, etc.), retouch placement for unifacial tools (dorsal and ventral) and secondary treatment (biconvex and plano-convex) for bifacial tools, and, finally, additional secondary modifications for dorsal and ventral thinning of different tools.

The specially noted denticulated piece from level Gb1-Gb2 is transversal convex dorsal with basal dorsal and ventral thinning - a morphological feature which completely corresponds to secondary treatment characteristics of only Middle Paleolithic unifacial points and scrapers among all tools from the 1990s excavations at Siuren I.

The special separation of this tool type is due to very distinct techno-typological characteristics for these pieces, which are unquestionably different from Upper Paleolithic and other tool types in the Siuren I units, being not just "retouched flakes" that also occur in many Upper Paleolithic complexes, but real Middle Paleolithic types characteristic for the Crimean Middle Paleolithic as well.

Retouched pieces

These are blades, flakes and even a single chunk which have only discontinuous irregular retouch that does not create a clear working edge or marginal continuous/discontinuous retouch. Their classification is based primarily on blank type (blade, flake, chunk), retouch characteristics (marginal/irregular and continuous/discontinuous partial) and location on blank edges and surfaces (e.g. lateral dorsal, distal ventral, etc.). Such secondary treatment characteristics are not sufficient to classify them into definite tool categories (e.g. Upper Paleolithic retouched blades or Middle Paleolithic scrapers) and, therefore, should be considered separately from other "true tools".

Non-geometric microliths

The most abundant tool group in the 1990s assemblages includes about 350 retouched bladelets and microblades. The great importance of these "small-sized tools" is well-known because their different types and forms very often serve as the main typological basis for industrial/"cultural" attributions of Upper Paleolithic assemblages. These pieces have thus been separated into a special tool group. The absence of any geometric forms is the basis for calling them *non-geometric microliths*, commonly used in Upper Paleolithic studies (e.g. Hours 1974). Taking into consideration retouch types applied to these "small-sized tools", we have divided these pieces into two main groups: *items with fine marginal and/or semi-steep micro-scalar and micro-stepped retouch* and *items with abrupt lateral retouch*. The first group deserves detailed discussion because of its typological variability and numerical dominance - more than 90% of all "small-sized tools" from the 1990s excavations, while the latter group of *pieces with an abrupt lateral retouch* accounts for less than 5%, being typologically represented by only two sub-types throughout the entire sequence.

Strictly morphologically, *non-geometric microliths with fine marginal and/or semi-steep micro-scalar and micro-stepped retouch* are represented by the following forms made on bladelets and microblades: *items with alternate bilateral retouch*, *items with ventral lateral retouch*, *items with dorsal lateral retouch*, *items with dorsal bilateral retouch*, *pointed items with dorsal bilateral retouch*, *pointed items with alternate bilateral retouch*, *items with dorsal retouch at distal end*, *truncated items*, *bitruncated items*, *items with either dorsal or ventral lateral micronotch*, *items with dorsal microdenticulated lateral edge*. There are 11 forms in total. All of these forms can be structured into three typological sub-groups: *items with continuous lateral/bilateral retouch*; *pointed items* and *items differing from the first two sub-groups by retouch location and nature*. Again, these should be discussed separately.

Pieces with continuous lateral/bilateral, fine marginal and/or semi-steep micro-scalar and micro-stepped retouch, in a very broad typological definition, are usually referred to as "*Dufour bladelets*". We have examined the available published information on different approaches to identifying"*Dufour bladelets* and have come to such conclusions, although this typological subject definitely needs further study and a separate publication. Thus, since the first "*Dufour bladelets*" definition in Aurignacian complexes of the Périgord (e.g. Bouyssonie 1944; Sonneville-Bordes & Perrot 1956: 554-N 90 in the type-list), the most typical "*Dufour bladelets*" forms have either alternate bilateral or ventral lateral retouch, although bladelets *sensu lato* with dorsal lateral and dorsal bilateral retouch placement were also usually added to "*Dufour bladelets*" given the same retouch types for all these items. The first systematic typological subdivision of "*Dufour bladelets*" based on retouch placement data was proposed by J.K. Kozlowski (1965:37-38) who distinguished "*Dufour bladelets*" with alternate lateral retouch and "*pseudo-Dufour bladelets*" with dorsal lateral/bilateral retouch, used to differentiate the Central European Aurignacian (Kozlowski 1965). However, Kozlowski seems to have abandoned such criteria for the subdivision of "*Dufour bladelets*", using on retouch type and not retouch location for their identification, although it was notably applied by him to Gravettian complexes (e.g. Drobniewicz *et al*. 1992).

In sum, we also propose to differentiate *pieces with continuous lateral/bilateral, fine marginal and/or semi-steep micro-scalar and micro-stepped retouch* into two sub-types on the basis of retouch location: "*Dufour bladelets*" with alternate bilateral and ventral lateral retouch as the most typical for European Aurignacian complexes and "*pseudo-Dufour bladelets*" with dorsal lateral and dorsal bilateral retouch because of their much rarer occurrence in European Aurignacian complexes, instead being more characteristic for Epi-Aurignacian assemblages in Eastern Europe (Demidenko 1999).

Aside from the subdivision of "*Dufour bladelets*" based on retouch location, P.-Y. Demars has proposed differentiating "*Dufour bladelets*" on the basis of length and profile of the used blanks (bladelets *sensu lato*) into two sub-types: "*Dufour*" with an overall length between 3.0 and 4.5 cm and incurvate profile, and "*Roc de Combe*" with an overall length between 1.5 and 2.0 cm and twisted profile (Demars & Laurent 1989:102). We think that in general terms, this is a quite precise typological observation for additional subdivision of "*Dufour bladelets*", but it is also needed. First of all, there are few, if any, Aurignacian assemblages with enough whole "*Dufour bladelets*" to statistically determine average length, while broken items could in fact be from the longest examples of a particular assemblage. On the other hand, our own observations of "*Dufour bladelets*" morphological and metric parameters from Siuren I and other European Aurignacian and Epi-Aurignacian complexes, including Demars' data, have shown that Demars' "*Dufour bladelets sub-type*" is generally made on wide bladelets (bladelets *sensu stricto* in our terminology), with flat and incurvate profiles, bearing mostly semi-steep micro-scalar and micro-stepped alternate bilateral and ventral lateral retouch, while Demars' "*Roc de Combe bladelets sub-type*" are made on narrow bladelets (microblades in our terminology), with twisted profile, with in most cases fine marginal ventral lateral and dorsal lateral/bilateral retouch. These differences can be used to subdivide *"Dufour bladelets"* into "*Dufour bladelets*" and "*Roc de Combe bladelets*".

For Siuren I, taking into consideration our criteria on "*Dufour bladelets*" and "*pseudo-Dufour bladelets*", and our thoughts on the separation of "*Dufour bladelets* and *Roc de Combe*", we use the terms "*Dufour* and *pseudo-Dufour*" and separate them according to blank type (bladelets or microblades), retouch type (fine marginal or semi-steep micro-scalar and micro-stepped) and profile types (flat and incurvate or twisted). The main difference with Demars' sub-types added by our data consist in regarding bladelets *sensu lato* with ventral lateral retouch as a form of "*Dufour bladelets*" not "*pseudo-Dufour*" or "*Roc de Combe sub-type*". On the other hand, Demars' "*Dufour bladelets* and *Roc de Combe sub-types*" can be also used for general analysis of European Aurignacian and Epi-Aurignacian of Krems-Dufour type complexes, especially during analysis of such complexes known by the present author from published data and personal observation.

Pointed bladelets and microblades with noted retouch type characteristics were first distinguished on Aurignacian materials of the Périgord as "*Font-Yves points-Pointes de Font-Yves*" (Bardon & Bouyssonie 1920; Sonneville-Bordes & Perrot 1956:547-N 52 in the type-list) made on bladelets *sensu lato* with semi-steep dorsal bilateral retouch forming a pointed tip and often distributed along the entire length of the lateral edges. Unlike the universal term "*Dufour bladelets*", the *Font-Yves type point* definition became only one of several such special terms proposed through time for these basically Aurignacian bladelet points.

So, similarly retouched points made on bladelets *sensu lato* were defined in different regions of the Old World in mainly Aurignacian complexes, e.g. *El Wad points* in the Near East

(Bar-Yosef 1970:211; Hours 1974:6-8; Besançon *et al.* 1975-1977:32-35; Marks 1976a:381; Bergman 1987:13-14) and Gar Arjeneh points in the Zagros Baradostian/Aurignacian of the Middle East (Hole & Flannery 1967:156-158; Olszewski 1993:189; Olszewski & Dibble 1994:69). These non-European, mainly Aurignacian, bladelet points were considered to be typological equivalents of *Font-Yves points*, but have local names to underly industrial differences between the Asian and French Aurignacian complexes. Also, these bladelet points in Near Eastern and Middle Eastern, mainly Aurignacian, context were sometimes called as *Krems points* (e.g. Howell 1959:26; Hole & Flannery 1967:157) based on similarities to shorter points from the Krems-Hundssteig site (Austria) attributed to the Central European Aurignacian (Strobl & Obermaier 1909) in comparison to the French *Font-Yves type points*. Points from the Austrian site include, aside from points with dorsal bilateral retouch similar to the *Font-Yves type*, about 25% of pointed pieces with alternate bilateral retouch that has led to determination of the fourth name for these Aurignacian bladelet points-the *Krems type* (Schwabedissen 1954:5-6). Thus, for European Aurignacian complexes, it was generally established that *Font-Yves type points* are mainly made on elongated bladelets with dorsal bilateral retouch and *Krems type points* are usually made on shorter bladelets with alternate bilateral retouch (e.g. Kozlowski 1965:37-38; Kozlowski & Kozlowski 1975:162; Hahn 1977:59). Given these definitions, it seemed reasonable to also identify *Font-Yves points* in the Central European Upper Paleolithic, e.g. for the Banat Aurignacian (Romania) (Mogosanu 1983). But can we really accept such typological distinctions between *Font-Yves type points* and their Asian *El Wad* and *Gar Arjeneh* analogies with *Krems type points* on the basis of different retouch location? A review of published pieces from Aurignacian complexes in Western and Central Europe and Northern Levantine sites does not prove it, however. First of all, the type-site for the *Krems points* (Krems-Hundssteig site) is characterized by both types: points with dorsal bilateral retouch (*Font-Yves type*) and points with alternate bilateral retouch (*Krems type*) (see Broglio & Laplace 1966:77-85; Laplace 1970:250-252). Then, the Northern Levantine *El Wad type points* also include some items with, in addition to dorsal bilateral retouch, "... *small amounts of inverse retouch at the proximal end of the piece*" which were separately called "*El Wad variant points*" (Bergman 1987:14). Finally, statements on the only occurrence of points with dorsal bilateral retouch (*Font-Yves type*) in Western Europe does not reveal a typological truth because in such Aurignacian complexes of sites Dufour (Pradel 1968: fig. 4, 1, 4 on p. 474) and Bos-del-Ser (Pradel 1972: fig. 1, 11 on p. 430) in the Périgord (France) and Cueva Morin (Gonzalez Echegaray & Freeman 1971: fig. 85, 26 and fig. 93, 54) in Cantabria (Spain), points with alternate bilateral retouch (*Krems type*) are actually present, often along with points with dorsal bilateral retouch, but were typologically identified as *Dufour bladelets*. Such European pointed bladelets with alternate bilateral retouch were sometimes considered as a pointed variant of alternately retouched *Dufour bladelets* and called *Font-Yves bladelets* (e.g. Laplace 1958). Thus, both *Font-Yves* and *Krems* bladelet points with dorsal bilateral and alternate bilateral retouch placement are actually known throughout different Old World "Aurignacian regions" and their particular restriction to a few very local regions does not find actual support.

Both types of points on bladelets and microblades are found in the 1990s Units H and G and in the 1920s Lower layer assemblages at Siuren I, as is also characteristic of the Krems-Hundssteig site in Austria. We have decided to identify the Siuren I points as follows: pieces with dorsal bilateral retouch as *Krems points* and pieces with alternate bilateral retouch as *Krems points variant*. Elongated *Font-Yves type points* (see, for example, Demars & Laurent 1989:104-105 and especially length data for 16 such points from the Font-Yves type-site with an average length of 4.2 cm and length range between 2.6 and 7.9 cm, with only four items less than 3.0 cm long and 10 with length more than 3.5 cm; Pradel 1978) are absent at Siuren I, being represented by just two of the longest complete points, with lengths of 3.2 and 3.5 cm among 7 such pointed bladelets *sensu lato* from Units H and G.

Pieces differing from Dufour bladelets and pseudo-Dufour, Krems points type and its variant retouch location and nature are subdivided into several forms on the basis of very limited retouch/secondary treatment to create either micronotches and partially treated microdenticulated edges or semi-steeply retouched distal edges and truncated by almost steep retouch terminations of bladelets and microblades. Similar subdivision of these forms is often used in Upper Paleolithic type-lists (e.g. Hours 1974).

Non-geometric microliths with abrupt lateral retouch are represented by two sub-types of backed bladelets and microblades among the 1990s assemblages. The first sub-type includes *items with fine very thin continuous dorsal "micro-abrupt" retouch* identified in assemblages from Units G, F and A, totalling 7 pieces, The second sub-type is represented by 5 *items with thick pronouncely abrupt continuous dorsal retouch (true backed pieces) found* out of context during the 1990s excavations in the uppermost humus deposits at Siuren I. Moreover, of these 5 backed bladelets and microblades, 3 items have characteristic macro-traces of projectile damage. The industrial attribution of these two sub-types with abrupt lateral retouch will be made during detailed discussion of the assemblages in which these pieces were found or assumed to be associated.

Unidentifiable tool fragments

These are heavily broken pieces which in most cases are small fragments of retouched edges from indicative tool types; identification of tool categories and types for these pieces is impossible. They are therefore grouped in the category of *unidentifiable tool fragments*. In each of the Siuren I 1990s assemblages, *unidentifiable tool fragments* are counted, divided into pieces with or without primary cortex and types of raw material identified.

Non-flint tools

These include *retouchers, choppers, a battered piece* and *grinding tools* on different sorts of limestone pebbles, fragments and flakes. Each category is described individually for the respective levels of Units H, G and F.

Waste from production and rejuvenation of tools

This artifact category is composed of two general groups: (1) *burin spalls* and (2) *retouch flakes and chips, "a chamfer-like spall"*. Such division of these pieces is proposed because the first group will include only waste from burin manufacture and rejuvenation, while the second group will include waste from production and rejuvenation of all the other indicative tool types with no burin facets showing pattern, degree and variability of secondary treatment processes applied to Middle and Upper Paleolithic tool types.

Burin spalls are classified according to traditional descriptions (e.g. Tixier 1974:9-14; Kozlowski *et al.* 1982:139) for complete and broken *primary* and *secondary* items. *Primary* burin spalls are also divided into simple unretouched and retouched (unilateral and bilateral). All *primary* and *secondary* burin spalls are then described through their profiles, butt types and metrics. For plain butts, we assumed an origin from angle burins, subsequently confirmed by refitting of such a burin spall to a double angle burin in level Gc1-Gc2. Finely-faceted butts of burin spalls testify to their removal from burins on truncation and lateral preparation, while one or two distinct longitudinal facets on butts of secondary burin spalls tend to be considered as flaked during rejuvenation of dihedral burins.

Retouch flakes are assumed to be waste products from secondary treatment processes for Middle Paleolithic tool types. This is indeed so because all 22 such items with flake proportions are found in Units H and G where Middle Paleolithic tool types are only known for the entire archaeological sequence. Basic morphological principles to identify *retouch flakes* from the other flakes in these units are those already used for classification of lithic artifacts from Crimean Middle Paleolithic sites (Chabai & Demidenko 1998:40). Along with this, these *retouch flakes* have varying morphological features and thus five distinct types of *retouch flakes* were defined (see Demidenko 2003, 2004a:139-141, 2004b:54-60).

Here we note the main data for differentiation between waste products from Middle and Upper Paleolithic tool types. All *retouch flakes* (items more than 1.5 cm in maximum dimension) are considered to be detached from Middle Paleolithic bifacial and unifacial tools because such large flakes, in our opinion, cannot have come from retouching Upper Paleolithic end-scrapers or retouched blades which, on their working edges, do not show removal scars of this size. Accordingly, all but one *retouch chips* are considered to be waste products from secondary treatment processes of both Middle and Upper Paleolithic tool types as it is impossible to find "a morphological line of demarcation" between them, apart from a single very unique chip that will be discussed on its own.

All *retouch flakes* are composed of the following five types: *bifacial shaping flakes, bifacial thinning flakes, resharpening flakes for tips of bifacial convergent tools, resharpening flakes for tips of unifacial convergent tools* and *simple retouch flakes.*

Bifacial shaping flakes are represented by the sole item from Unit H and it is recognized through very characteristic crudely-faceted butt with lipped and abrasion features and acute angle, as well as a significant amount of distal cortex testifying with the butt's data on its detachment during an initial shaping treatment of a bifacial tool.

Bifacial thinning flakes (2 items in Unit H and level Gc1-Gc2) have been identified on the basis of finely-faceted butts with lipped and abrasion characteristics and acute angles with no dorsal cortex, interpreted in sum as resulting from thinning/rejuvenation of bifacial tools.

Resharpening flakes of bifacial convergent tools' tips are represented by a single piece from Unit H. It is properly a triangular non-cortical tip from a Middle Paleolithic bifacial rather symmetric tool with traces of multiple bifacial treatment that was detached by a side transversal blow during thinning/rejuvenation of the tool's distal tip.

Resharpening flakes of unifacial convergent tools' tips is noted for a single example from Unit H. This is a non-cortical flake with shortened, transversal proportions and a distinct triangular tip of a Middle Paleolithic type unifacial convergent tool on one of its lateral edges. Three similar pieces were also identified by the present author in the 1920s *Lower* layer assemblage. Such waste products are very characteristic for rejuvenation of unifacial points and scrapers in Middle Paleolithic/Crimean Micoquian Tradition complexes, being especially common in assemblages of the Kiik-Koba type industry.

Simple retouch flakes (17 items from Unit H and levels Gd, Gc1-Gc2 and Gb1-Gb2) are characterized by plain or linear butts with mainly lipped and abrasion characteristics, acute angles, and mostly non-cortical dorsal surfaces, interpreted as waste from general thinning/rejuvenation of Middle Paleolithic unifacial tool types (points and scrapers).

Retouch chips are pieces less than or equal to 1.5 cm in their maximum dimension. They are identified by the presence of plain, linear and puctiform butts (lipped, abrasion, acute angles) and non-cortical dorsal surfaces - waste products of both Middle and Upper Paleolithic indicative tool types in Units H and G, and of only Upper Paleolithic indicative tool types in Unit F where Middle Paleolithic tool types are completely absent.

The one *unusual retouch chip* (level Gd) is a waste chip from basal ventral thinning of a Middle Paleolithic tool type. It is a non-cortical ovoid chip with a dorsal-plain scar pattern on its dorsal surface that is actually part of a tool's blank ventral surface. So, it is a kind of "Janus/Kombewa" chip. Moreover, the dorsal-plain surface of this chip has a small part of a faceted butt (most likely, a flake) that was basally ventrally thinned by this chip. Thus, aside from the 22 retouch flakes, this *retouch chip* can be added to the waste products produced during secondary treatment processes of Middle Paleolithic tool types.

A "*chamfer-like spall*" is noted for level Fb1-Fb2 only. This is a spall with the remains of a rather steep simple end-scraper's working edge tip removed by a side transversal blow during rejuvenation of the front-edge. Such a method of rejuvenation of the fronts of simple end-scrapers is well-known for some Initial Upper Paleolithic complexes in Northern Levant and especially was described in great detail for Ksar Akil finds in levels 25-21 (Newcomer 1970), although it was also sometimes noted in chronologically later European Upper Paleolithic industries, e.g. in the Central European Gravettian complexes of Dolni Vestonice and Pavlov (Otte 1979:153).

Debris

This very general artifact category includes *chips, uncharacteristic debitage pieces, chunks* and *heavily burnt pieces*. Their morphological features and definitions are summarized as follows.

Chips

These are tiny debitage and retouch pieces and their fragments with flake proportions and less than or equal to 1.5 cm in maximum dimension.

Uncharacteristic debitage pieces

These are heavily fragmented debitage pieces with maximum dimension greater than 1.5 cm which cannot be identified either as flakes, blades or bladelets.

Chunks

Here we repeat and directly cite the chunks definition used for the classification of Crimean Middle Paleolithic artifacts. "*These are distinguished as variably sized pieces of raw material without recognizable dorsal or ventral surfaces, striking platforms, or dorsal scar patterns*" (Chabai & Demidenko 1998:40).

Heavily burnt pieces

These are cracked fragments of flint artifacts of any size which have become completely unidentifiable due to burning. Most often, such flints are included in the chunks category (e.g. Chabai & Demidenko 1998:40), but for the Siuren I 1990s materials we have decided to separate them as their frequency in each archaeological level will additionally provide evidence for fire use.

For these debris sub-categories, *heavily burnt pieces* are simply counted, while for *chips, uncharacteristic debitage pieces* and *chunks* presence/absence of cortex and raw material types are also described.

Attribute analysis adopted here

A number of attributes, important for technological studies, are not reflected in typological classification and are therefore discussed here. Many of these attributes are either well-known or already listed and described for analysis of Crimean Middle Paleolithic flints (Chabai & Demidenko 1998:47-51); here they will be simply listed. On the other hand, some more specific Upper Paleolithic attributes, lacking in the Crimean Middle Paleolithic attribute analysis system, will be discussed in more detail.

Cores

Platform types: cortical, plain, dihedral, crudely-faceted.

Platform angles: right, semi-acute, acute.

Platform abrasion: present/absent.

This is a very important core morphological feature that evidences the use of the "true Upper Paleolithic marginal soft hammer flaking mode" for intensive production of blades and bladelets *sensu lato*. The most convincing arguments for its technological significance were presented by K. Ohnuma and C.A. Bergman for Northern Levantine Ksar Akil materials (Bergman 1987; Ohnuma 1988; Ohnuma & Bergman 1990) and by Russian archaeologists E.Yu. Girya and P.E. Nekhoroshev (Girya 1997; Girya & Nekhoroshev 1993; Nekhoroshev 1999) in general technological studies of Middle and Upper Paleolithic industries.

Platform morphology in plane and removal scars on flaking surfaces.

Platform morphology in plane can be straight, semicircular or offset.

Removal scars on flaking surfaces can be twisted or non-twisted. These two morphological attributes are considered together because they are technologically strongly interrelated as platform shapes of straight and semicircular cores in plane are usually associated with non-twisted removal scars on the flaking surfaces, while platform morphology of offset cores in plane is mostly correlated with twisted removal scars on flaking surfaces. These technological specificites of cores were well-established for the Ksar Akil material from levels 13-6 (Bergman 1987:13) and actually served as one of the basis for demonstration of technological variability of these Upper Paleolithic/Northern Levantine Aurignacian complexes. Moreover, the presence of many bladelets and microblades with twisted profile and "off-axis" removal direction in Unit F, in contrast to the dominance of bladelets and microblades with incurvate and flat profiles and "on-axis" removal direction in Units H and G, requires some technological explanations; the attributes under discussion are of particular relevance and are in accordance with the following observation for the Ksar Akil Aurignacian bladelet cores, having "... *the removal of a large flake from the side of the platform in order to narrow the platform and flaking face. It is essential to maintain a relatively narrow platform and flaking face during the manufacture of twisted bladelets*" (Ohnuma & Bergman 1990:117). This "narrowing process" for core platforms corresponds to the offset morphology for bladelet core platforms and also for thick shouldered/nosed end-scrapers and some carinated and buskoid burins from which twisted bladelets and especially microblades could also be systematically detached.

Condition of flaking surface: regular, overpassed, hinged.

Reasons for core abandonment: a heavily hinged flaking surface, a heavily overpassed flaking surface, a crushed striking platform, too radical striking platform rejuvenation, general poor knapping quality of a used flint blank for core-like reduction, too small and thin exhausting a core's overall size, striking platform or flaking surface.

The latter two attributes are rarely used for technological analysis of core-like pieces, although their significance was clearly demonstrated by specialists from whom these attributes were borrowed (Bicho 1992:114; Sobczyk 1993:33-34).

Core-like pieces are also characterized by the following metric parameters: *overall size (length, width, thickness), platform width* and *thickness, scar maximum length off platform*.

Debitage pieces (flakes, blades, bladelets, microblades) and tool blanks of debitage character

The same range of attributes has been used for the description of flakes, blades, bladelets and microblades with or without secondary treatment, although not all attributes occur in equal representation for these debitage pieces/blanks already of technological importance.

Condition: complete and broken; proximal, medial, distal fragments, and longitudinally fragmented.

Dorsal scar pattern types: cortical, dorsal-plain, lateral, unidirectional, unidirectional-crossed, bidirectional, 3-directional, centripetal.

Most of these types were previously described by V.P. Chabai and Yu.E. Demidenko (1998:48) and only the following notions can be added. The *dorsal-plain scar pattern* is characterized by the completely flat surface of a previous removal from a core and lack of dorsal scars (Gladilin 1976:49). Technologically, pieces with a dorsal-plain scar pattern are associated with re-preparation processes of core flaking surfaces. The *unidirectional-crossed scar pattern* is also known as *orthogonal*, while the *3-directional scar pattern* is a simplified definition of the *bidirectional-crossed scar pattern*. The *cortical scar pattern* is only for pieces which have more than 75% dorsal cortex.

Surface cortex area and **location**. These attributes are used for all partially cortical pieces: less than 75% dorsal cortex, excluding wholly cortical and non-cortical items. On the basis of *overall cortex area,* all partially cortical pieces are divided into *items with a significant amount of cortex (*26-75% dorsal cortex) and *items with a non-significant amount of cortex* (less than 26% dorsal cortex). All partially cortical items are also described by *surface cortex location* on different areas of their dorsal surfaces: *proximal, distal, lateral, central* and all possible combinations, e.g. distal + lateral, etc.

The interrelationship of each dorsal scar pattern type with surface cortex area and location for partially cortical debitage pieces/blanks is important for the evaluation of the technological roles of flakes, blades, bladelets and microblades in decortification processes and regular reduction of core-like pieces.

Shape: parallel, converging, expanding, ovoid, irregular.

Parallel, converging and **expanding** shaped are also often called *rectangular, triangular and trapezoidal,* respectively. Strict evaluation of each shape for each debitage sub-category is of great importance for establishing their technological role and significance in general Upper Paleolithic parallel primary reduction processes.

Axis: "on-axis" and "off-axis" removal directions.

General profiles: flat, incurvate medial, incurvate distal, convex, twisted.

The interrelationship of *axis* and *general profile types,* as already noted for Siuren I bladelets *sensu lato*, is one of the most indicative ways for technological analysis of the value of each debitage sub-category in core processes and determining technological variability within the Upper Paleolithic as a whole or even within a single Upper Paleolithic technocomplex in a single selected region, e.g. Northern Levantine Aurignacian (Bergman 1987; Ohnuma & Bergman 1990). For Siuren I, with its Aurignacian of Krems-Dufour type industry complexes, this is one of the main technological keys for understanding the different morphological features and primary reduction methods characteristic for bladelet and microblade production in Units H-G and F.

Profiles at distal end: feathering, hinged, overpassed, blunt.

Feathering and *blunt types* are considered as indicating regular and successful reduction of debitage pieces, while *hinged* and *overpassed types* are most likely evidence of technological mistakes and unsuccessfully detached debitage pieces. In general, *profiles at distal end* are also called *distal terminations*.

Profiles at midpoint: flat, triangular, trapezoidal, multifaceted, lateral steep, crescent, irregular.

Among these seven profiles at midpoint, *trapezoidal* and *multifaceted* ones are the main indicators of intensive Upper Paleolithic parallel primary reduction and their indices will be calculated together.

Butt types: cortical, plain, punctiform, linear, dihedral, crudely-faceted, finely-faceted, crushed.

There are some difficulties in exact identification of *plain, punctiform* and *linear* butts because, generally speaking, they all are variants of the *plain* butt type but with different dimensions that leads either to their common identification as *plain* butts (e.g. Ohnuma & Bergman 1990) or sometimes to misunderstandings of the criteria for their separation. It is proposed here to use the following metric dimensions for identification of these three butt types. *Punctiform butts* are those for which butt width and height (thickness) is no more than 1 mm each. *Linear butts* have a butt height (thickness) no more than 1 mm and butt width more than 1 mm with no definite length limits, although this almost never exceeds 1.0 cm. *Plain butts* are all plain butt variants with a butt width and height (thickness) of at least 2 mm each and typically more, such that their dimensions exclude punctiform or linear butt classification. At the same time, the "*plain-punctiform-linear*" butt types group is also calculated for their common statistical value, an important indicator of general application of the "true Upper Paleolithic marginal soft hammer flaking mode" for each of the debitage pieces/blanks sub-categories, although some interesting proportional differences for the occurrence of each of these butt types are shown for flakes, blades, bladelets and microblades. *Cortical butts* are usually associated with wholly cortical and partially cortical pieces, while all *faceted* (including *dihedral* type) butts are also separately counted.

Lipping: lipped, semi-lipped, not lipped.

Butt angles: right, semi-acute, acute.

Butt abrasion: present and absent.

These three attributes seem to be the most important ones for evaluation of "true Upper Paleolithic marginal soft hammer flaking mode" and for identification of retouch flakes and chips from secondary treatment processes for Middle and Upper Paleolithic indicative tool types as well. Association of mostly semi-lipped butts with semi-acute angle and abrasion is most typical for this Upper Paleolithic flaking mode, while retouch flakes and chips usually have lipped butts with acute angle and abrasion. Unlipped butts with right angle and no abrasion are mainly characteristic of debitage pieces/blanks detached during core preparation and re-preparation processes. Thus, such strict morphological subdivision of all debitage pieces/blanks butts is of the great technological importance.

Some specialists (e.g. Ohnuma 1988; Ohnuma & Bergman 1990) add a special attribute, or, more appropriately, indicator: "*flaking mode- hard or soft*", but as it seems that strict objective morphological criteria have not yet been determined for such identification for debitage pieces/blanks (see Girya 1997:70), we therefore consider that butt lipping, angle and abrasion data is generally enough for a basic understanding of hard/soft hammer flaking modes used in each Paleolithic complex. The *presence/absence of percussion point on a butt's edge* (Drobniewicz *et al.* 1992:394-396) may also help for such studies, but was not used for artifact analysis at Siuren I.

Debitage piece/blank measurements. Identification of *overall size* (*length, width, thickness*) and *butt width* and *height* (*thickness*) through the measurement principles used by V.P. Chabai & Yu.E. Demidenko (1998:50) for analyses of Crimean Middle Paleolithic artifacts.

Raw material types

Most lithic artifacts from the 1990s excavations, as well as the late 19th century and the 1920s excavations, were made on different kinds of flint, with only a small number of other lithic artifacts made on different kinds of limestone.

The following *flint types* are distinguished there: *black, gray, color* and *brown* ones.

The source of *black flints* is known in the immediate vicinity of the site, about 1 km to the east in the small and narrow Zmeinaya ("Snake") Valley (Vekilova 1957:259 and personal observations during the 1990s investigations). A large number of small nodules of this coarse-grained, speckled black flint occurs in limestone deposits. This black flint should be considered as local for the Paleolithic inhabitants of Siuren I, although because of its definitely poor knapping quality, its use during each human occupation of the site was quite limited. It is worth noting that such small poor-quality black flint nodules were only rarely used by Crimean Paleolithic human groups. For example, its presence for debitage and tools from levels 1 and 3 at Starosele, another Western Crimean, but exclusively Middle Paleolithic site, was only between 2.7 and 7.7% (Marks & Monigal 1998:125) and here these nodules were not even a hundred meters away from the site.

Gray flints varying from light to dark shades are fine-grained with good knapping quality. Fresh, unweathered cortex on most of these gray flints show that they were either actually quarried from some deposits or, more likely, were collected in front of actively eroding sources. On the other hand, some of these gray flints have a weathered, smooth cortex indicative of a gravel/alluvial sources. E.A. Vekilova (1957:259) suggested that the most probable sources of these gray flints are in "*Kacha valley near the road from Bashtanovka village*" further to the east, about 7-10 km from Siuren I as the crow flies. At the same time, it should be kept in mind that there were no flint sources were found in Kacha Valley during survey in the 1980s (V.P. Chabai, pers. comm.). Again it is useful to refer to Starosele, as these gray flints are the main ones for lithic artifacts there and their original outcrops unknown (Marks & Monigal 1998:125), and, at the same time, the location of this Middle Paleolithic site is only ca. 13 km from Siuren I. Taking all of this into consideration, as well as the dominance of artifacts made on gray flints in each archaeological level at Siuren I, we would assume that the source(s) of the gray flints sources are not very far from the site and that these gray flints were easily available for the rock-shelter's Paleolithic inhabitants.

Colored flints are a translucent rose-ochre shade, fine-grained with fresh, unweathered cortex. Knapping quality of these colored flints is considered the best among all the range of flint types at the site, but their provenance is still unknown despite surveys undertaken for their identification in the 1950s (Vekilova 1957:259). These colored flints are thus considered to be meso-local for the Siuren I Paleolithic inhabitants. These colored flints were used quite often in flint treatment processes in the 1990s Units H and G and the 1920s excavations *Lower* layer, but very rarely occur in the 1990s Unit F and the 1920s excavations *Middle* layer, and, finally, they are entirely absent in the site's Upper cultural bearing deposits. Interestingly, these colored flints is also that they have never been identified in any Crimean Paleolithic sites except for Siuren I and are thus a kind of "enigmatic flint" for the Crimean Paleolithic.

Brown flints are of fine-grained type with dark shades and fresh, unweathered cortex. This is a new flint type defined after the 1990s excavations; however, there are very few artifacts and its source is also unknown.

The varying occurrence of these four flint types through the Siuren I archaeological sequence will be discussed in detail for the 1990s excavations, for artifact categories, sub-categories, groups and types in each level and unit.

Various *limestones* are almost exclusively characteristic for the site's *non-flint tools*. Most limestone pebbles were highly likely collected from gravels/alluvial deposits in the nearby Belbek River.

Concluding remarks

The classification and attribute analysis system applied to the Siuren I lithic artifacts is evidently very detailed, for which its application allows us to make an overall techno-typological description and to understand the industries. On the other hand, many European Upper Paleolithic complexes compared to the Siuren I Upper Paleolithic assemblages have not been classified in such detail, but many of their techno-typological features could be recognized and used for such comparisons. We are not afraid of very detailed descriptions for Upper Paleolithic complexes and through time, we hope that more information will be necessary for understanding of Upper Paleolithic artifacts, the basis of which is their description.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 109-133.

10 - UNIT H: LITHIC ARTIFACTS

Yuri E. DEMIDENKO & Victor P. CHABAI

General representation of artifact categories

Unit H yielded 682 lithic artifacts which have been divided into 12 categories (tabl. 1). The most abundant category, as is common, is chips – somewhat more than one third of the assemblage (36.1%). Excluding chips, chunks, uncharacteristic debitage and heavily burnt pieces, flakes are dominant in the assemblage (32.7%), followed by tools (18.2%), bladelets (17.7%) blades (12.9%), microblades (7.1%), waste from tool production and rejuvenation (5.3%) and core maintenance products (5%). Core-like pieces are rare (1.1%). The relatively high percentage of tools is the main characteristic feature of the Unit H assemblage structure.

Typological structure of artifacts

Core-like pieces

These include only 4 cores and no pre-cores were found. The following categories of cores are represented: a blade/bladelet core, a bladelet "carinated" core, a bladelet multiplatform core and a core fragment. Both bladelet cores are on colored flint nodules/chunks, while the blade/bladelet core and the core fragment are on gray flint nodules/chunks.

The *blade/bladelet core* (fig. 1:1) has a double-platform with two bidirectional-adjacent flaking surfaces. Removal of blades and bladelets *sensu lato* from two opposed platforms in bidirectional order from two adjacent flaking surfaces gives the core a volumetric character with sub-cylindrical shape. Platform types and angles: 1st - roughly faceted acute and 2nd - plain acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surfaces: 1st - straight with no twist scars and 2nd - semicircular with twist scars. Condition of flaking surfaces: 1st - hinged and 2nd - regular. Metrics: length - 5.2 cm, width - 3.9 cm, thickness - 2.9 cm. First platform width and thickness: 3.1 and 2.9 cm. Second platform width and thickness: 2.9 and 2.8 cm. The size of the second plain platform indicates removal of a core tablet with flake proportions for possible rejuvenation. Platform negatives, maximum length: the

	TOTAL #	%	esse %
CORE-LIKE PIECES	4	0.6	1.1
CORE MAINTENANCE PRODUCTS	19	2.8	5.0
DEBITAGE :	267	39.1	70.4
Flakes	124	18.2	32.7
Blades	49	7.2	12.9
Bladelets	67	9.8	17.7
Microblades	27	3.9	7.1
TOOLS	69	10.1	18.2
WASTE FROM PRODUCTION & REJUVENATION OF TOOLS	20	2.9	5.3
DEBRIS :	303	44.5	
Chips	246	36.1	
Uncharacteristic Debitage Piece	23	3.4	
Chunks	19	2.8	
Heavily Burnt Pieces	15	2.2	
TOTAL	**682**	**100.00**	**100.00**

Table 1 - Siuren-I. Unit H. General Artifacts Categories Representation.

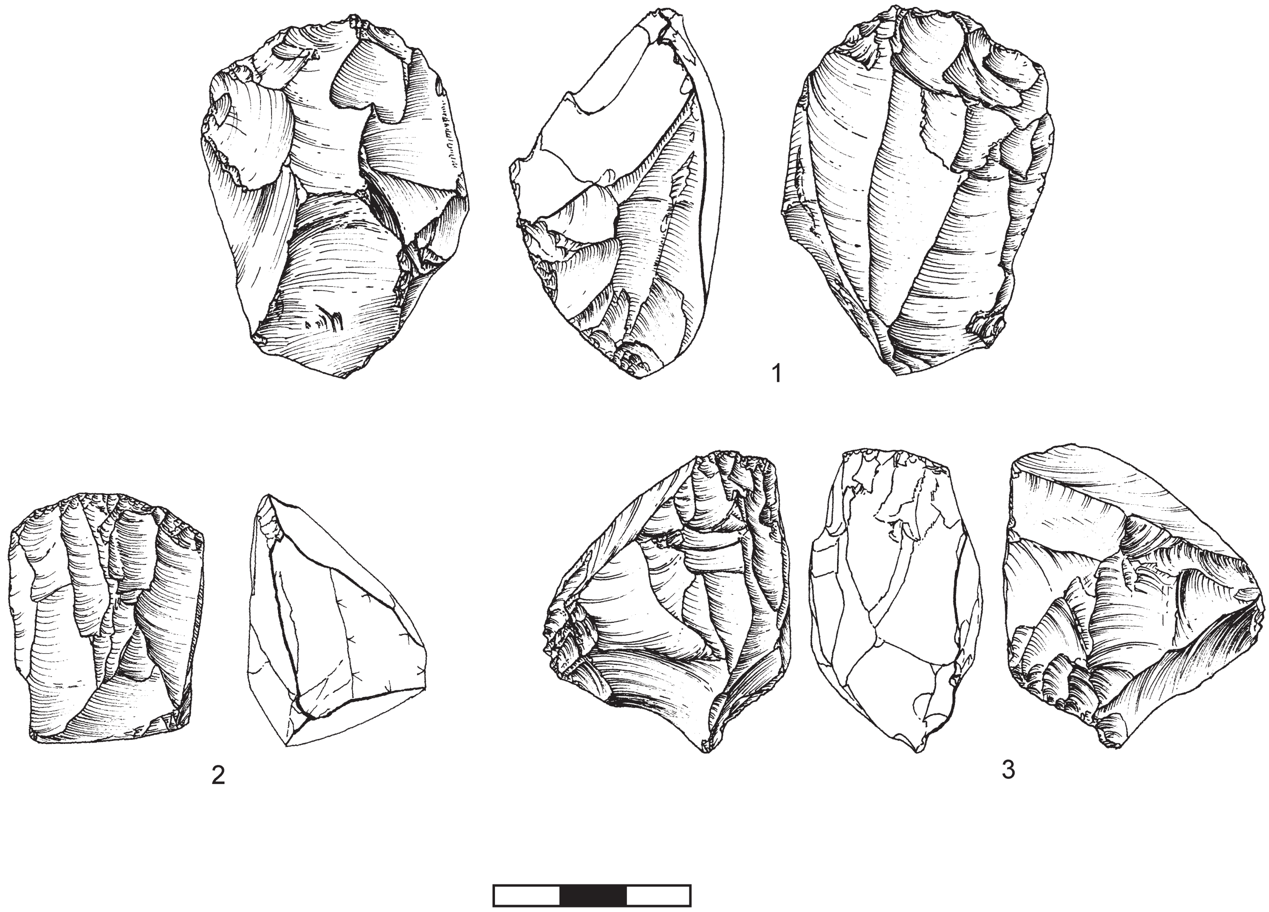


Figure 1 - Siuren I. Unit H. Flint Artifacts – Cores. 1, double-platform bidirectional-adjacent sub-cylindrical blade/bladelet core; 2, "carinated" single-platform sub-cylindrical bladelet core; 3, multiplatform exhausted bladelet core.

same as the core length - 5.2 cm. Reason for core abandonment: for 1st platform and flaking surface - hinged scars and for 2nd platform and flaking surface - no obvious reason.

Bladelet "carinated" core (fig. 1:2) has a single-platform and is of volumetric character with sub-cylindrical shape. Platform type and angle: dihedral acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: semicircular with no twist scars. Condition of flaking surface: regular. Metrics: length - 3.7 cm, width - 2.9 cm, thickness - 2.6 cm. Platform width and thickness: 2.9 and 2.5 cm. Platform size indicates removal of a core tablet with flake proportions for possible rejuvenation. Platform negatives, maximum length: the same as the core's length - 3.7 cm. Reason for core abandonment: no obvious reason.

Bladelet multiplatform exhausted core (fig. 1:3) has three separate striking platforms and three flaking surfaces. Platform types and angles: 2 plain acute and 1 crudely-faceted acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surfaces: 1 semicircular and 2 straight platforms with no twist scars. Condition of flaking surfaces: 2 regular and 1 hinged, the latter one associated with plain acute platform with straight morphology in plane. Metrics: length - 4.5 cm, width - 4.0 cm, thickness - 2.4 cm. Other metric data are not mentioned, as they would be too subjective, but some morphological features deserve a discussion. The disposition of the core's striking platforms and removal order on the flaking surfaces allow us to make some technological conclusions. First, this bladelet multiplatform core was a bladelet double-platform one with two bidirectional-alternate flaking surfaces. Then, after exhaustion of these two platforms and flaking surfaces, a third platform was formed on one of the core's narrow edges (plain acute with straight morphology in plane) from which new bladelet production began. This new exploitation stage was not long or successful since from the start most of the removals were heavily hinged straight in the upper part of this narrow flaking surface near the platform, obviously leading to core abandonment. Thus, we clearly see three stages of bladelet production on this core – two sequential ones from a single-platform to double-platform core on two different flaking surfaces and then, a third one with preparation and use of a third platform. Moreover, some removal scars with only the distal parts preserved are not associated with these three striking platforms, indicating the existence of at least one more stage in primary core reduction prior to these three stages. So, this bladelet core had a long and multiple "reduction history" that certainly led it to its final multiplatform exhausted form.

Core-like pieces of Unit H are represented by only three definable cores which suggest intensive bladelet production with the simultaneous presence of bladelet "carinated" and multiplatform types, and a blade/bladelet core with the notable absence among these cores of true bidirectional primary reduction from two opposed platforms on one flaking surface.

Core maintenance products (CMP)

This category is represented by 19 artifacts which are subdivided into crested pieces (15 items) and core tablets (4 items); no core trimming elements are present (see also tabl. 2).

Crested pieces

Based on metric proportions, crested pieces are additionally subdivided into crested flakes (n=2 /13.3%), crested blades (n=11 /73.4%) and crested bladelets (n=2 /13.3%). All but one crested blade are primary with a crested ridge present.

Crested flakes. 1 primary flake and 1 re-crested flake are pre-

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
cortical			11	11 / 8.8%
dorsal-plain			3	3 / 2.4%
lateral			3	3 / 2.4%
crested	1	2		3 / 2.4%
unidirectional	2		66	68 / 54.4%
unidirectional-crossed			21	21 / 16.8%
bidirectional			10	10 / 8.0%
3-directional	1		4	5 / 4.0%
centripetal			1	1 / 0.8%
core tablet		3		3
unidentifiable	1		5	6
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical			1	1 / 1.4%
plain				
lateral				
crested		11		11 / 15.1%
unidirectional	12		43	55 / 75.3%
unidirectional-crossed			2	2 / 2.7%
bidirectional	1		3	4 / 5.5%
3-directional				
centripetal				
core tablet		1		1
unidentifiable	1			1
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
plain				
lateral				
crested		2		2 / 2.3%
unidirectional	17		59	76 / 87.4%
unidirectional-crossed			5	5 / 5.7%
bidirectional	1		3	4 / 4.6%
3-directional				
centripetal				
core tablet				
unidentifiable				
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain				
lateral				
crested				
unidirectional	24		26	50 / 96.2%
unidirectional-crossed	1			1 / 1.9%
bidirectional			1	1 / 1.9%
bidirectional-crossed				
centripetal				
core tablet				
unidentifiable				
N	**25**		**27**	**52**

UNIT H. DEBITAGE TOTAL (INCLUDING TOOLS & CMP):

	N	%
Flakes	134	38.5
Blades	75	21.6
Bladelets	87	25.0
Microblades	52	14.9
TOTAL	**348**	**100**

Table 2 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Dorsal Scar Patterns.

sent. Both have the same crested ridge characteristics: unilateral wholly crested treatment with lateral steep profile. Other features differ. The primary crested flake has a dorsal-plain scar pattern that shows only initial preparation of a core's flaking surface. The flake is whole with irregular shape, "on-axis" removal direction, convex profile, feathering distal end, slight lateral cortex, crushed butt. This piece is on a gray flint with the following metrics: length - 3.7 cm, width - 2.1 cm, thickness - 0.7 cm. Because it has a heavily convex profile, this crested piece did not reach blade size and became a flake. The re-crested flake has a regular unidirectional scar pattern with bladelet scars that are evidence of re-cresting repreparation of a core's flaking surface during continued reduction. This flake is a non-cortical proximal fragment with only an identifiable punctiform butt – semi-lipped, semi-acute angle, with abrasion. This piece is on a gray flint, 1.7 cm long, 1.5 cm wide, 0.4 cm thick.

Crested blades. These include 5 primary, 3 re-crested, 1 secondary and 1 unidentifiable blades with preserved crested ridge, and one truly secondary piece with no preserved crested ridge.

Five primary crested blades have the following characteristics of crested ridges: 4 unilateral and 1 bilateral wholly crested treatments with 4 triangular and 1 lateral steep profiles. Other morphological features are as follows: 3 complete, 1 proximal and 1 distal fragments; 1 cortical, 2 dorsal-plain, 1 crested and 1 unidentifiable scar patterns; 3 converging, 1 parallel and 1 irregular shapes; 1 "on-axis" and 4 "off-axis" removal directions; 3 twisted, 1 incurvate medial and 1 incurvate distal general profiles; 3 feathering, 1 blunt and 1 unidentifiable distal ends; 3 non-cortical, 1 cortical and 1 partially cortical with non-significant amount of lateral cortex; 3 plain, 1 dihedral and 1 missing butts (3 semi-lipped and 2 unidentifiable; 3 semi-acute and 2 unidentifiable; 1 with abrasion, 3 with no abrasion and 1 unidentifiable). There are 3 pieces on gray flints and 2 on colored flints. Their metric parameters are in the following ranges: length - 3.3-4.5 cm (including broken pieces), width - 1.3-1.9 cm, thickness - 0.7-1.4 cm.

Three re-crested blades have crested ridges as follows: bilateral (2)/unilateral (1) and wholly (1)/partially (2) crested treatment with 1 triangular and 2 lateral steep profiles. Other morphological features: 1 complete, 1 proximal and 1 distal fragments; 3 unidirectional scar patterns; 1 converging and 2 unidentifiable shapes; 1 "on-axis" and 2 unidentifiable removal directions; 1 flat and 2 unidentifiable general profiles; 1 hinged, 1 blunt and 1 unidentifiable distal ends; 1 non-cortical and 2 partially cortical with non-significant distal and lateral amount of cortex; 1 plain butt (semi-lipped, semi-acute angle, with abrasion), 1 crushed and 1 missing butts. There are 2 pieces on gray flints and one more piece on colored flint. Metric parameters are in the following ranges: length - 3.0-4.6 cm (including broken pieces), width - 2.1-2.4 cm, thickness - 0.8-0.9 cm.

The secondary complete blade has a unilateral partially treated crested ridge with lateral steep profile. It is also has the following morphological features: unidirectional scar pattern, irregular shape, "off-axis" removal direction, flat general profile, hinged distal end, non-cortical dorsal surface, crushed butt. It is 5.4 cm long, 2.5 cm wide, 1.0 cm thick, made on gray flint.

An unidentifiable blade is a medial fragment with a unilateral wholly treated and lateral steep crested ridge. The only other identifiable characteristics are that it is non-cortical broken with an unidentifiable scar pattern on gray flint with measurements of 2.9 cm length, 1.3 cm width and 0.8 cm thickness.

There is a single truly secondary blade with no preserved crested ridge. This is a medial partially cortical fragment with an insignificant amount of lateral cortex on gray flint - 2.4 cm long, 1.5 cm wide, 0.7 cm thick.

Crested bladelets. Both are primary crested items which have unilateral wholly treated crested ridges with lateral steep profiles. One is complete and the second is a medial fragment. The latter is on gray flint, partially cortical with an insignificant amount of lateral cortex, cortical dorsal surface, and is 2.4 cm long, 1.1 cm wide and 0.7 cm thick. The complete bladelet has a dorsal-plain scar pattern, converging shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end, non-cortical dorsal surface, crushed butt. It is on colored flint with measurements of 4.1 cm length, 0.7 cm width, 0.8 cm thickness.

Core tablets

There are 3 primary and 1 secondary core tablets. All are complete and non-cortical items made on gray flints. As expected, none of the core tablets have butt abrasion.

One primary piece has blady metric proportions (length - 6.5 cm, width - 3.1 cm, thickness - 1.0 cm), while the other 2 primary pieces are flakes (length - 2.7 and 3.0 cm, width - 2.4 and 3.9 cm, thickness - 0.4 and 1.1 cm). One piece on a flake has core striking platform remnants both on its butt area and one lateral edge, while the other 2 pieces have such top parts of cores only on their butt areas.

A single secondary core tablet is on a flake (2.1 cm long, 1.2 cm wide, 0.4 cm thick). As a primary core tablet on flake, this piece also has core striking platform remnants both on its butt area and along a lateral edge.

The structure and characteristics of the core maintenance products allow us to make some technological observations for them. First, the prevalence of blades among crested pieces evidences core flaking processes starting from relatively large nodules and/or pre-cores with the aim of subsequent general blade reduction. It is also obvious that of the 11 crested blades, 10 are primary. The presence of two crested primary bladelets also serves to indicate independent bladelet core reduction at the site. Along with this, the presence of a crested primary flake and a re-crested flake is evidence of a subordinate role for crested pieces with flake proportions at the beginning of primary flaking processes at Siuren I, probably pointing out their accidental origin. The basic core tablet features are regular ones with the dominance of such pieces on flakes and another on a blade that again shows bladelet core reduction. All in all, the presence of 19 core maintenance products with 4 cores (ratio 4.75:1) showing multiple bladelet reduction is strong evidence for intensive primary flaking processes taking place at the rock-shelter by the Aurignacian inhabitants of archaeological level H.

Debitage

This category of artifacts is composed of 267 pieces which are divided into flakes (n=124/46.4%-, blades (n=49 18.4%), bladelets (n=67/25.1%) and microblades (n=27/10.1%) (see also tabl. 2-11).

Flakes

All 124 flakes have been subdivided into complete (n=79/63.8%) and broken (n=45/36.2%), with further distribution of the latter into proximal (n=11/8.9%), medial (n=4/3.2%), distal (n=23/18.5%) and longitudinally fragmented (n=7/5.6%).

Dorsal scar pattern. All eight scar pattern types on 119 flakes with definable scar pattern have been identified. The most common type is unidirectional (55.6%), followed by the much less common unidirectional-crossed type (17.6%). Bidirectional (8.4%) and cortical (9.2%) types are similar in percentage, and again much less representative than the previous type. The remaining four scar pattern types are represented by only a few pieces each and none reach 5%, although even the minimal presence of three-directional (3.4%), centripetal (0.8%), dorsal-plain (2.5%) and lateral (2.5%) types is notable.

Comparisons of scar pattern types with presence/absence of cortex on respective flakes are as follows. Cortical pieces have the following proportions for the different scar pattern types: unidirectional - 36.4%, unidirectional-crossed - 33.3%, bidirectional - 20%, lateral - 33.3% and centripetal - 100% (only one piece is cortical).

Surface cortex area and location. All 124 flakes were used for surface cortex area identification. Non-cortical flakes are dominant (63.7%). Partially cortical flakes are about twice as predominant as wholly cortical flakes – 25% vs. 11.3%. For whole flakes only, proportions are as follows: non-cortical (63.3%), partially cortical (24.1%) and wholly cortical (12.6%). This smaller sample shows an internal subdivision of partially cortical flakes into pieces with a significant amount of cortex (36.8%) and pieces with an insignificant amount (63.2%).

Only 19 complete partially cortical flakes were used for surface cortex location. More than half of these flakes have distal cortex (52.7%), while three other identified types (flakes with proximal, lateral, distal + lateral cortex) are much less common – 10.5%, 21%, 15.8%, respectively.

Shape and axis. 99 flakes with definable shapes and 112 flakes with definable axis of removal direction were used for this analysis.

The most common shape type is expanding, present for nearly half of the flakes (44.4%). This is followed by irregular (30.3%)

	flakes-tools	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel			11	11 / 10.6%
converging	1		8	9 / 8.6%
expanding	2		44	46 / 44.2%
ovoid			6	6 / 5.8%
irregular	1	1	30	32 / 30.8%
unidentifiable	1	4	25	30
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel	3	1	6	10 / 21.7%
converging	4	4	7	15 / 32.6%
expanding	1		7	8 / 17.4%
ovoid				
irregular		2	11	13 / 28.3%
unidentifiable	6	5	18	29
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets**	**bladelets total**
parallel	3		10	13 / 35.1%
converging	2	1	16	19 / 51.4%
expanding			1	1 / 2.7%
ovoid				
irregular			4	4 / 10.8%
unidentifiable	13	1	36	50
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	11		2	13 / 59.1%
converging	2		6	8 / 36.4%
expanding				
ovoid				
irregular			1	1 / 4.5%
unidentifiable	12		18	30
N	**25**		**27**	**52**

Table 3 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Shapes as Percentages of Each Type

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
on-axis	2	1	53	56 / 47.9%
off-axis	2		59	61 / 52.1%
unidentifiable	1	4	12	17
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis	3	2	7	12 / 26.1%
off-axis	2	7	25	34 / 73.9%
unidentifiable	9	3	17	29
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis	18	1	54	73 / 92.4%
off-axis			6	6 / 7.6%
unidentifiable		1	7	8
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis	25		1	26 / 76.5%
off-axis			8	8 / 23.5%
unidentifiable			18	18
N	**25**		**27**	**52**

Table 4 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Axis as Percentages of Each Type.

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
flat			30	30 / 23.6%
incurvate medial	2		43	45 / 35.4%
incurvate distal			21	21 / 16.6%
convex		1	13	14 / 11.0%
twisted	2		15	17 / 13.4%
unidentifiable	1	4	2	7
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	3	2	8	13 / 21.7%
incurvate medial	5	1	14	20 / 33.3%
incurvate distal	1	1	6	8 / 13.3%
convex				
twisted	1	3	15	19 / 31.7%
unidentifiable	4	5	6	15
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat	2		10	12 / 15.2%
incurvate medial	3	1	22	26 / 32.9%
incurvate distal	1		4	5 / 6.3%
convex			1	1 / 1.3%
twisted	9		26	35 / 44.3%
unidentifiable	3	1	4	8
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat	4		8	12 / 24%
incurvate medial	8		11	19 / 38%
incurvate distal	3			3 / 6%
convex				
twisted	10		6	16 / 32%
unidentifiable			2	2
N	**25**		**27**	**52**

Table 5 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade General Profiles as Percentages of Each Type.

and parallel (11.1%) types. Two other types (converging and ovoid) occur in small numbers less than 10% each – 8.1% and 6.1%, respectively. Such distribution of shape types is similar to the subdivision of dorsal scar pattern types in terms of their proportional representation.

Flakes with “off-axis” removal direction (52.7%) are slightly more common than flakes with “on-axis” removal direction (47.3%). This corresponds well to the predominance of expanding and irregular shapes (together 74.7%), for which the “off-axis” removal direction is very characteristic.

General profiles of flakes, profiles at distal end and midpoint

Data for such analyses were obtained from 122 definable flakes and separately from 79 complete flakes for general profiles, from 103 definable flakes for profiles at the distal end and from 117 definable flakes for profiles at midpoint.

The unique feature of the general profiles of flakes is that none of the five types is represented at less than 10%. Although incurvate medial (35.2%) are dominant followed by flat type (24.6%), incurvate distal (17.2%), twisted (12.3%) and convex (10.7%) are also in relatively good numbers for the larger sample of 122 flakes. These data are also in good agreement with the general profiles of 79 complete flakes – incurvate medial (38%), flat (21.5%), incurvate distal (15.2%), convex (13.9%) and twisted (11.4%).

Half of the definable flakes have a feathering distal end (50.5%). The second most common type is hinged (28.2%). The blunt type occurs in a moderate percentage (15.5%). Overpassed distal ends are quite rare (5.8%). It is worth noting here that a significant number of hinged distal ends which, additionally in conjunction with overpassed distal ends, make up one third (34%) of all flakes.

The striking feature of profiles at midpoint is that none of the 7 types is particularly dominant. Moreover, 3 types (triangular, irregular and trapezoidal) are practically identical in percentage – 24.8%, 22.2% and 21.4%, respectively. Two more types (lateral steep and multifaceted) are less common – 13.7% and 9.4%, respectively, but are still not rare. The only rare types are crescent and flat profiles – 5.1% and 3.4%, respectively.

The data below on four morphological attributes of flake butts (types, lipping, angle, abrasion) are based on the same sample of 90 pieces which is composed of the 79 complete flakes and 11 proximal fragments.

Butt types. The most common group of types among the 90 identifiable butts is “plain-punctiform-linear” – 46.7%, with corresponding internal representation - 24.5% - 10% - 12.2%. The next common type is crushed – 22.2%, followed by faceted – 14.4%, with a slight prevalence of finely-faceted (8.9%) over crudely-faceted butts (5.5%). The dihedral type follows with 10%. Cortical butts are the least common – 6.7%, but their presence is nevertheless notable.

	flakes-tools	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering	2	1	52	55 / 51.4%
hinged			29	29 / 27.1%
overpassed			6	6 / 5.6%
blunt	1		16	17 / 15.9%
unidentifiable	2	4	21	27
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering	4	3	17	24 / 57.1%
hinged	2	2	5	9 / 21.4%
overpassed			3	3 / 7.2%
blunt		2	4	6 / 14.3%
unidentifiable	8	5	20	33
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering	5	1	26	32 / 82.1%
hinged			2	2 / 5.1%
overpassed			2	2 / 5.1%
blunt			3	3 / 7.7%
unidentifiable	13	1	34	48
N	**18**	**2**	**67**	**48**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering	10		9	19 / 90.4%
hinged	1			1 / 4.8%
overpassed	1			1 / 4.8%
blunt				
unidentifiable	13		18	31
N	**25**		**27**	**52**

Table 6 - Siuren-I, Unit H, Flake, Blade, Bladelet and Microblade Profiles at Distal End as Percentages of Each Type.

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
flat			4	4 / 3.2%
triangular	1		29	30 / 24.4%
trapezoidal	2		25	27 / 22.0%
multifaceted			11	11 / 8.9%
lateral steep		2	16	18 / 14.6%
crescent			6	6 / 4.9%
irregular	1		26	27 / 22.0%
unidentifiable	1	3	7	11
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
flat				
triangular	3	5	12	20 / 27.8%
trapezoidal	7		19	26 / 36.1%
multifaceted	1		13	14 / 19.4%
lateral steep	1	5	3	9 / 12.5%
crescent				
irregular	1		2	3 / 4.2%
unidentifiable	1	2		3
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat				
triangular	4		26	30 / 34.9%
trapezoidal	13		34	47 / 54.6%
multifaceted	1		5	6 / 7.0%
lateral steep		1	2	3 / 3.5%
crescent				
irregular				
unidentifiable		1		1
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat				
triangular	11		20	31 / 59.6%
trapezoidal	13		5	18 / 34.6%
multifaceted	1		2	3 / 5.8%
lateral steep				
crescent				
irregular				
unidentifiable				
N	**25**		**27**	**52**

Table 7 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Profiles at Midpoint as Percentages of Each Type.

Lipping, butt angle and butt abrasion

There are 69 butts suitable for lipping identification. There is a great predominance of semi-lipped butts – 72.5%. Therefore, the most important is the ratio between lipped (18.8%) and unlipped (8.7%) butts: 1 unlipped butt: 2.2 lipped butts.

68 butts are suitable for angle identification. The most common is semi-acute – 41.2%. Right angle (33.8%) is only slightly more common than acute (25%) and their ratio is 1 right angle: 0.7 acute angle.

There are 69 identifiable butts for identification of presence/absence of abrasion. Only 47.8% butts have traces of abrasion, while 52.2% lack abrasion. Thus, the ratio for present/absent abrasion is 1: 1.1.

Metrics (length, width, thickness) of flakes. Detailed metric data are mainly based on the analysis of 79 complete flakes, with some additional comparable information obtained from broken flakes.

Length. The common group of complete flakes in terms of length is in the range 1.6-2.5 cm – 59.4%. As a whole, flakes with length in the range 0.5-3.0 cm make up 86% of all complete flakes. The remaining 14% of flakes have a length of more than 3 cm with one unique feature – only 2 flakes (2.6%) pass the 4.5 cm threshold (6.3 and 9.0 cm). Thus, flakes are certainly not long. Moreover, average length is only 2.3 cm, falling into the most common metric range of 1.6-2.5 cm.

Analysis of all broken 45 flakes is consistent with the data on complete flakes. Most broken flakes (89%) are not longer than 3.0 cm and only 2 flakes (4.4%) of the remaining 11% are longer the 4.5 cm threshold (both 5.1 cm).

Width. Data on flake width are very similar to length. The most common are complete flakes with width in the 1.6-2.5 cm range

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
cortical			6	6 / 6.2%
plain			22	22 / 22.9%
punctiform		1	9	10 / 10.4%
linear			11	11 / 11.5%
dihedral			9	9 / 9.4%
crudly-faceted			5	5 / 5.2%
finely-faceted	2		8	10 / 10.4%
crushed	2	1	20	23 / 24.0%
missing	1	3	34	38
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
plain	1	4	14	19 / 38.8%
punctiform			7	7 / 14.3%
linear			5	5 / 10.2%
dihedral	4	1	5	10 / 20.4%
crudly-faceted				
finely-faceted			1	1 / 2.0%
crushed		2	5	7 / 14.3%
missing	9	5	12	26
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
plain	1		2	3 / 6%
punctiform	1		9	10 / 20%
linear	4		19	23 / 46%
dihedral			4	4 / 8%
crudly-faceted				
finely-faceted				
crushed	2	1	7	10 / 20%
missing	10	1	26	37
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain			1	1 / 5%
punctiform	2		6	8 / 40%
linear	6		3	9 / 45%
dihedral			1	1 / 5%
crudly-faceted				
finely-faceted				
crushed			1	1 / 5%
missing	17		15	32
N	**25**		**27**	**52**

Table 8 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Butt Types as Percentages of Each Type.

– 53.2%. Flakes with width between 0.5-3.0 cm again exceed 80% – 83.5% to be precise. There are only 3 flakes (3.8%) with width larger the 4.5 cm threshold (4.6, 4.7 and 6.8 cm). The average width of flakes is again 2.3 cm.

Analysis of 38 broken flakes (without longitudinally fragmented pieces) shows the same situation. Most broken flakes (92.1%) have width in the 0.5-3.0 cm range and no other flake is wider than 4.1 cm.

Having such metrics on length and width of flakes, let us take a closer look at them right now. It appears that the average length and width are identical (2.3 cm), making "an ideal complete flake" with shortened, transversal proportions (L<=W). Moreover, accounts on actual (not ideal) complete flakes show that there are indeed in reality 51.9% flakes with shortened, transversal proportions (L<=W). Such very minor prevalence of shortened flakes (51.9%) over flakes which are longer than they are wide (48.1%) appears because of some slight numerical differences for length and width in several metric intervals, as well as the general rarity of elongated flakes with L >1.5W (n=12 /15.2%).

Thickness. The average thickness of all 79 complete and 45 broken flakes is 0.4 cm. In terms of metric intervals, the most com-

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
lipped			13	13 / 18.1%
semi-lipped	2	1	50	53 / 73.6%
not lipped			6	6 / 8.3%
unidentifiable	3	4	55	62
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped			5	5 / 12.2%
semi-lipped	4	5	27	36 / 87.8%
not lipped				
unidentifiable	10	7	17	34
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped	7		6	13 / 25.5%
semi-lipped			28	28 / 54.9%
not lipped			10	10 / 19.6%
unidentifiable	11	2	23	36
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped	8		3	11 / 55%
semi-lipped			9	9 / 45%
not lipped				
unidentifiable	17		15	32
N	**25**		**27**	**52**

Table 9 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Butt Lipping as Percentages of Each Type.

mon are flakes with thickness in the 0.1-0.5 cm range – 77.2% for complete and 77.8% for broken flakes. Flakes with thickness in the 0.6-1.0 cm range are more than three times lower – 19% for complete and 17.8% for broken flakes. There are only a few rather thick flakes with thickness in the 1.1-1.5 cm range – 3.8% for complete and 2.2% for broken flakes. There are no flakes with thickness more than 1.5 cm, although even the rarity of flakes with thickness between 1.1 and 1.5 cm is notable. Thus, flakes are generally thin.

Butt size. Two more metric attributes (butt width and height) were recorded for all 79 complete flakes and 11 proximal frag-

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
right	1		23	24 / 33.8%
semi-acute	1	1	28	30 / 42.3%
acute			17	17 / 23.9%
unidentifiable	3	4	56	63
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
right			6	6 / 14.6%
semi-acute	4	4	21	29 / 70.8%
acute	1		5	6 / 14.6%
unidentifiable	9	8	17	34
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right	7		2	9 / 22.0%
semi-acute			24	24 / 58.5%
acute			8	8 / 19.5%
unidentifiable	11	2	33	46
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right				
semi-acute	8		11	19 / 100%
acute				
unidentifiable	17		16	33
N	**25**		**27**	**52**

Table 10 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Butt Angles as Percentages of Each Type.

ments. To calculate average indices, all 20 crushed butts (not measured as they are damaged) and all 9 punctiform (all have size 0.1 x 0.1 cm) were excluded from this sample of 90 butts. Thus, average butt width is 1.1 cm and average butt height 0.4 cm. Twenty two plain butts have an average width of 0.9 cm and average height of 0.3 cm, showing their even smaller size in comparison with all flake butts, which are themselves not very big.

Thus, the flakes of Unit H can be generally characterized by:
- a dominance of unidirectional scar pattern (55.6%), a moderate number of unidirectional-crossed scar pattern (17.6%) and rare representation of 6 other types (< 10% each);
- a prevalence of non-cortical pieces (63.7%), while wholly cortical and partially cortical specimens together make up a little more than one third of all flakes and distal cortex location is the most characteristic for partially cortical pieces, as well as almost 40% with a significant amount of cortex;
- a dominance of expanding and irregular shaped pieces (74.7% together) in association with mainly "off-axis" removal directions (52.7%);
- a wide range of general profiles of flakes with the most common incurvate medial type represented by no more than one third of all flakes, while twisted type accounts only 12.3%;
- a dominance of feathering distal ends (50.5%) with about one third representation of hinged and overpassed ("not regular") types together (34%);
- a wide range of profiles at midpoint types with about equal representation of triangular, trapezoidal and irregular types (together 68.39%), while trapezoidal and multifaceted types, so characteristic for intensive parallel reduction processes, together make up only 30.8%;
- a dominance of "plain-punctiform-linear" group of butt types, although together they do not exceed half of all butts (46.7%), and a notable presence of all other butt types, including crudely- and finely-faceted and cortical ones;
- a predominance of semi-lipped butts with semi-acute angle, with poor representation of lipped butts with acute angle and a moderate quantity of unlipped butts with generally right angle;
- a slight dominance of flakes with no butt abrasion (52.2%) over flakes with butt abrasion (47.8%);
- a dominance of pieces with shortened, transversal metric proportions (average flake length and width of 2.3 cm) and an average thickness of 0.4 cm.

Regarding raw material types, all 124 flakes are as follows: gray flints (n=103/83.1%), colored flints (n=19/15.3%,) limestone (n=2/1.6%).

Blades

All blades (n=49) have been subdivided into complete (n=26/53.1%) and broken (n=23/46.9%), with subsequent subdivision of the latter into proximal (n=11/22.4%), medial (n=7/14.3%) and distal (n=5/10.2%).

Dorsal scar pattern. Four scar patterns types have been identified for all 49 blades. Most blades have a unidirectional scar pattern – 87.8%, while unidirectional-crossed (4.1%) and bidirectional (6.1%) are each represented by a few pieces and a single cortical blade is also present (2%).

Comparison of scar pattern types with presence/absence of cortex on respective blades revealed an important regularity. Both unidirectional-crossed blades have some cortex on their dorsal surfaces, while only 1 of 3 bidirectional blades has cortex. There are 14 (32.5%) partially cortical pieces among 43 unidirectional blades.

Surface cortex area and location. All 49 blades were used for surface cortex area identification. Non-cortical blades are dominant – 63.3%. Partially cortical blades are represented by somewhat more than half as many – 34.7%, while there is only a single cortical blade (2%). Additional cortex area data on the smaller

	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
present	1	1	33	35 / 47.3%
absent		3	36	39 / 52.7%
unidentifiable	4	1	55	60
N	**5**	**5**	**124**	**134**
	blades-tools	**blades-CMP**	**blades-debitage**	**Blades Total**
present	5	2	28	35 / 89.7%
absent		3	1	4 / 10.3%
unidentifiable	9	7	20	36
N	**14**	**12**	**49**	**75**
	bladelets-tools	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present	8		30	38 /82.6%
absent			8	8 / 17.4%
unidentifiable	10	2	29	41
N	**18**	**2**	**67**	**87**
	microblades-tools	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present	8		7	15 / 93.7%
absent			1	1 / 6.3%
unidentifiable	17		19	36
N	**25**		**27**	**52**

Table 11 - Siuren-I. Unit H. Flake, Blade, Bladelet and Microblade Butt Abrasion as Percentages of Each Type.

sample of 26 complete blades are slightly different and help to make some specifications for the data on all blades. So, there are 57.7% non-cortical blades and 42.3% partially cortical blades, none with a wholly cortical dorsal surface. This sample also allows us to make an internal subdivision of partially cortical blades into pieces with significant amount of cortex - 18.2% and pieces with an insignificant amount of cortex - 81.8%. Thus, we should assume on the basis of these additional data that there was not actually a single wholly cortical specimen among blades, as the only piece identified as such is a proximal fragment which may have been only partially cortical if complete; while partially cortical pieces compose an important portion among blades with, however, only a fifth of them having a significant amount of cortex.

Only 11 complete partially cortical blades were used to record surface cortex location. More than half of these blades have lateral cortex – 54.5%, while distal cortex is present on 36.4%. There is one blade with distal + lateral cortex – 9.1%. Lateral cortex location is the most characteristic for blades.

Shape and axis. 31 blades with definable shapes and 32 blades with definable axis of removal direction were used to record shape and axis traits.

The striking feature is that the most common shape is irregular (35.5%). Parallel, converging and expanding shape are all of similar moderate percentages – 19.3%, 22.6%, 22.6%, respectively. Ovoid shape is absent.

"Off-axis" blades (78.1%) are more than three times more common than "on-axis" blades (21.9%). This is consistent with the predominance of irregular and expanding shapes (together 58.1%), for which an "off-axis" removal direction is very characteristic.

General profiles of blades, profiles at distal end and midpoint. Data for such analyses are based on 43 definable blades and separately on 26 complete blades for general profiles, 29 definable blades for profiles at distal end and all 49 blades for profiles at midpoint.

In terms of general profiles for the bigger sample of 43 blades, there is nearly equal predominant representation of twisted (34.9%) and incurvate medial (32.6%) types, followed by the much less common flat (18.6%) and incurvate distal (13.9%) types. For only 26 complete blades, on the other hand, there is a slightly higher dominance of twisted type (42.2%), similar representation of incurvate medial (34.7%) and incurvate distal (15.4%) types compared to the larger sample and a rarity of flat type (7.7%). There are thus some differences in representation of twisted and flat types. We are inclined to trust the more restricted data only the 26 complete blades for the following reasons. The flat type for 43 blades is represented by 2 complete and 6 broken pieces where the latter, if they are complete, could be of any type – not necessarily flat. On the other hand, the twisted type for 43 blades is represented by 11 complete and only 4 broken pieces, as for showing possible twisting a blade needs some length which is often absent for broken specimens. In this case, it would be better to accept that blades quite often have twisted profile, although this type does not prevail over "regular" (flat, incurvate medial and incurvate distal) types, and the flat type is rather rare. Blades with incurvate medial and incurvate distal profiles occur in significant and moderate percentages. Convex type is absent.

More than half of all definable blades have a feathering distal end – 58.7%. The other three types are less common and similar in percentage: hinged - 17.2%, blunt - 13.8%, overpassed - 10.3%. So, hinged and overpassed distal ends together compose about one quarter of identifiable pieces (27.5%).

There is a dominance of trapezoidal type (38.8%) for profiles at midpoint identification. The next two types are well represented by about the same percentage: multifaceted - 26.5% and triangular - 24.5%. Altogether these three types comprise almost 90% of all blade profiles at midpoint. The other two types are uncommon: irregular - 4.1% and lateral steep - 6.1%, while flat and crescent types are absent.

All data below on four morphological attributes on blade butt characteristics (types, lipping, angle, abrasion) are based on the sample of 37 pieces which is composed of all 26 complete blades and 11 proximal fragments.

Butt types. The most common group of types is "plain-punctiform-linear"– 70.3%, with corresponding internal representation - 37.9% - 18.9% - 13.5%. Two other types present are crushed and dihedral – 13.5% each. Faceted butts are represented by a single finely-faceted butt (2.7%), while cortical butts are completely absent.

Lipping, butt angle and butt abrasion

There are 32 butts suitable for lipping identification. There is a great dominance of semi-lipped type (84.4%) and a much smaller percentage of lipped type (15.6%), while no unlipped butt was identified. There are 32 butts suitable for angle identification. The most common is semi-acute (65.6%). Right angle (18.8%) and acute angle (15.6%) are represented by similar quantities and their exact ratio is as follows: 1 right angle: 0.8 acute angle. There are 29 identifiable butts for presence/absence of abrasion identification. 28 butts have abrasion (96.6%) with only one butt with no traces of abrasion (3.4%).

Metrics (length, width, thickness) of blades. Detailed metric data are based only on the analysis of 26 complete blades with some comparable information from 23 broken blades.

Length. There are 2 clusters of 26 complete blades in terms of their length intervals: one at 2.6-5.5 cm (n=24/92.4%) and the second at 7.1-8.0 cm (n=2 (7.2 and 7.6 cm)/7.6%) with "a metric gap" at 5.6-7.0 cm with no blades. The most typical blade length is in the 3.6-5.0 cm range (65.5% of all complete blades). This conclusion is also supported by an average length of complete blades of 4.4 cm.

Data on all 23 broken blades cannot serve as a serious source of information for blade length analysis. Nevertheless, these data are provided: 2.1-3.0 cm – 60.9%, 3.1-4.0 cm – 30.4%, 4.1-5.0 cm – 8.7% with the longest example at 4.3 cm.

Width. The following width distribution of 26 complete blades is observed: 1.2-1.5 cm – 46.1%, 1.6-2.0 cm – 38.5% and 2.1-2.5 cm – 15.4%. This is supplemented with data on 23 broken blades: 1.2-1.5 cm – 65.2% and 1.6-2.0 cm – 34.8%. As a whole, these data show that really wide blades are totally absent – there are no blades with width more than 2.5 cm and a dominance of blades with width close to abrupt "threshold" of 1.2 cm between blades and bladelets – 55.1% of all 49 blades are in width interval of 1.2-1.5 cm. The average width for all blades is 1.6 cm which could actually be even lower (1.5 cm) if we exclude rare blades with width 2.0-2.5 cm.

Thickness. The average thickness of both 26 complete and 23 broken blades is 0.4 cm. In terms of metric intervals, the most common are blades with thickness in the 0.1-0.5 cm range – 57.7% for complete and 87% for broken blades. All other blades have a thickness in the 0.6-1.0 cm range. Thus, blade thickness shows their overall thinness where no blade is thicker than 1.0 cm.

Butt size. Two more metric attributes (butt width and height) were recorded for all 26 complete blades and 11 proximal fragments. To calculate average indices, all 5 crushed butts and all 7 punctiform were excluded from this sample of 37 butts. Thus, average butt width is 0.5 cm and average butt height 0.2 cm for the sample of 25 blades. Plain butts (n=14) have an average butt width of 0.4 cm and average butt height of 0.2 cm, showing their general similarity in sizes to other blade butt types.

Thus, the blades of Unit H can be generally characterized by:
- a dominance of unidirectional scar pattern (87.8%) and rare representation of only three other scar pattern types;
- a prevalence of non-cortical pieces (63.3%) over partially cortical pieces with no real representation of wholly cortical items, as well as the dominance of lateral cortex location for partially cortical pieces with less than 20% having a significant amount of cortex;
- a dominance of irregular (35.5%) and a moderate representation of expanding, converging and parallel shaped pieces in association with mainly "off-axis" removal directions (78.1%);
- a near equal representation of twisted and "regular" (flat, incurvate medial and incurvate distal) general profiles types;
- a dominance of feathering distal ends (58.7%) with about one quarter representation of hinged and overpassed types together (27.5%);
- a wide range of profiles at midpoint with dominance of trapezoidal and multifaceted types (65.3% together) which with the addition of triangular type account for 89.8%;
- a dominance of "plain-punctiform-linear" group of butt types (together 70.3%) with absence of cortical butts and a single representation of a faceted butt;
- a great predominance of semi-lipped butts (84.4%) with mainly semi-acute (65.6%) and some right (18.8%) angles, a low number of lipped butts (15.6%) with acute angle (15.6%), and absence of unlipped butts;
- a characteristic presence of abrasion for blade butts (96.6%);
- an average length of 4.4 cm, average width of 1.6 cm and average thickness of 0.4 cm.

By raw material types, the 49 blades are made on gray flint (n=36/73.5%) and colored flint (n=13/26.5%).

Bladelets

All 67 bladelets have been subdivided into complete (n=19/28.4%) and broken (n=48/71.6%), with subsequent subdivision of the latter into proximal (n=22/32.8%), medial (n=14/20.9%) and distal (n=12/17.9%).

Dorsal scar pattern. Only three scar pattern types were identified for all 67 bladelets. The most common is unidirectional – 88%, while two other types occur in small numbers: unidirectional-crossed – 7.5% (n=5) and bidirectional – 4.5% (n=3).

Comparison of scar pattern types with presence/absence of cortex on respective bladelets has shown a unique feature. All unidirectional-crossed and bidirectional bladelets lack cortex, while 16.9% of unidirectional bladelets are partially cortical. These data may point to the possibility that non-unidirectional bladelets reflect multiple reduction of bladelet cores, whereas some unidirectional bladelets with cortex may be evidence of systematic bladelet core reduction from the start of their flaking.

Surface cortex area and location. All 67 bladelets were used to record surface cortex area. Non-cortical bladelets comprise more than 4/5 of all bladelets (85.1%). Other bladelets are partially cortical (14.9%) and none (even a fragmented piece) is wholly covered by cortex. The same proportions are observed in the sample of 19 complete bladelets: non-cortical – 89.4% and partially cortical – 10.6%. There are 6 bladelets (60%) with significant amount of cortex and 4 bladelets (40%) with an insignificant amount of cortex among all 67 bladelets.

Comparative analysis of cortex area location is not possible as there are only 2 partially cortical pieces among 19 complete bladelets. One has distal cortex and the other distal + lateral cortex.

Shape and axis. 31 bladelets with definable shapes and 60 bladelets with definable axis of removal directions were used for the present analysis.

The most numerous is a converging shape (51.6%). It is followed by parallel shape (32.3%), while irregular (12.9%) are much less numerous. The expanding shape is represented by only a single piece (3.2%) and ovoid type is not noted at all.

"On-axis" bladelets (90%) are much more dominant than "off-axis" bladelets (10%). Comparison of shape geometry and axis of removal direction shows an association between converging and parallel shapes (together 83.9%) with the predominance of the "on-axis" removal direction (90%).

General profiles of bladelets, profiles at distal end and midpoint. Data for these analyses were recorded for 63 definable bladelets and separately for 19 complete bladelets for general profiles, 33 definable bladelets for profiles at distal end and for all 67 bladelets for profiles at midpoint.

For general profiles for the bigger sample of 63 bladelets, there is a slight dominance of twisted type (41.3%) which is followed by the incurvate medial type (34.9%). The flat type is moderately represented (15.9%), while incurvate distal (6.3%) and convex (1.6%) types are rare. The dominance of twisted and incurvate medial types and the possibly accidental presence of other general profile types become even more evident when we examine the 19 complete bladelets: twisted - 47.4%, incurvate medial - 42%, flat and incurvate distal - 5.3% each. The latter two types are represented by only a single piece each, while the convex type is absent.

The most dominant type for profiles at distal end is feathering – 78.7%. Other types (hinged and overpassed - 6.1% each, blunt - 9.1%) are represented by only a few pieces each, while a combination of hinged and overpassed types is only 12.2%.

There are two common types for profiles at midpoint: trapezoidal (50.7%) and triangular (40.3%). Two more types (multifaceted - 6% and lateral steep - 3%) are present but rare, although trapezoidal and multifaceted types together could be considered the dominant group (56.7%). Flat and crescent types are absent.

Data on four morphological attributes on bladelet butt characteristic (types, lipping, angle, abrasion) were recorded on a sample of 41 pieces – 19 complete bladelets and 22 proximal fragments.

Butt types. The most common group of types is "plain-punctiform-linear" – 73.1%. Internal representation of this butt type group shows for the first time a subordinate position of plain butts (4.9%), a moderate number of punctiform (21.9%) and dominance of linear (46.3%). The two other types present are crushed (17.1%) and dihedral (9.8%) ones. Cortical and faceted butts are absent.

Lipping, butt angle and butt abrasion

There are 34 butts suitable for lipping identification. These show the great dominance of semi-lipped type (82.4%) and a much lower presence of lipped butts (17.6%). All bladelets have some form of lipping.

For angle identification of the same sample, the most common is semi-acute (70.6%). Right angle (5.9%) is much less common in comparison to acute angle (23.5%): 1 right angle per 4 acute angles.

There are 38 butts for presence/absence of abrasion identification. Of these, 79% have butt abrasion and 21% do not.

Metrics (length, width, thickness) of bladelets. These analyses are mainly based on the sample of 19 complete bladelets with some additional data from 48 broken bladelets.

Length. Complete bladelets (n=19) were subdivided into two groups according to length: up to 3 cm (n=13/68.5%) and greater than 3 cm (n=6/31.5%). So, "short" bladelets are twice as common as "long" bladelets, a ratio of 2.2: 1. The shortest bladelet is 1.6 cm long and the longest 4.5 cm long. The average length of all complete bladelets is 2.7 cm. There are only 2 pieces (4.2%) with length more than 3 cm among all broken 48 bladelets, although the presence of 16 fragmented bladelets (33.3%) in the length interval of 2.1-3.0 cm is notable. Thus, data on broken specimens seem to be in accordance with the data on complete bladelets, although possible fragmentation of initially relatively long bladelets should be kept in mind.

Width. The following width subdivision of complete 19 bladelets is obtained: 0.7-0.9 cm (n=10/52.6%) and 1.0-1.1 cm (n=9/47.4%). Data on 48 broken bladelets show a similar pattern: 0.7-0.9 cm (n=28/58.3%) and 1.0-1.1 cm (n=20/41.7%). These width data show approximately equal representation of "narrower" and "wider" bladelets. Some quantitative differences are easily explained by differences in measurement: an interval of 3 mm for the first group (0.7-0.9 cm) and 2 mm for the second group (1.0-1.1 cm). The approximate balance of these two groups of bladelets is confirmed by an average width for all 67 bladelets of 0.9 cm, an intermediate index that is exactly the same for both complete and broken pieces.

Thickness. All 67 bladelets have thickness no more than 0.4 cm. Average thickness is 0.2 cm for all bladelet categories: complete, broken and all items together. So, bladelets are quite thin.

Butt sizes. Butt width and height data were obtained on the sample of 19 complete bladelets and 22 proximal fragments with the exclusion of 7 crushed and 9 punctiform butts. Average butt width is 0.3 cm and average butt height 0.1 cm for the sample of 25 bladelets. All but one (0.6 cm) butt width fall within the interval of 0.1-0.5 cm, and all but one (0.9 cm) butt height are within the interval of 0.1-0.2 cm. Plain butts are represented by only two pieces with butt widths of 0.4 and 0.5 cm, and butt heights of 0.2 cm. These data show the small sizes of bladelet butts.

In sum, the bladelets from Unit H can be generally characterized by:
- a dominance of unidirectional scar pattern (88%) and a rare representation of only two other scar pattern types; a low number (14.9%) of partially cortical pieces and absence of wholly cortical items;
- a dominance of converging and parallel shaped pieces (83.9% together) in association with "on-axis" removal direction (90%);
- a near equal representation of twisted and "regular" (flat, incurvate medial and incurvate distal) types of profiles;
- prevalence of feathering distal ends (78.7%) with less than 1/8 representation of hinged and overpassed types together (12.2%);
- a dominance of trapezoidal and multifaceted types of profiles at midpoint (56.7% together) which including the triangular type make up 97%;
- a dominance of the "plain-punctiform-linear" group of butt types (73.1% together) with the most significant among them being linear (46.3%), as well as a notable absence of cortical and faceted butts;
- a great predominance of semi-lipped butts (82.4%) with mainly semi-acute (70.6%), right (5.9%) and some acute angles, a low number of lipped butts (17.6%) with acute angle (23.5%) and absence of unlipped butts;

- a dominance of butts with abrasion, although about 20% lack traces of abrasion;
- an average length of 2.7 cm, an average width of 0.9 cm and an average thickness of 0.2 cm.

Identification of raw material types for all 67 microblades reveals 58 pieces on gray flints (86.6%), 7 pieces on colored flints (10.4%) and 2 pieces on black flints (3%).

Microblades

All 27 microblades have been subdivided into complete (n=3 /11.1%) and broken (n=24/88.9%), with subsequent subdivision of the latter into proximal (n=9/33.3%), medial (n=9 /33.3%) and distal (n=6/22.3%).

Dorsal scar pattern. Aside from a bidirectional complete microblade (3.7%), the other 26 microblades (96.3%) have a unidirectional scar pattern. None have dorsal cortex.

Shape and axis. There are only 9 microblades for such analysis.

The predominant shape is converging (n=6/66.6%). Parallel (n=2/22.2%) and irregular (n=1/11.1%) are quite rare. Expanding and ovoid shapes are absent.

"Off-axis" microblades (n=8/88.8%) are predominant over a single "on-axis" microblade (11.1%).

General profiles of microblades, profiles at distal end and midpoint. Data for these analyses are based on 25 definable microblades and separately on 3 complete microblades for general profiles, 9 definable microblades for profiles at distal end and on all 27 microblades for profiles at midpoint.

Only three general profile types (incurvate medial - 44%, flat - 32% and twisted - 24%) were identified for the 25 microblades. Such a distribution, however, may be unreliable since only three complete pieces are present: two twisted and one incurvate medial profile. Therefore, it is probably reasonable to consider at least some flat profiles of broken microblades may have been unidentifiable, and to regard incurvate medial and twisted profiles as the two main types. A similar situation has already been observed for the general profiles of bladelets.

All 9 definable microblades have feathering distal ends.

The most common type among profiles at midpoint is triangular (74.1%). The rest are trapezoidal (18.5%) and multifaceted (7.4%). No other profile at midpoint type was identified.

Data on four morphological attributes for microblade butt characteristics (types, lipping, angle, abrasion) were recorded for a sample of 12 pieces – 3 complete artifacts and 9 proximal fragments.

Butt types. The most common group of types is "plain-punctiform-linear" – 83.3%, with corresponding internal representation: n=1/8.3%; n=6/50%; n=3/25%. As seen, the punctiform type is dominant. Other types (dihedral and crushed) are represented by a single piece each – 8.3%. No cortical or faceted butts are present.

Lipping, butt angle and butt abrasion

There are 9 semi-lipped (75%) and 3 lipped (25%) butts.

Semi-acute angle is the characteristic for 11 microblade butts.

There are 7 butts with abrasion (87.5%) and only 1 butt with no abrasion (12.5%) in the sample of 8 identifiable microblade butts.

Metrics (length, width, thickness) of microblades

Length. All 3 complete microblades have length in metric interval 1.5 - 2.0 cm (1.7 cm in average). No one from 24 broken microblades is longer 3 cm, while broken microblades with length more than 1.5 cm compose 20.8% (5 pieces) where a longest piece is 2.6 cm.

Width. All 27 microblades have the following distribution in terms of their width: 0.6 cm (n=18/66.7%), 0.5 cm (n=5/18.5%) and 0.4 cm (n=4/14.8%). There is one item with a width of 0.4 cm and two 0.6 cm wide among the three microblades. Thus, the majority of microblades are similar to bladelets in their width: 85.2% of them are in the interval of 0.5-0.6 cm, while the remaining 14.8% are have a width of 0.4 cm; none has a width less than 0.4 cm. Average width of all microblades is 0.6 cm.

Thickness. There is only a single microblade with a thickness of 0.3 cm (3.7%), while all of the other 26 microblades (including three complete ones) are in the interval of 0.1-0.2 cm. Average thickness is 0.1 cm. So, microblades are "featheringly" thin.

Butt sizes. Butt width and height average indices were calculated for only 5 microblades as 1 crushed and 6 punctiform butts were excluded. Microblades have an average butt width of 0.4 cm and butt height of 0.1 cm. A single plain butt has a width of 0.3 cm and a height of 0.2 cm, very close to the minimal size of plain butts (0.2 x 0.2 cm).

In sum, the microblades of Unit H can be generally characterized by:
- a near exclusive representation of the unidirectional scar pattern (96.3%);
- a dominance of converging and parallel shaped pieces (88.8% together) in association of "off-axis" removal direction (88.8%);
- a near equal dominance of twisted and incurvate medial general profile types and a moderate number of flat type with no other types represented;
- an exclusive presence of feathering distal ends;
- a dominance of triangular type of profiles at midpoint and presence of only trapezoidal and multifaceted types which together comprise only about 25%;
- a great dominance of "plain-punctiform-linear" group of butt types (83.3% together) with punctiform types most common (50%);

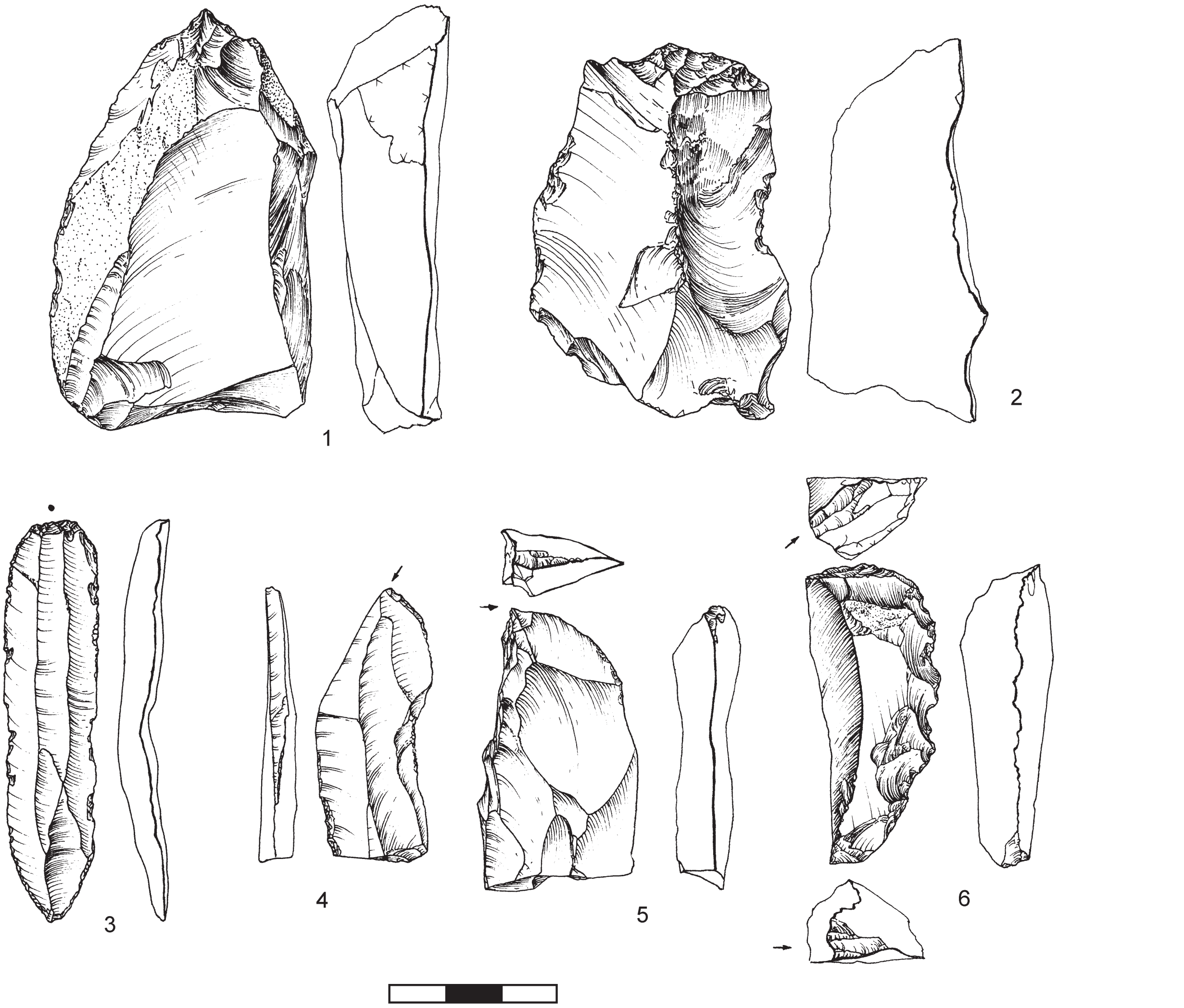


Figure 2 - Siuren I. Unit H. Flint Artifacts – Indicative Upper Paleolithic tool types. 1, thick nosed end-scraper; 2, thick shouldered end-scraper; 3, flat simple end-scraper; 4, burin on an oblique straight truncation; 5, transverse burin on a straight lateral preparation; 6, double transverse burin on natural surfaces.

- a presence of dominant semi-lipped and some lipped butts with only semi-acute angle;
- a characteristic presence of abrasion for microblade butts (87.5%);
- an average length of 1.7 cm, an average width of 0.6 cm and an average thickness of 0.1 cm.

Of the 27 microblades, 26 are on gray flints (96.3%) and a single piece on colored flint (3.7%).

Some summarizing data on the debitage

The attribute data for the Unit H debitage artifacts can be briefly summarized as follows (see also tabl. 2-11). The proportional representation of flakes (46.4%), blades (18.4%), bladelets (25.1%) and microblades (10.1%) is the first, but not last, indication of the general blade orientation of core reduction processes. The seeming large quantitative representation of flakes does not provide evidence that this category was the intention of primary flaking processes. This is seen, not only by their overall small size and cortex data, but also by the diversity of all of their attributes. However, diversity in size and morphology sharply decreases for blady artifacts from blades to microblades. The internal structure of blady pieces in the re-calculated view is as follows: blades – 34.3%, bladelets – 46.8% and microblades – 18.9%. Also taking into consideration the strong similarities between bladelets and microblades and their likely production from the same objects, bladelets *sensu lato* were intentional products of significant core reduction, as blanks for retouched non-geometric microliths, which also correspond well with the core data, while blades had a rather subordinate role in blank production, serving as blanks for different Upper Paleolithic type tools. These conclusions are also supported by tool composition data.

Tools

There are 69 tools which have been subdivided into seven groups: 1) Indicative Upper Paleolithic types (n=9/13.05%); 2) Non-Geometric Microliths (n=43/62.31%); 3) “Neutral” types (n=3/4.35%); 4) Retouched Pieces (n=5/7.25%); 5) Unidentifiable Tool Fragments (n=4/5.8%); 6) Non-Flint Tools (n=2/2.9%); and 7) Middle Paleolithic types (n=3/4.35%) (tabl. 12).

Indicative Upper Paleolithic tool types

These include 3 end-scrapers, 3 burins, 1 truncation and 2 retouched blades.

End-scrapers

1 flat simple, 1 thick nosed and 1 thick shouldered.

The flat simple end-scraper (fig. 2:3) is on a complete blade with bilateral dorsal marginal discontinuous retouch. The end-scraper's front is straight, formed on the blade's dorsal surface proximal end by non-convergent scalar steep non-lamellar retouch. The blade is non-cortical with a bidirectional scar pattern, converging shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end, trapezoidal profile at midpoint, the butt replaced by the end-scraper's front. It is on gray flint, 7.1 cm long, 1.7 cm wide, 0.5 cm thick.

The thick nosed end-scraper (fig. 2:1) is on a complete flake with lateral dorsal irregular partial retouch. The end-scraper's front is very narrow, formed on the flake's dorsal surface distal end by convergent sub-parallel lamellar (microblade scars) retouch. The flake is partially cortical and truly secondary crested (with no preserved crested ridge) with an insignificant amount of cortex on both laterals edges, with a bidirectional scar pattern, converging shape, "on-axis" removal direction, twisted general profile, blunt distal end, trapezoidal profile at midpoint, crushed butt. It is on colored flint, 7.2 cm long, 4.6 cm wide, and 1.6 cm thick.

The thick shouldered end-scraper (fig. 2:2) is on a large thick chunk. The end-scraper's front is convex with a one-sided notch, of a general shouldered shape to offset a core's platform morphology in plane, formed by convergent sub-parallel lamellar (microblade scars) retouch. The chunk is non-cortical on gray flint, 6.1 cm long, 4.6 cm wide, 2.7 cm thick.

Groups & Types	N	%
INDICATIVE UPPER PALEOLITHIC TOOL TYPES	**9**	**13,05**
END-SCRAPERS	*3*	*4,35%*
Simple flat on blade	1	1,45
Thick nosed	1	1,45
Thick shouldered	1	1,45
BURINS	*3*	*4,35*
On oblique straight truncation	1	1,45
Transverse on lateral preparation	1	1,45
Double Transverse on natural surfaces	1	1,45
TRUNCATIONS	*1*	*1,45*
RETOUCHED BLADES	*2*	*2,9*
NON-GEOMETRIC MICROLITHS	**43**	**62,31**
Dufour, *bladelets with alternate retouch*	15	21,73
Dufour, *microblades with alternate retouch*	16	23,18
Dufour, *microblades with ventral retouch*	3	4,35
Pseudo-Dufour, *microblades with dorsal retouch*	2	2,9
Pseudo-Dufour, *bladelets with bilateral dorsal retouch*	1	1,45
Pseudo-Dufour, *microblades with bilateral dorsal retouch*	2	2,9
Krems point, *bladelets with bilateral dorsal retouch*	1	1,45
Krems point, *microblades with bilateral dorsal retouch*	1	1,45
Krems point, *microblades with alternate retouch*	1	1,45
Bladelet *with dorsal retouch at proximal end*	1	1,45
"NEUTRAL" TOOL TYPES	**3**	**4,35**
NOTCHED PIECES	*3*	*4,35*
RETOUCHED PIECES (with marginal and/or irregular retouch)	**5**	**7,25**
BLADES WITH MARGINAL RETOUCH	*4*	*5,8*
FLAKES WITH IRREGULAR RETOUCH	*1*	*1,45*
UNIDENTIFIABLE TOOL FRAGMENTS	**4**	**5,8**
NON-FLINT TOOLS	**2**	**2,9**
CHOPPERS	*1*	*1,45*
RETOUCHERS	*1*	*1,45*
MIDDLE PALEOLITHIC TOOL TYPES	**3**	**4,35**
SCRAPERS	*3*	*4,35*
Simple wavy dorsal	1	1,45
Elongated semi-trapezoidal dorsal	1	1,45
Transversal wavy dorsal *with ventral basal thinning + bipolar dorsal thinnings of both lateral edges*	1	1,45
TOTAL	**69**	**100,01**

Table 12 - Siuren-I. Unit H. Tools Classification.

Burins

1 on truncation, 1 transverse and 1 double transverse.

The first burin (fig. 2:4) is on an oblique straight truncation with bilateral dorsal marginal continuous retouch, made on a broken blade. The burin's termination is on the distal end, with a single burin facet struck from the dorsal truncation formed by light scalar steep retouch. The blade is a non-cortical distal fragment with a unidirectional scar pattern, flat general profile, feathering distal end and trapezoidal profile at midpoint. It is on colored flint, 4.9 cm long, 1.8 cm wide, 0.5 cm thick.

The second burin (fig. 2:5) is transverse on a straight lateral preparation, formed on a broken blade. The burin's termination is on the distal end, has a single weakly developed burin facet struck from limited dorsal lateral preparation formed by scalar steep retouch. The blade is a non-cortical truly secondary crested (with no preserved crested ridge) distal fragment with a unidirectional scar pattern, incurvate distal general profile, hinged distal end, irregular profile at midpoint. It is on colored flint, 5.1 cm long, 2.8 cm wide, 1.1 cm thick.

The third burin (fig. 2:6) is double transverse on natural surfaces, made on a complete blade. Two opposing burin terminations are on the proximal and distal ends, have two burin facets each, struck from different unprepared loci on the same lateral edge. The blade is a partially cortical piece with an insignificant amount of central cortex. It appears to be either a large primary burin spall or a crested blade from a core with narrow-edged flaking surface, or, more likely, because of its general large size and well-developed lateral denticulate retouch, it is a burin-like spall blade from radical rejuvenation of a large denticulate tool. Most of the blank's morphological features are unidentifiable, aside from a twisted general profile. It is on gray flint, 5.1 cm long, 1.7 cm wide, 2.0 cm thick.

Truncation

There is a single truncation that is double alternate, made on a complete narrow blade. Two opposing truncations are on the proximal and distal ends. The distal truncation is straight and formed by marginal retouch on the dorsal surface. The proximal truncation, on the other hand, is concave and formed by scalar retouch on the ventral surface. The blade is non-cortical crested (with re-cresting characteristics) with a unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end, lateral steep profile at midpoint, the butt removed by retouch. It is on colored flint, 3.0 cm long, 1.3 cm wide, 0.5 cm thick.

Retouched blades

There are two blades with lateral dorsal retouch, one complete and one broken.

The first has light scalar semi-steep partial retouch. The blade is complete and partially cortical with an insignificant amount of lateral cortex and has a unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, unidentifiable distal end, trapezoidal profile at midpoint, small 0.3 x 0.1 cm linear butt (semi-lipped, semi-acute angle, with abrasion). It is on colored flint, 5.4 cm long, 2.1 cm wide, 0.5 cm thick.

The second has scalar flat continuous retouch. The blade is a non-cortical medial fragment with a unidirectional scar pattern, flat general profile, and trapezoidal profile at midpoint. It is on gray flint, 2.9 cm long, 2.2 cm wide, 0.5 cm thick.

Non-geometric microliths

These are subdivided into four types: Dufour bladelet– 34 items (79.0%), pseudo-Dufour bladelet– 5 items (11.7%), Krems point – 3 items (7.0%), bladelet with dorsal retouch at distal end – 1 item (2.3%).

The *Dufour bladelet type, on bladelets with alternate retouch* (fig. 3:1-4, 6) comprises 15 pieces (34.8% of all microliths). The retouch placement on these microliths is as follows. Two microliths have ventrally retouched left and dorsally retouched right edges. The other microliths of this type have dorsal retouch on the left edge and ventral retouch on the right edge. Continuous retouch was identified on 23 of 30 retouched edges. Also, 6 lateral edges were partially retouched. A single edge has discontinuous retouch. Semi-abrupt and flat retouched angles were measured on 19 and 11 edges, respectively. Micro-stepped (16 edges) and micro-scalar (12 edges) retouch was employed in near equal proportions. Two other edges were marginally retouched.

In sum, the most representative retouch combination is continuous semi-abrupt micro-stepped (10 edges), followed by: continuous flat micro-scalar (6 edges), continuous semi-abrupt micro-scalar (3 edges), continuous flat micro-stepped (3 edges), partial semi-abrupt micro-stepped (3 edges), partial semi-abrupt micro-scalar (2 edges), continuous flat marginal (1 edge), discontinuous flat micro-scalar (1 edge) and partial semi-abrupt marginal (1 edge).

The *Dufour bladelet type, on microblades with alternate retouch* (fig. 3:7-12) is represented by 16 pieces (37.2% of all microliths). The retouch placement on these microliths is as follows. All have dorsal retouch on the left edge, while the right edges have ventral retouch. Continuously retouched edges are the most representative – 23 of 32 edges. Discontinuously and partially retouched edges are fairly rare – 2 and 7, respectively. Semi-abruptly (21 items) retouched angles are more common than edges with flat (11 items) retouched angle. The micro-scalar type of retouch is represented on 18 edges. The edges treated by micro-stepped retouch (11 edges) are also relatively common. Marginally retouched edges are rare – 3 examples.

Thus, three combinations of retouch are more or less representative: continuous semi-abrupt micro-stepped – 10 edges, continuous semi-abrupt micro-scalar – 5 edges, continuous flat micro-scalar – 7 edges. The remaining variants of retouch combinations are represented by low frequencies: continuous flat marginal – 1 edge, discontinuous semi-abrupt micro-scalar – 2 edges, partial semi-abrupt micro-scalar – 3 edges, partial semi-abrupt micro-stepped – 1 edge, partial flat micro-scalar – 1 edge, partial flat marginal – 2 edges.

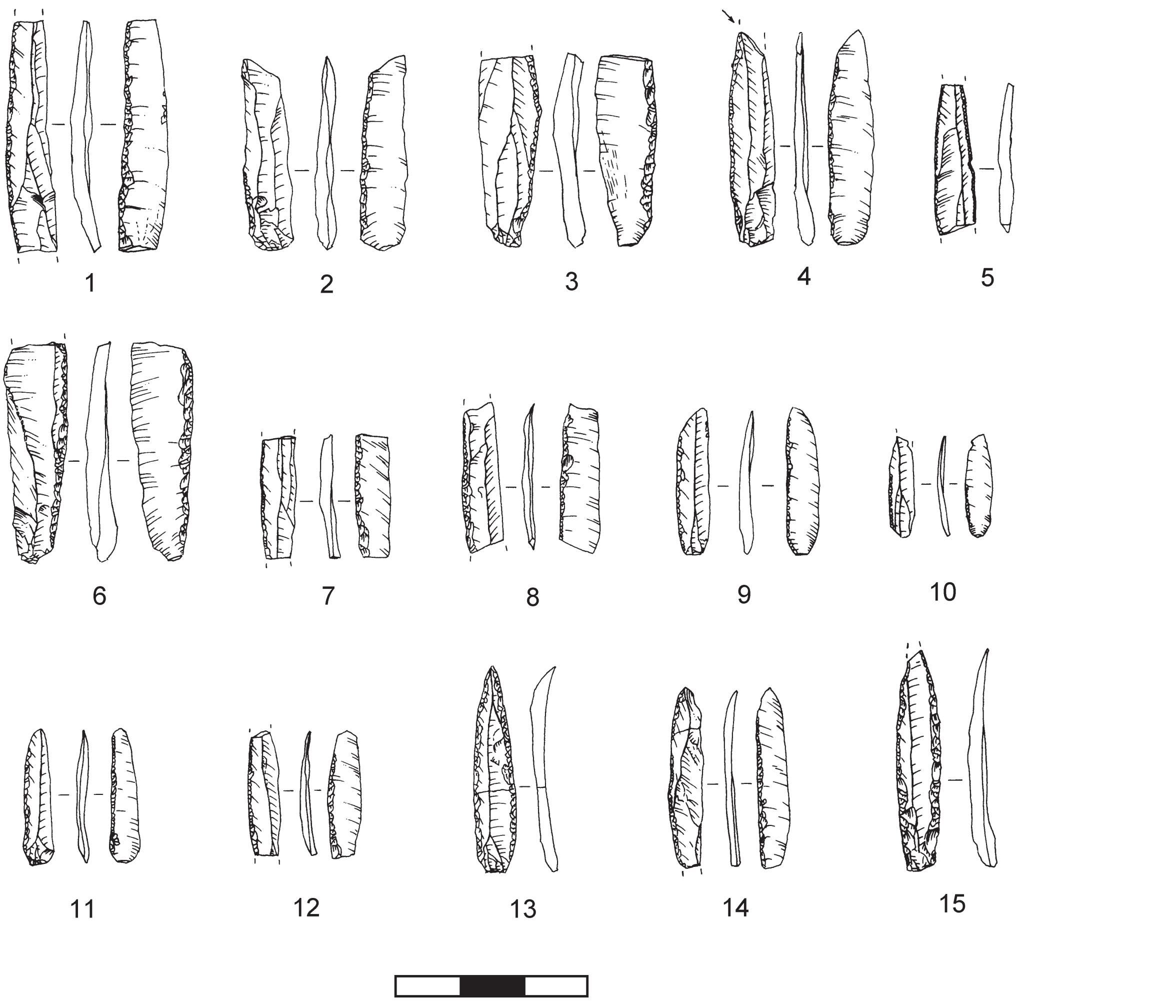


Figure 3 - Siuren I. Unit H. Flint Artifacts – "Non-Geometric Microliths". 1-4, 6, Dufour type bladelet, on bladelets with alternate retouch; 5, pseudo-Dufour type bladelet, on bladelet with bilateral dorsal retouch; 7-12, Dufour type bladelets, on microblades with alternate retouch; 13, Krems point, on microblade with bilateral dorsal retouch; 14, Krems point, on microblade with alternate retouch; 15, Krems point, on bladelet with bilateral dorsal retouch.

The *Dufour bladelet type, on microblades with ventral retouch* includes 3 items (7.0% of all microliths). All have ventral retouch on the right edge. Two variants of retouch combinations were employed for edge treatment: partial flat marginal (2 edges) and continuous semi-abrupt micro-stepped (1 edge).

The *pseudo-Dufour bladelet type, on microblades with dorsal retouch* is represented by 2 pieces (4.7% of all microliths). Microliths of this type have dorsal retouch on the left edges: continuous semi-abrupt micro-stepped and continuous semi-abrupt micro-scalar.

The *Pseudo-Dufour bladelet type, on bladelet with bilateral dorsal retouch* (fig. 3:5) is represented by a single piece (2.3% of all microliths). Its left and right edges have continuous flat marginal and continuous semi-abrupt marginal retouch, respectively.

The *Pseudo-Dufour bladelet type, on microblades with bilateral dorsal retouch* is represented by 2 pieces (4.7 % of all microliths). Both edges of the first microblade have partial semi-abrupt micro-scalar retouch. The left and right edges of the second microlith have discontinuous semi-abrupt micro-scalar and discontinuous flat marginal retouch.

The *Krems point type, on bladelet with bilateral dorsal retouch* (fig. 3:15) is represented by a single piece (2.3% of all microliths). Both edges have continuous semi-abrupt micro-stepped retouch.

The *Krems point type, on microblade with bilateral dorsal retouch* (fig. 3:13) is represented by one item (2.3% of all microliths). Both edges have continuous semi-abrupt micro-stepped retouch.

The *Krems point type, on microblade with alternate retouch* (fig. 3:14) is represented by one item (2.3% of all microliths). The left edge of the point is dorsally retouched with discontinuous semi-abrupt micro-stepped retouch, while its right edge is ventrally retouched by partial semi-abrupt micro-stepped retouch.

There is only a single *bladelet with dorsal retouch at proximal end* (2.3% of all microliths). The proximal end has continuous abrupt micro-stepped retouch.

18 bladelets and 25 microblades were selected for non-geometric microlith production. All were removed "on-axis". Blanks with twisted (19 pieces) and incurvate medial (11 pieces) general profiles are dominant. The other general profile types are

represented by relatively low numbers of blanks: flat – 6 pieces, incurvate distal – 4 pieces, unidentifiable – 3 pieces.

Eight microliths are complete: 3 *Dufour* bladelets on microblades with alternate retouch (length - 1.6, 2.1, 2.3 cm); 2 *Dufour* bladelets on bladelets with alternate retouch (length - 3.0 and 4.0 cm); a *Krems point* on bladelet with bilateral dorsal retouch (length – 3.5 cm); a *Krems point* on microblade with bilateral dorsal retouch (length – 3.2 cm); a *Krems point* on microblade with alternate retouch (length – 2.8 cm). Also, 5 other broken microliths are longer than 3.0 cm.

43 microliths are represented by 80 edges. Most of the edges have micro-stepped and micro-scalar retouch: 36 and 34 edges, respectively. Ten more edges are marginally retouched. A sole edge has an abruptly retouched angle, while 53 edges are semi-abruptly retouched. Also, 26 edges have flat retouch angle. Continuous retouch was employed for 66 microliths edges. Discontinuous and partial retouch were used on 6 and 18 edges, respectively (see tabl. 13-15).

In total, 16 different retouch combinations were identified. The continuous semi-abrupt micro-stepped retouch combination was employed for 26 edges. The other combinations are as follows: continuous semi-abrupt micro-scalar – 9 edges, continuous flat micro-scalar – 13, continuous flat marginal – 3, continuous flat micro-stepped – 3, continuous abrupt micro-stepped – 1, continuous semi-abrupt marginal – 1, discontinuous flat micro-scalar – 1, discontinuous semi-abrupt micro-stepped – 1, discontinuous semi-abrupt micro-scalar – 3, discontinuous flat marginal – 1, partial semi-abrupt micro-scalar – 7, partial semi-abrupt micro-stepped – 5, partial flat micro-scalar – 1, partial flat marginal – 4, partial semi-abrupt marginal –1.

The 43 non-geometric microliths are made on gray flints (29 pieces) and colored flints (14 pieces).

"Neutral" tool types

These are composed of just three notched pieces.

Notched pieces

All three tools are lateral ones on broken blades, but with differences in number and location of retouched notches.

The first has two separated notches on one lateral edge and another notch on the other lateral edge. All three notches were formed by scalar semi-steep retouch on the blade's dorsal surface. The blade is a non-cortical proximal fragment with a unidirectional scar pattern and multifaceted profile at midpoint. It is on colored flint, 2.5 cm long, 1.9 cm wide, 0.5 cm thick.

The second has a single lateral dorsal notch formed by scalar steep retouch. The blade is a non-cortical proximal fragment with a unidirectional scar pattern, trapezoidal profile at midpoint, small 0.3 x 0.1 cm linear butt (semi-lipped, semi-acute angle, with abrasion). It is on colored flint, 2.0 cm long, 1.6 cm wide, 0.4 cm thick.

		Dufour	Pseudo-Dufour	Krems points	N	%
LEFT EDGE	MARGINAL	4	1	0	5	6,33
	SCALAR	19	3	0	22	27,85
	STEPPED	8	1	3	12	15,19
RIGHT EDGE	MARGINAL	3	2	0	5	6,33
	SCALAR	11	1	0	12	15,19
	STEPPED	20	0	3	23	29,11
TOTAL		**65**	**8**	**6**	**79**	**100**

Table 13 - Siuren-I. Unit H. Non-Geometric Microliths: Retouch Types.

The third specimen again has only one lateral, but ventral, notch formed by scalar semi-steep retouch. The blade is a partially cortical medial fragment with a significant amount of lateral cortex, a unidirectional scar pattern and triangular profile at midpoint. It is on gray flint, 2.4 cm long, 2.6 cm wide, 0.5 cm thick.

Retouched pieces

These include four blades with marginal retouch and one flake with irregular retouch.

Blades with marginal retouch are represented by 2 complete blades, 1 proximal fragment and 1 distal fragment. All but the proximal fragment have unilateral dorsal marginal retouch (continuous for 2 pieces and partial for 1 piece). The proximal fragment has bilateral dorsal marginal continuous retouch. All 4 blades are non-cortical. The blades have the following morphological features: 4 unidirectional scar patterns; 1 converging, 1 expanding and 2 unidentifiable shapes; 2 "off-axis" and 2 unidentifiable removal directions; 1 flat, 2 incurvate medial and 1 unidentifiable general profiles; 1 feathering, 1 hinged and 2 unidentifiable distal ends, 2 triangular and 2 trapezoidal profiles at midpoint; 1 small 0.3 x 0.2 cm plain butt (lipped, acute angle, with abrasion), 2 linear 0.6 x 0.1 cm and 0.5 x 0.1 cm butts (both semi-lipped, semi-acute angles, with abrasion) and 1 unidentifiable missing butt. Three are made on colored flints with one of them burnt (the proximal fragment) and only a single piece is made on gray flint. Two complete blades are 7.6 and 5.0 cm long, both 1.7 cm wide, 0.4 and 0.6 cm thick, respectively. Two broken blades have the following metrics: length - 2.7 and 2.3 cm, width - 1.4 and 2.3 cm, thickness - both 0.3 cm, respectively.

The retouched flake (fig. 4:1) has two dorsally retouched edges and is on a complete flake. One lateral edge has sub-parallel flat partial retouch and the transversal edge has irregular semi-steep discontinuous retouch. The retouched portions of these two edges are not connected. According to our typological definitions, this piece is a flake with irregular retouch. However, if two retouched edges were connected by "well-made" retouch, this piece would be certainly classified as a semi-trapezoidal dorsal scraper (a déjeté side-scraper in F. Bordes' terminology). Thus, from an interpretative point of view, it is also possible

		Dufour	Pseudo-Dufour	Krems points	N	%
LEFT EDGE	FLAT	15	1	0	16	20,51
	SEMI-ABRUPT	16	2	3	21	26,92
	ABRUPT	0	0	0	0	0
RIGHT EDGE	FLAT	9	2	0	11	14,1
	SEMI-ABRUPT	25	2	3	30	38,46
	ABRUPT	0	0	0	0	0

Table 14 - Siuren-I. Unit H. Non-Geometric Microliths: Retouch Angles.

		Dufour	Pseudo-Dufour	Krems points	N	%
LEFT EDGE	CONTINUOUS	23	3	2	28	35,44
	DISCONTINUOUS	2	1	1	4	5,06
	PARTIAL	6	1	0	7	8,86
RIGHT EDGE	CONTINUOUS	24	1	2	27	34,18
	DISCONTINUOUS	1	1	0	2	2,53
	PARTIAL	9	1	1	11	13,92
TOTAL		**65**	**8**	**6**	**79**	**100**

Table 15 - Siuren-I. Unit H. Non-Geometric Microliths: Retouch Features.

to consider this tool as an unfinished Middle Paleolithic type scraper. The flake is non-cortical with a 3-directional scar pattern, expanding (trapezoidal) shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end, irregular profile at midpoint, crushed butt. It is on gray flint, 2.1 cm long, 3.7 cm wide (shortened, transversal proportions), 0.7 cm thick.

Unidentifiable tool fragments

These four pieces can only be described through the presence/ absence of cortex on their dorsal surfaces and raw material types. All fragments lack cortex. Three are on gray flints, including one burnt, and the fourth is on colored flint, also burnt.

Non-flint tools

These include a retoucher on a tuff-like limestone pebble and a chopper on a limestone pebble.

The retoucher is found on a longitudinally splintered small pebble (length - 5.0 cm, width - 3.6 cm, thickness - 1.4 cm) that was partially refitted from three fragments. It was identified as a retoucher by the presence of a series of short shallow striations (small battering-like traces) on one of the rounded tips.

The chopper is on a large pebble (length - 11.9 cm, width - 8.4 cm, thickness - 6.1 cm) with unifacial circular rough treatment around its entire perimeter.

Middle Paleolithic tool types

There are three different Middle Paleolithic types of scrapers with unifacial secondary treatment.

The first scraper (fig. 4:3) is a simple wavy dorsal one on a complete flake. The scraper's wavy edge is formed by heavy scalar steep retouch on one lateral edge. The flake is partially cortical with a unidirectional scar pattern, irregular shape, "on-axis" removal direction, twisted general profile, trapezoidal profile at midpoint, non-significant amount of lateral cortex, finely-faceted 3.4 x 0.7 cm butt (semi-lipped, semi-acute angle, with no abrasion), made on gray flint, 5.8 cm long, 3.3 cm wide, 0.5 cm thick.

The second scraper (fig. 4:4) is an elongated semi-trapezoidal dorsal one on a complete flake. This scraper has two nearly connected retouched edges in a pointed flat tip at the distal end of the flake. Absence of retouch on the very tip of the piece, however, makes this tool typologically a scraper and not a point. The left lateral edge has sub-parallel flat retouch, while the transversal edge has stepped semi-steep retouch. The flake is non-cortical with a unidirectional scar pattern, expanding (elongated trapezoidal) shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end, triangular profile at midpoint, small 0.7 x 0.4 cm finely-faceted butt (semi-lipped, right angle, with no abrasion). It is on gray flint, 5.8 cm long, 3.0 cm wide, 0.6 cm thick. In F. Bordes' terminology, this tool would be defined as a convergent asymmetric side-scraper.

The third scraper (fig. 4:5) is a transversal wavy dorsal one on a complete flake. The scraper's wavy edge is formed by stepped semi-steep retouch on the transversal edge. This scraper also has ventral basal thinning and rather unusual bipolar dorsal thinning of both lateral edges. Heavily treated by different thinning techniques, this flake can only be described as partially cortical with an insignificant amount of central cortex. It is on colored flint, 3.9 cm long, 4.5 cm wide (shortened, transversal proportions), 1.6 cm thick.

Some summarizing data on the tool-kit

The internal structure of the tools and their typological and morphological characteristics are in generally good correspondence with the core and debitage data. These data will be discussed in detail in another chapter in the present volume – "Inter-Unit and Inter-Level Comparisons of Assemblages from the 1990s Units H, G and F". Therefore here, as well as for other typological data from the different units, we note simply the main features of the tool-kit.

The first feature of note is the quite surprising representation of raw material types used for tool production in Unit H. Of the 69 tools, 26 are on colored flints (37.7%) that, without taking into account an equal representation of gray and colored flints for only four core-like pieces, is the highest rate of such flints for all other artifact categories of the assemblage and is more than twice as high in comparison with the average index

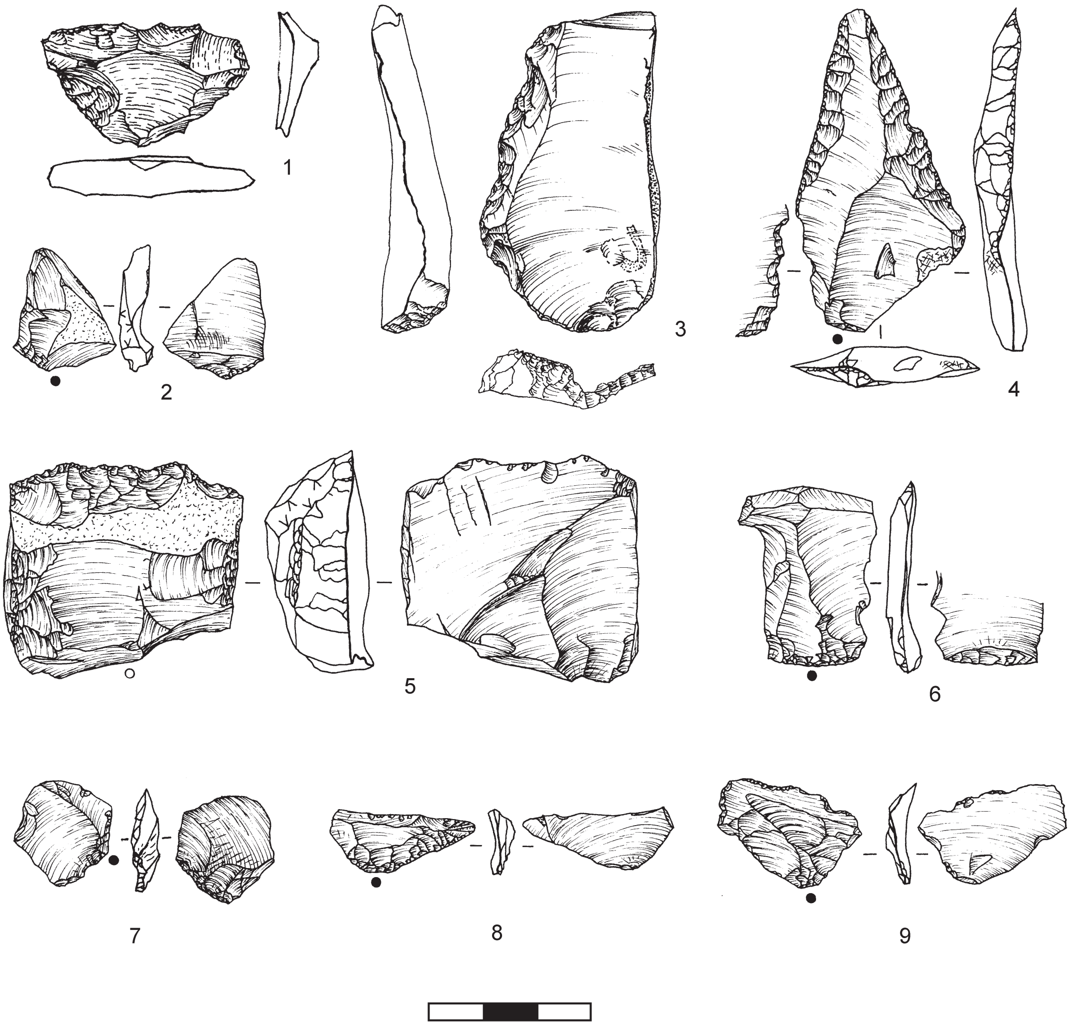


Figure 4 - Siuren I. Unit H. Flint Artifacts – Middle Paleolithic pieces. 1, retouched flake (an unfinished Middle Paleolithic scraper?); 2, bifacial shaping flake; 3, simple wavy dorsal scraper; 4, elongated semi-trapezoidal dorsal scraper; 5, transversal wavy dorsal scraper with ventral basal thinning and bipolar dorsal thinning of both lateral edges; 6, bifacial thinning flake; 7, resharpening flake from the tip of a bifacial convergent tool; 8, resharpening flake from the tipe of a unifacial convergent tool; 9, simple retouch flake.

of 14.7% for colored flints (see tabl. 16). The other tools are on gray flints (41 pieces/59.4%) and limestones (2 pieces/2.9%). We may thus reasonably infer human attention to the selection of colored flint blanks for tool production at the site.

Now let us turn to data for tool blanks. Excluding unidentifiable tool fragments and non-flint tools, the following information has been recorded. One of the end-scrapers (a thick shouldered one) is made on a chunk and excluded since this is not a debitage piece. For all the other 62 tools, the following blanks were used: flakes – 5/8.1%; blades – 14/22.6%; bladelets – 18/29.0% and microblades – 25 /40.3%. This list is a kind of staircase with increasing indices. Moreover, 5 flake-blanks (all of them complete) have a separate place here. All three Middle Paleolithic types of scrapers are made on flakes and the single retouched flake is also "suspected" to be an unfinished Middle Paleolithic scraper. The last flake-blank is characteristic for a thick nosed end-scraper and no other Upper Paleolithic tool was made on a flake. Taking also into consideration the common practice of making Aurignacian carinated end-scrapers (in a broad sense) on thick blanks (flakes and chunks), we can suppose a very specific role of flakes for the properly Upper Paleolithic industrial component within the assemblage where, aside from the their clearly technological supplementary role in on core decortification and preparation of striking platforms and flaking surfaces, and some Aurignacian end-scraper production, flake blanks are limited to the Middle Paleolithic typological component. Therefore, the internal structure of blady pieces only for tool blanks is as follows: blades – 24.6%, bladelets – 31.6% and microblades – 43.8 with joint accounts for bladelets *sensu lato* to 75.4%. The latter index is higher than for just blady debitage – 65.7%. So, there is clearly high selection of bladelets *sensu lato* for retouching into many non-geometric microliths. At the same time, the role of blades in the tool-kit should not be underestimated, as apart from the two end-scrapers, all the other tools were made on blades – 1 end-scraper, all 3 burins, all 3 notches and, of course, all 4 retouched pieces on blades. Thus, we should conclude that the Upper Paleolithic part of the assemblage mainly consists of both primary reduction of blades and bladelets *sensu lato* and their selection for tool production, while the certainly minor Middle Paleolithic typological component of the tool-kit is exclusively restricted to

	gray flint%	color flint%	black flint%	limestones%	TOTAL #	%	esse %
Core-Like Pieces	50	50	0	0	4	0,6	1,1
Core Maintenance Products	78,9	21,1	0	0	19	2,8	5
Flakes	83,1	15,3	0	1,6	124	18,2	32,7
Blades	73,5	26,5	0	0	49	7,2	12,9
Bladelets	86,6	10,4	3	0	67	9,8	17,7
Microblades	96,3	3,7	0	0	27	3,9	7,1
Tools	59,4	37,7	0	2,9	69	10,1	18,2
Waste From Production & Rejuvenation of Tools	90	10	0	0	20	2,9	5,3
Chips	91,1	8,5	0,4	0	246	36,1	
Uncharacteristic Debitage Pieces	91,3	8,7	0	0	23	3,4	
Chunks	94,7	5,3	0	0	19	2,8	
Heavily Burnt Pieces					15	2,2	
TOTAL	**84,3**	**14,7**	**0,4**	**0,6**	**682**	**100**	**100**

Table 16 - Siuren-I. Unit H. Artifacts Totals by Raw Material Types as Percentages of Each Type.

flakes. Accordingly, having now the two separate Middle Paleolithic and Upper Paleolithic tool-kits in the assemblage, we can take more precise look at them. The Upper Paleolithic one is structured as follows: Indicative Upper Paleolithic tool types – 9/15.3%, Non-Geometric Microliths – 43/72.8%, Retouched Pieces (on blades) – 4/6.8% and "Neutral" types (notches on blades) – 3/5.1%. The co-occurrence of thick nosed/shouldered end-scrapers and mostly Dufour bladelets of Dufour sub-type with alternate retouch (31 pieces/72.1%) and Krems points (3 pieces/7.0%) within the 43 non-geometric microliths, and, at the same time, the absence of any flat nosed/shouldered end-scrapers, carinated and dihedral burins, altogether point out that this is definitely an Early/Ancient Aurignacian of Krems-Dufour type industry. This is new for Siuren I, as Unit H was identified only during the 1990s excavations. Three Middle Paleolithic types of scrapers from Unit H, from only a typological point of view, are most comparable to the Crimean Micoquian Tradition.

The tool-kit blanks aspect can also be studied with respect to blank selection from different debitage categories, including all tools and core maintenance products. All 62 identifiable tool blanks of debitage character and altogether flakes, blades, bladelets and microblades show the following selection practices: 5 flake-tools of all 134 flakes (3.7% selection); 14 blade-tools of all 75 blades (18.7% selection); 18 bladelet-tools of all 87 bladelets (20.7% selection) and 25 microblade-tools of all 52 microblades (48.1% selection). These data clearly show both the high importance of non-geometric microliths in the tool-kit and the clear pattern of many bladelets *sensu lato* selected for retouch – 43 of all 139 (30.9%), nearly a third of all bladelets. At the same time, the selection of blades for secondary treatment processes is similar to that for bladelets *sensu lato*, testifying once again the importance of blade production in the assemblage, whereas flake selection for tool production was very minor and limited to a few Middle Paleolithic tools. As a result, it can be seen that flakes were not the aim of core reduction processes for blank production for Upper Paleolithic tool types and are mostly technological waste by-products of blade and bladelet reduction. All these data, finally, point out the general non-flake and overall general blady character of the Siuren I Unit H Early/Ancient Aurignacian of Krems-Dufour type assemblage.

Some more data on blanks

The joint and most complete accounts for all debitage pieces (flakes, blades, bladelets and microblades), including tools-blanks and core maintenance products, were treated through our attribute analysis and the data can be compared with attributes of the debitage only sample (see tabl. 2-11). In general, these two sets of data correspond well to another, although some discrepancies are listed below with additional explanations. Dorsal scar pattern data vary to some extent because of the inclusion of the crested type in the most complete sample (tabl. 2). Also, because of crested pieces, converging shape became the most representative one for blades in the most complete sample, while it occupied the 2nd-3rd position with expanded blades in the debitage only sample (tabl. 3). Adding tools-blanks for microblade shape identification, parallel type was dominant in the most complete sample, whereas converging type was predominant for the debitage only sample (tabl. 3). For axis identification (tabl. 4), "on-axis" microblades are dominant in the most complete sample, but "off-axis" microblades are dominant in the debitage sample. For general profile data (tabl. 5), one of our very basic technological indicators, indices of both samples show a subordinate position of twisted type for all debitage types. Butt type shows some changes within the "plain-punctiform-linear" group for microblades: punctiform butts are most dominant in the debitage sample, although for the most complete sample they follow linear butts (tabl. 8). Accordingly, microblade butt lipping data also vary (tabl. 9): semi-lipped butts are very common in the debitage sample and lipped butts over semi-lipped butts in the most complete sample. This is due to the addition of microblade-tools to the microblade-debitage sample. Namely, it definitely shows that for retouching, "on-axis" microblades were preferred. Thus, the two represented data sets complement one another and provide additional information for technological considerations during Inter-Unit and Inter-Level comparisons for assemblages from Units H, G and F.

Waste from production and rejuvenation of tools

This artifact category consists of two groups: burin spalls – 7 items, and retouch chips and flakes – 13 items.

Burin spalls. There are 2 complete burin spalls (both on colored flints) and 5 broken burin spalls (all on gray flints). Both complete specimens are primary burin spalls. The first is a simple unretouched one with flat general profile and faceted butt that is evidence of its removal from a burin on truncation. It is 3.3 cm long, 0.5 cm wide, 0.6 cm thick. The second has unilateral retouch (fine very partial), twisted general profile and crushed butt that makes identification of its origin unclear. It is 2.7 cm long, 0.3 cm wide, 0.7 cm thick. Broken burin spalls are represented by 1 proximal and 4 distal fragments. These 5 burin spalls are also primary. The proximal specimen has bilateral retouch similar to cresting preparation, twisted general profile and linear 0.3 x 0.1 cm butt that prevents identification of the burin type from which it was struck. It is 1.7 cm long, 0.5 cm wide and thick. There is one simple distal specimen with no retouch. It also has a flat general profile and is 1.8 cm long, 0.3 cm wide and thick. Three other distal specimens have some unilateral retouch but two have only irregular partial retouch, while the third has regular sub-parallel retouch that suggests use of a retouched blade for burin manufacture. It has a convex general profile and is 3.1 cm long, 0.3 cm wide, 0.7 cm thick. Two other distal specimens have twisted general profiles and very similar metrics: 1.7 cm length, 0.5 cm width and thickness for the first and 1.8 cm length, 0.6 cm width and thickness for the second. All four distal fragments of burin spalls are unidentifiable in origin because of missing butts.

Because all 7 burin spalls are primary, we may infer that rejuvenation/resharpening of burin working edges at the site was not intensive. At the same time, it should be kept in mind that the proportion of 7 primary burin spalls to just 3 burins may indicate production and export of burins from the rock-shelter. The single identifiable burin spall from a burin on truncation corresponds well to the presence in the tool-kit of one burin on truncation and one transverse burin on a lateral preparation among the three burins.

Retouch flakes and chips. According to their morphological and metric characteristics, these pieces are subdivided into:

- bifacial shaping flake - 1 piece;
- bifacial thinning flake - 1 piece;
- resharpening flake of a bifacial convergent tool's tip - 1 piece;
- resharpening flake of a unifacial convergent tool's tip - 1 piece;
- simple retouch flakes - 3 pieces;
- retouch chips - 6 pieces.

All these retouch flakes and chips are on gray flints.

Bifacial shaping flake (fig. 4:2): a partially cortical complete piece with significant amount of distal cortex and unidirectional-crossed scar pattern, expanding shape, "off-axis" removal direction, incurvate medial general profile, blunt distal end, irregular profile at midpoint, crudely-faceted 1.8 x 0.6 cm butt (lipped, acute angle, with abrasion). It is 2.2 cm long, 1.9 cm wide, 0.4 cm thick. Because of the very characteristic crudely-faceted butt and some dorsal cortex, this piece is identified as a shaping flake of Middle Paleolithic bifacial tool type.

Bifacial thinning flake (fig. 4:6): a non-cortical complete piece with unidirectional scar pattern, expanding shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end, trapezoidal profile at midpoint, finely-faceted 1.7 cm x 0.4 cm butt (lipped, acute angle, with abrasion). It is 3.3 cm long, 2.6 cm wide, 0.4 cm thick. Because of the very characteristic finely-faceted butt with pronounced abrasion and absence of any cortex on its dorsal surface, this piece is interpreted as a thinning flake of Middle Paleolithic bifacial tool type.

Resharpening flake of a bifacial convergent tool's tip (fig. 4:7): a non-cortical complete piece with only characteristics of a bifacial convergent tool's tip. The flake is 1.8 cm long and wide, 0.3 cm thick. It has the very tip (0.8 x 1.5 cm) of a Middle Paleolithic type bifacial convergent tool on its left lateral from ventral surface. Such disposition of a bifacial tool's tip and its triangular shape on the flake allow us, first, to suppose a side resharpening blow on a bifacial tool's tip and, second, to consider this bifacial tool as a convergent symmetric one. The presence of a large and concave scar on the flake's dorsal surface also points out multiple resharpening of this bifacial convergent tool's tip which ended by the final removal of this flake.

Resharpening flake of a unifacial convergent tool's tip (fig. 4:8): a non-cortical complete piece 1.0 cm long, 2.7 cm wide, 0.2 cm thick. This flake has the very tip (0.7 x 0.4 cm) of a Middle Paleolithic type unifacial convergent tool on its right lateral dorsal surface. The tip's ventral surface is plain, indicating unifacial treatment (dorsal) of a tool. The tip's very pointed features should also be considered as characteristic of a point rather than a convergent scraper. Moreover, such shortened, transversal metric proportions (length 1.0 cm vs. width 2.7 cm) of this resharpening flake with expanding shape and scalar retouch along the entire length of its right lateral edge are quite characteristic of secondary treatment of "déjeté/semi- and sub-trapezoidal points with "off-axis" removal direction in Crimean Middle Paleolithic Micoquian Tradition industries.

Simple retouch flakes. All three are non-cortical complete pieces with nearly the same morphological features: unidirectional scar pattern, expanding shapes, "off-axis" removal directions, incurvate medial general profiles, feathering distal ends, multifaceted profiles at midpoint, 1 plain 1.6 x 0.6 cm butt (lipped, acute angle, with abrasion) and 2 linear 0.3 x 0.1 cm and 0.4 x 0.1 cm (fig. 4:9) butts (1st - lipped, acute angle, with abrasion; 2nd - semi-lipped, acute angle, with abrasion). They have the following metrics: length - 1.6 - 1.7 - 1.8 cm, width - 1.4 - 1.1 - 2.6 cm, thickness - 0.3 - 0.1 - 0.3 cm, respectively. These morphological features and especially plain and punctiform butts which are either with lipping, acute angles and abrasion, or, in one case, with semi-lipping but with acute angle and abrasion, distinguish these three pieces from all other debitage pieces and allow us to consider them rather as retouch flakes from Middle Paleolithic type unifacial tools (points and scrapers) than from Middle Paleolithic bifacial tools, although this cannot be completely excluded. The rather large general size of these flakes precludes their removal from Upper Paleolithic tool types such as end-scrapers and retouched blades.

Retouch chips. All six are non-cortical. Two are proximal fragments and four more are complete. None exceed 1.5 cm in length and width and all have butts (2 plain, 2 punctiform, 2 linear) with lipping, acute angles and abrasion. Such metric and morphological characteristics allow us to consider these chips as retouch chips from secondary treatment of either Middle Paleolithic or Upper Paleolithic unifacial tool types; a more precise determination is impossible.

The data on retouch flakes and chips allow us to make the following comments. The appearance of six retouch chips is not surprising, given the presence in the tool-kit of several end-scrapers and retouched blades of the Indicative Upper Paleolithic tool types group and scrapers of the Middle Paleolithic tool types group. On the other hand, the structure of retouch flakes, reflecting secondary treatment processes of Middle Paleolithic tool types, can surely help to reconstruct the tools' "life history". Of note is that there are no bifacial tools whatsoever in the tool-kit, whereas three definite bifacial retouch flakes are present. This is strong evidence of Middle Paleolithic bifacial tool use and rejuvenation at the rock-shelter, tools that were then taken away from the rock-shelter by their human users. Moreover, the presence of a resharpening flake of a unifacial convergent tool's tip also shows a probable similar process of use of a unifacial point at the site and its subsequent removal from the site. Thus, analysis of both Middle Paleolithic tool types and their retouch flakes seems to be very promising for "bringing back to life dead flints". Finally, the morphological features of the retouch flakes once again confirm the Crimean Micoquian Tradition industrial affiliation of the Unit H Middle Paleolithic component, first noted only for the tools.

Debris (see also tabl. 1 and 16)

Chips, uncharacteristic debitage pieces and chunks are only described by presence/absence of cortex and raw material types, while heavily burnt pieces (15 items) were counted.

Chips

There are 246 chips and 27 (11%) have some cortex. The following raw material types have been identified. There are 224 chips on gray flints – 91.1% and 24 items have some cortex – 10.7%. There are 21 chips on colored flints – 8.5% and two have some cortex – 9.5%. There is a single chip (0.4%) on black flint which also has some cortex.

Uncharacteristic debitage pieces

There are 23 such pieces and 4 (17.4%) have some cortex. There are 21 pieces (91.3%) on gray flints and 4 (19%) have some cortex. There are also 2 pieces (8.7%) on colored flints, none with cortex.

Chunks

There are 19 chunks and 8 (42.1%) have some cortex. Most chunks (18 pieces/94.7%) are on gray flints and 7 (38.9%) have some cortex. Colored flints are represented by just a single piece (5.3%) which also has some cortex.

11 - UNIT G: LITHIC ARTIFACTS

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General artifact category representation

The four archaeological levels of Unit G excavated in the 1990s are characterized by variability in lithic artifact frequencies (stratigraphically from bottom to top): level Gd – 848 pieces, level Gc1-Gc2 – 2332 pieces, level Gb1-Gb2 – 1259 pieces, and level Ga – 270 pieces. The middle levels Gc1-Gc2 and Gb1-Gb2 are respectively composed of three and two sub-levels and exact counts of all artifacts and artifact categories from each sub-level is given in table 1. The number of finds from each Unit G level varies considerably; their relative proportions to the total number of lithics within the unit (n=4709) are as follows: level Gd – 18.0%, level Gc1-Gc2 – 49.5%, level Gb1-Gb2 – 26.7%, level Ga – 5.8%. The analyses below of the Unit G finds are mainly based on data from the most representative levels – Gd, Gc1-Gc2 and Gb1-Gb2 –, additionally set apart by the clear presence of hearths/fireplaces and/or ashy lenses, showing traces of human activities within the levels. On the other hand, level Ga lacks any hearths/fireplaces and/or ashy lenses, it is characterized by incomplete artifact categories (no core-like pieces, waste from production and rejuvenation of tools and Middle Paleolithic tool types) and its assemblage size is the lowest for Unit G. Taking these facts into consideration along with the stratigraphic position of level Ga directly above level Gb1-Gb2, we can presume that the artifacts in level Ga may actually represent the uppermost fraction of level Gb1-Gb2. Given this suggestion, the 1990s Unit G data with three hearths/fireplaces and/or ashy lenses would correspond well to the 1920s Lower layer which also contains three stratigraphically visible ashy lenses. The artifact data from level Ga is examined expediently to complete the artifact analysis of Unit G and to note separate indicative positions.

At the same time, representation of the different artifact categories in levels Gd, Gc1-Gc2 and Gb1-Gb2 breaks down as follows: core-like pieces – 0.5-0.6%, core maintenance products – 2.2-2.9%, debitage – 27.6-35.3%, tools – 5.6-9.1%, waste from production and rejuvenation of tools – 0.7-1.2%, debris – 51.6-63.0%. These show the comparable representation of core-like pieces and core maintenance products and minor differences for non-abundant waste from production and rejuvenation of tools, whereas debitage, tools and debris vary more significantly. The subsequent artifact analyses of Unit G enable the explanation of these similarities and differences by means of quite plausible explanations of real industrial uniformity in these artifacts with some changes in representation through the Upper Paleolithic component of the archaeological sequence.

Typological structure of artifacts

Core-like pieces

In total, this artifact category is represented in levels Gd, Gc1-Gc2 and Gb1-Gb2 by 23 items (see tabl. 2).

Level Gd

There are 4 cores and no pre-cores. By typological categories, the cores are as follows: a bladelet core, a bladelet carinated core and 2 blade/bladelet exhausted cores. For two cores colored flints were used: a plaquette for the bladelet core and a nodule/chunk for one blade/bladelet exhausted core. For the other two cores (bladelet carinated core and second blade/bladelet exhausted core) gray flint nodules were used.

Bladelet Regular Core (fig. 1:1) is a double-platform one with bidirectional-alternate two non-volumetric narrow flaked surfaces. The core's two flaking surfaces are disposed on two narrow edges of a plaquette and this original form may have led to the reduction of narrow surfaces. Moreover, technologically the core had two successive and identical bladelet reduction stages. When the first stage ended, the distal terminations of its flaking surface's removal negatives were rejuvenated by a removal preparing a second striking platform from which next the reduction stage took place. Thus, we have two independent bladelet production stages on the same core using single-platform reduction each on one of the two narrow edges of the plaquette. The following morphological features are found on this core. Platform types and angles: both plain and acute. Platform abrasion: present on both platforms. Platform morphology in plane and removal scars on flaking surfaces: 1st – offset with no twisted scars and 2nd – straight with no twisted scars. Condi-

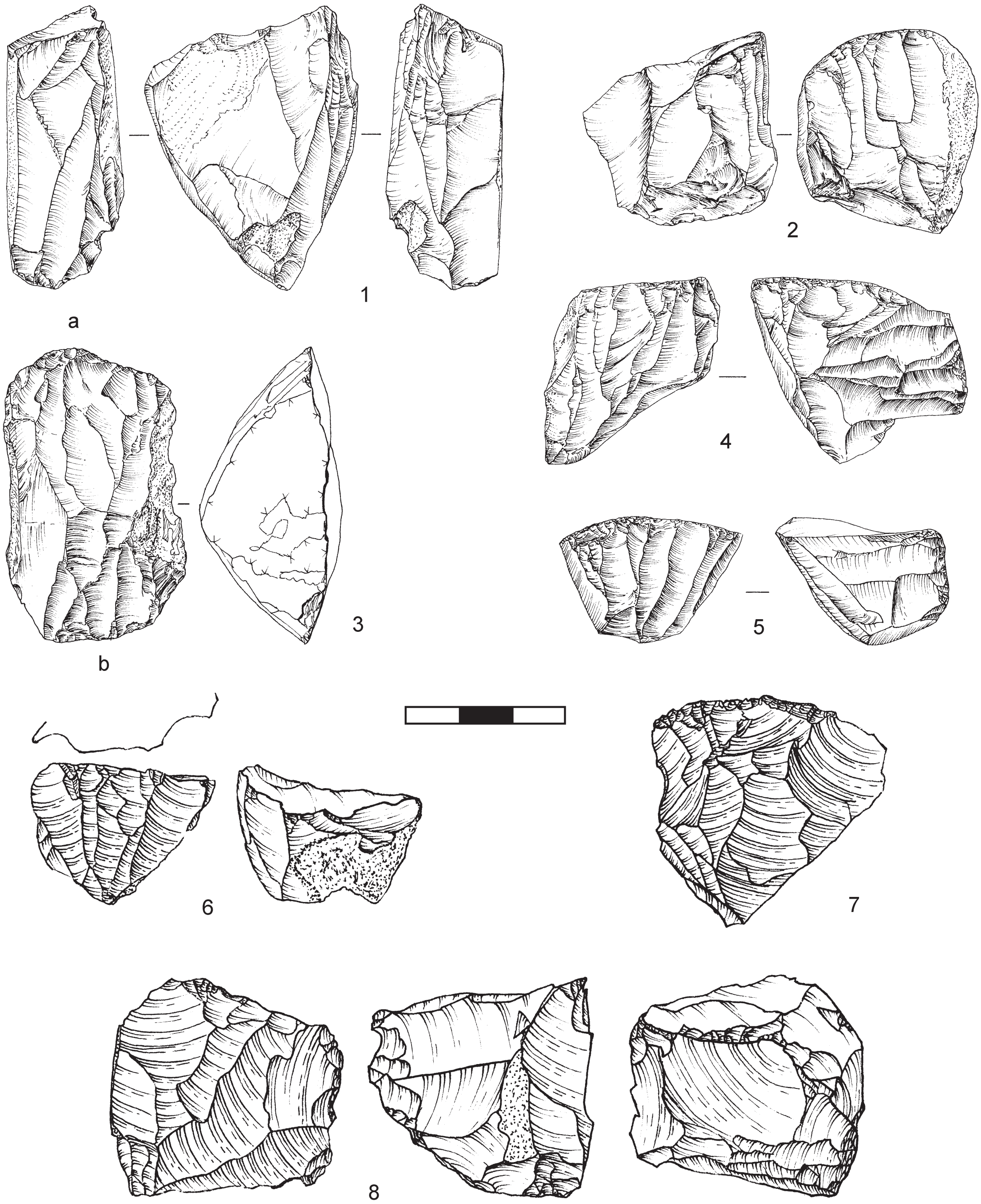

Figure 1 - Siuren I. Unit G, levels Gd and Gc1-Gc2. Flint Artifacts – Cores. 1, regular double-platform bidirectional-alternate with two narrow flaked surfaces bladelet core (level Gd); 2, "carinated" single-platform sub-cylindrical bladelet core (level Gd); 3, "carinated" double-platform bidirectional-perpendicular bladelet core (level Gc1-Gc2); 4-5, carinated double-platform orthogonal-adjacent bladelet cores (level Gc1-Gc2); 6, "carinated" single-platform sub-pyramidal bladelet core (level Gc1-Gc2); 7, single-platform sub-pyramidal flake/blade core (level Gc1-Gc2); 8, multiplatform exhausted flake/blade core (level Gc1-Gc2).

tion of flaking surfaces: both regular. Metrics: length - 5.3 cm, width - 2.1 cm, thickness - 3.7 cm. First platform width and thickness: 1.8 cm and 2.3 cm. Second platform width and thickness: 0.9 cm and 2.3 cm. Such size of both platforms indicates the use of core tablets with flake proportions for possible rejuvenation. Platform negatives maximum length: the same as the flaking surface length - 5.3 cm for the first and 4.8 cm for the second. Reason for core abandonment: no obvious reason.

The Bladelet Carinated Core (fig. 1:2) is a single-platform one of volumetric character with sub-cylindrical shape. Platform type and angle: plain and semi-acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: semicircular with no twisted scars. Condition of flaking surface: regular. Metrics: length - 3.2 cm, width - 3.4 cm, thickness - 2.9 cm. Platform width and thickness: 2.5 cm and 2.3 cm. Such size of both platforms indicates the use of core tablets

	Level Gd			Level Gc1-Gc2						Level Gb1-Gb2					Level Ga		
	N	%	esse %	Gc2a	Gc2	Gc1	N	%	esse %	Gb2	Gb1	N	%	esse %	N	%	esse %
Core-Like Pieces	4	0.5	1.0	3		8	11	0.5	1.0	3	5	8	0.6	1.7			
Core Maintenance Products	24	2.8	5.8	13	10	45	68	2.9	6.0	7	21	28	2.2	6.0	4	1.5	4.6
Debitage:	299	35.3	72.9	125	101	582	808	34.6	71.9	130	218	348	27.6	74.5	65	24.1	74.7
Flakes	91	10.7	22.2	38	45	168	251	10.7	22.3	43	65	108	8.6	23.1	28	10.4	32.2
Blades	81	9.6	19.7	30	16	136	182	7.8	16.2	21	42	63	5.0	13.5	13	4.8	14.9
Bladelets	88	10.4	21.5	44	29	193	266	11.4	23.7	38	63	101	8.0	21.6	14	5.2	16.1
Microblades	39	4.6	9.5	13	11	85	109	4.7	9.7	28	48	76	6.0	16.3	10	3.7	11.5
Tools	77	9.1	18.8	19	36	155	210	9.0	18.7	29	42	71	5.6	15.2	18	6.7	20.7
Waste From Production & Rejuvenation of Tools	6	0.7	1.5	7	3	17	27	1.2	2.4	1	11	12	1.0	2.6			
Debris:	438	51.6		228	62	918	1208	51.8		262	530	792	63.0		183	67.7	
Chips	317	37.4		173	42	683	898	38.5		202	453	655	52.0		135	50.0	
Uncharacteristic Debitage Pieces	56	6.6		18	11	86	115	4.9		18	22	40	3.2		9	3.3	
Chunks	10	1.1		19	4	53	76	3.3		5	11	16	1.3		17	6.3	
Heavily Burnt Pieces	55	6.5		18	5	96	119	5.1		37	44	81	6.5		22	8.1	
TOTAL	**848**	100.0	100.0	395	212	1725	**2332**	100.0	100.0	432	827	**1259**	100.0	100.0	**270**	**100.0**	100.0

Table 1 - Siuren-I. Unit G. General Artifacts Categories Representation by Level and Sub-Level.

with flake proportions for possible rejuvenation. Platform negatives maximum length: the same as the core length - 3.2 cm. Reason for core abandonment: no obvious reason.

The Blade/Bladelet Exhausted Cores are single-platform ones of volumetric character with sub-cylindrical shapes. These two cores were defined as exhausted because of "too radical" rejuvenation of the striking platforms by removal of a thick core tablet. These rejuvenations left deep concavities on the striking platforms, making further primary reduction of these cores impossible due to lost length on the flaking surfaces. Thus, we can assume regular achievement of the first stages of blade/bladelet reduction for these cores, which were not continued due to rapid and sudden exhaustion of unsuccessful attempts to rejuvenate the striking platforms. Metric data are not given as these cores have "broken characteristics".

Groups & Types	Level Gd	Level Gc1-Gc2	Level Gb1-Gb2	Level Ga	TOTAL
PRE-CORES			2		**2**
CORES	4	10	3		**17**
Blade Cores					**1**
- single-platform sub-cylindrical			1		
Blade / Bladelet Cores		1			**1**
- single-platform narrow flaked					
Blade / Bladelet Exhausted Cores					**2**
- single-platform sub-cylindrical	2				
Bladelet Regular Cores					**2**
- single-platform sub-cylindrical			1		
- double-platform bidirectional-alternate narrow flaked	1				
Bladelet Carinated Cores					**5**
- single-platform sub-cylindrical	1				
- single-platform sub-pyramidal		1			
- double-platform bidirectional-perpendicular		1			
- double-platform orthogonal-adjacent		2			
Flake-Blade Cores					**5**
- single-platform sub-pyramidal		1			
- multiplatform exhausted		4			
Flake Multiplatform Exhausted Cores			1		**1**
CORE FRAGMENTS		1	3		**4**
TOTAL	**4**	**11**	**8**	**0**	**23**

Table 2 - Siuren-I. Unit G. Core-like Pieces Classification.

Level Gc1-Gc2

Eleven core-like pieces were identified in level Gc1-Gc2. According to typological categories and raw material types, these core-like pieces are identified as follows: 1 blade/bladelet core (on a gray flint plaquette), 4 bladelet carinated cores (one on a black flint nodule/chunk, 2 on gray flint nodules/chunks and one on a colored flint nodule/chunk), 1 flake/blade single-platform core (on a gray flint nodule/chunk), 4 flake/blade multiplatform cores (one on a colored flint nodule/chunk and 3 on gray flint nodules/chunks) and 1 core fragment (on a gray flint nodule/chunk). No pre-core was found in level Gc1-Gc2.

The Blade/Bladelet Core is a single platform one of non-volumetric character with narrow flaked surface. Use of a plaquette as the original core form led to quite simple narrow flaked blade/bladelet primary reduction. Platform type and angle: crudely-faceted and semi-acute. Platform abrasion: partially present. Platform morphology in plane and removal scars on flaking surface: straight with twisted scars. Condition of flaking surface: regular. Metrics: length - 5.1 cm, width - 2.5 cm, thickness - 6.3 cm. Platform width and thickness: 2.2 cm and 4.7 cm. Platform negatives maximum length – the same as the core length - 5.1 cm. Reason for core abandonment: the crushed platform.

The Bladelet Carinated Cores number four specimens, subdivided into a double-platform bidirectional-perpendicular piece, 2 double-platform orthogonal-adjacent pieces and a single-platform piece.

The Bladelet Carinated Double-Platform Bidirectional-Perpendicular Core (fig. 1:3) is characterized by two opposed striking platforms and two weakly developed volumetric flaking surfaces which are connected by distal terminations of bladelet scars and in general profile are perpendicular to each other. The general shape of the core is conventionally sub-cylindrical. Platform types and angles: both plain and acute. Platform abrasion: present on both platforms. Platform morphology in plane and removal scars on flaking surfaces: both offset with no twisted scars. Condition of flaking surfaces: both regular. Metrics: length - 5.4 cm, width - 4.3 cm, thickness - 2.4 cm. First platform (fig. 1:3a) width is 2.9 cm. Second platform (fig. 1:3b) width is 2.4 cm. Platform thickness is the same for both – 5.4 cm, as it corresponds to the core's general length but on its back side. Such size of platforms indicates the use of core tablets with flake proportions for possible rejuvenation. The first platform negatives maximum length – 3.2 cm. The second platform negatives maximum length – 3.4 cm. Reason for core abandonment: no obvious reason.

Two Bladelet Carinated Double-Platform Orthogonal-Adjacent Cores (fig. 1:4-5) are practically identical in morphology, especially by the presence of two striking platforms on adjacent edges of the core (at a nearly right angle) and two flaking surfaces. Similar cores with such platforms disposition but with one flaking surface are also termed "orthogonal", "ninety-degree" and "change of orientation" in the archaeological literature. Reduction processes of each platform took place volumetrically with a general sub-cylindrical shape. The only differences between these two cores lie in their metrics, although their overall proportions are similar. Platform types and angles: all four plain and acute. Platform abrasion: present on all four platforms. Platform morphology in plane and removal scars on flaking surfaces: all semicircular with no twisted scars. Condition of flaking surfaces: all four regular. Metrics for the first core on gray flint (fig. 1:4): length - 4.1 cm, width - 4.0 cm, thickness - 2.5 cm. Metrics for the second core on colored flint (fig. 1:5): length - 3.3 cm, width - 3.1 cm, thickness - 1.9 cm. First core's platform width: 3.8 cm and 2.5 cm. Second core's platform width: 3.4 cm and 1.4 cm. First core's platform thickness: 2.4 cm and 1.9 cm. Second core's platform thickness: 2.8 cm and 3.3 cm. Such size of the four platforms indicates the use of core tablets with flake proportions for possible rejuvenation. First core's platform negatives maximum length – 4.1 cm and 3.1 cm. Second core's platform negatives maximum length – 2.9 cm and 2.8 cm. Reason for core abandonment: no obvious reason. We suggest that these particular bladelet carinated cores be called the *Siuren-I type* of Aurignacian bladelet carinated cores.

The Bladelet Carinated Single-Platform Core on a black flint nodule/chunk (fig. 1:6) shows volumetric reduction resulting in a sub-pyramidal shape. This core is an exceptional example of a carinated piece which was classified as a core with platform width longer than platform negatives maximum length (typical feature of carinated end-scrapers) due to irregular, denticulate-like platform edge with partial abrasion, not similar to regular retouch. Platform type and angle: plain and semi-acute. Platform abrasion: partially present. Platform morphology in plane and removal scars on flaking surface: semicircular with no twisted scars. Condition of flaking surface: regular. Metrics: length - 2.4 cm, width - 3.8 cm, thickness - 3.1 cm. Platform width and thickness: 3.6 cm and 3.0 cm. Such size of the platform indicates the use of a core tablet with flake proportions for possible rejuvenation. Platform negatives maximum length: the same as the core length - 2.4 cm. Reason for core abandonment: no obvious reason.

The Flake/Blade Single-Platform Core (fig. 1:7) shows volumetric reduction resulting in a sub-pyramidal shape. Platform type and angle: plain and semi-acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: semicircular with no twisted scars. Condition of flaking surface: hinged. Metrics: length - 4.4 cm, width - 4.3 cm, thickness - 2.2 cm. Platform width and thickness: 3.7 cm and 2.4 cm. Such size of the platform indicates the use of a core tablet with flake proportions for possible rejuvenation. Platform negatives maximum length: the same as the core length – 4.4 cm. Reason for core abandonment: hinged flaking surface.

Four Flake/Blade Multiplatform Exhausted Cores (fig. 1:8) are unsystematic/amorphous with no special order to the striking platforms and flaking surfaces when flaking surfaces served as striking platforms and vice versa. These cores are highly exhausted and their abandonment was caused by the presence of hinged flaking surfaces. They are in the following metric intervals: length – 4.1-5.0 cm, width – 3.8-4.8 cm, thickness – 2.7-3.7 cm.

Level Gb1-Gb2

Eight core-like pieces were identified in level Gb1-Gb2. According to typological categories and raw material types, these

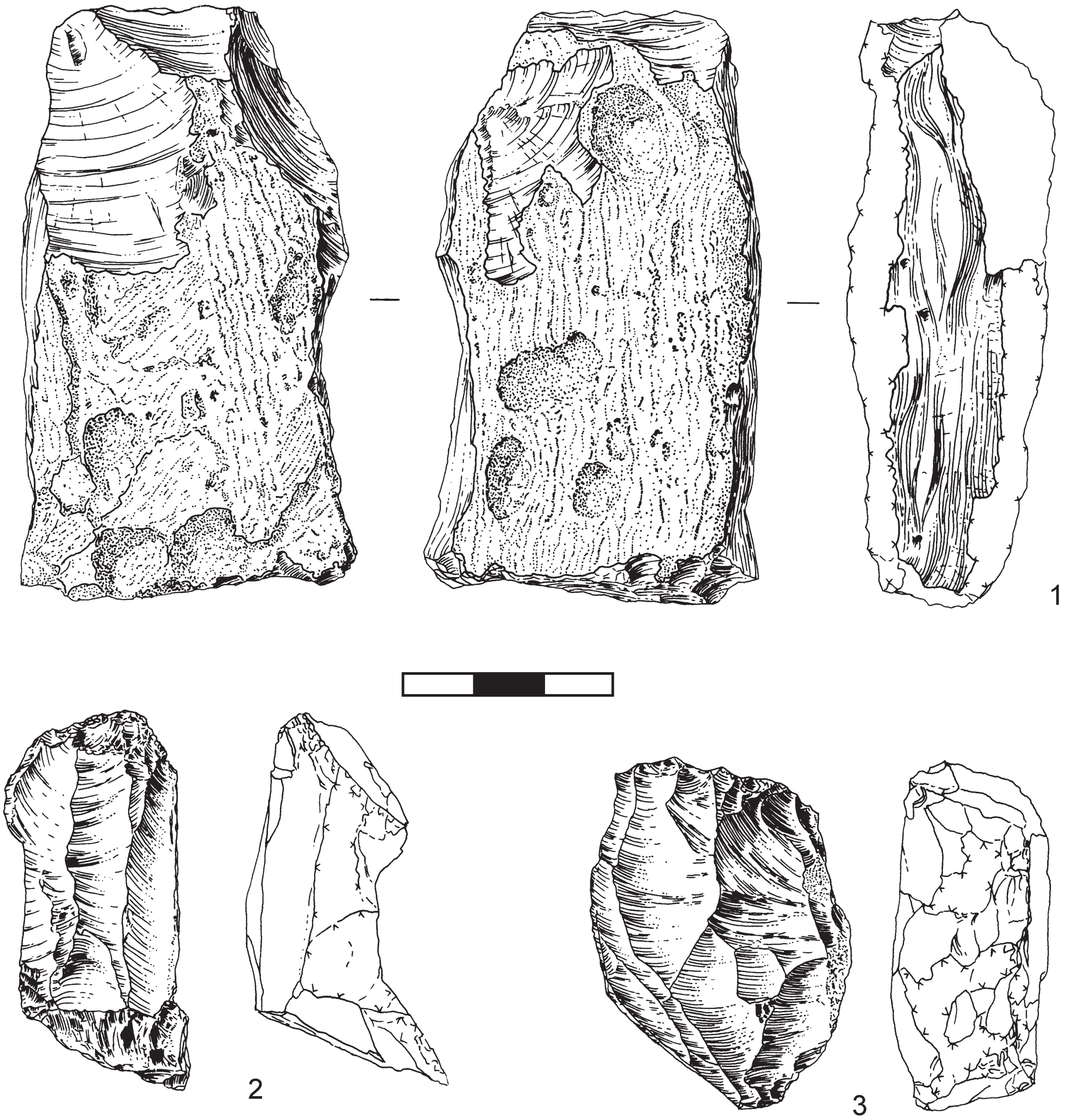

Figure 2 - Siuren I. Unit G, level Gb1-Gb2. Flint Artifacts – Cores. 1, pre-core – an initially tested piece; 2, blade single-platform sub-cylindrical core; 3, regular single-platform sub-cylindrical bladelet core.

core-like pieces are as follows. There are 2 pre-cores (one on a gray flint plaquette and one on a black flint nodule), 1 blade core (on a gray flint nodule/chunk), 1 bladelet core (on a colored flint blade), 1 flake multiplatform core (on a gray flint nodule/chunk) and 3 core fragments (all on gray flints).

The Pre-Cores are pieces with initial attempts at core-like primary reduction.

The First Pre-Core is simply an initially tested piece (fig. 2:1). Its morphological and metric data strongly support such a typological definition. It is a rather large plaquette (length - 8.6 cm, width - 4.8 cm, thickness - 2.7 cm) with no real striking platform, as one of the plaquette's short edges, from which was actually struck off only a single flake, is broken and, accordingly, plain with right angle, with no abrasion and no definite morphology in plane. The single flake was removed from the wide, not narrow, surface of the plaquette and its negative's length is only 3.6 cm. So, this removal did not even reach half of the plaquette's length and was heavily hinged. After this very initial core-like testing, the plaquette was discarded.

The Second Pre-Core is on a large rather flat nodule (length - 8.6 cm, width - 5.8 cm, thickness - 3.8 cm) with crudely-faceted striking platform (acute angle, no abrasion and no definite morphology in plane) from which a single flake was struck off its narrow edge. This removal was short (negative only 3.1 cm long), but not hinged. The reason for abandonment may be connected to the generally poor knapping quality of the black flint used.

A very important technological feature of both pre-cores is the absence of any striking platform abrasion, probably testifying to the use of abrasion only during regular core reduction and not for initial preparation and reduction of cores.

The Blade Core (fig. 2:2) is a single-platform one of weak volumetric character with sub-cylindrical shape. Its weak volumetric character is important as this is probably connected to the core's rather exhausted nature after intensive blade production. Platform type and angle: crudely-faceted and semi-acute. Platform abrasion: very partially present. Platform morphology in plane and removal scars on flaking surface: semicircular with no twisted scars. Condition of flaking surface: hinged. Metrics: length - 4.8 cm, width - 3.6 cm, thickness - 2.0 cm. Platform width and thickness: 2.6 cm and 2.0 cm. Platform negatives maximum length: the same as the core length – 4.8 cm. Reason for core abandonment: hinged flaking surface.

The Bladelet Regular Core (fig. 2:3) is a single-platform one of volumetric character with sub-cylindrical shape. The particularity of this core is the use of a blade: the blade's proximal end was structured as the core's striking platform with subsequent bladelet detachment from the blade's dorsal surface. Platform type and angle: plain and acute. Platform abrasion: present, similar to retouch along the entire platform edge – use of the core as an end-scraper after core reduction? Platform morphology in plane and removal scars on flaking surface: semicircular with no twisted scars. Condition of flaking surface: regular. Metrics: length - 4.3 cm, width - 2.5 cm, thickness - 1.1 cm. Platform width and thickness: 1.8 cm and 2.2 cm. Such size of both platforms indicates the use of core tablets with flake proportions for possible rejuvenation. Platform negatives maximum length: the same as the core length – 4.3 cm. Reason for core abandonment: no obvious reason, although overall small thickness may have played a role.

The Flake Multiplatform Exhausted Core is classified as flake only because of the presence of flake scars, but this definition is very conventional as it should actually be considered an unsystematic/amorphous multiplatform core with no special order to the striking platforms and flaking surfaces. Moreover, flaking surfaces served as striking platforms and vice versa. This core is quite exhausted with a probable "long history" of multiple reduction phases that are no longer clear. Metrics (length - 4.4 cm, width - 3.7 cm, thickness - 3.9 cm) and hinged flaking surfaces were recorded.

To summarize the descriptions of these 23 core-like pieces from three levels of Unit G, the most notable feature is the absence of double-platform bidirectional cores with opposite striking platforms and a single flaking surface, which was also observed for the Unit H cores. Next, the presence of definite bladelet carinated cores in levels Gd (1 item) and Gc1-Gc2 (4 items) is the most prominent Aurignacian feature. At the same time, of these five cores, only two are single-platform ones, while the other three pieces are particular double-platform ones. The prevalence of bladelet carinated double-platform cores is an indicator of intensive bladelet production. This point is further strengthened by the presence of "regular" (non-carinated) bladelet cores in levels Gd (1 piece) and Gb1-Gb2 (1 piece). The dominance of bladelet reduction in Unit G is also evidenced by the rarity of blade cores proper, known here by only on a single-platform piece from level Gb1-Gb2. To this can be added mixed cores: a blade/bladelet single-platform core in level Gc1-Gc2 and 2 blade/bladelet exhausted single platform cores in level Gd. On the other hand, except for a single flake/blade single-platform core from level Gc1-Gc2, the other Unit G cores include four flake/blade multiplatform exhausted and unsystematic/amorphous cores from level Gc1-Gc2 and one flake multiplatform exhausted core from level Gb1-Gb2. These may be representative of primary flaking, given their high degree of exhaustion after likely multiple reduction phases. Finally, the availability of two pre-cores in level Gb1-Gb2 points to at least some initial core reduction at the site. Together these data support the focus of core reduction activity on bladelet production in Unit G; this is further support below by debitage and tool data with an abundant of unretouched and retouched bladelets *sensu lato*.

Core maintenance products (CMP)

This artifact category is well-represented in levels Gd, Gc1-Gc2 and Gb1-Gb2 with only a few in level Ga. In total, 124 core maintenance products are known for in the Unit G assemblage as a whole (see tabl. 3A).

Level Gd

The 24 core maintenance products here have been subdivided into crested pieces (17 items), core tablets (5 items) and core trimming elements (2 items).

Crested Pieces. These include crested flakes (1 piece/5.9%), crested blades (12 pieces/70.5%), crested bladelets (2 pieces/11.8%) and crested microblades (2 pieces /11.8%).

The Crested Flake is a re-crested non-cortical complete flake with unilateral partial crested preparation and lateral steep profile. Morphological features: unidirectional scar pattern, expanding shape, "off-axis" removal direction, incurvate distal general profile, feathering distal end and cortical 0.6 x 0.4 cm butt (semi-lipped, semi-acute angle, with no abrasion). On black flint, 2.7 cm long, 2.3 cm wide and 0.8 cm thick.

Crested Blades. There are 6 primary blades with preserved crested ridge and 6 truly secondary blades with no preserved crested ridge.

The six primary pieces have the following crested ridge attributes: unilateral (5)/bilateral (1) and wholly (3)/partially (3) crested preparation with only triangular profiles. Other morphological features: 2 complete, 1 proximal and 3 distal fragments; 1 cortical, 3 dorsal-plain, 1 crested and 1 bidirectional scar patterns; 1 expanding, 3 irregular and 2 unidentifiable shapes; 1 "on-axis", 3 "off-axis" and 2 unidentifiable removal directions; 2 incurvate medial and 4 twisted general profiles; 1 feathering, 1 overpassed and 4 unidentifiable distal ends; 2 non-cortical, 3 partially cortical with significant amount of lateral cortex and 1 partially cortical with insignificant lateral cortex; 1 plain 0.2 x 0.2 cm butt (semi-lipped, semi-acute angle, with no abrasion), 2 crushed and 3 missing butts. All six pieces are on gray flints. Their dimensions are in the following ranges: length – 3.6-6.6 cm (including broken pieces), width – 1.3-1.8 cm (for 5 pieces) and 3.0 cm for the sixth, thickness – 0.5-1.8 cm.

Six truly secondary pieces have the following morphological features: 2 complete, 2 proximal and 2 distal fragments; 5 unidirectional and 1 unidentifiable scar patterns; 1 converging, 1

	Level Gd	Level Gc1-Gc2	Level Gb1-Gb2	Level Ga	TOTAL
CRESTED PIECES	*17*	*56*	*19*	*4*	**96 / 77.4%**
- Crested Flakes	1	6	7		
- Crested Blades	12	31	10	1	
- Crested Bladelets	2	13	2	1	
- Crested Microblades	2	6		2	
CORE TABLETS	*5*	*5*	*6*		**16 / 12.9%**
- on Flakes	4	5	5		
- on Blades	1		1		
CORE TRIMMING ELEMETS	*2*	*7*	*3*		**12 / 9.7%**
TOTAL	**24 / 19.4%**	**68 / 54.8%**	**28 / 22.6%**	**4 / 3.2%**	**124 / 100.0%**

Table 3A - Siuren-I. Unit G. Core Maintenance Products Structure.

	Level Gd	Level Gc1-Gc2	Level Gb1-Gb2	Level Ga	TOTAL
FLAKES	91 / 30.5%	251 / 31.1%	108 / 31.1%	28 / 43.1%	**478 / 31.4%**
BLADES	81 / 27.1%	182 / 22.5%	63 / 18.1%	13 / 20.0%	**339 / 22.3%**
BLADELETS	88 / 29.4%	266 / 32.9%	101 / 29.0%	14 / 21.5%	**469 / 30.9%**
MICROBLADES	39 / 13.0%	109 / 13.5%	76 / 21.8%	10 / 15.4%	**234 / 15.4%**
TOTAL	**299 / 19.7%**	**808 / 53.1%**	**348 / 22.9%**	**65 / 4.3%**	**1520 / 100.0%**

Table 3B - Siuren-I. Unit G. Debitage Structure.

	Level Gd	Level Gc1-Gc2	Level Gb1-Gb2	Level Ga	TOTAL
BLADES	81 / 38.9%	182 / 32.6%	63 / 26.2%	13 / 35.1%	**339 / 32.5%**
BLADELETS	88 / 42.3%	266 / 47.8%	101 / 42.1%	14 / 37.8%	**469 / 45.0%**
MICROBLADES	39 / 18.8%	109 / 19.6%	76 / 31.7%	10 / 27.1%	**234 / 22.5%**
TOTAL	**208 / 100.0%**	**557 / 100.0%**	**240 / 100.0%**	**37 / 100.0%**	**1042 / 100.0%**

Table 3C - Siuren-I. Unit G. Blady Debitage Structure.

expanding, 2 irregular and 2 unidentifiable shapes; 1 "on-axis", 3 "off-axis" and 2 unidentifiable removal directions; 2 incurvate medial, 3 twisted and 1 unidentifiable general profiles; 2 feathering, 1 overpassed, 1 blunt and 2 unidentifiable distal ends; 3 triangular, 2 trapezoidal and 1 multifaceted profiles at midpoint; 3 non-cortical and 3 partially cortical with insignificant proximal (1), distal (1) and lateral (1) cortex; 2 plain 0.5 x 0.2 cm butts (semi-lipped, semi-acute angle, with abrasion), 2 linear 0.6 x 0.1 cm and 0.3 x 0.1 cm butts (semi-lipped, semi-acute angle, with abrasion) and 2 missing butts. There are four pieces on gray flints and two pieces on colored flints. Their dimensions are as follows: length – 5.3 and 5.9 cm for two complete pieces and 1.5-4.4 cm for four broken pieces; width – 1.3-2.6 cm and thickness – 0.4-0.9 cm.

Crested Bladelets are represented by a primary and a secondary piece with preserved crested ridges.

The primary piece has unilateral wholly crested preparation with triangular profile and is complete and partially cortical with a significant amount of lateral cortex. Other morphological features: dorsal-plain scar pattern, parallel shape, "on-axis" removal direction, convex general profile, hinged distal end and crushed butt. On gray flint, 2.9 cm long, 1.1 cm wide and 0.6 cm thick.

The secondary piece has unilateral partial crested preparation with triangular profile and is a distal non-cortical fragment. Morphologically, it is characterized only by irregular shape, "off-axis" removal direction and feathering distal end. On gray flint, 1.4 cm long, 0.7 cm wide and 0.2 cm thick.

Crested Microblades include 2 primary ones with unilateral wholly crested preparation, 1 triangular and 1 lateral steep profile. One is complete and the other is a distal fragment. The latter is morphologically described only by dorsal-plain scar pattern, parallel shape, "on-axis" removal direction and feathering distal end. On colored flint, 1.4 cm long, 0.5 cm wide and 0.2 cm thick. The complete piece has a dorsal-plain scar pattern, expanding shape, "off-axis" removal direction, twisted general profile, blunt distal end and punctiform butt (semi-lipped, semi-acute angle, with no abrasion). On gray flint, 1.2 cm long, 0.6 cm wide and 0.3 cm thick.

Core tablets

All 5 pieces are primary core tablets: 4 complete flakes and 1 complete blade.

Four pieces on flakes have remnants of core striking platforms, in two cases in the butt area only and two others in the butt area and also one lateral edge. Two are non-cortical, 1 partially cortical with significant amount of distal cortex and 1 partially cortical with insignificant distal cortex. They are on gray flints and have the following dimensions: length – 1.5-4.5 cm, width – 2.2-3.9 cm (only 1 piece with shortened, transversal proportions) and thickness – 0.6-2.1 cm.

One piece on a blade has the top part of a core on one lateral edge and is partially cortical with an insignificant distal cortex. On gray flint, 3.6 cm long, 1.2 cm wide and 1.3 cm thick.

Core trimming elements
Two of these pieces are complete partially cortical flakes with insignificant lateral cortex and transversal placement of crested ridges (unilateral partially treated). Both items are on gray flints with the following dimensions: length - 3.6 and 1.3 cm, width - 3.3 and 1.9 cm (one with shortened, transversal proportions), thickness - 1.3 and 0.6 cm. One item has a crushed butt and the second has a plain 0.6 x 0.2 cm butt (semi-lipped, semi-acute angle, with no abrasion).

Level Gc1-Gc2

There are 68 core maintenance products: crested pieces (56 items), core tablets (5 items) and core trimming elements (7 items).

Crested Pieces. These include crested flakes (6 pieces/10.7%), crested blades (31 pieces/55.4%), crested bladelets (13 pieces/23.2%) and crested microblades (6 pieces/10.7%).

Crested Flakes. These include 1 re-crested and 5 primary pieces with preserved crested ridge.

The five primary complete pieces have the following traits of crested ridges: unilateral (3)/bilateral (2) and only wholly crested preparation with 3 triangular and 2 lateral steep profiles. Morphology: 3 dorsal-plain and 2 crested scar patterns; 1 converging, 3 expanding and 1 ovoid shapes; 2 "on-axis" and 3 "off-axis" removal directions; 2 incurvate medial, 2 incurvate distal and 1 twisted general profiles; 5 feathering distal ends; 4 non-cortical and 1 partially cortical with insignificant lateral cortex; 2 plain 0.6 x 0.2 cm and 0.4 x 0.2 cm butts (1 lipped and 1 semi-lipped, 2 semi-acute angles, 2 with no abrasion), 1 punctiform butt with no abrasion and 2 crushed butts. Two are on gray flints and three others on colored flints, including one burnt. Dimensions: length – 2.0-3.7 cm, width – 1.8-2.4 cm (2 with shortened, transversal proportions), thickness – 0.5-1.1 cm.

One complete re-crested piece is non-cortical with a unilateral partial crested ridge and triangular profile. Morphologically, it has a unidirectional scar pattern, expanding shape, "on-axis" removal direction, flat general profile, blunt distal end and crushed butt. On gray flint, 4.5 cm long, 3.2 cm wide and 1.2 cm thick.

Crested Blades. These include 9 primary, 10 re-crested, 5 secondary pieces with preserved crested ridge and 7 truly secondary pieces with no preserved crested ridge.

Nine primary pieces have the following traits of crested ridges: unilateral (4)/bilateral (5) and wholly (8)/partially (1) crested preparation with 5 triangular and 4 lateral steep profiles. Other morphological features: 4 complete, 2 proximal and 3 distal fragments; 3 dorsal-plain, 5 crested and 1 unidentifiable scar patterns; 1 parallel, 4 converging and 4 unidentifiable shapes; 5 "on-axis", 1 "off-axis" and 3 unidentifiable removal directions; 2 incurvate medial, 1 incurvate distal, 3 twisted and 3 unidentifiable general profiles; 3 feathering, 1 hinged, 3 blunt and 2 unidentifiable distal ends; 6 non-cortical, 1 partially cortical with significant amount of proximal + lateral cortex and 2 partially cortical with insignificant lateral (1) and distal + lateral (1) cortex; 1 plain 0.3 x 0.3 cm butt (semi-lipped, semi-acute angle, with no abrasion), 1 punctiform butt with no abrasion, 4 crushed and 3 missing butts. There are eight pieces on gray flints and one on colored flint. Nine primary crested blades have the following dimensions: length – 2.6-6.4 cm for four complete pieces and 1.9-6.3 cm for five broken items, width – 1.2-3.1 cm, thickness – 0.3-1.9 cm.

Ten re-crested pieces have the following traits of crested ridges: unilateral (9)/bilateral (1) and wholly (4)/partially (6) crested preparation with 3 triangular and 7 lateral steep profiles. Morphologically, they have the following features: 5 complete, 1 medial and 4 distal fragments; 8 unidirectional, 1 unidirectional-crossed and 1 bidirectional scar patterns; 3 converging, 4 expanding, 1 irregular and 2 unidentifiable shapes; 3 "on-axis", 5 "off-axis" and 2 unidentifiable removal directions; 1 flat, 3 incurvate medial, 1 incurvate distal, 4 twisted and 1 unidentifiable general profiles; 3 feathering, 2 hinged, 4 blunt and 1 unidentifiable distal ends; 7 non-cortical and 3 partially cortical with insignificant distal (2) and lateral (1) cortex; 1 plain 0.4 x 0.2 cm butt (semi-lipped, semi-acute angle, with abrasion), 4 crushed and 5 missing butts. Seven are on gray flints and three on colored flints. Dimensions: length – 3.3-4.7 cm for five complete items and 2.9-5.1 cm for five broken items; width – 1.3-2.3 cm, thickness – 0.5-1.3 cm.

Five secondary pieces have the following traits of crested ridges: 5 unilateral and wholly (1)/partially (4) crested preparation with 3 triangular and 2 lateral steep profiles. Morphological features: 2 complete and 3 distal fragments; 5 unidirectional scar patterns; 3 converging, 1 irregular and 1 unidentifiable shapes; 4 "off-axis" and 1 unidentifiable removal directions; 3 incurvate medial, 1 incurvate distal and 1 twisted general profiles; 3 feathering and 2 blunt distal ends; 4 non-cortical and 1 partially cortical with insignificant lateral cortex; 1 punctiform butt with no abrasion, 1 crushed and 3 missing butts. All pieces are on gray flints, including one burnt. Metrics: length – 4.2 and 3.0 cm for two complete pieces and 1.8-6.1 cm for three broken pieces; width – 1.2-2.9 cm and thickness – 0.5-1.1 cm.

Seven truly secondary pieces with no preserved crested ridges have the following morphological features: 2 complete, 3 proximal and 2 distal fragments; 6 unidirectional and 1 bidirectional scar patterns; 1 converging, 1 expanding, 2 irregular and 3 unidentifiable shapes; 1 "on-axis", 3 "off-axis" and 3 unidentifiable removal directions; 4 incurvate medial and 3 twisted general profiles; 1 feathering, 3 blunt and 3 unidentifiable distal ends; 1 triangular, 2 trapezoidal and 4 multifaceted profiles at midpoint; 3 non-cortical and 4 partially cortical with insignificant lateral (3) and distal (1) cortex; 2 plain 0.6 x 0.2 cm and 0.2 x 0.2 cm butts (2 semi-lipped, 2 semi-acute angles, 1 with abrasion and 1 with no abrasion), 3 linear 0.4 - 0.3 - 0.2 x 0.1 cm butts (3 semi-lipped, 3 semi-acute angles, 3 with abrasion) and 2 missing butts. All seven pieces are on gray flints. They have the following metrics: length – 4.4 and 4.5 cm for two complete pieces and 4.4-6.5 cm for five broken pieces; width – 1.4-2.5 cm and thickness – 0.6-0.9 cm.

Crested Bladelets. There are 6 primary, 3 re-crested, 1 secondary and 3 unidentifiable pieces with preserved crested ridge and a truly secondary item with no preserved crested ridge.

Six primary pieces have the following traits of crested ridges: unilateral (5)/bilateral (1) and only wholly crested preparation with 4 triangular and 2 lateral steep profiles. Morphologically, they are as follows: 3 complete and 3 distal fragments; 2 cortical, 2 dorsal-plain, 1 crested and 1 unidirectional scar patterns; 1 parallel, 1 converging, 1 expanding, 2 irregular and 1 unidentifiable shapes; 5 "off-axis" and 1 unidentifiable removal directions; 2 flat and 4 twisted general profiles; 4 feathering, 1 blunt and 1 unidentifiable distal ends; 4 non-cortical and 2 partially cortical with significant amount of lateral (2) cortex; 1 plain 0.5 x 0.2 cm butt (semi-lipped, semi-acute angle, with abrasion), 2 punctiform butts with no abrasion and 3 missing butts. All six pieces are on gray flints. They have such dimensions: length – 1.5-2.7 cm for three complete pieces and 1.5-2.4 cm for three broken pieces; width – 0.7-1.0 cm and thickness – 0.2-0.4 cm.

Three re-crested non-cortical pieces have the following traits of crested ridges: unilateral (2)/bilateral (1) and only partially crested preparation with 2 triangular and 1 lateral steep profiles. They have the following morphological features: 1 proximal and 2 distal fragments; 1 crested and 2 unidirectional scar patterns; 1 flat, 1 incurvate medial and 1 twisted general profiles; 1 feathering, 1 blunt and 1 unidentifiable distal ends; 1 linear 0.3 x 0.1 cm butt (semi-lipped, semi-acute angle, with abrasion). All 3 pieces are on colored flints. Dimensions: length – 2.4-3.6 cm, width – 0.8-1.1 cm and thickness – 0.3-0.6 cm.

One secondary piece has a unilateral wholly crested ridge with lateral steep profile and is a complete partially cortical item with insignificant distal cortex. It has a unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end and crushed butt. On gray flint, 2.3 cm long, 1.0 cm wide and 0.4 cm thick.

Two unidentifiable items have unilateral (2) and wholly (1)/ partially (1) crested ridges with 2 lateral steep profiles and are non-cortical medial and distal fragments. Morphologically, they are unidentifiable. They are on gray and colored flints. Metrics: length – 1.4 and 2.7 cm, width – 0.7 and 0.9 cm, thickness – 0.4 and 0.7 cm, respectively.

The single truly secondary item with no preserved crested ridge is a partially cortical distal fragment with insignificant lateral cortex. Identifiable morphology: unidirectional scar pattern, converging shape, "on-axis" removal direction, flat general profile, feathering distal end and triangular profile at midpoint. On a burnt gray flint, 2.2 cm long, 0.7 cm wide and 0.5 cm thick.

Crested Microblades. There are 5 primary pieces with preserved crested ridge and a truly secondary item with no preserved crested ridge. Five primary pieces have the following traits of crested ridges: unilateral (3)/bilateral (2) and wholly (4)/partially (1) crested preparation with 4 triangular and 1 lateral steep profiles. Morphological features: 2 complete, 1 medial and 2 distal fragments; 2 crested, 2 dorsal-plain and 1 unidirectional scar patterns; 1 parallel, 2 converging and 2 unidentifiable shapes; 2 "on-axis", 1 "off-axis" and 2 unidentifiable removal directions; 1 flat, 2 incurvate medial, 1 twisted and 1 unidentifiable general profiles; 1 feathering, 1 hinged, 1 blunt and 2 unidentifiable distal ends; 4 non-cortical and 1 partially cortical with insignificant distal cortex; 1 punctiform butt with no abrasion, 1 dihedral 0.4 x 0.2 cm butt (semi-lipped, right angle, with no abrasion) and 3 missing butts. All five pieces are on gray flints. Dimensions: length – 1.7 and 2.2 cm for two complete items and 1.0-1.4 cm for three broken items; width – 0.4-0.6 cm and thickness – 0.2-0.4 cm.

One truly secondary piece with no preserved crested ridge is a non-cortical medial fragment. Identifiable morphology: unidirectional scar pattern, incurvate medial general profile and multifaceted profile at midpoint. On colored flint, 2.2 cm long, 0.4 cm wide and 0.2 cm thick.

Core Tablets. All 5 pieces are primary core tablets on flakes. In terms of cortical characteristics, there are 2 non-cortical, 2 partially cortical with insignificant lateral cortex and 1 cortical pieces. Location of remnants of core striking platforms: on butt's area for 3 items, on butt's area and 1 lateral edge for 2 items. There are two pieces on gray flints and three pieces on colored flints. Metrics: length – 3.1-5.1 cm, width – 2.6-4.0 cm (1 with shortened, transversal proportions) and thickness – 0.4-1.2 cm.

Core Trimming Elements. There are 4 complete flakes and 3 distal flake fragments with the following cortex characteristics – 1 cortical, 1 partially cortical with insignificant distal cortex and 5 non-cortical pieces. All are characterized by transversal location of dorsal crested ridges: all 7 unilateral with 4 partial and 3 wholly crested preparation. There are six pieces on gray flints, including one burnt, and another piece is on black flint. Dimensions: length – 1.6-3.9 cm for four complete pieces and 1.5-2.8 cm for three broken pieces; width – 1.3-6.7 cm (two items with shortened, transversal proportions) and thickness – 0.6-2.1 cm. Butts: 2 plain 1.1 x 0.5 cm and 0.9 x 0.3 cm (semi-lipped, semi-acute angle, with no abrasion), 1 linear 0.5 x 0.1 cm (semi-lipped, semi-acute angle, with no abrasion), 1 crushed and 3 missing.

Level Gb1-Gb2

There are 28 core maintenance products which are subdivided into crested pieces (19 items), core tablets (6 items) and core trimming elements (3 items).

Crested Pieces. These include crested flakes (7 pieces/36.8%), crested blades (10 pieces/52.7%) and crested bladelets (2 pieces/10.5%).

Crested Flakes. There are 2 primary, 2 re-crested, 1 secondary and 1 unidentifiable pieces with preserved crested ridge and one more truly secondary item with no preserved crested ridge.

Two primary complete pieces have unilateral partial crested ridges with 1 triangular and 1 lateral steep profiles. They have the following morphological features: 2 cortical dorsal surfaces, 1 parallel and 1 expanding shapes, 1 "on-axis" and 1 "off-axis" removal directions, 1 incurvate distal and 1 twisted general profiles, 1 feathering and 1 blunt distal ends, 2 partially cortical with significant amount of proximal + lateral cortex, 1 cortical 1.5 x 0.7 cm butt (not lipped, right angle, with no abrasion) and 1 crushed butt. One is on gray flint and another on colored flint. Metrics: length – 2.2 and 2.6 cm, width – 1.6 and 2.0 cm, thickness – 0.6 and 0.8 cm, respectively.

Two re-crested complete non-cortical pieces have unilateral partial crested ridges with 1 triangular and 1 lateral steep profiles. Morphology: 1 unidirectional and 1 unidirectional-crossed scar patterns, 1 converging and 1 irregular shapes, 2 "off-axis" removal direction, 1 flat and 1 incurvate distal general profiles, 2 feathering distal ends, 1 punctiform butt with no abrasion and 1 plain 0.5 x 0.2 cm butt (semi-lipped, semi-acute angle, with no abrasion). One is on gray flint and another one on colored flint. Dimensions: length – 2.7 and 2.9 cm, width – 1.5 and 1.6 cm, thickness – 0.7 and 0.5 cm, respectively.

A secondary complete non-cortical piece is characterized by unilateral partial crested ridge preparation with lateral steep profile and the following morphological features: unidirectional-crossed scar pattern, expanding shape, "off-axis" removal direction, convex general profile, hinged distal end and plain 1.8 x 0.2 cm butt (semi-lipped, semi-acute angle, with abrasion). On gray flint, 3.0 cm long, 2.2 cm wide and 0.9 cm thick.

An unidentifiable piece is a medial non-cortical fragment with unilateral wholly prepared crested ridge and lateral steep profile. Morphologically, a flat general profile is the only definable feature. On colored flint, 1.8 cm long, 1.6 cm wide and 0.2 cm thick.

A truly secondary crested flake with no preserved crested ridge is complete and non-cortical. Morphology: unidirectional-crossed scar pattern, converging shape, "off-axis" removal direction, incurvate medial general profile, hinged distal end, irregular profile at midpoint and linear 0.4 x 0.1 cm butt (semi-lipped, semi-acute angle, with abrasion). On gray flint, 3.3 cm long, 1.7 cm wide (almost blady proportions) and 0.4 cm thick.

Crested Blades. These include 4 primary, 4 re-crested, 1 secondary pieces with preserved crested ridge and 1 truly secondary piece with no preserved crested ridge.

Four primary pieces have the following traits of crested ridges: unilateral (2)/bilateral (2) and wholly (4) crested preparation with only lateral steep profiles. Morphology: 1 complete, 1 proximal, 1 medial and 1 distal fragments; 1 cortical, 1 dorsal-plain and 2 crested scar patterns; 1 parallel and 3 unidentifiable shapes; 1 "on-axis" and 3 unidentifiable removal directions; 2 twisted and 2 unidentifiable general profiles; 1 feathering, 1 hinged and 2 unidentifiable distal ends; 3 non-cortical and 1 partially cortical with insignificant lateral cortex; 1 cortical 1.2 x 0.2 cm butt (not lipped, right angle, with no abrasion), 1 crushed and 2 missing butts. Three are on gray flints and another is on colored flint. Metrics: length – 5.9 cm for one complete piece and 3.5-5.2 cm for 3 broken pieces; width – 2.0-2.6 cm, thickness – 0.6-1.3 cm.

Four re-crested pieces have the following traits of crested ridges: unilateral with partially (2)/wholly (2) crested preparation and 2 triangular and 2 lateral steep profiles. Morphology: 3 proximal and 1 medial fragments; 2 unidirectional, 1 3-directional and 1 unidentifiable scar patterns; 3 non-cortical and 1 partially cortical with insignificant distal cortex; 1 plain 0.2 x 0.2 cm butt (semi-lipped, semi-acute angle, with abrasion), 1 dihedral 0.8 x 0.3 cm butt (semi-lipped, semi-acute angle, with abrasion), 1 finely-faceted 1.0 x 0.4 cm butt (semi-lipped, semi-acute angle, with no abrasion) and 1 missing butt. One is on gray flint and three others on colored flints. Dimensions: length – 2.1-5.6 cm, width – 1.3-2.6 cm, thickness – 0.4-0.9 cm.

A secondary piece with preserved crested ridge is a non-cortical distal fragment (unilateral partial crested ridge with lateral steep profile). Morphology: unidirectional scar pattern, converging shape, "off-axis" removal direction, incurvate medial general profile, hinged distal end and missing butt. On colored flint, 3.4 cm long, 1.6 cm wide and 0.4 cm thick.

A truly secondary piece with no preserved crested ridge is a proximal non-cortical fragment with the following identifiable morphological features: unidirectional scar pattern, triangular profile at midpoint and punctiform butt with abrasion. On colored flint, 1.9 cm long, 1.3 cm wide and 0.3 cm thick.

Crested Bladelets are represented by 2 pieces: 1 primary and 1 re-crested.

The primary piece is a proximal non-cortical fragment with unilateral wholly crested preparation and lateral steep profile, and morphologically definable butt – dihedral 0.5 x 0.4 cm (semi-lipped, semi-acute angle, with no abrasion). On gray flint, 1.1 cm long, 0.7 cm wide and 0.4 cm thick.

A re-crested piece is a distal partially cortical fragment with insignificant lateral cortex. It has a unilateral crested ridge with lateral steep profile. Morphology: bidirectional scar pattern, converging shape, "off-axis" removal direction, twisted general profile and feathering distal end. On gray flint, 3.3 cm long, 1.1 cm wide and o.5 cm thick.

Core Tablets. All 6 pieces are primary core tablets: 5 complete flakes and 1 complete blade.

Five pieces on flakes have remnants of core striking platform on the butt area alone for two pieces and on the butt area and one lateral edge for three pieces. Four are partially cortical with insignificant distal (1), lateral (2) and central (1) cortex. Another piece is non-cortical. Three are on gray flints and two on colored flints. Metrics: length – 1.9-5.3 cm, width – 2.9-4.9 cm (3 with shortened, transversal proportions) and thickness – 0.8-1.5 cm. A core tablet on blade has the top part of a core on the butt area and one lateral edge and is partially cortical with insignificant lateral cortex. On gray flint, 3.8 cm long, 1.8 cm wide and 0.8 cm thick.

Core Trimming Elements. Three of these pieces (flakes) are complete with two non-cortical and another partially cortical with insignificant lateral cortex. All have transversal dorsal crested ridges (2 unilateral and 1 bilateral partial). Two are on gray flints and one is on limestone. Their dimensions are as follows: length – 1.8-7.0 cm, width – 2.1-5.4 cm (2 with shortened, transversal proportions), thickness – 0.5-2.5 cm. Butts: 1 plain 1.3 x 0.3 cm (semi-lipped, acute angle, with no abrasion), 1 punctiform butt (semi-lipped, semi-acute angle, with no abrasion) and 1 crudely-faceted 3.9 x 1.6 cm (semi-lipped, semi-acute angle, with no abrasion).

Level Ga

Core maintenance products are represented by only 4 crested pieces. They are subdivided into 1 crested blade, 1 crested bladelet and 2 crested microblades.

The Crested Blade is a truly secondary complete non-cortical one with no preserved crested ridge. Morphological features: unidirectional scar pattern, expanding shape, "off-axis" removal direction, twisted general profile, feathering distal end, trapezoidal profile at midpoint and linear 0.5 x 0.1 cm butt with only identifiable abrasion. On gray flint, 4.0 cm long, 1.6 cm wide and 0.5 cm thick.

The Crested Bladelet is an unidentifiable non-cortical medial fragment with a unilateral partially treated crested ridge with triangular profile. Identifiable morphological features: unidirectional scar pattern and twisted general profile. On gray flint, 3.1 cm long, 0.6 cm wide and 0.4 cm thick.

Crested Microblades. There are 2 pieces: 1 re-crested and 1 secondary.

The re-crested item is a non-cortical proximal one and has unilateral wholly treated crested ridge with lateral steep profile. It has a unidirectional scar pattern, incurvate medial general profile and crushed butt. On gray flint, 1.4 cm long, 0.6 cm wide and 0.2 cm thick.

The secondary item is a non-cortical proximal truly secondary one with no preserved crested ridge. It has a unidirectional scar pattern, multifaceted profile at midpoint and plain 0.2 x 0.2 cm butt (semi-lipped, semi-acute angle, with no abrasion). On gray flint, 0.7 cm long, 0.6 cm wide and 0.2 cm thick.

The inner structure and characteristics of Unit G core maintenance products allow us to make the following conclusions. Cresting and re-cresting processes (the "*lame à crête technique*") are truly blady ones. Moreover, apart from some crested bladelets in all four levels, there are also several crested microblades in levels Gd, Gc1-Gc2 and Ga that once more strengthen the inference for general bladelet production in Unit G primary reduction processes. Crested bladelets and microblades are evidence of bladelet core reduction from the initiation stage; the presence of secondary crested and re-crested bladelets in levels Gd, Gc1-Gc2 and Gb1-Gb2, one secondary crested microblade in level Gc1-Gc2 and two secondary and re-crested microblades in level Ga also points to the recurrent application of crested processes during continuous bladelet core reduction. At the same time, the occurrence of single core tablets on blades in levels Gd and Gb1-Gb2 shows occasional bladelet production from the narrow sides of cores. Finally, the correlation of 120 core maintenance products to 21 cores (5.7:1) for levels Gd, Gc1-Gc2 and Gb1-Gb2 is also high enough to infer both multiple and intensive reduction processes taking place at the site.

Debitage

This category of artifacts from the four archaeological levels of Unit G has the following internal structure for each level artifact assemblage (see tabl. 3B).

Debitage of level Gd (total 299 pieces) is composed of 91 flakes (30.5%), 81 blades (27.1%), 88 bladelets (29.4%) and 39 microblades (13%).

Debitage of level Gc1-Gc2 (total 808 pieces) is composed of 251 flakes (31.1%), 182 blades (22.5%), 266 bladelets (32.9%) and 109 microblades (13.5%).

Debitage of level Gb1-Gb2 (total 348 pieces) is composed of 108 flakes (31.1%), 63 blades (18.1%), 101 bladelets (29%) and 76 microblades (21.8%).

Debitage of level Ga (total 65 pieces) is composed of 28 flakes (43.1%), 13 blades (20%), 14 bladelets (21.5%) and 10 microblades (15.4%).

Flakes

In terms of their condition, the flakes from Unit G are subdivided into complete and broken pieces, with further distribution of the latter into proximal, medial, distal and longitudinal fragments.

91 flakes of level Gd consist of 70 complete pieces (76.9%) and 21 broken pieces (23.1%) – 7 proximal (7.7%), no medial, 6 distal (6.6%) and 8 longitudinally fragmented (8.8%).

251 flakes of level Gc1-Gc2 consist of 183 complete pieces (72.8%) and 68 broken pieces (27.2%) – 29 proximal (11.6%), 4 medial (1.6%), 28 distal (11.2%) and 7 longitudinally fragmented (2.8%).

108 flakes of level Gb1-Gb2 consist of 87 complete pieces (80.6%) and 21 broken pieces (19.4%) – 8 proximal (7.4%), no medial, 8 distal (7.4%) and 5 longitudinally fragmented (4.6%).

28 flakes of level Ga consist of 17 complete pieces (60.8%) and 11 broken pieces (39.2%) – 3 proximal (10.7%), 5 medial (17.8%), 2 distal (7.1%) and one longitudinally fragmented (3.6%).

Dorsal Scar Pattern. All eight scar pattern types have been recognized on all 91flakes from level Gd, on 236 definable flakes from level Gc1-Gc2, on 101 definable flakes from level Gb1-Gb2, while only five scar pattern types are characteristic for the small sample of 28 flakes from level Ga. Separately, representation of scar pattern types for flakes from each level are as follows (see tabl. 4).

Flakes of level Gd: unidirectional - 52.7%, unidirectional-crossed - 16.5%, cortical - 14.3%, lateral - 7.7%, dorsal-plain - 3.3%, 3-directional and centripetal - 2.2% each, bidirectional - 1.1%.

Flakes of level Gc1-Gc2: unidirectional - 64.1%, unidirectional-crossed and cortical - 11% each, bidirectional - 4.7%, dorsal-plain - 4.2%, lateral - 3.8%, 3-directional - 0.8%, centripetal - 0.4%.

Flakes of level Gb1-Gb2: unidirectional - 60.3%, cortical - 14.8%, unidirectional-crossed - 12.9%, lateral - 4%, dorsal-plain - 3%, bidirectional and 3-directional - 2% each, centripetal - 1%.

Flakes of level Ga: unidirectional -35.8%, cortical - 32.1%, unidirectional-crossed - 21.4%, lateral - 7.1%, bidirectional - 3.6%.

Such structure for dorsal scar pattern types for the flake samples from levels Gd, Gc1-Gc2 and Gb1-Gb2 shows the dominant position of unidirectional type (52.7%-64.1%), subordinate role of unidirectional-crossed (11%-16.5%) and cortical (11%-14.8%) types, poor representation of the other five types (dorsal-plain, lateral, bidirectional, 3-directional, centripetal) which each do not usually exceed 5% apart from a single, but not very different case for lateral type in level Gd (7.7%).

On the other hand, the rare flakes from level Ga show some differences in comparison to flakes in the other three levels, shown by less representation of unidirectional type (35.8%) and a rather high proportion of cortical type (32.1%).

Comparison of scar pattern types with presence/absence of cortex on flakes shows the following representation for levels Gd, Gc1-Gc2 and Gb1-Gb2. Pieces with cortex among unidirectional flakes compose about a quarter in each level: 27.1% in level Gd, 26.5% in level Gc1-Gc2 and 27.9% in level Gb1-Gb2. The next most common pattern is the unidirectional-crossed scar pattern on pieces with cortex, which shows significant fluctuations between levels: 20% in level Gd, 53.8% in level Gc1-Gc2 and 38.5% in level Gb1-Gb2. Other scar pattern types do not show any systematic correlations with respect to dorsal cortex representation. Level Ga, on the other hand, shows that 70% of unidirectional flakes with cortex, 50% of unidirectional-crossed flakes with cortex and 100% of lateral flakes with cortex.

Surface Cortex Area and Location. All flakes from each level of Unit G were used for surface cortex area identification. Non-cortical flakes slightly prevail in the following levels: 59.3% in level Gd, 61.4% in level Gc1-Gc2 and 61.1% in level Gb1-Gb2. On the other hand, non-cortical pieces compose only 25% in level Ga. Wholly cortical flakes are represented by a rather moderate number in levels Gd, Gc1-Gc2 and Gb1-Gb2 (14.3%, 10.7%, 13.9%, respectively) and a significant number in level Ga (32.1%). Other flakes are partially cortical – 26.4% in level Gd, 27.9% in level Gc1-Gc2, 25% in level Gb1-Gb2 and 42.9% in level Ga. Only complete flakes show very similar cortex area: level Gd (70 pieces) – non-cortical - 58.5%, partially cortical - 27.2% and cortical - 14.3%; level Gc1-Gc2 (183 pieces) – non-cortical - 60.2%, partially cortical - 30% and cortical - 9.8%; level Gb1-Gb2 (87 pieces) – non-cortical - 64.4%, partially cortical - 23% and cortical - 12.6%; level Ga (17 pieces) – non-cortical - 29.4%, partially cortical - 47.1% and cortical - 23.5%. Complete partially cortical flakes have such internal cortex subdivision: pieces with significant amount of cortex – 31.6% (6 pieces) in level Gd, 36.4% (20 pieces) in level Gc1-Gc2, 20% (4 pieces) in level Gb1-Gb2 and 75% (6 pieces) in level Ga, and pieces with insignificant cortex – 68.4% (13 pieces) in level Gd, 63.6% (35 pieces) in level Gc1-Gc2, 80% (16 pieces) in level Gb1-Gb2 and 25% (2 pieces) in level Ga. Thus, aside from level Ga, flakes of levels Gd, Gc1-Gc2 and Gb1-Gb2 show a dominance of partially cortical flakes with insignificant cortex.

The same samples of complete partially cortical flakes also allow us to study surface cortex location: level Gd (19 pieces) – lateral cortex - 42.2%, distal cortex - 31.7%, distal + lateral cortex - 10.5%, proximal, central and proximal + central cortex - 5.2% each; level Gc1-Gc2 (55 pieces) – lateral cortex - 54.6%, distal cortex - 23.6%, distal + lateral cortex - 9.1%, central cortex - 7.3%, proximal cortex - 3.6%, distal + central cortex - 1.8%; level Gb1-Gb2 (20 pieces) – lateral cortex - 45%, distal cortex - 40%, distal + lateral cortex - 10% and proximal cortex - 5%; level Ga (8 pieces) – lateral and distal + lateral cortex - 37.5% each, distal and proximal cortex - 12.5% each. Thus, there is a prevalence of partially cortical pieces with lateral cortex over partially cortical pieces with distal cortex, while flakes with other cortex location (aside from distal + lateral) are represented by only a few pieces each.

Shape. 75 flakes with definable shapes from level Gd, 202 from level Gc1-Gc2, 95 from level Gb1-Gb2 and only 24 from level Ga were used to record shape (see tabl. 5).

Flakes of level Gd have the following shape types: expanding - 47.9%, parallel - 18.7%, irregular - 14.7%, converging - 12% and ovoid - 6.7%.

Flakes of level Gc1-Gc2 have the following shape types: expanding - 51%, irregular - 24.3%, converging - 10.9%, parallel and ovoid - 6.9% each.

Flakes of level Gb1-Gb2 have the following shape types: expanding - 52.6%, irregular - 27.4%, parallel - 9.5%, converging - 8.4% and ovoid - 2.1%.

Flakes of level Ga have the following such shape types: expanding - 37.5%, parallel - 25%, irregular - 16.7%, ovoid - 12.5% and converging - 8.3%.

It can be seen that there are two clusters for shape type. For the two most abundant flake samples for shape identification (levels Gc1-Gc2 and Gb1-Gb2), there is a dominance of expanding type (51% and 52.6%) and a moderate number of irregular type (24.3% and 27.4%) that together account for about three-fourths of all flakes from these two levels, while the other three types are much less represented; the quantity of parallel and converging types together does not reach 20% (17.8%-17.9%). For the other two less abundant flake samples for shape

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
cortical			13	13 / 13.4%
dorsal-plain			3	3 / 3.1%
lateral			7	7 / 7.2%
crested		3		3 / 3.1%
unidirectional	2		48	50 / 51.5%
unidirectional-crossed			15	15 / 15.4%
bidirectional	1		1	2 / 2.1%
3-directional			2	2 / 2.1%
centripetal			2	2 / 2.1%
core tablet		4		4
unidentifiable	1			1
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical	2		26	28 / 10.4
dorsal-plain			10	10 / 3.7
lateral	1		9	10 / 3.7
crested		13		13 / 4.8
unidirectional	8		151	159 / 59.2
unidirectional-crossed	5		26	31 / 11.5
bidirectional	2		11	13 / 4.8
3-directional	2		2	4 / 1.5
centripetal			1	1 / 0.4
core tablet		5		5
unidentifiable	6		15	21
N	26	18	38	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical	2		15	17 / 14.4%
dorsal-plain			3	3 / 2.5%
lateral	1		4	5 / 4.2%
crested		10		10 / 8.5%
unidirectional	1		61	62 / 52.6%
unidirectional-crossed	1		13	14 / 11.9%
bidirectional	1		2	3 / 2.5%
3-directional			2	2 / 1.7%
centripetal	1		1	2 / 1.7%
core tablet		5		5
unidentifiable	4		7	11
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical			9	9 / 30.0%
dorsal-plain				
lateral			2	2 / 6.7%
crested				
unidirectional	1		10	11 / 36.7%
unidirectional-crossed	1		6	7 / 23.3%
bidirectional			1	1 / 3.3%
3-directional				
centripetal				
core tablet				
unidentifiable				
N	2	0	28	30

DEBITAGE TOTAL
(INCLUDING TOOLS & CMP)

	N	%
flakes	561	28.3
blades	471	23.7
bladelets	566	28.5
microblades	386	19.5
TOTAL	1984	100.0

Table 4 - Siuren-I. Unit G. Flake Dorsal Scar Patterns as Percentages of Each Type.

identification (levels Gd and Ga), there is again a dominance of expanding type (47.9% and 37.5%), although it is less than 50% and, accordingly, is not as pronounced as in levels Gc1-Gc2 and Gb1-Gb2 even together with irregular type (62.6% and 54.2%), and a moderate number of parallel and converging types (30.7%-33.3%).

Axis. 75 flakes with definable axis of removal directions from level Gd, 203 flakes from level Gc1-Gc2, 93 flakes from level Gb1-Gb2 and only 24 flakes from level Ga were used to record axis (see tabl. 6). As for shape identification, there are two clusters of axis types for flakes from the four levels in Unit G. The first show the clear dominance of "off-axis" type – 81.8%

for level Gc1-Gc2 and 79.6% for level Gb1-Gb2. The second is characterized by comparable representation of "on-axis" (49.3%) and "off-axis" (50.7%) types for level Gd and a prevalence of "on-axis" type (62.5%) over "off-axis" type (37.5%) for level Ga.

It is worth noting the good correspondence of the two clusters of axis types to the two clusters of shape types for the Unit G flakes in all four levels. Thus, the dominance of "off-axis" type for flakes in level Gc1-Gc2 (81.8%) and level Gb1-Gb2 (79.6%) corresponds to the high number of expanding and irregular shape types in these levels (Gc1-Gc2 - 75.3% and Gb1-Gb2 - 80%). On the other hand, similar representation of "on-axis" and "off-axis" types for flakes of level Gd corresponds to less representation of expanding and irregular shape types in this level (62.6%) in comparison to levels Gc1-Gc2 and Gb1-Gb2, while the dominance of "on-axis" type (62.5%) in level Ga is linked to the lowest representation of expanding shape type (37.5%) and the highest rate of parallel shape type (25%) in this level among all four levels.

General Profiles of Flakes. These data are based on separate analyses of all flakes and of complete flakes (see tabl. 7).

Level Gd. There are 84 flakes with the following general profile types: incurvate medial - 32.1%, twisted - 19%, flat and incurvate distal - 16.7% each, convex - 15.5%. For 69 complete definable flakes there are recognized 30.5% of incurvate medial type, 18.8% of flat type, 17.4% of incurvate distal and convex types each, 15.9% of twisted type.

Level Gc1-Gc2. There are 211 flakes with the following general profile types: twisted - 37.5%, incurvate medial - 28.9%, flat - 14.2%, incurvate distal - 12.3%, convex - 7.1%. For all 183 complete flakes there are recognized 34.9% of twisted type, 29% of incurvate medial type, 15.3% of flat type, 13.1% of incurvate distal type, 7.7% of convex type.

Level Gb1-Gb2. There are 102 flakes with the following general profile types: incurvate medial - 29.4%, flat - 28.4%, twisted 16.7%, convex - 13.7% and incurvate distal - 11.8%.For all 87 complete flakes there are recognized 33.4% of flat type, 28.7% of incurvate medial type, 13.8% of convex type,12.6% of twisted type and 11.5% of incurvate distal type.

Level Ga. There are 25 flakes with the following general profile types: incurvate distal - 28%, incurvate medial and twisted - 24% each, flat - 16% and convex - 8%. For all 17 complete flakes there are recognized 41.1% of incurvate distal type, 29.4% of incurvate medial type, 11.8% of flat and twisted types each, 5.9% of convex type.

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
parallel			14	14 / 17.7%
converging	1		9	10 / 12.7%
expanding	1	1	36	38 / 48.1%
ovoid			5	5 / 6.3%
irregular	1		11	12 / 15.2%
unidentifiable	1	6	16	23
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel	1		14	15 / 6.5%
converging		1	22	23 / 10.1%
expanding	10	4	103	117 / 51.1%
ovoid		1	14	15 / 6.5%
irregular	10		49	59 / 25.8%
unidentifiable	5	12	49	66
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel	1	1	9	11 / 10.5%
converging		2	8	10 / 9.5%
expanding		2	50	52 / 49.5%
ovoid	1		2	3 / 2.9%
irregular	2	1	26	29 / 27.6%
unidentifiable	7	9	13	29
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel			6	6 / 24%
converging			2	2 / 8%
expanding	1		9	10 / 40%
ovoid			3	3 / 12%
irregular			4	4 / 16%
unidentifiable	1		4	5
N	2	0	28	30

Table 5 - Siuren-I. Unit G. Flake Shapes as Percentages of Each Type.

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
on-axis	1	1	37	39 / 49.4%
off-axis	2		38	40 / 50.6%
unidentifiable	1	6	16	23
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
on-axis	5	3	37	45 / 19.7%
off-axis	14	3	166	183 / 80.3%
unidentifiable	7	12	48	67
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
on-axis	3	1	19	23 / 22.3%
off-axis	1	5	74	80 / 77.7%
unidentifiable	7	9	15	31
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
on-axis			15	15 / 60%
off-axis	1		9	10 / 40%
unidentifiable	1		4	5
N	2	0	28	30

Table 6 - Siuren-I. Unit G. Flake Axis as Percentages of Each Type.

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
flat	2		14	16 / 18.0%
incurvate medial	1		27	28 / 31.5%
incurvate distal		1	14	15 / 16.8%
convex			13	13 / 14.6%
twisted	1		16	17 / 19.1%
unidentifiable		6	7	13
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat	6	1	30	37 / 15.4%
incurvate medial	10	2	61	73 / 30.4%
incurvate distal	2	2	26	30 / 12.5%
convex	1		15	16 / 6.7%
twisted	4	1	79	84 / 35.0%
unidentifiable	3	12	40	55
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat	2	2	29	33 / 28.2%
incurvate medial	2	1	30	33 / 28.2%
incurvate distal	1	2	12	15 / 12.8%
convex	2	1	14	17 / 14.5%
twisted	1	1	17	19 / 16.3%
unidentifiable	3	8	6	17
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat			4	4 / 14.8%
incurvate medial			6	6 / 22.2%
incurvate distal	2		7	9 / 33.4%
convex			2	2 / 7.4%
twisted			6	6 / 22.2%
unidentifiable			3	3
N	2	0	28	30

Table 7 - Siuren-I. Unit G. Flake General Profiles as Percentages of Each Type.

So, there are only minimal statistical differences between the data set of all flakes and the data set of complete flakes. Along with this, the represented data for all four levels in Unit G are similar in that the twisted type plays a subordinate role (reaching its maximum in 37.5% only in level Gc1-Gc2 and not exceeding 25% in the other levels), while "regular" types (flat, incurvate medial and incurvate distal) range between 55% and 70%.

Profiles at Distal End. Data for these analyses were based on 78 flakes from level Gd, 209 flakes from level Gc1-Gc2, 90 flakes from level Gb1-Gb2 and 20 flakes from level Ga (see tabl. 8).

Level Gd has the following representation: feathering - 56.5%, hinged - 26.9%, blunt - 11.5% and overpassed - 5.1%.

Level Gc1-Gc2 has the following representation: feathering - 68.9%, hinged - 24.4%, blunt - 4.8% and overpassed - 1.9%.

Level Gb1-Gb2 has the following representation: feathering - 61.1%, hinged - 26.7%, blunt - 10% and overpassed - 2.2%.

Level Ga has the following representation: feathering - 60%, blunt - 30%, hinged and overpassed - 5% each.

Thus, we see a similar dominance of feathering – 56.5%-68.9% for flakes from all four levels in Unit G. At the same time, for three flake samples (Gd, Gc1-Gc2 and Gb1-Gb2) we also have similar proportions of hinged (24.4%-26.9%), blunt (4.8%-11.5%) and overpassed (1.9%-5.1%) types, where the latter is quite rare, also true for level Ga (5%). It is worth noting here the rather high proportion of "not regular" types (hinged and overpassed) which make up almost one-third of all flakes in levels Gd, Gc1-Gc2 and Gb1-Gb2.

Profiles at Midpoint. Data for these analyses were recorded on 88 flakes from level Gd, from 227 flakes from level Gc1-Gc2, 100 flakes from level Gb1-Gb2 and 27 flakes from level Ga (see tabl. 9).

Level Gd shows the following variety of types: trapezoidal - 29.5%, triangular - 21.6%, irregular - 20.5%, lateral steep - 9.1%, multifaceted - 8%, crescent - 6.8% and flat - 4.5%.

Level Gc1-Gc2 shows the following variety of types: irregular - 30.3%, multifaceted - 19.4%, trapezoidal - 18.5%, triangular - 13.7%, crescent - 8.8%, flat 8.4% and lateral steep - 0.9%.

Level Gb1-Gb2 shows the following variety of types: irregular - 31%, trapezoidal - 19%, triangular - 17%, multifaceted and flat - 13% each, crescent - 7% and no lateral steep.

Level Ga shows the following variety of types: triangular - 51.9%, trapezoidal - 18.5%, flat - 11.1%, crescent - 7.4%, multi-faceted, irregular and lateral steep - 3.7% each.

While the profiles at midpoint are fairly diverse, they can nonetheless be grouped given some similarities. So, for three flake samples (levels Gd, Gc1-Gc2 and Gb1-Gb2) there is a

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
feathering	2	1	44	47 / 58.1%
hinged			21	21 / 25.9%
overpassed			4	4 / 4.9%
blunt			9	9 / 11.1%
unidentifiable	2	6	13	21
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering	8	5	144	157 / 67.7%
hinged	3		51	54 / 23.3%
overpassed	1		4	5 / 2.1%
blunt	5	1	10	16 / 6.9%
unidentifiable	9	12	42	63
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering	2	3	55	60 / 59.4%
hinged	1	2	24	27 / 26.7%
overpassed			2	2 / 2.0%
blunt	2	1	9	12 / 11.9%
unidentifiable	6	9	18	33
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering			12	12 / 57.1%
hinged	1		1	2 / 9.5%
overpassed			1	1 / 4.8%
blunt			6	6 / 28.6%
unidentifiable	1		8	9
N	2	0	28	30

Table 8 - Siuren-I. Unit G. Flake Profiles at Distal End as Percentages of Each Type.

similar dominance of three types – triangular, irregular and trapezoidal, with the addition of multifaceted type in level Gc1-Gc2 as well. All other types are relatively poorly represented. On the other hand, such characteristic types of intensive reduction (trapezoidal and multifaceted) make up from 32% to 37.9% in these three levels. At the same time, irregular type fluctuates from 20.5% to 31% in these levels, which is a rather high index for only a single type. The range of types in level Ga can be explained by small sample size for this analysis.

Butt Types. This analysis is based on 81 flakes with butts from level Gd, 219 from level Gc1-Gc2, 101 from level Gb1-Gb2 and only 20 from level Ga (see tabl. 10).

Butts of level Gd are as follows: plain - 24.7%, punctiform - 12.3%, linear and cortical - 11.1% each, dihedral - 9.9%, crudely-faceted - 2.5%, finely-faceted - 3.7% and crushed - 24.7%.

Butts of level Gc1-Gc2 are as follows: plain - 21.5%, punctiform - 9.1%, linear - 20.5%, cortical - 7.8%, dihedral - 4.1%, crudely-faceted - 3.6%, finely-faceted - 4.6% and crushed - 28.8%.

Butts of level Gb1-Gb2 are as follows: plain - 23.9%, punctiform - 10.9%, linear - 15.8%, cortical - 11.9%, dihedral - 6.9%, crudely-faceted - 3%, finely-faceted - 2% and crushed - 25.7%.

Butts of level Ga are as follows: plain - 25%, punctiform - 5%, linear - 10%, cortical - 5%, no dihedral, crudely-faceted - 10%, finely-faceted - 5% and crushed - 40%.

Thus, the most common group of butt types, comprising half of all butts, is "plain-punctiform-linear"– 48.1%-51.1% for levels Gd, Gc1-Gc2 and Gb1-Gb2 and 40% for level Ga. The lower percentage for the latter level may be explained by a very high proportion of crushed butts (40%) there. Nearly a quarter of the flakes have a damaged crushed butt in levels Gd, Gc1-

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
flat			4	4 / 4.3%
triangular			19	19 / 20.2%
trapezoidal	1		26	27 / 28.7%
multifaceted	1		7	8 / 8.5%
lateral steep		3	8	11 / 11.7%
crescent			6	6 / 6.4%
irregular	1		18	19 / 20.2%
unidentifiable	1	4	3	8
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat			19	19 / 7.5%
triangular	2	4	31	37 / 14.7%
trapezoidal	4		42	46 / 18.3%
multifaceted	4		44	48 / 19.0%
lateral steep	1	2	2	5 / 2.0%
crescent			20	20 / 7.9%
irregular	8		69	77 / 30.6%
unidentifiable	7	12	24	43
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat			13	13 / 11.6%
triangular		2	17	19 / 17.0%
trapezoidal	1		19	20 / 17.8%
multifaceted	1		13	14 / 12.5%
lateral steep		4		4 / 3.6%
crescent	1		7	8 / 7.1%
irregular	2	1	31	34 / 30.4%
unidentifiable	6	8	8	22
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat			3	3 / 10.3%
triangular			14	14 / 48.4%
trapezoidal			5	5 / 17.2%
multifaceted	1		1	2 / 6.9%
lateral steep			1	1 / 3.4%
crescent			2	2 / 6.9%
irregular	1		1	2 / 6.9%
unidentifiable			1	1
N	2		28	30

Table 9 - Siuren-I. Unit G. Flake Profiles at Midpoint as Percentages of Each Type.

Gc2 and Gb1-Gb2 – 24.7%-28.8%. At the same time, a tenth of the flakes have a cortical butt (7.8%-11.9%) in levels Gd, Gc1-Gc2 and Gb1-Gb2, and also similarly present in level Ga (5%). There are also comparable proportions of faceted and dihedral butts in levels Gd, Gc1-Gc2 and Gb1-Gb2 where neither alone exceeds 10%.

Lipping. There are 63 butts suitable for lipping identification from level Gd, 143 from level Gc1-Gc2, 63 from level Gb1-Gb2 and only 12 butts from level Ga (see tabl. 11).

Butts of level Gd have the following lipping characteristics: semi-lipped - 84.1%, lipped - 4.8% and not lipped - 11.1%.

Butts of level Gc1-Gc2 have the following lipping characteristics: semi-lipped - 94.4%, lipped and not lipped - 2.8%.

Butts of level Gb1-Gb2 have the following lipping characteristics: semi-lipped - 88.9%, lipped - 4.8% and not lipped - 6.3%.

Butts of level Ga have the following lipping characteristics: semi-lipped - 58.3%, lipped - 25% and not lipped - 16.7%.

It can be seen that level Ga is quite different in lipping characteristics from the other three levels in Unit G, likely due to the small sample size. On the other hand, levels Gd, Gc1-Gc2 and Gb1-Gb2 are all quite similar. Semi-lipped butts are the most

Level Gd	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical		1	9	10 / 11.6%
plain	1	1	20	22 / 25.6%
punctiform			10	10 / 11.6%
linear			9	9 / 10.5%
dihedral			8	8 / 9.3%
crudly-faceted			2	2 / 2.3%
finely-faceted			3	3 / 3.5%
crushed	1	1	20	22 / 25.6%
missing	2	4	10	16
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical			17	17 / 6.9%
plain	6	3	47	56 / 22.8%
punctiform		1	20	21 / 8.5%
linear	1	1	45	47 / 19.1%
dihedral			9	9 / 3.6%
crudly-faceted	3		8	11 / 4.5%
finely-faceted	3		10	13 / 5.3%
crushed	5	4	63	72 / 29.3%
missing	8	9	32	49
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical		1	12	13 / 10.9%
plain	2	4	24	30 / 25.2%
punctiform		2	11	13 / 10.9%
linear		1	16	17 / 14.3%
dihedral			7	7 / 5.9%
crudly-faceted	1	1	3	5 / 4.2%
finely-faceted	2		2	4 / 3.4%
crushed	3	1	26	30 / 25.2%
missing	3	5	7	15
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical			1	1 / 4.5%
plain	1		5	6 / 27.3%
punctiform			1	1 / 4.5%
linear	1		2	3 / 13.6%
dihedral				
crudly-faceted			2	2 / 9.1%
finely-faceted			1	1 / 4.5%
crushed			8	8 / 36.5%
missing			8	8
N	2	0	28	30

Table 10 - Siuren-I. Unit G. Flake Butt Types as Percentages of Each Type.

common type – 84.1%-94.4%. Lipped and not lipped butts are represented by only a few pieces each where their correlation is either 1:1 (level Gc1-Gc2) or with prevalence of not lipped over lipped butts - 2.3:1 (level Gd) and 1.3:1 (level Gb1-Gb2).

Butt Angle. There are 62 butts suitable for angle identification from level Gd, 141 from level Gc1-Gc2, 63 from level Gb1-Gb2 and only 12 from level Ga (see tabl. 12).

Butts of level Gd have the following angles: semi-acute - 64.6%, right - 30.6% and acute - 4.8%.

Butts of level Gc1-Gc2 have the following angles: semi-acute - 86.6%, right - 10.6% and acute - 2.8%.

Butts of level Gb1-Gb2 have the following angles: semi-acute - 90.5%, right - 7.9% and acute - 1.6%.

Butts of level Ga have the following angles: semi-acute - 58.3%, right - 25% and acute - 16.7%.

Butt angles are fairly similar for all four levels. There are only in significant differences in proportion of semi-acute angle which are, however, dominant in each level (58.3%-90.5%). Moreover, right angles are always more common than acute angle in the following correlations: 6.4:1 for level Gd, 3.8:1 for level Gc1-Gc2, 4.9:1 for level Gb1-Gb2 and 1.5:1 for level Ga.

Butt Abrasion. The number of identifiable flake butts for to record presence/absence of abrasion in the four levels of Unit G is as follows: 63 from level Gd, 150 from level Gc1-Gc2, 64 from level Gb1-Gb2 and only 16 from level Ga (see tabl. 13).

Butts of level Gd have the following abrasion identifications: present - 38.1% and absent - 61.9%.

Butts of level Gc1-Gc2 have the following abrasion identifications: present - 72% and absent - 28%.

Butts of level Gb1-Gb2 have the following abrasion identifications: present - 48.4% and absent - 51.6%.

Butts of level Ga have the following abrasion identifications: present - 31.3% and absent - 68.7%.

Thus, correlations of presence/absence is 1:1.6 for level Gd, 1:0.4 for level Gc1-Gc2, 1:1.1 for level Gb1-Gb2 and 1:2.2 for level Ga. These correlations show similarity in flakes from levels Gd, Gb1 - Gb2 and Ga where there is some dominance of butts with no abrasion over butts with abrasion. On the other hand, the flakes from level Gc1-Gc2 show a reverse correlation with a significant prevalence of butts with abrasion.

Metrics (Length, Width, Thickness) of Flakes. Metric data are mainly based on the analysis of complete flakes from each level, while additional comparable information was also obtained when possible from broken flakes.

Length. The most abundant group of complete flakes in terms of length is in the interval 1.6-2.5 cm - 53.1% for level Gd, 50.3% for level Gc1-Gc2, 50.8% for level Gb1-Gb2 and 52.8% for level Ga. In general, flakes with length in the interval 0.5-3.0 cm comprise 75.9% for level Gd, 79.3% for level Gc1-Gc2, 79.5% for level Gb1-Gb2 and 100% for level Ga. The remaining flakes have lengths of more than 3 cm but pieces with length more than

Level Gd	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped	1		3	4 / 5.7%
semi-lipped		6	53	59 / 84.3%
not lipped			7	7 / 10.0%
unidentifiable	3	1	28	32
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped	3	1	4	8 / 4.8%
semi-lipped	10	5	135	150 / 89.8%
not lipped	1	4	4	9 / 5.4%
unidentifiable	12	8	108	128
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped			3	3 / 3.7%
semi-lipped	6	11	56	73 / 90.1%
not lipped		1	4	5 / 6.2%
unidentifiable	5	3	45	53
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped			3	3 / 21.4%
semi-lipped	2		7	9 / 64.3%
not lipped			2	2 / 14.3%
unidentifiable			16	16
N	2	0	28	30

Table 11 - Siuren-I. Unit G. Flake Butt Lipping as Percentages of Each Type.

5 cm among them account for just a few pieces - 2.8% for level Gd, 0.5% for level Gc1-Gc2, 3.4% for level Gb1-Gb2 and none for level Ga. Moreover, no flake is longer than 6 cm. Mean length for complete flakes of each level is as follows: 2.4 cm for levels Gd and Gc1-Gc2, 2.3 cm for level Gb1-Gb2 and 1.9 cm for level Ga. So, complete flakes of all levels of Unit G are quite short.

The analysis of broken flakes shows that the majority are in the interval 0.5-3.0 cm – 76.1% for level Gd, 89.8% for level Gc1-Gc2, 76.2% for level Gb1-Gb2 and 72.7% for level Ga. Moreover, no broken flake in any of the four levels is longer than 5 cm.

Width. The most abundant group of complete flakes in terms of width is in the interval 1.6-2.5 cm – 54.4% for level Gd, 56.2% for level Gc1-Gc2, 53% for both levels Gb1-Gb2 and Ga. Complete flakes with width in the interval 0.5-3.0 cm comprise the vast majority: 84.4% for level Gd, 86.3% for level Gc1-Gc2, 84% for level Gb1-Gb2 and 76.5% for level Ga. The remaining pieces have widths more than 3 cm, but only a few more than 5 cm – 1.4% for level Gd, none for level Gc1-Gc2, 1.1% for level Gb1-Gb2 and none for level Ga. None of these few "large" flakes have a width more than 6 cm. Mean width for complete flakes of each level is as follows: 2.3 cm for level Gd and 2.2 cm for the three other levels Gc1-Gc2, Gb1-Gb2 and Ga together.

Analysis of broken flakes parallels the data on complete flakes. So, there are many broken flakes with width in the interval 0.5-3.0 cm – 76.9% for level Gd, 87% for level Gc1-Gc2, 93.8% for level Gb1-Gb2 and 70% for level Ga. No broken flake has a width of more than 5 cm.

We now look at the correlation of length and width of flakes from the four levels of Unit G. Strictly speaking, only level Ga has "an ideal complete flake" with shortened, transversal proportions (1.9 cm L <2.2 cm W). On the other hand, prevalence of mean length over mean width in levels Gd, Gc1-Gc2 and Gb1-Gb2 compose only 1 - 2 mm – 2.4 cm L > 2.3 cm W for level Gd, 2.4 cm L > 2.2 cm W for level Gc1-Gc2 and 2.3 cm L > 2.2 cm W for level Gb1-Gb2. Moreover, there is also a significant quantity of actual (not ideal) complete flakes with shortened, transversal proportions (L <W) in all four levels – 38 pieces/54.3% for level Gd, 84 pieces/45.9% for level Gc1-Gc2, 46 pieces/52.9% for level Gb1-Gb2 and 13 pieces/76.4% for level Ga. Along with this, the quantity of "elongated" flakes (L > 1.5 W) is not large at all – 14 pieces/20% for level Gd, 43 pieces/23.5% for level Gc1-Gc2, 15 pieces/17.2% for level Gb1-Gb2 and only 2 pieces /11.8% for level Ga. Thus, length and width of complete flakes of the levels of Unit G is very similar.

Thickness. Mean thickness for both complete and broken flakes from all four levels is 0.5 cm. Flakes in the interval 0.1-0.5 cm comprise 75.8% for complete and 76.2% for broken flakes in level Gd, 74.3% for complete and 69.1% for broken flakes in level Gc1-Gc2, 64.4% for complete and 66.6% for broken flakes in level Gb1-Gb2 and 75.8% for complete and 76.2% for broken flakes in level Ga. On the other hand, just a few flakes have thickness more than 1.0 cm: 2.8% for complete and none for broken flakes in level Gd, 2.7% for complete and 1.5% for broken flakes in level Gc1-Gc2, 3.3% for complete and 4.8% for broken flakes in level Gb1-Gb2 and none in level Ga, although even the minimal presence of rather thick flakes is notable. Thus, flakes of all four levels of Unit G are not thick.

Butt Sizes. Mean metric data for flake butts are similar for all four levels. They are as follows for butt width: 0.9 cm for both levels Gd (55 butts) and Gc1-Gc2 (129 butts), and 1.2 cm for both levels Gb1-Gb2 (59 butts) and Ga (12 butts). They are as follows for butt height: 0.3 cm for all four levels. Plain butts have mean width of 0.8 cm for both levels Gd (20 butts) and Gc1-Gc2 (47 butts), 1.1 cm for level Gb1-Gb2 (24 butts) and 1.2 cm for level Ga (5 butts) and have mean height of 0.3 cm for both levels Gd and Gc1-Gc2, and 0.4 cm for both levels Gb1-Gb2 and Ga.

In sum, then, the flakes of all four levels can be generally characterized by:

- a dominance of unidirectional scar pattern (52.7%-64.1%), a subordinate position of both unidirectional-crossed (11%-16.5%) and cortical (11%-14.8%) scar patterns, and a small number of other five scar pattern types (usually <5% each) for levels Gd, Gc1-Gc2 and Gb1-Gb2, while level Ga has a different representation of scar pattern types that is most likely due to the rather small sample of flakes;

- a presence of two clusters of flake samples based on surface cortex area and location: 1) there is a prevalence of non-cortical pieces (59.3%-61.4%) and a moderate number of wholly cortical pieces (10.7%-14.3%); lateral cortex location is the most typical for partially cortical flakes, which often (20%-36.4%) have a significant amount of cortex – levels Gd, Gc1-Gc2 and Gb1-Gb2; and 2) there is a dominance of partially cortical pieces (42.9%) and a significant number of wholly cortical pieces (32.1%); lateral cortex location is dominant for partially cortical flakes, of which the majority (75%) have a significant amount of cortex – level Ga;

- a presence of two clusters of flake samples based on their shape and axis: 1) a great number of expanding and irregular shape types (75.3%-80% together) correspond to a dominance of "off-axis" type of removal direction (79.6%-81.8%) in levels Gc1-Gc2 and Gb1-Gb2, while 2) level Gd is characterized a lower number of expanding and irregular shape types (62.6% together) that correspond to a near-equal representation of "on-axis" (49.3%) and "off-axis" (50.7%) types of removal direction, and, moreover, level Ga has the lowest representation of expanding shape (37.5%) and the highest rate of parallel shape (25%) in all four levels and, accordingly, "on-axis" removal direction (62.5%) is dominant;

-a dominance of "regular" (flat, incurvate medial and incurvate distal) types of general profiles, while twisted type plays a subordinate role, reaching its maximum of 37.5% only in level Gc1-Gc2 and not exceeding 25% for the other three levels;

- a dominance of feathering distal ends (56.5%-68.9%) and, at the same time, a rather high proportion of "not regular" hinged and overpassed types (26.3%-32% together);

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
right		3	19	22 / 31.9%
semi-acute		3	40	43 / 62.3%
acute	1		3	4 / 5.8%
unidentifiable	3	1	29	33
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
right	5	5	15	25 / 14.8%
semi-acute	8	5	122	135 / 80.4%
acute	4		4	8 / 4.8%
unidentifiable	9	8	110	127
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
right	2	5	5	12 / 14.8%
semi-acute	4	6	57	67 / 82.7%
acute		1	1	2 / 2.5%
unidentifiable	5	3	45	
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
right	1		3	4 / 28.6%
semi-acute	1		7	8 / 57.1%
acute			2	2 / 14.3%
unidentifiable			16	16
N	2	0	28	30

Table 12 - Siuren-I. Unit G. Flake Butt Angles as Percentages of Each Type.

Level Gd	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
present	1		24	25 / 35.7%
absent		6	39	45 / 64.3%
unidentifiable	3	1	28	32
N	4	7	91	102
Level Gc1-Gc2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
present	5		108	113 / 67.7%
absent	5	7	42	54 / 32.3%
unidentifiable	16	11	101	128
N	26	18	251	295
Level Gb1-Gb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
present	2	2	31	35 / 42.7%
absent	3	11	33	47 / 57.3%
unidentifiable	6	2	44	52
N	11	15	108	134
Level Ga	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
present			5	5 / 31.3%
absent			11	11 / 68.7%
unidentifiable	2		12	14
N	2	0	28	30

Table 13 - Siuren-I. Unit G. Flake Butt Abrasion as Percentages of Each Type.

- a dominance of triangular, irregular and trapezoidal types of profiles at midpoint (62.5%-71.6%) with a significant number of irregular type among them (20.5%-31%), while trapezoidal and multifaceted types together make up only 32%-37.9% in levels Gd, Gc1-Gc2 and Gb1-Gb2, and a different structure of types in level Ga;

- a dominance of the "plain-punctiform-linear" group of butt types which comprise around half of all butts (48.1%-51.1%) in levels Gd, Gc1-Gc2 and Gb1-Gb2 (40% in level Ga), and a notable presence of the five other butt types;

- a dominance of semi-lipped butts with semi-acute angle with, at the same time, a rather small number of lipped butts with acute angle and a moderate representation of not lipped butts with mainly right angle in levels Gd, Gc1-Gc2 and Gb1-Gb2, and a different structure of butt types in level Ga;

- a presence of two clusters of flake samples based on presence/absence of butt abrasion: 1) a dominance of flakes with no butt abrasion (51.6%-68.7%) over flakes with butt abrasion (31.3%-48.4%) in levels Gd, Gb1-Gb2 and Ga; and 2) a significant prevalence of flakes with butt abrasion (72%) over flakes with no butt abrasion (28%) in level Gc1-Gc2;

- a dominance of pieces with shortened, transversal metric proportions in level Ga (1.9 cm L <2.2 cm W in mean data) and a similar dominance of generally short pieces in the other three levels (2.4 cm L > 2.3 cm W in level Gd, 2.4 cm L > 2.2 cm W in level Gc1-Gc2 and 2.3 cm L > 2.2 cm W in level Gb1-Gb2 in mean data) and a mean thickness of 0.5 cm for flakes in all four levels;

- a considerable prevalence of gray flints for flakes of all four levels with a tendency to increase through the archaeological sequence (Gd – 60 pieces/65.9%; Gc1-Gc2 – 185 pieces/73.7%; Gb1-Gb2 – 85 pieces/78.7%; Ga – 23 pieces/82.2%), a variable moderate representation of colored flints with a respective decreasing tendency (Gd – 25 pieces/27.5%; Gc1-Gc2 – 57 pieces/22.7%; Gb1-Gb2 – 21 pieces/19.5%; Ga – 3 pieces/10.7%), and very low representation of black flints (Gd – 4 pieces/4.4%; Gc1-Gc2 – 9 pieces/3.6%; Gb1-Gb2 – 2 pieces/1.8%; Ga – 2 pieces/7.1%) and especially limestones (only known in level Gd – 2 pieces/2.2%).

Blades

In terms of condition, blades from the four archaeological levels of Unit G are subdivided into complete and broken pieces, with further distribution of the latter into proximal, medial, distal and longitudinal fragments.

81 blades of level Gd include 16 complete (19.8%) and 65 broken pieces (80.2%) – 26 proximal (32.1%), 21 medial (25.9%), 18 distal (22.2%) and none longitudinally fragmented.

182 blades of level Gc1-Gc2 include 34 complete (18.7%) and 148 broken pieces (81.3%) – 60 proximal (32.9%), 46 medial (25.3%), 40 distal (22%) and 2 longitudinally fragmented (1.1%).

63 blades of level Gb1-Gb2 include 13 complete (20.6%) and 50 broken pieces (79.4%) – 15 proximal (23.8%), 19 medial (30.2%), 16 distal (25.4%) and none longitudinally fragmented.

13 blades of level Ga include only broken pieces (100%) – 2 proximal (15.4%), 6 medial (46.1%), 5 distal (38.5%) and none longitudinally fragmented.

Dorsal Scar Pattern. Four scar pattern types have been identified on all 81 blades from level Gd, five scar pattern types on 180 blades from level Gc1-Gc2, three scar pattern types on 62 blades from level Gb1-Gb2 and only one scar pattern type for all 13 blades from level Ga (see tabl. 14). Thus, there is a kind of interconnection between the quantity of blades and the number of scar pattern types identified for them in each level. Separately, blades from each level have the following scar pattern type representation.

Blades of level Gd: unidirectional - 93.9%, bidirectional - 3.7%, unidirectional-crossed and 3-directional - 1.2% each.

Blades of level Gc1-Gc2: unidirectional - 76%, unidirectional-crossed - 15%, bidirectional - 6.7%, cortical - 1.7% and 3-directional - 0.6%.

Blades of level Gb1-Gb2: unidirectional - 85.5%, bidirectional - 9.7% and unidirectional-crossed - 4.8%.

Blades of level Ga are characterized by only unidirectional scar pattern.

Thus, there is a clear dominance of unidirectional scar pattern for blades (more than three-quarters), while other 3-5 defined scar pattern types are certainly more or less occasional and/or preparatory/re-preparatory ones.

Comparison of scar pattern types with presence/absence of cortex on blades revealed the following regularity. Specimens with cortex among unidirectional blades have a rather stable moderate proportion – 22.4% in level Gd, 29.9% in level Gc1-Gc2, 24.5% in level Gb1-Gb2 and 15.4% in level Ga where the latter level contains blades exclusively with unidirectional scar pattern. Other rare scar pattern types for blades, on the other hand, are represented by many more cortical pieces. Level Gd. A single blade with unidirectional-crossed scar pattern (100%) has cortex, as well as one of three bidirectional blades (33.3%). Level Gc1-Gc2. Nine of 27 unidirectional-crossed blades (33.3%), 7 of 18 bidirectional blades (38.9%) and a single blade with 3-directional scar pattern (100%) are cortical. Level Gb1-Gb2. Two of 3 unidirectional-crossed blades (66.6%) are cortical. This allows us to infer a non-systematic character for the removal of non-unidirectional blades, mainly during core preparation processes.

Surface Cortex Area and Location. All blades from each level of Unit G were used to record surface cortex area. Non-cortical blades prevail – 74.1% in level Gd, 68.1% in level Gc1-Gc2, 74.6% in level Gb1-Gb2 and 84.6% in level Ga. Wholly cortical blades are absent in levels Gd, Gb1-Gb2, Ga and account for only 1.1% (2 complete pieces) in level Gc1-Gc2. The remaining blades are partially cortical – 25.9% in level Gd, 30.8% in level Gc1-Gc2, 25.4% in level Gb1-Gb2 and 15.4% in level Ga. Taken separately, complete blades have the following cortex area data: level Gd (16 pieces) – non-cortical - 62.5% and partially cortical - 37.5%; level Gc1-Gc2 (34 pieces) – non-cortical - 70.6%, partially cortical - 23.5% and cortical - 5.9%; level Gb1-Gb2 (13 pieces) – non-cortical - 38.5% and partially cortical - 61.5%; level Ga has no complete blades. Complete partially cortical blades have the following internal cortex subdivision: pieces with a significant amount of cortex – none in level Gd, 75% (6 pieces) in level Gc1-Gc2 and 37.5% (3 pieces) in level Gb1-Gb2, and pieces with insignificant cortex – 100% (6 pieces) in level Gd, 25% (2 pieces) in level Gc1-Gc2 and 62.5% (5 pieces) in level Gb1-Gb2.

Surface cortex location was recorded on the same samples of complete partially cortical blades: distal cortex - 50% (3 pieces) in level Gd, 12.5% (1 piece) in level Gc1-Gc2 and 37.5% (3 pieces) in level Gb1-Gb2; lateral cortex - 50% (3 pieces) in level Gd, 62.5% (5 pieces) in level Gc1-Gc2 and 50% (4 pieces) in level Gb1-Gb2; distal + lateral cortex - none in level Gd, 25% (2

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
cortical		1		1 / 0.9%
dorsal-plain		3		3 / 2.8%
lateral				
crested		1		1 / 0.9%
unidirectional	14	5	76	95 / 89.8%
unidirectional-crossed			1	1 / 0.9%
bidirectional		1	3	4 / 3.8%
3-directional			1	1 / 0.9%
centripetal				
core tablet		1		1
unidentifiable		1		1
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical			3	3 / 1.2%
dorsal-plain		3		3 / 1.2%
lateral	2			2 / 0.8%
crested		5		5 / 1.9%
unidirectional	38	19	137	194 / 75.8%
unidirectional-crossed		1	27	28 / 10.9%
bidirectional	6	2	12	20 / 7.8%
3-directional			1	1 / 0.4%
centripetal				
core tablet				
unidentifiable		1	2	3
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical		1		1 / 1.2%
dorsal-plain		1		1 / 1.2%
lateral				
crested		2		2 / 2.5%
unidirectional	8	4	53	65 / 81.3%
unidirectional-crossed	1		3	4 / 5.0%
bidirectional			6	6 / 7.6%
3-directional		1		1 / 1.2%
centripetal				
core tablet		1		1
unidentifiable	1	1	1	3
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
dorsal-plain				
lateral				
crested		1		1 / 5.0%
unidirectional	5		13	18 / 90.0%
unidirectional-crossed	1			1 / 5.0%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	6	1	13	20

Table 14 - Siuren-I. Unit G. Blade Dorsal Scar Patterns as Percentages of Each Type.

pieces) in level Gc1-Gc2 and 12.5% (1 piece) in level Gb1-Gb2. So, lateral cortex location is the most common for blades.

Shape. There were used 34 blades with definable shapes from level Gd, 77 from level Gc1-Gc2, 27 from level Gb1-Gb2 and just 4 from level Ga (see tabl. 15).

Blades from level Gd are characterized by the following shape types: converging - 35.4%, parallel and irregular - 23.5% each, expanding - 17.6%. Blades from level Gc1-Gc2 are characterized by the following shape types: parallel - 57.1%, expanding - 18.2%, converging - 14.3% and irregular - 10.4%. Blades from level Gb1-Gb2 are characterized by the following shape types:

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
parallel	2		8	10 / 20.4%
converging	2	1	12	15 / 30.6%
expanding		2	6	8 / 16.3%
ovoid				
irregular	2	6	8	16 / 32.7%
unidentifiable	8	4	47	59
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel	10	1	44	55 / 45.1%
converging	6	11	11	28 / 22.9%
expanding	5	5	14	24 / 19.7%
ovoid				
irregular	3	4	8	15 / 12.3%
unidentifiable	22	10	105	137
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel	2	1	9	12 / 38.7%
converging		1	7	8 / 25.8%
expanding			7	7 / 22.6%
ovoid				
irregular			4	4 / 12.9%
unidentifiable	8	9	36	53
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel			1	1 / 14.3%
converging			1	1 / 14.3%
expanding	1	1	1	3 / 42.9%
ovoid				
irregular	1		1	2 / 28.5%
unidentifiable	4		9	13
N	6	1	13	20

Table 15 - Siuren-I. Unit G. Blade Shapes as Percentages of Each Type.

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
on-axis	3	2	9	14 / 29.2%
off-axis	3	6	25	34 / 70.8%
unidentifiable	8	5	47	59
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis	10	9	155	174 / 83.7%
off-axis	9	13	12	34 / 16.3%
unidentifiable	27	9	15	51
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis	2	1	9	12 / 40.0%
off-axis		1	17	18 / 60.0%
unidentifiable	8	9	37	54
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis	2		1	3 / 37.5%
off-axis	1	1	3	5 / 62.5%
unidentifiable	3		9	12
N	6	1	13	20

Table 16 - Siuren-I. Unit G. Blade Axis as Percentages of Each Type.

parallel - 33.4%, converging and expanding - 25.9% each, irregular - 14.8%. Blades from level Ga are characterized by the following shape types: parallel, converging, expanding and irregular - 25% each (by a single piece each).

Two clusters of blade shape types can be observed. One is represented by the level Gc1-Gc2 sample where parallel type is the most common (57.1%), while the other three types are about three times lower each. The second cluster is represented by the levels Gd and Gb1-Gb2 samples where there is an insignificant prevalence of parallel and converging types (58.9% and 59.3%) over irregular and expanding types (41.1% and 40.7%), and by an unclear equality of all four types due to the too small sample size from level Ga.

Axis. 34 blades with definable axis of removal directions from level Gd, 167 from level Gc1-Gc2, 26 from level Gb1-Gb2 and just 4 from level Ga were used to record axis (see tabl. 16).

As in the case for shape identification, two clusters of axis types for blades can be observed among the four levels. The first has an almost exclusive dominance of "on-axis" type (92.8%) in level Gc1-Gc2. The second cluster is characterized by the reverse, with a majority of "off-axis" type: level Gd - 73.5%, level Gb1-Gb2 - 65.4% and level Ga - 75%.

Such clusters of axis types correspond to clusters of shape types. The first clusters (level Gc1-Gc2) show an interconnection between the great dominance of parallel and converging shape types (71.4% together) and the absolute majority of "on-axis" removal direction (92.8%). The second clusters (levels Gd, Gb1-Gb2 and Ga), on the other hand, represent an interconnection between the less significant dominance of parallel and converging shape types (50%-59% together) and prevalence of "off-axis" removal direction (65.4%-75%).

General Profiles of Blades. These data are based on separate analyses of all blades and of complete blades only (see tabl. 17).

Level Gd. There are 66 blades with the following general profile types: incurvate medial - 47%, twisted - 33.3%, flat - 15.2% and incurvate distal - 4.5%. For 16 complete blades: 62.5% of incurvate medial type, 25% of twisted type and 12.5% of incurvate distal type.

Level Gc1-Gc2. There are 169 blades with the following general profile types: twisted - 56.8%, incurvate medial - 27.8%, flat - 11.2%, incurvate distal - 3.6% and convex - 0.6%. For 34 complete blades: recognized 58.8% of twisted type, 35.4% of incurvate medial type, 2.9% of flat and convex types each.

Level Gb1-Gb2. There are 43 blades with the following general profile types: twisted - 44.2%, incurvate medial - 32.6%, flat - 20.9% and incurvate distal - 2.3%. For 13 complete blades: 53.8% of incurvate medial type, 38.5% of twisted type and 7.7% of flat type.

Level Gd	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	2		10	12 / 13.6%
incurvate medial	4	4	31	39 / 44.4%
incurvate distal	3		3	6 / 6.8%
convex				
twisted	2	7	22	31 / 35.2%
unidentifiable	3	2	15	20
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	8	1	19	28 / 12.0%
incurvate medial	10	12	47	69 / 29.5%
incurvate distal	2	3	6	11 / 4.7%
convex	1		1	2 / 0.8%
twisted	17	11	96	124 / 53.0%
unidentifiable	8	4	13	25
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	2		9	11 / 21.2%
incurvate medial	3	1	14	18 / 34.6%
incurvate distal			1	1 / 1.9%
convex				
twisted	1	2	19	22 / 42.3%
unidentifiable	4	8	20	32
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	1		3	4 / 30.8%
incurvate medial			2	2 / 15.4%
incurvate distal				
convex				
twisted	3	1	3	7 / 53.8%
unidentifiable	2		5	7
N	6	1	13	20

Table 17 - Siuren-I. Unit G. Blade General Profiles as Percentages of Each Type.

Level Ga. There are 8 blades with the following general profile types: twisted and flat - 37.5% each, incurvate medial - 25%. There are no complete blades in level Ga.

These data show a kind of "rough equality" of twisted and "regular" (flat, incurvate medial and incurvate distal) general profile types of blades which is seen in the minor prevalence of one type(s) over another type(s) in different levels.

Profiles at Distal End. Data for this analysis were based on 33 blades from level Gd, on 77 from level Gc1-Gc2, on 28 from level Gb1-Gb2 and only on 5 from level Ga (see tabl. 18).

Level Gd has the following type representation: feathering - 63.5%, hinged and blunt - 15.2%, overpassed - 6.1%.

Level Gc1-Gc2 has the following type representation: feathering - 61%, blunt - 29.9%, overpassed - 6.5% and hinged - 2.6%.

Level Gb1-Gb2 has the following type representation: feathering - 46.4%, hinged - 28.6%, blunt - 14.3% and overpassed - 10.7%.

Level Ga has the following type representation: feathering - 60%, hinged and blunt - 20% each.

A feathering profile type of the distal end is the most common for blades in all four levels of Unit G, with very similar percentages in levels Gd, Gc1-Gc2 and Ga – 60%-63.5%, while a little less than 50% in level Gb1-Gb2. There are some fluctuations for "not regular" types (hinged and overpassed) – from a minimal representation for level Gc1-Gc2 (9.1%) to a moderate number for levels Ga (20%) and Gd (21.3%) and to a significant quantity in level Gb1-Gb2 (39.3%).

Profiles at Midpoint. Data for this analysis are recorded on all 81 blades from level Gd, from 181 definable blades from level Gc1-Gc2, from 61 from level Gb1-Gb2 and from all 13 blades from level Ga (see tabl. 19).

Level Gd shows the following variety of types: triangular - 35.9%, trapezoidal - 33.3%, multifaceted - 24.7%, irregular - 4.9% and lateral steep - 1.2%.

Level Gc1-Gc2 shows the following variety of types: trapezoidal - 40.3%, triangular - 32.6%, multifaceted - 21%, lateral steep - 4.4% and crescent - 1.7%.

Level Gb1-Gb2 shows the following variety of types: trapezoidal - 39.3%, triangular - 34.4%, multifaceted - 23% and irregular - 3.3%.

Level Ga shows the following variety of types: trapezoidal - 53.8%, multifaceted and triangular - 23.1% each.

These data show the absolute dominance of three types (triangular, trapezoidal and multifaceted) – 93.9%-100% with, at the

Level Gd	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering	1	3	21	25 / 59.5%
hinged	1		5	6 / 14.3%
overpassed		2	2	4 / 9.5%
blunt	1	1	5	7 / 16.7%
unidentifiable	11	7	48	66
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering	9	10	47	66 / 56.9%
hinged		3	2	5 / 4.3%
overpassed			5	5 / 4.3%
blunt	5	12	23	40 / 34.5%
unidentifiable	32	6	105	143
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering	1	1	13	15 / 46.9%
hinged		1	8	9 / 28.1%
overpassed			3	3 / 9.4%
blunt		1	4	5 / 15.6%
unidentifiable	9	8	35	52
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering		1	3	4 / 50.0%
hinged	1		1	2 / 25.0%
overpassed				
blunt	1		1	2 / 25.0%
unidentifiable	4		8	12
N	6	1	13	20

Table 18 - Siuren-I. Unit G. Blade Profiles at Distal End as Percentages of Each Type.

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
flat				
triangular	5	9	29	43 / 40.2%
trapezoidal	6	2	27	35 / 32.7%
multifaceted	3	1	20	24 / 22.4%
lateral steep			1	1 / 1.0%
crescent				
irregular			4	4 / 3.7%
unidentifiable		1		1
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat				
triangular	13	12	59	84 / 32.5%
trapezoidal	16	2	73	91 / 35.3%
multifaceted	16	4	38	58 / 22.5%
lateral steep		13	8	21 / 8.1%
crescent			3	3 / 1.2%
irregular	1			1 / 0.4%
unidentifiable			1	1
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat				
triangular	2	3	21	26 / 32.5%
trapezoidal	4		24	28 / 35.0%
multifaceted	3		14	17 / 21.3%
lateral steep		7		7 / 8.7%
crescent				
irregular			2	2 / 2.5%
unidentifiable	1	1	2	4
N	10	11	63	84
Level Ga	**blades-tools**	**blades-c.pr.**	**blades-debitage**	**Blades Total**
flat				
triangular	2		3	5 / 25.0%
trapezoidal	2	1	7	10 / 50.0%
multifaceted	1		3	4 / 20.0%
lateral steep				
crescent				
irregular	1			1 / 5.0%
unidentifiable				
N	6	1	13	20

Table 19 - Siuren-I. Unit G. Blade Profiles at Midpoint as Percentages of Each Type.

same time, the extreme rarity of the irregular type – 0%-4.9%. Moreover, such characteristic types of reduction as trapezoidal and multifaceted make up together 58%-62.3% for levels Gd, Gc1-Gc2 and Gb1-Gb2 and even 76.9% for level Ga with a very stable index of the multifaceted type alone for all four levels – 21%-24.7%.

Butt Types. This analysis is based on 42 blade butts from level Gd, 93 from level Gc1-Gc2, 28 from level Gb1-Gb2 and only 2 from level Ga (see tabl. 20).

Butts of level Gd are as follows: plain - 7.1%, punctiform - 33.3%, linear - 38.1%, dihedral - 4.8%, finely-faceted - 2.4% and crushed - 14.3%. Butts of level Gc1-Gc2 are as follows: plain - 34.4%, punctiform - 5.4%, linear - 37.6%, cortical - 2.2%, dihedral - 5.4%, crudely-faceted and finely-faceted - 1.1% each, crushed - 12.8%. Butts of level Gb1-Gb2 are as follows: plain - 21.4%, punctiform - 35.7%, linear - 17.9%, dihedral - 7.1% and crushed - 17.9%. Two butts of level Ga are punctiform and dihedral.

The "plain-punctiform-linear" group of butt types reaches three-quarters of all types in levels Gd, Gc1-Gc2 and Gb1-Gb2 – 75%-78.5%. Crushed butts comprise only 12.8%-17.9% for levels Gd, Gc1-Gc2 and Gb1-Gb2. Dihedral, crudely-faceted and finely-faceted types are poorly represented and do not exceed 10% together, while a few cortical butts are only noted as an exception in level Gc1-Gc2.

Lipping. There are 28 butts suitable for lipping identification from level Gd, 82 from level Gc1-Gc2, 19 from level Gb1-Gb2 and just one from level Ga (see tabl. 21).

Butts of level Gd have the following lipping characteristics: semi-lipped - 85.7%, lipped - 14.3% and no one not lipped. Butts of level Gc1-Gc2 have the following lipping characteristics: semi-lipped - 84.2%, lipped - 14.6% and not lipped - 1.2%. Butts of level Gb1-Gb2 have the following lipping characteristics: semi-lipped - 94.7%, lipped - 5.3% and no one not lipped.

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
cortical				
plain	1	3	3	7 / 13.2%
punctiform	2		14	16 / 30.2%
linear	1	2	16	19 / 35.8%
dihedral			2	2 / 3.8%
crudly-faceted				
finely-faceted			1	1 / 1.9%
crushed		2	6	8 / 15.1%
missing	10	6	39	55
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical			2	2 / 1.5%
plain	10	4	32	46 / 33.7%
punctiform	1	2	5	8 / 5.8%
linear	6	3	35	44 / 32.1%
dihedral			5	5 / 3.6%
crudly-faceted			1	1 / 0.7%
finely-faceted	2		1	3 / 2.2%
crushed	7	9	12	28 / 20.4%
missing	20	13	89	122
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical		1		1 / 2.6%
plain	1	1	6	8 / 20.5%
punctiform	1	1	10	12 / 30.7%
linear			5	5 / 12.8%
dihedral		1	2	3 / 7.7%
crudly-faceted				
finely-faceted		1		1 / 2.6%
crushed	3	1	5	9 / 23.1%
missing	5	5	35	45
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
plain				
punctiform	1		1	2 / 33.3%
linear		1		1 / 16.6%
dihedral	1		1	2 / 33.3%
crudly-faceted				
finely-faceted				
crushed	1			1 / 16.6%
missing	3		11	14
N	6	1	13	20

Table 20 - Siuren-I. Unit G. Blade Butt Types as Percentages of Each Type.

The single definable butt of level Ga is semi-lipped.

Thus, a majority of butts are semi-lipped – 84.2%-94.7%. The remaining butts are lipped, as not lipped butts in level Gc1-Gc2 are represented by only a single piece.

Butt Angle. There are 28 butts suitable for angle identification from level Gd, 81 butts from level Gc1-Gc2, 19 from level Gb1-Gb2 and just one definable butt from level Ga (see tabl. 22).

Butts of level Gd have the following angles: semi-acute - 75%, acute - 14.3% and right - 10.7%. Butts of level Gc1-Gc2 have the following angles: semi-acute - 75.3%, acute - 16.1% and right - 8.6%. Butts of level Gb1-Gb2 have the following angles: semi-acute - 94.7%, acute - 5.3% and no right.

The single definable butt of level Ga has a semi-acute angle.

There is a significant dominance of blade butts with semi-acute angle – about three –quarters for levels Gd and Gc1-Gc2 and even more for level Gb1-Gb2 – 94.7%. There is also a clear prevalence of acute angle over right angle in level Gd (correlation 1.3:1) and in level Gc1-Gc2 (correlation 1.9:1) with no butts with right angle in level Gb1-Gb2.

Butt Abrasion. Identifiable blade butts to record presence/absence of abrasion identification in the four levels of Unit G number 33 from level Gd, 96 from level Gc1-Gc2, 22 from level Gb1-Gb2 and only 2 from level Ga (see tabl. 23). Butts of level Gd have the following abrasion identification: present - 93.9% and absent - 6.1%. Butts of level Gc1-Gc2 have the

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
lipped			4	4 / 10.8%
semi-lipped	4	5	24	33 / 89.2%
not lipped				
unidentifiable	10	8	53	71
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped	3		12	15 / 13.9%
semi-lipped	16	7	69	92 / 85.2%
not lipped			1	1 / 0.9%
unidentifiable	27	24	100	151
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped			1	1 / 4.0%
semi-lipped	2	3	18	23 / 92.0%
not lipped		1		1 / 4.0%
unidentifiable	8	7	44	59
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped				
semi-lipped	2		1	3 / 100%
not lipped				
unidentifiable	4	1	12	17
N	6		13	20

Table 21 - Siuren-I. Unit G. Blade Butt Lipping as Percentages of Each Type.

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
right			3	3 / 8.1%
semi-acute	4	5	21	30 / 81.1%
acute			4	4 / 10.8%
unidentifiable	10	8	53	71
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
right	3		7	10 / 9.3%
semi-acute	14	7	61	82 / 76.7%
acute	2		13	15 / 14.0%
unidentifiable	27	24	101	152
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
right		1		1 / 4.0%
semi-acute	2	3	18	23 / 92.0%
acute			1	1 / 4.0%
unidentifiable	8	7	44	59
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
right				
semi-acute	2		1	3 / 100.0%
acute				
unidentifiable	4	1	12	17
N	6	1	13	20

Table 22 - Siuren-I. Unit G. Blade Butt Angles as Percentages of Each Type.

following abrasion identification: present - 83.3% and absent - 16.7%. Butts of level Gb1-Gb2 have the following abrasion identification: present - 95.5% and absent - 4.5%. Two definable butts of level Ga have abrasion.

There is a common majority of abrasion for blade butts for levels Gd and Gb1-Gb2 (93.9%-95.5%) and about 10% less dominant in level Gc1-Gc2 (83.3%). Blade butts with no abrasion are represented by 1-2 examples in levels Gd and Gb1-Gb2, and 16 examples in level Gc1-Gc2 in actual numbers (not percentage).

Metrics (Length, Width, Thickness) of Blades. Metric data are mainly based on the analysis of complete blades from each level, with

Level Gd	blades-tools	blades-CMP	blades-debitage	Blades Total
present	3	4	31	38 / 92.7%
absent		1	2	4 / 7.3%
unidentifiable	11	8	48	67
N	14	13	81	108
Level Gc1-Gc2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
present	18	5	80	103 / 83.1%
absent	1	4	16	21 / 16.9%
unidentifiable	27	22	86	135
N	46	31	182	259
Level Gb1-Gb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
present	3	3	21	27 / 90.0%
absent		2	1	3 / 10.0%
unidentifiable	7	6	41	54
N	10	11	63	84
Level Ga	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
present	2	1	2	5 / 100.0%
absent				
unidentifiable	4		11	15
N	6	1	13	20

Table 23 - Siuren-I. Unit G. Blade Butt Abrasion as Percentages of Each Type.

some additional comparable information also obtained when possible from broken blades.

Length. Level Gd. There are three clusters of 16 complete blades in terms of length intervals: the first is 2.1-4.0 cm – 43.7%, the second is 4.6-6.0 cm – 43.8% and the third is 6.6-7.0 cm – 12.5% with "metric gaps" at 4.1-4.5 cm and 6.1-6.5 cm with no blade presence, as well as no presence of complete blades with length more than 7 cm. Mean length of complete blades is 4.5 cm. For 65 broken blades, 72.4% are in the interval 1.1-3.0 cm and none is longer than 7 cm.

Level Gc1-Gc2. There are three characteristic clusters of 34 complete blades in terms of length intervals: the first is 2.1-5.0 cm – 85.4%, the second is 5.1-6.0 cm – 8.8% and the third is 6.1-7.0 cm – 5.8%. No complete blade has a length of more than 7 cm. Mean length of complete blades is 4.1 cm. 66.9% of 148 broken blades are in the interval 1.1-3.0 cm and no broken blade is longer than 7 cm.

Level Gb1-Gb2. There are two clusters of complete 13 blades in terms of their length intervals: the first is 2.6-5.0 cm – 84.6% and the second is > 6.1 cm – 15.4% (2 pieces – 6.1-7.0 cm and another piece 7.6 cm long). Mean length of complete blades is 4.3 cm. 72% of 50 broken blades are in the interval 1.1-3.0 cm and no broken blade is longer than 5 cm.

Level Ga. Because of the absence of complete blades, only data on 13 broken blades was recorded. 76.9% have length in the interval 1.1-3.0 cm. No broken blade is longer than 5 cm.

Blade length for all four levels is quite similar. The average length of blades is from 4.1 to 4.5 cm. No complete blade is longer than 7 cm in levels Gd and Gc1-Gc2, and there is just a single longer complete blade (7.6 cm) in level Gb1-Gb2. Thus, blades are generally not long, but rather "medium" in length.

Width. The following width distribution of complete blades is observed for levels Gd, Gc1-Gc2 and Gb1-Gb2: 1.2-1.5 cm - 68.8% for level Gd, 53% for level Gc1-Gc2 and 61.5% for level Gb1-Gb2; 1.6-2.0 cm - 31.2% for level Gd, 35.3% for level Gc1-Gc2 and 30.8% for level Gb1-Gb2; 2.1-2.5 cm - none for level Gd, 8.8% for level Gc1-Gc2 and 7.7% for level Gb1-Gb2, > 2.5 cm - just a single piece (2.9%) in level Gc1-Gc2. Mean widths for complete blades are as follows: 1.4 cm for level Gd, 1.6 cm for level Gc1-Gc2 and 1.5 cm for level Gb1-Gb2.

Width of broken blades for all four levels is similar to complete blades, but with a somewhat higher frequency of wider specimens: 1.2-1.5 cm - 55.4% for level Gd, 52.1% for level Gc1-Gc2, 58% for level Gb1-Gb2 and 53.9% for level Ga; 1.6-2.0 cm - 35.4% for level Gd, 31.8% for level Gc1-Gc2, 26% for level Gb1-Gb2 and 46.1% for level Ga; 2.1-2.5 cm - 7.7% for level Gd, 10.8% for level Gc1-Gc2, 14% for level Gb1-Gb2 and none for level Ga; > 2.5 cm - 1.5% (a single piece with width 3.0 cm) for level Gd, 5.3% (6 pieces with the largest width of 3.1 cm) for level Gc1-Gc2, 2% (a single piece with width 3.8cm) for level Gb1-Gb2 and none for level Ga. Mean widths for broken blades are as follows: 1.6 cm for levels Gd, Gc1-Gc2 and Gb1-Gb2, and 1.5 cm for level Ga.

Overall, width data for all complete and broken blades together for levels Gd, Gc1-Gc2 and Gb1-Gb2 are as follows: 1.2-1.5 cm - 58% for level Gd, 52.3% for level Gc1-Gc2 and 58.7% for level Gb1-Gb2; 1.6-2.0 cm - 34.6% for level Gd, 32.4% for level Gc1-Gc2 and 27% for level Gb1-Gb2; 2.1-2.5 cm - 6.2% for level Gd, 10.4% for level Gc1-Gc2 and 12.7% for level Gb1-Gb2; > 2.5 cm - 1.2% for level Gd, 4.9% for level Gc1-Gc2 and 1.6% for level Gb1-Gb2. Mean widths are as follows: 1.5 cm for level Gd and 1.6 cm for both levels Gc1-Gc2 and Gb1-Gb2.

In sum, there is a dominance of quite narrow blades with width 1.2-1.5 cm (52.3%-58.7%) in all four levels of Unit G, while blades with width more than 2.5 cm width are rare exceptions

(<5%). Mean widths of 1.5-1.6 cm clearly confirm these conclusions.

Thickness. These data are also given separately for complete and broken blades and then for all blades from levels Gd, Gc1-Gc2 and Gb1-Gb2, and only on the set of broken blades from level Ga.

Complete blades have the following mean thickness: 0.4 cm for level Gd, 0.3 cm for level Gc1-Gc2 and 0.5 cm for level Gb1-Gb2. Broken blades have the following mean thicknesses: 0.4 cm for levels Gd, Gc1-Gc2 and Gb1-Gb2, and 0.3 cm for level Ga. Together, all blades from levels Gd, Gc1-Gc2 and Gb1-Gb2 have mean thickness of 0.4 cm. Based on mean thickness, the most common thickness interval is 0.1-0.5 cm - 76.9% for complete and 86% for broken blades in level Gd, 91.2% for complete and 89.9% for broken blades in level Gc1-Gc2, 87.5% for complete and 89.2% for broken blades in level Gb1-Gb2 and 100% for broken blades only in level Ga. All but 4% (only 2 pieces with thickness 1.1 and 1.3 cm) for the interval 1.1-1.5 cm in level Gd, other complete and broken blades from levels Gd, Gc1-Gc2 and Gb1-Gb2 have thickness in the interval 0.6-1.0 cm.

In sum, then, blades are rather thin in all four levels of Unit G.

Butt Sizes. Average metric data for blade butts are similar for levels Gd, Gc1-Gc2 and Gb1-Gb2. They are as follows for butt width: 0.6 cm for level Gd (22 butts) and 0.5 cm for both levels Gc1-Gc2 (77 butts) and Gb1-Gb2 (13 butts). They are as follows for butt height: 0.1 cm for level Gd and 0.2 cm for both levels Gc1-Gc2 and Gb1-Gb2. Plain butts have widths of 0.7 cm for level Gd (3 butts), 0.6 cm for level Gc1-Gc2 (32 butts) and 0.5 cm for level Gb1-Gb2 (6 butts) and have heights of 0.3 cm for both levels Gd and Gc1-Gc2, and 0.2 cm for level Gb1-Gb2. A single butt (a dihedral one) from level Ga has width 0.9 cm and height 0.4 cm.

Thus, the blades of the four levels of Unit G can be generally characterized by:

- a clear dominance of unidirectional scar pattern (76%-93.9%) in levels Gd, Gc1-Gc2 and Gb1-Gb2 and 100% in level Ga, while the 3-5 other scar pattern types do not show any regularity in their small representation;

- a significant prevalence of non-cortical pieces (68.1%-84.6%) over partially cortical pieces with no real representation of wholly cortical pieces, as well as dominance of lateral cortex for partially cortical pieces which, at the same time, have very different cortex areas in each level of Unit G;

- a presence of two clusters of blade samples based on shape and axis: 1) an association of an insignificant dominance of parallel and converging shape types (50%-59% together) and prevalence of "off-axis" removal direction (65%-75%) in levels Gd, Gb1-Gb2 and Ga; and 2) an association of a great dominance of parallel and converging shape types (71.4% together) and an absolute majority of "on-axis" removal direction (92.8%) in level Gc1-Gc2;

- a "rough equality" of twisted and "regular" (flat, incurvate medial and incurvate distal) types of general profiles which is seen in some minor prevalence of one type(s) over another type(s) in each of the four levels;

- a dominance of feathering distal ends (60%-63.5% in levels Gd, Gc1-Gc2 and Ga and only 46.4% in level Gb1-Gb2) and a very different representation of "not regular" (hinged and overpassed) types in all four levels – 9.1%-39.3%;

- a dominance of trapezoidal and multifaceted types of profiles at midpoint (58%-62.3% in levels Gd, Gc1-Gc2 and Gb1-Gb2, and even 76.9% in level Ga) which with the addition of triangular type make up 93.9%-100% of all levels;

- a dominance of the "plain-punctiform-linear" group of butt types (75%-78.5% in levels Gd, Gc1-Gc2 and Gb1-Gb2), while other butt types are poorly represented;

- a great dominance of semi-lipped butts (84.2%-94.7%) with mainly semi-acute angle (75%-94.7%) and some right angle (8.6%-10.7%), a low number of lipped butts (5.3%-14.6%) with acute angle (5.3%-16.1%) and actual absence of not lipped butts (a single example in level Gc1-Gc2 is an exception);

- a characteristic presence of nearly all butts with abrasion in levels Gd and Gb1-Gb2 (93.9%-95.5%) and a dominance in level Gc1-Gc2 (83.3%);

- a dominance of "medium length" (mean range 4.1-4.5 cm), narrow width (mean range 1.5-1.6 cm) and overall thin (0.4 cm for thickness);

- a stable dominance of gray flints in the three representative levels (Gd – 49 pieces/60.5%; Gc1-Gc2 – 115 pieces/63.2%; Gb1-Gb2 – 38 pieces/60.3%) with lower occurrence in level Ga (7 pieces/53.8%), again a stable but moderate number of colored flints in all four levels (Gd – 29 pieces/35.8%; Gc1-Gc2 – 67 pieces/36.8%; Gb1-Gb2 – 23 pieces/36.5%, Ga - 5 pieces/38.5%), and, finally, a couple of black flints with a notable complete absence in the most abundant blade sample in level Gc1-Gc2 (Gd – 3 pieces/3.7%; Gb1-Gb2 – 2 pieces/3.2%, Ga – 1 piece/7.7%).

Bladelets

In terms of their condition, bladelets from the four levels of Unit G are subdivided into complete and broken pieces, with further distribution of the latter into proximal, medial and distal.

88 bladelets of level Gd consist of 14 complete pieces (15.9%) and 74 broken pieces (84.1%) – 31 proximal (35.3%), 23 medial (26.1%) and 20 distal (22.7%).

266 bladelets of level Gc1-Gc2 consist of 31 complete pieces (11.7%) and 235 broken pieces (88.3%) – 107 proximal (40.1%), 89 medial (33.5%) and 39 distal (14.7%).

101 bladelets of level Gb1-Gb2 consist of 17 complete pieces (16.8%) and 84 broken pieces (83.2%) – 39 proximal (38.7%), 29 medial (28.7%) and 16 distal (15.8%).

14 bladelets of level Ga consist of only broken pieces (100%) – 6 proximal (42.9%), 6 medial (42.9%) and 2 distal (14.2%).

Dorsal Scar Pattern. Four scar pattern types are identified on 87 definable bladelets from level Gd, three on all 266 bladelets from level Gc1-Gc2, four on all 101 bladelets from level Gb1-Gb2 and only two on all 14 bladelets from level Ga (see tabl. 24).

Separately, bladelets from each level have the following scar pattern type representation.

Bladelets of level Gd: unidirectional - 79.4%, unidirectional-crossed - 16.1%, bidirectional - 3.4% and cortical - 1.1%.

Bladelets of level Gc1-Gc2: unidirectional - 94.7%, bidirectional - 3% and unidirectional-crossed - 2.3%.

Level Gd	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical			1	1 / 1.0%
dorsal-plain		1		1 / 1.0%
lateral				
crested				
unidirectional	15		69	84 / 81.5%
unidirectional-crossed			14	14 / 13.6%
bidirectional			3	3 / 2.9%
3-directional				
centripetal				
core tablet				
unidentifiable	1	1	1	3
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical		2		2 / 0.6%
dorsal-plain		2		2 / 0.6%
lateral				
crested		2		2 / 0.6%
unidirectional	45	5	252	302 / 93.8%
unidirectional-crossed			6	6 / 1.9%
bidirectional			8	8 / 2.5%
3-directional				
centripetal				
core tablet				
unidentifiable	1	2		3
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical			1	1 / 0.9%
dorsal-plain				
lateral				
crested		1		1 / 0.9%
unidirectional	11		89	100 / 87.0%
unidirectional-crossed			8	8 / 6.9%
bidirectional	1	1	3	5 / 4.3%
3-directional				
centripetal				
core tablet				
unidentifiable	1			1
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
dorsal-plain				
lateral				
crested				
unidirectional	2	1	12	15 / 78.9%
unidirectional-crossed	1			1 / 5.3%
bidirectional	1		2	3 / 15.8%
3-directional				
centripetal				
core tablet				
unidentifiable				
N	4	1	14	19

Table 24 - Siuren-I. Unit G. Bladelet Dorsal Scar Patterns as Percentages of Each Type.

Level Gd	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel	3	1	14	18 / 45.0%
converging	1		10	11 / 27.5%
expanding			4	4 / 10.0%
ovoid				
irregular	1	1	5	7 / 17.5%
unidentifiable	11		55	66
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel	3	2	28	33 / 41.8%
converging	1	2	28	31 / 39.2%
expanding		1	2	3 / 3.8%
ovoid			8	8 / 10.1%
irregular		2	2	4 / 5.1%
unidentifiable	42	6	198	246
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel	4		23	27 / 67.5%
converging		1	4	5 / 12.5%
expanding	2		4	6 / 15.0%
ovoid				
irregular			2	2 / 5.0%
unidentifiable	7	1	68	76
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel	1		2	3 / 75.0%
converging	1			1 / 25.0%
expanding				
ovoid				
irregular				
unidentifiable	2	1	12	15
N	4	1	14	19

Table 25 - Siuren-I. Unit G. Bladelet Shapes as Percentages of Each Type.

Bladelets of level Gb1-Gb2: unidirectional - 88.1%, unidirectional-crossed - 7.9%, bidirectional - 3% and cortical - 1%.

Bladelets of level Ga: unidirectional - 85.7% and bidirectional - 14.3%.

Thus, there is a clear dominance of unidirectional scar pattern for bladelets, a minor role for unidirectional-crossed and bidirectional scar patterns, while cortical scar pattern is quite rare, represented only by single pieces in levels Gd and Gb1-Gb2.

Comparison of scar pattern types with presence/absence of cortex on bladelets has revealed a specific feature. Bladelets with unidirectional scar pattern have cortex in a quite stable moderate quantity: 14.5% in level Gd, 10.7% in level Gc1-Gc2, 12.4% in level Gb1-Gb2 and 16.7% in level Ga. On the other hand, rarely represented scar pattern types for bladelets have cortex only on single pieces in the following levels: one of 14 unidirectional-crossed (7.1%) in level Gd; one of 6 unidirectional-crossed (16.7%) and one of 8 bidirectional (12.5%) in level Gc1-Gc2 and one of 3 bidirectional (33.3%) in level Gb1-Gb2. By this feature, bladelets from the three levels of Unit G are highly similar to bladelets in Unit H, with regular and continuous unidirectional reduction of bladelet cores, while non-unidirectional bladelets are result of re-preparation of bladelet core flaking surfaces.

Surface Cortex Area and Location. All bladelets were used from each level of Unit G to record surface cortex area. Non-cortical bladelets comprise more than four-fifths of all bladelets: 86.4% in level Gd, 89.1% in level Gc1-Gc2, 84.1% in level Gb1-Gb2 and 85.7% in level Ga. Wholly cortical bladelets account for just a few specimens in levels Gd (1.1%/1 broken piece) and Gb1-Gb2 (4%/2 complete and 2 broken pieces) and none in levels Gc1-Gc2 and Ga. Accordingly, partially cortical bladelets have the following percentages: 12.5% in level Gd, 10.9% in level Gc1-Gc2, 11.9% in level Gb1-Gb2 and 14.3% in level Ga. Taking complete bladelets separately, these have the following cortex data: level Gd (14 pieces) – non-cortical - 78.6% and partially cortical - 21.4%; level Gc1-Gc2 (31 pieces) – non-cortical - 83.8% and partially cortical - 16.2%; level Gb1-Gb2 (17 pieces) – non-cortical - 70.5%, partially cortical - 17.7% and cortical - 11.8%. Level Ga does not contain any complete bladelets. Complete partially cortical bladelets also demonstrate an internal subdivision into pieces with significant amount of cortex – none in level Gd, 60% (3 pieces) in level Gc1-Gc2 and 66.6% (2 pieces) in level Gb1-Gb2, and pieces with insignificant cortex – 100% (3 pieces) in level Gd, 40% (2 pieces) in level Gc1-Gc2 and 33.3% (1 piece) in level Gb1-Gb2.

The following data on surface cortex location identification for complete partially cortical bladelets are obtained: distal cortex – 66.6% (2 pieces) in level Gd, 40% (2 pieces) in level Gc1-

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
on-axis	13	1	75	89 / 90.8%
off-axis		1	8	9 / 9.2%
unidentifiable	3		5	8
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis	35	2	215	252 / 89.7%
off-axis	1	5	23	29 / 10.3%
unidentifiable	10	6	28	44
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis	10		91	101 / 96.2%
off-axis	1	1	2	4 / 3.8%
unidentifiable	2	1	8	11
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis	4		13	17 / 94.4%
off-axis			1	1 / 5.6%
unidentifiable		1		1
N	4	1	14	19

Table 26 - Siuren-I. Unit G. Bladelet Axis as Percentages of Each Type.

Gc2 and 33.3% (1 piece) in level Gb1-Gb2, and lateral cortex – 33.3% (1 piece) in level Gd, 60% (3 pieces) in level Gc1-Gc2 and 66.6% (2 pieces) in level Gb1-Gb2.

The data on surface cortex area and location on complete partially cortical bladelets are based, however, upon too few pieces and, therefore, they serve only as suggestive without being significant.

Shape. 33 bladelets with definable shapes from level Gd, 68 bladelets from level Gc1-Gc2, 33 from level Gb1-Gb2 and just 2 from level Ga were used to record shape (see tabl. 25).

Bladelets of level Gd are characterized by the following shape types: parallel - 42.4%, converging - 30.3%, irregular - 15.2% and expanding - 12.1%.

Bladelets of level Gc1-Gc2 are characterized by the following shape types: parallel and converging - 41.2% each, ovoid - 11.8%, expanding and irregular - 2.9% each.

Bladelets of level Gb1-Gb2 are characterized by the following shape types: parallel - 69.7%, converging and expanding - 12.1% each, irregular - 6.1%.

Two bladelets of level Ga have parallel shape.

So, there is a common dominance of parallel shape for bladelets – 41.2%-69.7%-100%. Moreover, parallel and converging shape types together consist of about three-quarters of all shape types – 72.7%-81.8% for levels Gd, Gc1-Gc2 and Gb1-Gb2. It is worth noting the minor presence of both irregular and expanding shape types.

Axis. 83 bladelets with definable axis of removal directions from level Gd, 238 from level Gc1-Gc2, 93 from level Gb1-Gb2 and all 14 bladelets from level Ga were used to record axis of removal direction (see tabl. 26).

There is an clear and absolute dominance of "on-axis" type for bladelets from all four levels of Unit G: 90.4% for level Gd, 90.3% for level Gc1-Gc2, 97.8% for level Gb1-Gb2 and 92.9% for level Ga. Accordingly, "off-axis" type accounts for less than 10% of bladelets in any level of Unit G: 9.6% for level Gd, 9.7% for level Gc1-Gc2, 2.2% for level Gb1-Gb2 and 7.1% for level Ga.

Such characteristic "on-axis" removal direction for bladelets is in good correspondence to the observed dominance of parallel and converging shape types for bladelets.

General Profiles of Bladelets. These data are based on separate analysis of all definable bladelets and only complete bladelets (see tabl. 27).

Level Gd. There are 78 definable bladelets with the following general profile types: twisted - 59%, incurvate medial - 25.6%, flat - 9%, incurvate distal - 3.8% and convex - 2.6%. For 14 complete bladelets: 64.2% of twisted type, 12.5% of incurvate medial and incurvate distal types each, 6.3% of flat type.

Level Gc1-Gc2. There are 247 definable bladelets with the following general profile types: twisted - 54.7%, incurvate medial - 26.7%, flat - 15.4%, incurvate distal - 2.4% and convex - 0.8%. For 31 complete bladelets: 54.8% of twisted type, 38.7% of incurvate medial type and 6.5% of flat type.

Level Gb1-Gb2. There are 93 definable bladelets with the following general profile types: twisted - 67.6%, incurvate medial - 19.4%, flat - 10.8% and incurvate distal - 2.2%. For 17 complete bladelets: 70.6% of twisted type, 23.5% of incurvate medial type and 5.9% of flat type.

Level Ga. There are 14 definable broken bladelets with such general profile types: twisted - 42.8%, incurvate medial and flat - 28.6% each, while there are no complete bladelets.

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
flat	3		7	10 / 10.9%
incurvate medial	6		20	26 / 28.3%
incurvate distal			3	3 / 3.3%
convex		1	2	3 / 3.3%
twisted	4		46	50 / 54.2%
unidentifiable	3	1	10	14
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat	6	3	38	47 / 15.8%
incurvate medial	9	2	66	77 / 25.9%
incurvate distal			6	6 / 2.0%
convex			2	2 / 0.7%
twisted	25	5	135	165 / 55.6%
unidentifiable	6	3	19	28
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat	3		10	13 / 12.4%
incurvate medial	3		18	21 / 20.0%
incurvate distal			2	2 / 1.9%
convex				
twisted	5	1	63	69 / 65.7%
unidentifiable	2	1	8	11
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat	2		4	6 / 31.6%
incurvate medial	1		4	5 / 26.3%
incurvate distal				
convex				
twisted	1	1	6	8 / 42.1%
unidentifiable				
N	4	1	14	19

Table 27 - Siuren-I. Unit G. Bladelet General Profiles as Percentages of Each Type.

These data show the dominance of twisted type over "regular" (flat, incurvate medial and incurvate distal) types of general bladelet profile, which is more evident for the samples of complete bladelets in levels Gd, Gc1-Gc2 and Gb1-Gb2 – reaching about 70% in levels Gd and Gb1-Gb2.

Profiles at Distal End. Data for such analyses were based on 34 definable bladelets from level Gd, 69 from level Gc1-Gc2, 33 from level Gb1-Gb2 and only 2 from level Ga (see tabl. 28).

There is a common dominance of feathering type – 70.6% for level Gd, 68.2% for level Gc1-Gc2, 60.6% for level Gb1-Gb2 and 100% for level Ga. There is also a stable moderate number of blunt type – 20.6% for level Gd, 15.9% for level Gc1-Gc2 and 21.2% for level Gb1-Gb2. Hinged (2.9% for level Gd, 15.9% for level Gc1-Gc2 and 18.2% for level Gb1-Gb2) and overpassed (5.9% for level Gd, none for the most representative levels Gc1-Gc2 and Gb1-Gb2) show some significant fluctuations and even together these two "not regular" types do not reach 20% of all types.

Profiles at Midpoint. Data for this analysis were recorded on 87 bladelets from level Gd, all 266 bladelets from level Gc1-Gc2, 98 bladelets from level Gb1-Gb2 and from all 14 bladelets from level Ga (see tabl. 29).

Level Gd shows the following variety of types: triangular - 41.5%, trapezoidal - 33.3%, multifaceted - 20.7%, lateral steep - 3.4% and crescent - 1.1%.

Level Gc1-Gc2 shows the following variety of types: triangular - 45.9%, trapezoidal 40.2%, multifaceted - 10.9%, lateral steep - 2.6% and flat - 0.4%.

Level Gb1-Gb2 shows the following variety of types: trapezoidal - 48%, triangular - 41.8%, multifaceted - 8.2% and lateral steep - 2%.

Level Ga shows the following variety of types: triangular - 57.2%, trapezoidal - 28.6%, multifaceted and lateral steep - 7.1% each.

These data show an absolute dominance of three types (triangular, trapezoidal and multifaceted) – 92.9%-98%. Other types are either poorly represented or do not occur at all. Among the missing ones is the especially notable absence of any pieces with irregular type of profile at midpoint. There is a slight dominance of trapezoidal and multifaceted types (51.1%-58.9%) over triangular type (41.5%-45.9%) in levels Gd, Gc1-Gc2 and Gb1-Gb2, while there is a reverse dominance of triangular type (57.2%) over trapezoidal and multifaceted types (35.7%) in level Ga.

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
feathering	3	1	24	28 / 68.3%
hinged	1	1	1	3 / 7.3%
overpassed			2	2 / 4.9%
blunt	1		7	8 / 19.5%
unidentifiable	11		54	65
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering	3	7	47	57 / 70.4%
hinged			11	11 / 13.6%
overpassed				
blunt		2	11	13 / 16.0%
unidentifiable	43	4	197	244
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering	2	1	20	23 / 57.5%
hinged			6	6 / 15.0%
overpassed				
blunt	4		7	11 / 27.5%
unidentifiable	7	1	68	76
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering			2	2 / 66.7%
hinged				
overpassed				
blunt	1			1 / 33.3%
unidentifiable	3	1	12	16
N	4	1	14	19

Table 28 - Siuren-I. Unit G. Profiles at Distal End as Percentages of Each Type.

Butt Types. This analysis is based on 45 bladelet butts from level Gd, 139 from level Gc1-Gc2, 56 from level Gb1-Gb2 and just 6 from level Ga (see tabl. 30).

Butts of level Gd are as follows: linear - 51.1%, plain - 28.9%, punctiform – 11.1% and crushed - 8.9%.

Butts of level Gc1-Gc2 are as follows: linear - 56.9%, plain - 7.9%, punctiform - 5%, dihedral - 3.6%, cortical - 0.7% and crushed - 25.9%.

Butts of level Gb1-Gb2 are as follows: linear - 37.4%, plain - 28.6%, punctiform - 12.5%, crudely-faceted, finely-faceted and cortical - 1.8% each, and crushed - 16.1%.

Butts of level Ga are as follows: plain - 50%, linear - 33.3% and crushed - 16.7%.

There is a clear prevalence of the "plain-punctiform-linear" group of butt types (69.8%-91.1%) over other types. It is worth noting a stable internal subdivision of this group for levels Gd, Gc1-Gc2 and Gb1-Gb2 where there is a dominance of linear type (reaching up even somewhat more than 50% in levels Gd and Gc1-Gc2) and prevalence of plain over punctiform. On the other hand, the presence of cortical type in level Gc1-Gc2 and cortical, crudely-faceted and finely-faceted types in level Gb1-Gb2 should be considered as insignificant and rather occasional as they are represented in these two levels by only a single piece each. Differing data on level Ga should be regarded as insignificant due to the presence of only a few identifiable butts.

Lipping. There are 39 butts suitable for lipping identification from level Gd, 103 from level Gc1-Gc2, 48 from level Gb1-Gb2 and just 5 butts from level Ga (see tabl. 31).

Butts of level Gd have the following lipping characteristics: semi-lipped - 82.1% and lipped - 17.9%.

Butts of level Gc1-Gc2 have the following lipping characteristics: semi-lipped - 68.9%, lipped - 30.1% and not lipped - 1%.

Butts of level Gb1-Gb2 have the following lipping characteristics: semi-lipped - 89.6%, lipped - 8.3% and not lipped - 2.1%.

All 5 bladelets' butts of level Ga are semi-lipped.

Thus, there are in reality only semi-lipped and lipped bladelets' butts with varying degrees of dominance of the former, while not lipped type is extremely rare as it is represented by a single piece in both levels Gc1-Gc2 and Gb1-Gb2.

Butt Angle. There are 41 butts suitable for angle identification from level Gd, 103 from level Gc1-Gc2, 47 from level Gb1-Gb2 and just 5 butts from level Ga (see tabl. 32).

Butts of level Gd have the following angles: semi-acute - 92.7%, acute - 4.9% and right - 2.4%.

Butts of level Gc1-Gc2 have the following angles: semi-acute - 87.4%, acute - 8.7% and right - 3.9%.

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
flat				
triangular	9	1	36	46 / 44.2%
trapezoidal	2		29	31 / 29.8%
multifaceted	3		18	21 / 20.2%
lateral steep	1		3	4 / 3.8%
crescent			1	1 / 1.0%
irregular		1		1 / 1.0%
unidentifiable	1		1	2
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat			1	1 / 0.3%
triangular	15	7	122	144 / 44.4%
trapezoidal	27		107	134 / 41.2%
multifaceted	2		29	31 / 9.5%
lateral steep	2	6	7	15 / 4.6%
crescent				
irregular				
unidentifiable				
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat				
triangular	3		41	44 / 39.6%
trapezoidal	7		47	54 / 48.7%
multifaceted	1		8	9 / 8.1%
lateral steep		2	2	4 / 3.6%
crescent				
irregular				
unidentifiable	2		3	5
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat				
triangular	2	1	8	11 / 57.9%
trapezoidal	1		4	5 / 26.3%
multifaceted	1		1	2 / 10.5%
lateral steep			1	1 / 5.3%
crescent				
irregular				
unidentifiable				
N	4	1	14	19

Table 29 - Siuren-I. Unit G. Bladelet Profiles at Midpoint as Percentages of Each Type.

Butts of level Gb1-Gb2 have the following angles: semi-acute - 87.2%, right - 8.5% and acute 4.3%.

All 5 bladelets' butts of level Ga have semi-acute angles.

There is a common great dominance of semi-acute angles with just a small presence of both acute and right angles. Nonetheless, we note that there is a prevalence of acute angle over right angle in levels Gd (2:1) and Gc1-Gc2 (2.2:1), while there is a reverse proportion in level Gb1-Gb2 – 1:2.

Butt Abrasion. To record presence/absence of abrasion, the following butt frequencies were used for the four levels of Unit G: 44 from level Gd, 136 from level Gc1-Gc2, 54 from level Gb1-Gb2 and 6 from level Ga (see tabl. 33).

There is a common prevalence of butts with abrasion: 93.2% for level Gd, 94.1% for level Gc1-Gc2, 79.6% for level Gb1-Gb2 and 100% for level Ga. Butts with no abrasion are poorly represented for both levels Gd (6.8%) and Gc1-Gc2, and present in moderate number in level Gb1-Gb2 (20.4%).

Metrics (Length, Width, Thickness) of Bladelets. Metric data are mainly based on the analysis of complete bladelets from each level with additional comparable information from broken bladelets as well when possible.

Length. There is a dominance among complete bladelets of "short" pieces with length no more than 3 cm – 10 pieces/71.5% for level Gd, 23 pieces/74.1% for level Gc1-Gc2 and 12 pieces/70.6% for level Gb1-Gb2. "Long" bladelets (with length more than 3 cm) are more less than twice as common – 4 pieces/28.5% for level Gd, 8 pieces/25.9% for level Gc1-Gc2 and 5 pieces/29.4% for level Gb1-Gb2. There are no complete bladelets with length more than 5 cm. The longest bladelets for each level are: 4.1 cm in level Gd, 5.0 cm in level Gc1-Gc2 and

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
cortical				
plain			13	13 / 25.5%
punctiform			5	5 / 9.8%
linear	4		23	27 / 52.9%
dihedral				
crudly-faceted				
finely-faceted				
crushed	1	1	4	6 / 11.8%
missing	11	1	43	55
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical			1	1 / 0.6%
plain	2	1	11	14 / 8.6%
punctiform	2	2	7	11 / 6.8%
linear	12	1	79	92 / 56.8%
dihedral	1		5	6 / 3.7%
crudly-faceted				
finely-faceted				
crushed	1	1	36	38 / 23.5%
missing	28	8	127	163
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical			1	1 / 1.7%
plain			16	16 / 26.6%
punctiform	1		7	8 / 13.3%
linear	1		21	22 / 36.7%
dihedral		1		1 / 1.7%
crudly-faceted			1	1 / 1.7%
finely-faceted			1	1 / 1.7%
crushed	1		9	10 / 16.6%
missing	10	1	45	56
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
plain			3	3 / 42.8%
punctiform				
linear	1		2	3 / 42.8%
dihedral				
crudly-faceted				
finely-faceted				
crushed			1	1 / 14.3%
missing	3	1	8	12
N	4	1	14	19

Table 30 - Siuren-I. Unit G. Bladelet Butt Types as Percentages of Each Type.

4.6 cm in level Gb1-Gb2. The shortest bladelets are: 1.9 cm in level Gd, 1.6 cm in both levels Gc1-Gc2 and Gb1-Gb2. Mean length for complete bladelets: 2.7 cm for level Gd, 2.6 cm for level Gc1-Gc2 and 2.8 cm for level Gb1-Gb2. Broken bladelets with length more than 3 cm: 5 pieces/6.8% in level Gd, 8 pieces/3.4% in level Gc1-Gc2, 1 piece/1.2% in level Gb1-Gb2 and none in level Ga. The longest broken bladelets: 3.7 cm in level Gd, 6.3 cm in level Gc1-Gc2, 3.2 cm in level Gb1-Gb2 and 2.8 cm in level Ga. At the same time, there are also a moderate number of broken bladelets in the length interval 2.1-3.0 cm - 18 pieces/24.3% in level Gd, 37 pieces/15.7% in level Gc1-Gc2, 7 pieces/8.3% in level Gb1-Gb2 and 2 pieces/14.3% in level Ga.

Overall, bladelet length in the four levels of Unit G are quite similar and characteristic of "medium" means with twice as many "short" pieces over "long" pieces for complete bladelets.

Width. The following width distribution of complete bladelets is observed for levels Gd, Gc1-Gc2 and Gb1-Gb2: 0.7-0.9 cm - 8 pieces/57.1% in level Gd, 18 pieces/58.1% in level Gc1-Gc2, 12 pieces/70.6% in level Gb1-Gb2, and 1.0-1.1 cm - 6 pieces/42.9% in level Gd, 13 pieces/41.9% in level Gc1-Gc2 and 5 pieces/29.4% in level Gb1-Gb2. Width of broken bladelets is similar to complete bladelets for levels Gd and Gc1-Gc2 and shows a higher proportion of "wide" bladelets for level Gb1-Gb2. These data are as follows: 0.7-0.9 cm - 42 pieces/56.8% in

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
lipped			7	7 / 16.3%
semi-lipped	4		32	36 / 83.7%
not lipped				
unidentifiable	12	2	49	63
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped	1		31	32 / 26.2%
semi-lipped	16	2	71	89 / 73.0%
not lipped			1	1 / 0.8%
unidentifiable	29	11	163	203
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped			4	4 / 7.8%
semi-lipped	2	1	43	46 / 90.2%
not lipped			1	1 / 2.0%
unidentifiable	11	1	53	65
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped				
semi-lipped	1		5	6 / 100.0%
not lipped				
unidentifiable	3	1	9	13
N	4	1	14	19

Table 31 - Siuren-I. Unit G. Bladelet Butt Lipping as Percentages of Each Type.

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
right			1	1 / 2.2%
semi-acute	4		38	42 / 93.4%
acute			2	2 / 4.4%
unidentifiable	12	2	47	61
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right			4	4 / 3.3%
semi-acute	16	2	90	108 / 88.5%
acute	1		9	10 / 8.2%
unidentifiable	29	11	163	203
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right			4	4 / 8.0%
semi-acute	2	1	41	44 / 88.0%
acute			2	2 / 4.0%
unidentifiable	11	1	54	66
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right				
semi-acute	1		5	6 / 100.0%
acute				
unidentifiable	3	1	9	13
N	4	1	14	19

Table 32 - Siuren-I. Unit G. Bladelet Butt Angles as Percentages of Each Type.

level Gd, 123 pieces/52.3% in level Gc1-Gc2, 39 pieces/46.4% in level Gb1-Gb2, 11 pieces/78.6% in level Ga, and 1.0-1.1 cm - 32 pieces/43.2% in level Gd, 112 pieces/47.7% in level Gc1-Gc2, 45 pieces/53.6% in level Gb1-Gb2, 3 pieces/21.4% in level Ga. Mean width for complete and broken bladelets, as well as means for all bladelets from each level of Unit G is the same – 0.9 cm, apart from a single exception of 1.0 cm for the sample of broken bladelets in level Gb1-Gb2. Thus, there is a general dominance of "medium" width for bladelets.

Thickness. Mean thickness is 0.2 cm for all bladelet categories of all four levels of Unit G: for complete bladelets only, for broken ones only and for all items together, aside from a single exception of 0.3 cm for the sample of complete bladelets in level

Level Gd	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
present	5		41	46 / 93.9%
absent			3	3 / 6.1%
unidentifiable	11	2	44	57
N	16	2	88	106
Level Gc1-Gc2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present	18	3	128	149 / 93.7%
absent		2	8	10 / 6.3%
unidentifiable	28	8	130	166
N	46	13	266	325
Level Gb1-Gb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present	3		43	46 / 79.3%
absent		1	11	12 / 20.7%
unidentifiable	10	1	47	58
N	13	2	101	116
Level Ga	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present	1		6	7 / 100.0%
absent				
unidentifiable	3	1	8	12
N	4	1	14	19

Table 33 - Siuren-I. Unit G. Bladelet Butt Abrasion as Percentages of Each Type.

Gb1-Gb2. Along with this, we also note that the thickest bladelet is 0.8 cm thick in level Gb1-Gb2, while all other bladelets from all four levels have thickness in the interval 0.1-0.4 cm.

Thus, bladelets are really thin.

Butt Sizes. Mean data for bladelet butts are similar for all four levels. They are as follows for butt width: 0.3 cm for levels Gd (36 butts), Gc1-Gc2 (95 butts) and Ga (5 butts), and 0.4 cm for level Gb1-Gb2 (39 butts). They are as follows for butt height: 0.1 cm for both levels Gd and Gc1-Gc2, and 0.2 cm for both levels Gb1-Gb2 and Ga. Plain butts have width of 0.4 cm for both levels Gd (13 butts) and Gc1-Gc2 (11 butts), 0.5 cm for level Gb1-Gb2 (16 butts) and 0.3 cm for level Ga (3 butts), and have mean height of 0.2 cm for levels Gd, Gc1-Gc2 and Ga, and 0.3 cm for level Gb1-Gb2.

Thus, the bladelets of the four levels of Unit G can be generally characterized by:

- a great dominance of unidirectional scar pattern (79.4%-94.7%), a minor varying representation of unidirectional-crossed and bidirectional scar patterns, and very rare presence of cortical scar pattern (single pieces in levels Gd and Gb1-Gb2);

- a low number (10.9%-15.9%) of partially cortical pieces with no real representation of wholly cortical items;

- a dominance of parallel and converging shape types (72.7%-81.8% together) in association with "on-axis" removal direction (90.3%-97.8%);

- a prevalence of twisted type over "regular" (flat, incurvate medial and incurvate distal) types of general profiles;

- a dominance of feathering distal ends (60.6%-70.6% in levels Gd, Gc1-Gc2 and Gb1-Gb2, and 100%/2 pieces in level Ga) with less than 20% for any of four levels representation of "not regular" (hinged and overpassed) types;

- a slight dominance of trapezoidal and multifaceted types of profiles at midpoint (51.1%-56.2% in levels Gd, Gc1-Gc2 and Gb1-Gb2 and only 35.8% in level Ga) which with the addition of triangular type make up 92.9%-98% in all four levels;

- a dominance of the "plain-punctiform-linear" group of butt types (69.8%-91.1%) and a rare and minimal presence of cortical and faceted butts;

- a significant dominance of semi-lipped butts (68.9%-89.6% in levels Gd, Gc1-Gc2 and Gb1-Gb2 and 100%/5 pieces in level Ga) with semi-acute (87.2%-92.7%) and some right (2.4%-8.5%) angles, a moderate number of lipped butts (8.3%-30.1%) with acute (4.3%-8.7%) and some semi-acute angles and extremely rare not lipped butts (single pieces in levels Gc1-Gc2 and Gb1-Gb2);

- a characteristic presence of nearly only butts with abrasion in levels Gd and Gc1-Gc2 (93.2%-94.1%), and level Ga (100%) and a significant dominance in level Gb1-Gb2 (79.6%);

- a dominance of "medium length" (mean range 2.6-2.8 cm), medium width (mean 0.9 cm) and overall thinness (mean 0.2 cm);

- the highest and stable dominance of gray flints for bladelets among all levels of Unit G debitage categories (Gd – 63 pieces/71.6%; Gc1-Gc2 – 189 pieces/71.0%; Gb1-Gb2 – 77 pieces/76.2%; Ga – 10 pieces/71.4%), a moderate but with decreasing pattern of occurrence of colored flints through the three representative levels (Gd – 24 pieces/27.3%; Gc1-Gc2 – 76 pieces/28.6%; Gb1-Gb2 – 23 pieces/22.8%) and just 4 colored bladelets (28.6%) in level Ga, whereas black flints are only known from single bladelets in the three levels (Gd – 1 piece/1.1%; Gc1-Gc2 – 1 piece/0.4%; Gb1-Gb2 – 1 piece/1.0%).

Microblades

In terms of their condition, microblades from the four levels of Unit G are subdivided into complete and broken pieces, with further distribution of the latter specimens into proximal, medial and distal. 39 microblades of level Gd consist of 2 complete pieces (5.1%) and 37 broken pieces (94.9%) – 17 proximal (43.6%), 16 medial (41%) and 4 distal (10.3%). 109 microblades of level Gc1-Gc2 consist of 8 complete pieces (7.3%) and 101 broken pieces (92.7%) – 35 proximal (32.1%), 43 medial (39.5%) and 23 distal (21.1%). 76 microblades of level Gb1-Gb2 consist of 7 complete pieces (9.2%) and 69 broken pieces (90.8%) – 23 proximal (30.3%), 30 medial (39.4%) and 16 distal (21.1%). 10 microblades of level Ga consist of one complete piece (10%) and 9 broken pieces (90%) – no proximal, 6 medial (60%) and 3 distal (30%).

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
cortical				
dorsal-plain		1		1 / 1.4%
lateral				
crested				
unidirectional	33		37	70 / 95.9%
unidirectional-crossed			2	2 / 2.7%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable		1		1
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
dorsal-plain	1	2		3 / 1.6%
lateral				
crested		2		2 / 1.1%
unidirectional	67	2	103	172 / 93.5%
unidirectional-crossed	1		6	7 / 3.8%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable	2			2
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
dorsal-plain			1	1 / 0.9%
lateral				
crested				
unidirectional	32		70	102 / 93.6%
unidirectional-crossed	1		5	6 / 5.5%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
dorsal-plain				
lateral				
crested				
unidirectional	5	2	8	15 / 88.2%
unidirectional-crossed			2	2 / 11.8%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	5	2	10	17

Table 34 - Siuren-I. Unit G. Microblade Dorsal Scar Patterns as Percentages of Each Type.

Dorsal Scar Pattern. Two scar pattern types were identified on all 39 microblades from level Gd, on all 109 microblades from level Gc1-Gc2, on all 10 microblades from level Ga and three scar pattern types on all 76 microblades from level Gb1-Gb2 (see tabl. 34).

This uniformity of scar pattern types is even more evident by the fact that two scar pattern types (unidirectional and unidirectional-crossed) are characteristic for microblades in all four levels of Unit G and a third pattern is represented by only a single microblade with dorsal-plain scar pattern in level Gb1-Gb2.

Thus, there is a great dominance of microblades with unidirectional scar pattern (94.9% for level Gd, 94.5% for level Gc1-Gc2, 92.1% for level Gb1-Gb2 and 80% for level Ga), a small number of microblades with unidirectional-crossed scar pattern (5.1% for level Gd, 5.5% for level Gc1-Gc2, 6.6% for level Gb1-Gb2 and 20% for level Ga) and a single microblade with dorsal-plain scar pattern in level Gb1-Gb2 (1.3%).

Some differences in proportional representation of unidirectional and unidirectional-crossed scar pattern types in levels Gd, Gc1-Gc2 and Gb1-Gb2, on one hand, and in level Ga, on the other hand, can be explained by a sample size too small for this analysis in level Ga.

The 5 partially cortical microblades in level Gc1-Gc2 (4.9%) and 5 partially cortical microblades in level Gb1-Gb2 (7.1%) have only unidirectional scar pattern.

Surface Cortex Area and Location. All microblades from each level of Unit G were used to record surface cortex area. The quantity of microblades with cortex, however, is very small. They are completely absent in levels Gd and Ga, and account for just a few pieces in levels Gc1-Gc2 and Gb1-Gb2. So, non-cortical microblades compose the following percentages: 100% in levels Gd and Ga, 95.4% in level Gc1-Gc2 and 93.4% in level Gb1-Gb2. No microblade is wholly covered by cortex and, accordingly, partially cortical items are only represented in levels Gc1-Gc2 and Gb1-Gb2. Level Gc1-Gc2 has 5 partially cortical microblades (4.6%) of which only a single example is complete with a significant amount of distal cortex. Level Gb1-Gb2 also has 5 partially cortical microblades which are broken and not suitable for identification of cortex area location.

Thus, these data allow us to consider microblades as a non-cortical debitage category because the few specimens with cortex are extremely rare.

Shape. Five microblades with definable shapes from level Gd, 31 from level Gc1-Gc2, 29 from level Gb1-Gb2 and 4 from level Ga were used to record shape (see tabl. 35).

Level Gd	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	9	1	4	14 / 77.8%
converging	2		1	3 / 16.7%
expanding		1		1 / 5.5%
ovoid				
irregular				
unidentifiable	22		34	56
N	33	2	39	74
Level Gc1-Gc2	**microblade-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	16	1	13	30 / 54.6%
converging	5	2	15	22 / 40.0%
expanding			2	2 / 3.6%
ovoid			1	1 / 1.8%
irregular				
unidentifiable	50	3	78	131
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	5		14	19 / 55.9%
converging			11	11 / 32.4%
expanding			1	1 / 2.9%
ovoid			1	1 / 2.9%
irregular			2	2 / 5.9%
unidentifiable	28		47	75
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	1		2	3 / 50.0%
converging	1		2	3 / 50.0%
expanding				
ovoid				
irregular				
unidentifiable	3	2	6	11
N	5	2	10	17

Table 35 - Siuren-I. Unit G. Microblade Shapes as Percentages of Each Type.

Microblades of level Gd are characterized by the following shape types: parallel - 80% and converging - 20%.

Microblades of level Gc1-Gc2 are characterized by the following shape types: converging - 48.4%, parallel - 41.9%, expanding - 6.5% and ovoid - 3.2%.

Microblades of level Gb1-Gb2 are characterized by the following shape types: parallel - 48.4%, converging - 37.9%, irregular - 6.9%, expanding and ovoid - 3.4% each.

Microblades of level Ga are characterized by the following shape types: parallel and converging - 50% each.

These shape data show a great dominance of parallel and converging types for microblades with the following pattern: when sample size is small (levels Gd and Ga) parallel and converging types are only represented, while when sample size is larger (levels Gc1-Gc2 and Gb1-Gb2), these 2 types (90.3% and 86.3%, accordingly) are complemented by other types which are represented only by one or two pieces.

Axis. 35 microblades with definable axis of removal directions from level Gd, 109 from level Gc1-Gc2, 54 from level Gb1-Gb2 and all 10 from level Ga were used to record axis of removal direction (see tabl. 36).

There is an absolute dominance of "on-axis" type for microblades: 88.6% for level Gd, 93.6% for level Gc1-Gc2, 83.3% for level Gb1-Gb2 and 90% for level Ga. Accordingly, "off-axis" type has a subordinate position: 11.4% for level Gd, 6.4% for level Gc1-Gc2, 16.7% for level Gb1-Gb2 and 10% for level Ga.

The quantity of microblades with "on-axis" type of removal direction corresponds to the number of microblades with parallel and converging shapes.

General Profiles of Microblades. These data are based on analysis of all microblades and of complete microblades only (see tabl. 37).

Level Gd. There are 33 definable microblades with the following general profile types: twisted - 72.7%, incurvate medial - 15.2%, flat - 9.1% and convex - 3%. Two complete microblades have flat general profiles.

Level Gc1-Gc2. There are 109 definable microblades with the following general profile types: twisted - 58.7%, incurvate medial - 19.3%, flat - 17.4%, incurvate distal - 2.8% and convex - 1.8%. For 8 complete microblades there are recognized 87.5% of twisted type and 12.5% of incurvate medial type.

Level Gb1-Gb2. There are 72 definable microblades with the following general profile types: twisted - 52.8%, incurvate medial - 26.4%, flat - 16.7%, convex - 2.7% and incurvate distal - 1.4%. For 7 complete microblades there are recognized 57.1% of twisted type, 28.6% of incurvate medial type and 14.3% of incurvate distal type.

Level Ga. All 10 microblades have twisted type of general profile and there are no complete microblades in this level.

These data show a dominance of twisted type over "regular" (flat, incurvate medial and incurvate distal) types of microblade general profile which is clearer for the samples of complete microblades in levels Gc1-Gc2 and Gb1-Gb2, while only two complete microblades from level Gd have, however, a flat general profile.

Profiles at Distal End. Data for this analysis were based on 8 microblades from level Gd, 31 from level Gc1-Gc2, 27 from level Gb1-Gb2 and only 4 from level Ga (see tabl. 38).

There is a common dominance of a feathering type with no less than three-quarters for any of the four levels – 75% for both levels Gd and Ga, 83.8% for level Gc1-Gc2 and 77.8% for

Level Gd	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis	33	1	31	65 / 92.9%
off-axis		1	4	5 / 7.1%
unidentifiable			4	4
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis	68	2	102	172 / 95.0%
off-axis	1	1	7	9 / 5.0%
unidentifiable	2	3		5
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis	32		45	77 / 89.5%
off-axis			9	9 / 10.5%
unidentifiable	1		22	23
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis	4		9	13 / 86.7%
off-axis	1		1	2 / 13.3%
unidentifiable		2		2
N	5	2	10	17

Table 36 - Siuren-I. Unit G. Microblade Axis as Percentages of Each Type.

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat	4		3	7 / 10.5%
incurvate medial	8		5	13 / 19.4%
incurvate distal				
convex			1	1 / 1.5%
twisted	21	1	24	46 / 68.6%
unidentifiable		1	6	7
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat	12	1	19	32 / 17.5%
incurvate medial	28	3	21	52 / 28.4%
incurvate distal			3	3 / 1.6%
convex			2	2 / 1.1%
twisted	29	1	64	94 / 51.4%
unidentifiable	2	1		3
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat	7		12	19 / 18.4%
incurvate medial	9		19	28 / 27.2%
incurvate distal			1	1 / 1.0%
convex			2	2 / 1.9%
twisted	15		38	53 / 51.5%
unidentifiable	2		4	6
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat	1			1 / 6.7%
incurvate medial	1	1		2 / 13.3%
incurvate distal				
convex				
twisted	2		10	12 / 80.0%
unidentifiable	1	1		
N	5	2	10	

Table 37 - Siuren-I. Unit G. Microblade General Profiles as Percentages of Each Type.

level Gb1-Gb2. Other types are as follows: level Gd – hinged and overpassed - 12.5% each; level Gc1-Gc2 – blunt - 9.7% and hinged - 6.5%; level Gb1-Gb2 – hinged - 18.5% and blunt - 3.7%; level Ga – hinged - 25%. Among these other types, it is only possible to note a rather high proportion of hinged type in levels Gd, Gb1-Gb2 and Ga, while representation of overpassed and blunt types do not show any pattern.

Profiles at Midpoint. Data for this analysis were recorded for all microblades in each level of Unit G, as all are definable through this feature (see tabl. 39).

Level Gd shows the following variety of types: triangular - 56.4%, trapezoidal - 33.3%, multifaceted - 5.1%, flat and lateral steep - 2.6% each.

Level Gc1-Gc2 shows the following variety of types: triangular - 61.4%, trapezoidal - 32.1%, lateral steep - 3.7% and multifaceted - 2.8%.

Level Gb1-Gb2 shows the following variety of types: triangular - 64.6%, trapezoidal - 28.9%, multifaceted and lateral steep - 2.6% each, flat - 1.3%.

Level Ga shows the following variety of types: triangular - 70%, lateral steep - 20% and trapezoidal - 10%.

These data show an absolute dominance of three types (triangular, trapezoidal and multifaceted) in levels Gd, Gc1-Gc2 and Gb1-Gb2 – 94.8%-96.1%. Data on level Ga are based only on 10 pieces and are not representative of all types. Nonetheless, it is worth noting a common dominance of triangular type in all four levels, typical of more than half of all microblades in each level. At the same time, no microblade with irregular profile at midpoint was noted.

Butt Types. This analysis is based on 19 microblade butts from level Gd, 43 from level Gc1-Gc2, 30 from level Gb1-Gb2 and only a single butt from level Ga (see tabl. 40). Butts of level Gd are as follows: linear - 42%, plain - 21.1%, punctiform - 10.5%, dihedral - 5.3% and crushed - 21.1%. Butts of level Gc1-Gc2 are as follows: linear - 55.8%, punctiform - 11.6%, plain - 4.7% and crushed - 27.9%. Butts of level Gb1-Gb2 are as follows: punctiform - 43.3%, linear - 16.7%, plain - 3.3% and crushed - 36.7%.

A single definable microblade butt from level Ga is a dihedral one.

Thus, aside from crushed butts and two dihedral butts in levels Gd and Ga, all other butts are representatives of the “plain-punctiform-linear” group of types. Levels Gd and Gc1-Gc2 are characterized by a dominance of linear butts, while punctiform type is dominant in level Gb1-Gb2.

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
feathering	9	1	6	16 / 76.2%
hinged	1		1	2 / 9.5%
overpassed	1		1	2 / 9.5%
blunt		1		1 / 4.8%
unidentifiable	22		31	53
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering	8	1	26	35 / 79.5%
hinged	1	1	2	4 / 9.1%
overpassed				
blunt	1	1	3	5 / 11.4%
unidentifiable	61	3	78	142
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering	4		21	25 / 80.7%
hinged			5	5 / 16.1%
overpassed				
blunt			1	1 / 3.2%
unidentifiable	29		49	78
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering	2		3	5 / 83.3%
hinged			1	1 / 16.7%
overpassed				
blunt				
unidentifiable	3	2	6	11
N	5	2	10	17

Table 38 - Siuren-I. Unit G. Microblade Profiles at Distal End as Percentages of Each Type.

Lipping. There are 15 butts suitable for lipping identification from level Gd, 31 from level Gc1-Gc2, 16 from level Gb1-Gb2 and only a single identifiable butt from level Ga (see tabl. 41).

Butts of level Gd have the following lipping characteristics: semi-lipped - 80% and lipped - 20%.

Butts of level Gc1-Gc2 have the following lipping characteristics: semi-lipped - 67.8% and lipped - 32.2%.

Butts of level Gb1-Gb2 have the following lipping characteristics: semi-lipped - 87.6%, lipped and not lipped - 6.2% each.

A single definable microblade butt of level Ga is not lipped.

Thus, there is a common dominance of semi-lipped butts, a subordinate position of lipped butts and an occasional presence of not lipped butts, with just single pieces in levels Gb1-Gb2 and Ga.

Butt Angle. There are 15 butts suitable for angle identification from level Gd, 31 from level Gc1-Gc2, 16 from level Gb1-Gb2 and only a single definable microblade butt from level Ga (see tabl. 42).

Butts of level Gd have the following angles: semi-acute - 80%, acute - 13.3% and right - 6.7%.

Butts of level Gc1-Gc2 have the following angles: semi-acute - 71%, acute - 22.6% and right - 6.4%.

Butts of level Gb1-Gb2 have the following angles: semi-acute - 81.3% and acute - 18.7%.

A single definable microblade butt from level Ga has a semi-acute angle.

So, there is a common dominance of semi-acute angles of microblade butts - 71%-81.3% in levels Gd, Gc1-Gc2 and Gb1-Gb2. Microblade butts of level Gb1-Gb2 have additionally only acute angles with no representation of right angles at all. Microblade butts of levels Gd and Gc1-Gc2 have both acute and right angles with prevalence of acute over right – 2:1 in level Gd and 3.5:1 in level Gc1-Gc2.

Butt Abrasion. To record presence/absence of abrasion, the following microblade butt frequencies were used for the four levels of Unit G: 18 from level Gd, 43 from level Gc1-Gc2, 25 from level Gb1-Gb2 and only a single butt from level Ga (see tabl. 43).

There is a common prevalence of butts with abrasion (94.5% in level Gd, 93% in level Gc1-Gc2, 92% in level Gb1-Gb2) over butts with no abrasion (5.5% in level Gd, 7% in level Gc1-Gc2 and 8% in level Gb1-Gb2) in 3 levels of Unit G. A single microblade butt in level Ga has abrasion.

Metrics (Length, Width, Thickness) of Microblades. Metric data are based on analysis of both complete and broken microblades from each level of Unit G with, unfortunately, a very small number of complete pieces.

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat			1	1 / 1.4%
triangular	19	1	22	42 / 57.5%
trapezoidal	12		13	25 / 34.3%
multifaceted	1		2	3 / 4.1%
lateral steep		1	1	2 / 2.7%
crescent				
irregular				
unidentifiable	1			1
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat	1			1 / 0.5%
triangular	47	4	67	118 / 63.4%
trapezoidal	23		35	58 / 31.2%
multifaceted		1	3	4 / 2.2%
lateral steep		1	4	5 / 2.7%
crescent				
irregular				
unidentifiable				
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat			1	1 / 0.9%
triangular	21		49	70 / 64.8%
trapezoidal	10		22	32 / 29.6%
multifaceted	1		2	3 / 2.8%
lateral steep			2	2 / 1.9%
crescent				
irregular				
unidentifiable	1			1
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat				
triangular	3		7	10 / 58.8%
trapezoidal	2		1	3 / 17.7%
multifaceted		1		1 / 5.9%
lateral steep		1	2	3 / 17.6%
crescent				
irregular				
unidentifiable				
N	5	2	10	17

Table 39 - Siuren-I. Unit G. Microblade Profiles at Midpoint as Percentages of Each Type.

Length. Taking into consideration the overall short length of microblades (none longer than 3 cm), these were subdivided into two groups: less than or equal to 1.5 cm and greater than 1.5 cm.

Level Gd. Two complete microblades have length less than 1.5 cm – 1.1 and 1.2 cm. Broken microblades with length less than or equal to 1.5 cm number 33 pieces/89.2%, while only 4 pieces/10.8% have length more than 1.5 cm.

Level Gc1-Gc2. There are 6 pieces/75% with length less than or equal to 1.5 cm and 2 pieces/25% (1.8 and 2.8 cm) with length more than 1.5 cm among complete microblades. Mean length is 1.6 cm. Broken microblades with length less than or equal to 1.5 cm number 85 pieces/84.2% and 16 pieces/15.8% are in the interval 1.6-3.0 cm with the longest example 2.6 cm.

Level Gb1-Gb2. There are 3 pieces/42.8% with length less than or equal to 1.5 cm and 4 pieces/57.2% with length more than 1.5 cm among complete microblades. The longest example is 2.5 cm long. Mean length is 1.6 cm. Broken microblades with length less than or equal to 1.5 cm number 66 pieces/95.7% and only 3 pieces/4.3% have length more than 1.5 cm with the longest one 2.7 cm.

Level Ga. The single complete microblade is 1.7 cm long. There are also 7 pieces/77.7% with length less than or equal to 1.5 cm and 2 pieces/ 22.2% with length more than 1.5 cm with the longest one 1.9 cm.

Thus, microblades generally have a "short" length but, at the same time, the presence of even a few fragmented microblades with length more than 2 cm could serve as evidence for the possible existence of some "long" (> 3 cm) microblades in Unit G.

Width. The following width distribution of complete microblades is observed: 0.6 cm - none for level Gd, 4 pieces/50% for

Level Gd	microblades-tools	microblade-CMP	microblade-debitage	Microblades Total
cortical				
plain	1		4	5 / 15.6%
punctiform	1	1	2	4 / 12.5%
linear	8		8	16 / 50.0%
dihedral	1		1	2 / 6.3%
crudly-faceted				
finely-faceted				
crushed	1		4	5 / 15.6%
missing	21	1	20	42
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain	1		2	3 / 4.1%
punctiform	9	1	5	15 / 20.5%
linear	13		24	37 / 50.7%
dihedral		1		1 / 1.4%
crudly-faceted				
finely-faceted				
crushed	5		12	17 / 23.3%
missing	43	4	66	113
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain	1		1	2 / 5.0%
punctiform	2		13	15 / 37.5%
linear	6		5	11 / 27.5%
dihedral				
crudly-faceted				
finely-faceted				
crushed	1		11	12 / 30.0%
missing	23		46	69
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain		1		1 / 33.3%
punctiform				
linear				
dihedral			1	1 / 33.3%
crudly-faceted				
finely-faceted				
crushed		1		1 / 33.3%
missing	5		9	14
N	5	2	10	17

Table 40 - Siuren-I. Unit G. Microblade Butt Types as Percentages of Each Type.

level Gc1-Gc2, 4 pieces/57.1% for level Gb1-Gb2 and a single piece/100% for level Ga; 0.5 cm - 1 piece/50% for level Gd, 3 pieces/37.5% for level Gc1-Gc2 and 2 pieces/28.6% for level Gb1-Gb2; 0.4 cm - 1 piece/50% for level Gd, 1 piece/12.5% for level Gc1-Gc2, 1 piece/14.3% for level Gb1-Gb2. Mean width for complete microblades are as follows: 0.5 cm for levels Gc1-Gc2 and Gb1-Gb2 as for levels with more than 1 or 2 pieces as is typical for levels Gd and Ga. It is also worth noting an absence of any complete microblade with width less than 0.4 cm.

Width for broken microblades is as follows: 0.6 cm - 26 pieces/70.3% for level Gd, 59 pieces/58.4% for level Gc1-Gc2, 38 pieces/55.1% for level Gb1-Gb2 and 5 pieces/55.5% for level Ga; 0.5 cm - 9 pieces/23.1% for level Gd, 29 pieces/28.7% for level Gc1-Gc2, 14 pieces/20.3% for level Gb1-Gb2 and none for level Ga; 0.4 cm - 3 pieces/7.7% for level Gd, 11 pieces/10.9% for level Gc1-Gc2, 14 pieces/20.3% for level Gb1-Gb2 and 4 pieces/44.4% for level Ga; 0.3 cm - 1 piece/2.7% for level Gd, 2 pieces/2% for level Gc1-Gc2, 3 pieces/4.3% for level Gb1-Gb2 and none for level Ga. Mean width for broken microblades are as follows: 0.6 cm for level Gd and 0.5 cm for levels Gc1-Gc2, Gb1-Gb2 and Ga.

Overall, mean width for all microblades from each level is identical – 0.5 cm. Moreover, the majority of microblades have width 0.6-0.5 cm – 89.7% for level Gd, 87.2% for level Gc1-Gc2, 76.4% for level Gb1-Gb2 and 60% for level Ga. At the same time, "truly narrow" microblades (0.3 cm wide) are quite rare: 2.6% for level Gd, 1.8% for level Gc1-Gc2, 3.9% for level Gb1-Gb2 and absent in level Ga.

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
lipped	1		3	4 / 14.3%
semi-lipped	11	1	12	24 / 85.7%
not lipped				
unidentifiable	21	1	24	46
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped	2		10	12 / 21.8%
semi-lipped	21	1	21	43 / 78.2%
not lipped				
unidentifiable	48	5	78	131
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped			1	1 / 4.0%
semi-lipped	9		14	23 / 92.0%
not lipped			1	1 / 4.0%
unidentifiable	24		60	84
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped				
semi-lipped		1		1 / 50.0%
not lipped			1	1 / 50.0%
unidentifiable	5	1	9	15
N	5	2	10	17

Table 41 - Siuren-I. Unit G. Microblade Butt Lipping as Percentages of Each Type.

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
right			1	1 / 3.7%
semi-acute	10	1	12	23 / 85.2%
acute	1		2	3 / 11.1%
unidentifiable	22	1	24	47
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right			2	2 / 3.6%
semi-acute	23	1	22	46 / 83.7%
acute			7	7 / 12.7%
unidentifiable	48	5	78	131
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right				
semi-acute	9		13	22 / 88.0%
acute			3	3 / 12.0%
unidentifiable	24		60	84
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right				
semi-acute		1	1	2 / 100.0%
acute				
unidentifiable	5	1	9	15
N	5	2	10	17

Table 42 - Siuren-I. Unit G. Microblade Butt Angles as Percentages of Each Type.

Thus, microblades of all four levels of Unit G are rather close to the "width border" in 0.7 cm separating microblades and bladelets.

Thickness. Mean thickness for all microblades from each level of Unit G are as follows: 0.1 cm for both levels Gd and Gc1-Gc2, and 0.2 cm for both levels Gb1-Gb2 and Ga. It is worth noting that the great majority of microblades are 0.1-0.2 cm thick, while thicker pieces are exceptionally rare: 1 piece/2.6% (0.3 cm) for level Gd, 4 pieces/3.7% (0.3 cm) for level Gc1-Gc2, 8 pieces/11.6% (0.3 - 0.4 cm) for level Gb1-Gb2 and 1 piece/10% (0.4 cm) for level Ga. No piece has a thickness of more than 0.4 cm.

Such data clear indicate the high degree of microblade thinness.

Level Gd	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
present	11		17	28 / 90.3%
absent	1	1	1	3 / 9.7%
unidentifiable	21	1	21	43
N	33	2	39	74
Level Gc1-Gc2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present	25		40	65 / 90.3%
absent	2	2	3	7 / 9.7%
unidentifiable	44	4	66	114
N	71	6	109	186
Level Gb1-Gb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present	9		23	32 / 94.1%
absent			2	2 / 5.9%
unidentifiable	24		51	75
N	33	0	76	109
Level Ga	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present			1	1 / 50.0%
absent		1		1 / 50.0%
questionable				
unidentifiable	5	1	9	15
N	5	2	10	17

Table 43 - Siuren-I. Unit G. Microblade Butt Abrasion as Percentages of Each Type.

Butt Sizes. Mean data for microblade butts are the same for levels Gd (13 butts), Gc1-Gc2 (26 butts) and Gb1-Gb2 (6 butts): butt width - 0.3 cm and butt height - 0.1 cm. A single butt from level Ga (dihedral) is 0.5 wide and height 0.3 cm. Plain butts have a mean width of 0.3 cm for level Gd (4 butts), 0.5 cm for level Gc1-Gc2 (2 butts) and 0.2 cm for level Gb1-Gb2 (one butt) and have mean height of 0.2 cm for these three levels.

Thus, the microblades of the four levels of Unit G are generally characterized by:

- an almost exclusive representation of unidirectional scar pattern (92.1%-94.9% in levels Gd, Gc1-Gc2 and Gb1-Gb2, and 80% in level Ga);

- a presence of very few pieces with some cortex only in levels Gc1-Gc2 and Gb1-Gb2;

- a great dominance of parallel and converging shape types (86.3%-100%) in association with "on-axis" removal direction (83.3%-93.6%);

- a prevalence of twisted type over "regular" (flat, incurvate medial and incurvate distal) types of general profiles;

- a great dominance of feathering distal ends (75%-83.8%) and a generally varying but insignificant representation by level of "not regular"(hinged and overpassed) types (6.5%-25%);

- a dominance of triangular type of profile at midpoint (56.4%-70%) and insignificant representation of trapezoidal and multifaceted types (31.5%-38.1% in levels Gd, Gc1-Gc2 and Gb1-Gb2, and only 10% (only trapezoidal type) in level Ga);

- an exclusive representation of "plain-punctiform-linear" group of butt types (63.3%-73.6% in levels Gd, Gc1-Gc2 and Gb1-Gb2) excluding crushed butts (21.1%-36.7%) and single dihedral butts in levels Gd and Ga;

- a significant dominance of semi-lipped butts (67.8%-87.6% in levels Gd, Gc1-Gc2 and Gb1-Gb2) with semi-acute (71%-81.3%) and some right (6.4%-6.7%) angles, as well as a generally moderate number of lipped butts (6.2%-32.2%) with acute (13.3%-22.6%) and some semi-acute angles, and absence of not lipped butts (only a single piece in level Gb1-Gb2);

- a characteristic presence of abrasion for butts (92%-94.5% in levels Gd, Gc1-Gc2 and Gb1-Gb2 and 100%/1 piece in level Ga);

- a dominance of "short length" (mean range 1.2-1.7 cm), medium width (mean 0.5 cm) and overall thinness (mean range 0.1 - 0.2 cm);

- a dominance of gray flints with a growing tendency in three levels (Gd – 24 pieces/61.5%; Gc1-Gc2 – 71 pieces/65.1%; Gb1-Gb2 – 54 pieces/71.0%) with 6 gray microblades (60%) in level Ga, a moderate number of colored flints decreasing through this sequence (Gd – 15 pieces/38.5%; Gc1-Gc2 – 37 pieces/34.0%; Gb1-Gb2 – 22 pieces/29.0%) with 4 colored microblades (40%) in level Ga, while a single microblade on black flint is known from level Gc1-Gc2 (0.9%).

Summarizing data on the debitage

A very short summary of the debitage can be done as follows (see also tabl. 3B-3C, 4-43). Excluding the limited sample of just 65 items from level Ga, the representations of flakes, blades, bladelets and microblades for the other three levels in Unit G are consistent for flakes and bladelets, but show some clear differences between levels for blades and microblades. Excluding flakes given their identical percentages in all three levels (30.5-31.1%) and considering only the blady debitage categories, we obtain the following percentages for levels Gd – Gc1-Gc2 – Gb1-Gb2: blades – 38.9%-32.6%-26.2%; bladelets – 42.3%-47.8%-42.1%; microblades – 18.8%-19.6%-31.7% (tabl. 3C). These percentages show a threefold structure. Blades show a decreasing pattern in the archaeological sequence from 38.9 to 26.2%, and it becomes more comparable to the respective blade index for Unit H (34.3%). Bladelets, on the other hand, are quite stable in the 47.8-42.1% range and the respective bladelet percentage in Unit H is 46.8%. But microblades are characterized a sharply increasing pattern from 18.8-19.6% in levels Gd and Gc1-Gc2 (18.9% for Unit H as well) to 31.7% for level Gb1-Gb2. Thus, we see that at the expense of decreasing blades, microblades increase throughout the archaeological sequence. At the same time, recall the very stable flake indices for the three levels of Unit G. All of these observations require explanation; along with data from the other artifact categories, solutions should be found.

Tools

Tool data are first presented below by level and then analyzed both jointly and through the archaeological sequence to establish possible common and different features . In total, there are 376 pieces with secondary treatment (i.e., retouch) and/or use-wear in the four assemblages of Unit G (see tabl. 44 – 46, 47 – 49).

Level Gd

Tools are represented by 77 specimens subdivided into 7 groups: 1) Indicative Upper Paleolithic types – 7 pieces/9.1%; 2) Non-Geometric Microliths – 49 pieces/63.6%; 3) "Neutral" types – 2 pieces/2.6%; 4) Retouched Pieces – 9 pieces/11.7%; 5) Unidentifiable Tool Fragments – 7 pieces/9.1%; 6) Non-Flint Tools – 2 pieces/2.6%; 7) Middle Paleolithic types – 1 piece/1.3%.

Indicative Upper Paleolithic tool types
These tools include 2 end-scrapers, 3 burins, 1 truncation and 1 retouched blade.

End-scrapers are represented by one item on a retouched piece, while the second is carinated.

The first end-scraper is on a retouched piece (fig. 3:1). It is made on a complete flake with bilateral dorsal light scalar retouch. The front is convex, formed on the distal dorsal surface by non-convergent sub-parallel retouch. The flake, as a blank, is non-cortical ne with a unidirectional scar pattern, expanding shape, "on-axis" removal direction, flat general profile, unidentifiable as retouched distal end, trapezoidal profile at midpoint, small 0.7 x 0.2 cm plain butt (lipped, acute angle, with abrasion). On gray flint, 4.6 cm long, 2.6 cm wide and 0.6 cm thick.

The second end-scraper is carinated on a thick chunk (fig. 3:2). The front is rather narrow (2.7 cm wide) and convex, formed by convergent sub-parallel lamellar (microblade negatives) retouch with maximum length 2.7 cm. The chunk, as a blank, is a piece of gray flint, 5.7 cm long, 4.3 cm wide and 4.2 cm thick.

Burins. These include one angle, one double mixed and one is a broken specimen.

The first is an angle burin on a natural surface, made on a broken blade (fig. 3:3). The burin termination is on the blade's distal end, has two flat burin facets on the ventral surface, struck from the blade's heavily hinged distal end. The blade, as a blank, is a non-cortical burnt distal fragment with unidirectional scar pattern, irregular shape, incurvate medial general profile, hinged distal end and trapezoidal profile at midpoint. On gray flint, 3.9 cm long, 2.1 cm wide and 0.9 cm thick.

The second is a double mixed burin (on truncation and angle) with lateral dorsal irregular discontinuous retouch, made on a broken blade (fig. 3:4). Two opposite burin terminations are on the distal end and the medial break of the blade. The truncated burin termination on the distal end is a concave truncation with two flat burin facets on the ventral surface. The angle burin termination on the medial break has one flat burin facet on the dorsal surface. The blade, as a blank, is a partially cortical distal fragment with insignificant central cortex and is only characterized by unidirectional scar pattern, "on-axis" removal direction, incurvate distal general profile and multifaceted profile at midpoint. On gray flint, 4.1 cm long, 2.2 cm wide, and 0.8 cm thick.

The third burin is broken given the lack of the burin termination from which two burin spalls were struck off. the location of burin facets along one of the blade's lateral edges and no signs of burin-like treatment or preparation on the other lateral edge suggest that this burin could be either angle or on truncation. The blade, as a blank, is a non-cortical medial fragment with unidirectional scar pattern, flat general profile and multifaceted profile at midpoint. On colored flint, 4.9 cm long, 1.5 cm wide, 0.5 cm thick.

The single *truncation* is concave, made on a broken blade. The truncated edge is formed by scalar dorsal retouch at the distal end. The blade, as a blank, is a non-cortical distal fragment with unidirectional scar pattern, "on-axis" removal direction, incurvate distal general profile and triangular profile at midpoint. On gray flint, 2.5 cm long, 1.4 cm wide and 0.4 cm thick.

A single *retouched blade* is a bilateral dorsal broken specimen with light scalar continuous retouch on both lateral edges. The blade, as a blank, is a non-cortical burnt distal fragment with unidirectional scar pattern, convergent shape, "off-axis" removal direction, incurvate distal general profile, blunt distal end and trapezoidal profile at midpoint. On colored flint, 3.6 cm long, 2.1 cm wide, 0.7 cm thick.

Non-Geometric Microliths
These include three types: Dufour bladelets– 35 pieces (71.4%), pseudo-Dufour bladelets– 13 pieces (26.5%) and a single backed microblade (2.1%).

The Dufour bladelet type, on bladelets with alternate retouch (fig. 3:7-12) is composed of 7 pieces, or 14.3% of all microliths. In all cases, the left edges of these microliths have dorsal retouch, while the right edges have ventral retouch. Seven microliths are

Groups & Types	Ga	Gb1-Gb2	Gc1-Gc2	Gd	TOTAL	
	N	N	N	N	N	%
INDICATIVE UPPER PALEOLITHIC TOOL TYPES	**5** / *27.8%*	**8** / *11.3%*	**22** / *10.5%*	**7** / *9.1%*	**42**	11.2
END-SCRAPERS	*3*	*2*	*5*	*2*	*12*	*3.2*
Simple flat on blades	1		3		4	
Atypical	1				1	
Double on retouched flakes			1		1	
On retouched flake				1	1	
Unilateral / Flake	1				1	
Carinated			1	1	2	
Carinated atypical		1			1	
Thick shouldered		1			1	
BURINS	*2*	*4*	*7*	*3*	*16*	*4.3*
Dihedral symmetrical	1				1	
Dihedral asymmetrical		1			1	
Dihedral angle	1				1	
Angle			2	1	3	
Angle Double		1	1		2	
On oblique straight truncation			1		1	
Transverse on lateral preparation		1			1	
Transverse on natural surface		1			1	
Double Mixed (on concave truncation + angle)				1	1	
Broken (unidentifiable)			3	1	4	
COMPOSITE TOOLS		*1*	*2*		*3*	*0.8*
End-scraper on retouched flake / Burin broken			1		1	
Perforator / Burin angle			1		1	
Scaled Tool / Burin on concave truncation		1			1	
TRUNCATIONS			*2*	*1*	*3*	*0.8*
RETOUCHED BLADES		*1*	*3*	*1*	*5*	*1.3*
RETOUCHED BLADES with Aurignacian-like retouch			*1*		*1*	*0.3*
SCALED TOOLS			*2*		*2*	*0.5*
NON-GEOMETRIC MICROLITHS	**9** / *50%*	**46** / *64.8%*	**117** / *55.7%*	**49** / *63.6%*	**221**	58.8
"NEUTRAL" TOOL TYPES (*NOTCHED PIECES*)		**2** / *2.8%*	**5** / *2.4%*	**2** / *2.6%*	**9**	2.4
RETOUCHED PIECES (with marginal and/or irregular retouch)	**3** / *16.7%*	**9** / *12.7%*	**39** / *18.6%*	**9** / *11.7%*	**60**	15.9
UNIDENTIFIABLE TOOL FRAGMENTS	**1** / *5.5%*	**3** / *4.2%*	**12** / *5.7%*	**7** / *9.1%*	**23**	6.1
NON-FLINT TOOLS			**2** / *0.9%*	**2** / *2.6%*	**4**	1.1
CHOPPERS / GRINDING TOOLS			*1*	*1*	*2*	*0.5*
BATTERED PIECES / GRINDING TOOLS				*1*	*1*	*0.3*
GRINDING TOOLS			*1*		*1*	*0.3*
MIDDLE PALEOLITHIC TOOL TYPES		**3** / *4.2%*	**13** / *6.2%*	**1** / *1.3%*	**17**	4.5
TOTAL	**18** / *100%*	**71** / *100%*	**210** / *100%*	**77** / *100%*	**376**	100.0

Table 44 - Siuren-I. Unit G. Tools General Structure & Classification.

represented by 14 retouched edges. Continuous retouch predominates (11 edges), that is followed by partially retouched (2 items) and discontinuously retouched (1 item) edges. Semi-abrupt retouch was defined on 11 edges. Three more edges have flat retouch. Micro-scalar and micro-stepped retouch are represented in similar numbers of edges: 8 and 6 edges, respectively. Thus, bladelets with alternate retouch were mostly retouched by continuous semi-abrupt micro-scalar retouch (5 edges) and continuous semi-abrupt micro-stepped retouch (4 edges). The other retouch combinations (continuous flat micro-scalar – 2 edges, discontinuous semi-abrupt micro-stepped – 1 edge, partial semi-abrupt micro-stepped – 1 edge, partial flat micro-scalar – 1 edge) are represented by insignificant numbers of items.

The Dufour bladelet type, on microblades with alternate retouch (fig. 3:13-18) are the most common type of the microliths – about half (24 pieces/48.9 %) of all microliths. Twenty-four microliths are represented by 48 retouched edges. As on bladelets, dorsal retouch is found on the left edges, while the right edges have ventral retouch. Continuous retouch significantly predominates – 33 edges. Discontinuous (7 edges) and partial (8 edges) retouch are represented in similar numbers. Semi-abrupt retouch was employed on 42 edges. The rest 6 edges were elaborated by flat retouch. Micro-scalar retouch was used for 34 edges. Twelve edges were elaborated by micro-stepped and two more edges by marginal retouch. So, the majority of edges on microblades with alternate retouch were produced by continuous semi-abrupt micro-scalar retouch – 19 edges. This amount could be easily increased by the inclusion of 11 edges with continuous semi abrupt micro-stepped retouch. The difference between micro-scalar and micro-stepped retouch on microblades is quite relative, because of the size of the initial blanks selected for this type of microlith production. Other retouch combinations are

Groups & Types	Ga	Gb1-Gb2	Gc1-Gc2	Gd	TOTAL
Pieces with flat and/or semi-abrupt retouch	**9 / 100%**	**46 / 100.0%**	**116 / 99.2%**	**48 / 98.0%**	**219 / 99.1%**
Dufour, *bladelets with alternate retouch*	2	3	26	7	38
Dufour, *microblades with alternate retouch*	2	28	57	24	111
Dufour, *bladelets with alternating retouch*		1			1
Dufour, *bladelets with bilateral ventral retouch*		1			1
Dufour, *bladelets with ventral retouch*		2	3	3	8
Dufour, *microblades with ventral retouch*	1	1	5	1	8
TOTAL:	5 / 55.6%	36 / 78.3%	91 / 77.8%	35 / 71.4%	167 / 75.6%
Pseudo-Dufour, *bladelets with dorsal retouch*	2	4	2	3	11
Pseudo-Dufour, *microblades with dorsal retouch*		3	3	4	10
Pseudo-Dufour, *bladelets with bilateral dorsal retouch*			4	3	7
Pseudo-Dufour, *microblades with bilateral dorsal retouch*	1	1	2	3	7
TOTAL:	3 / 33.3%	8 / 17.4%	11 / 9.4%	13 / 26.5%	35 / 15.8%
Krems Point, *bladelets with alternate retouch*			1		1
Krems Point, *microblades with bilateral dorsal retouch*	1		2		3
TOTAL:	1 / 11.1%		3 / 2.6%		4 / 1.8%
Bladelets *with dorsal retouch at distal end*		2	1		3
Bladelets *with lateral dorsal micro-notch*			3		3
Bladelets *with lateral ventral micro-notch*			3		3
Truncated Bladelets			2		2
Bitruncated Bladelets			1		1
Microblade *with micro-denticulated edge*			1		1
TOTAL:		2 / 4.3%	11 / 9.4%		13 / 5.9%
Pieces with backed lateral retouch			**1 / 0.8%**	**1 / 2.1%**	**2 / 0.9%**
Microblades *with bilateral abrupt dorsal retouch*			1	1	2
TOTAL	**9**	**46**	**117**	**49**	**221**

Table 45 - Siuren-I. Unit G. Non-Geometric Microliths Classification.

represented by insignificant numbers of edges: continuous flat micro-scalar – 3 items; discontinuous semi-abrupt micro-scalar – 5 items; discontinuous semi-abrupt marginal – 1 item; discontinuous flat micro-scalar – 1 item; partial semi-abrupt micro-scalar – 5 items; partial flat marginal – 1 item; partial flat micro-scalar – 1 item; partial semi-abrupt micro-stepped – 1 item.

The Dufour bladelet type, on bladelets with ventral retouch is represented by 3 pieces, which comprise 6.1% of all microliths. All have ventral retouch on the right edges. Two kinds of retouch combinations were used: continuous semi-abrupt micro-scalar (2 pieces) and continuous semi-abrupt micro-stepped (1 piece).

The Dufour bladelet type, on microblade with ventral retouch is represented by a sole broken piece (2.1%). The right edge of this microlith was elaborated by partial semi-abrupt micro-scalar retouch.

The Pseudo-Dufour bladelet type, on bladelets with dorsal retouch is represented by 3 pieces (6.1%). Two have retouch on the left edge (partial flat micro-scalar and continuous flat micro-scalar), while the third piece is retouched on the right edge (partial flat micro-scalar).

The Pseudo-Dufour bladelet type, on microblades with dorsal retouch is represented by 4 pieces (8.2%). Two have retouch on the left edge (discontinuous flat micro-scalar and partial semi-abrupt micro-scalar) and two on the right edge (partial semi-abrupt marginal and discontinuous semi-abrupt marginal). The piece with discontinuous retouch on the left edge is also basally thinned.

The Pseudo-Dufour bladelet type, on bladelets with bilateral dorsal retouch is represented by 3 pieces (6.1%). All edges of all these pieces have the same retouch combination: partial flat micro-scalar.

The Pseudo-Dufour bladelet type, on microblades with bilateral dorsal retouch (fig. 3:5) is represented by 3 pieces (6.1%). Five of six edges show the combination of continuous semi-abrupt micro-scalar retouch. One piece has continuous semi-abrupt marginal retouch on the right edge.

Bilaterally backed microblade. The only piece of this type (fig. 3:6) shows the combination of continuous abrupt micro-scalar retouch on the left edge and continuous semi-abrupt marginal retouch on the right edge. At the same time, the abruptly retouched part of the left edge is not very pronounced and could equally be identified as semi-abruptly retouched. If so, this microlith would be identified as a pseudo-Dufour bladelet on microblade with bilateral dorsal retouch.

Sixteen bladelets and 33 microblades were selected for non-geometric microlith production. Overall, the selected blanks selected were removed “on-axis”: 46 items. The others (3 pieces) are too small to identify “axis” removal direction. The majority of blanks have twisted profiles – 25 pieces. The other types of profiles are represented by: flat – 7 pieces; incurvate medial – 14 pieces; and, unidentifiable – 3 pieces.

Only 3 microliths are represented by complete pieces: Dufour bladelet on bladelet with alternate retouch (length – 3.6 cm); Dufour bladelet on microblade with alternate retouch (length – 3.7 cm); and, pseudo-Dufour bladelet on bladelet with bilateral

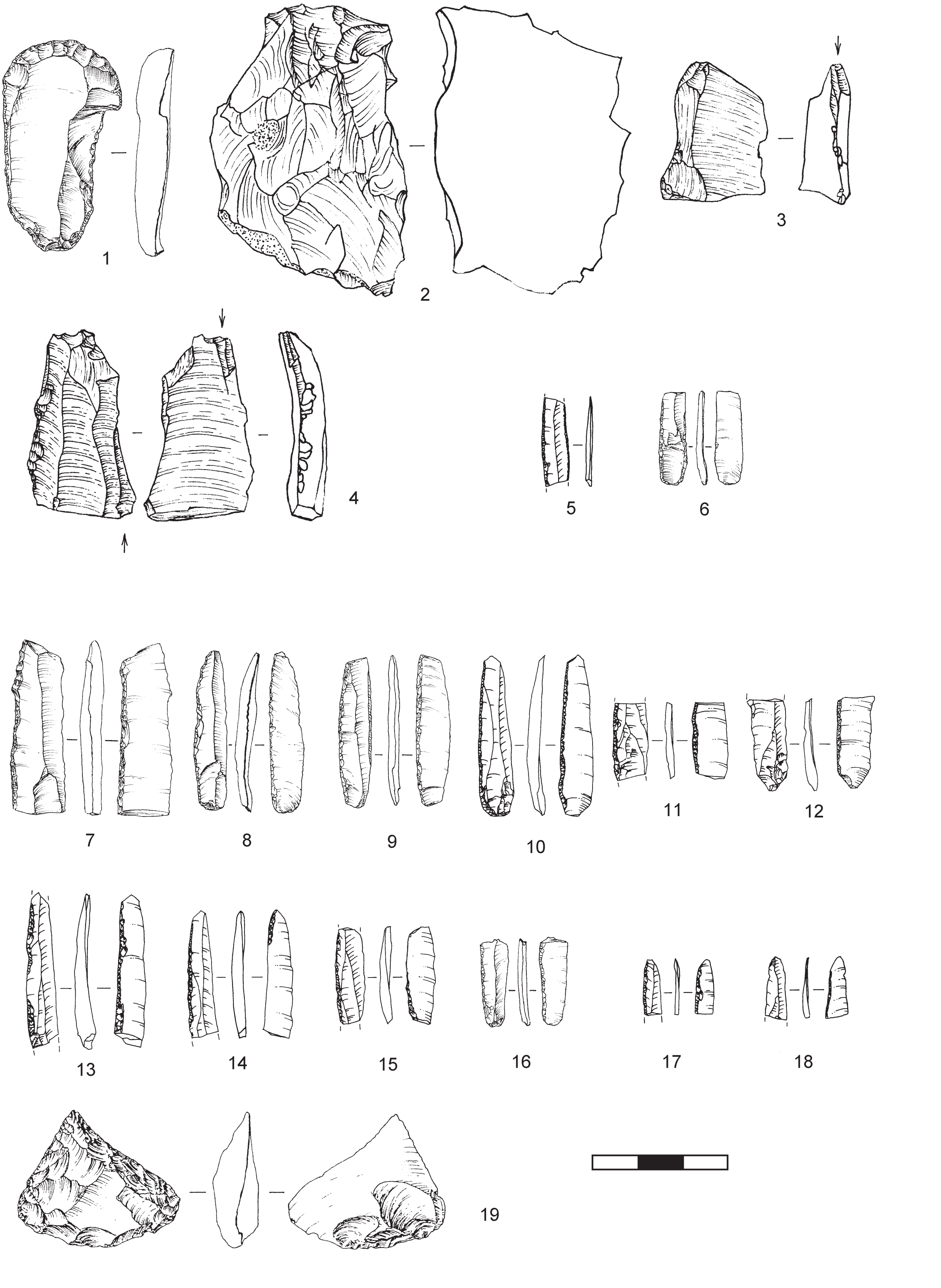

Figure 3 - Siuren I. Unit G, level Gd. Flint Artifacts – Tools. 1, end-scraper on a retouched piece (a flake); 2, carinated end-scraper; 3, angle burin; 4, double mixed (on truncation and angle) burin; 5, pseudo-Dufour type bladelet, on microblade with bilateral dorsal retouch; 6, bilaterally backed microblade; 7-12, Dufour type bladelet, on bladelets with alternate retouch; 13-18, Dufour type bladelet, on microblades with alternate retouch; 19, Middle Paleolithic sub-triangular dorsal point with basal ventral thinning (complete).

Groups & Types	Ga	Gb1-Gb2	Gc1-Gc2	Gd	TOTAL
BIFACIAL TOOLS			**3**		**3**
Point semi-leaf / triangular with a concave base (pseudo "bi-convex" - multiple "plano-convex")			1		1
Scraper single edged straight ("plano-convex")			1		1
Unidentifiable foliate piece - medial part ("plano-convex")			1		1
UNIFACIAL TOOLS		**3**	**10**	**1**	**14**
Points			3		4
- sub-triangular dorsal *with basal ventral thinning*				1	
- sub-leaf dorsal *with distal and basal ventral thinnings*			1		
- unidentifiable - distal tips			2		
Scrapers		2	7		9
Complete:			*4*		
- elongated semi-trapezoidal dorsal scraper *with basal ventral and lateral dorsal thinnings*			1		
- semi-trapezoidal dorsal			1		
- semi-trapezoidal ventral			1		
- semi-crescent dorsal			1		
Fragmented:		*2*	*3*		
- simple straight dorsal (*longitudinally fragmented proximal part of a flake*)			1		
- double straight-convex dorsal *with truncated-faceted base* (*proximal part of a flake*)			1		
- double convex dorsal *with basal ventral thinning* (*proximal part of a flake*)		1			
- semi-trapezoidal dorsal (*longitudinally fragmented flake*)		1			
- unidentifiable (*heavily burnt flint fragment*)			1		
Denticulated Pieces		1			1
- transversal convex dorsal *with basal dorsal and ventral thinnings* (*unidentifiable broken flake*)		1			
TOTAL		**3**	**13**	**1**	**17**

Table 46 - Siuren-I. Middle Paleolithic Tool Types Classification.

dorsal retouch (length – 3.3 cm). Three more broken microliths have the lengths more than 3.5 cm: 2 Dufour bladelet on bladelets with alternate retouch and 1 Dufour bladelet on microblade with alternate retouch.

Of 87 retouched edges, presented on 49 microliths, about 70 % were retouched by micro-scalar retouch. In addition, a relatively significant percentage of edges was produced by micro-stepped retouch – ca. 22 %. Among the latter, right edges clearly dominate. That is, micro-stepped retouch was mainly used on ventrally retouched edges of Dufour bladelets. Marginally retouched edges are represented by a few pieces. Semi-abruptly retouched edges comprise about 77 % of all modified edges on microliths. The percentage of semi-abrupt edges is slightly higher for right edges, while flat retouch is more common for left edges. About two-thirds of microlith edges have continuous retouch, although partially retouched edges are also important. At the same time, discontinuously retouched edges are represented by a very small number of pieces. In sum, non-geometric microliths are mainly represented by pieces with continuous semi-abrupt micro-scalar retouch and the total variability in retouch typology for microliths is similar, as described for alternatively retouched Dufour bladelet, which are the most common type of microliths in level Gd.

All 49 non-geometric microliths are made on gray flints (37 pieces) and colored flints (12 pieces).

"Neutral" tool types
These tools are represented only by two notched pieces.

Notched Pieces. Both are lateral dorsal with single notches formed by scalar steep retouch and made on broken blanks: a blade and a flake.

The blade of the first notched piece, as a blank, is a non-cortical distal fragment with unidirectional scar pattern, irregular shape, "on-axis" removal direction, twisted general profile, feathering distal end and triangular profile at midpoint. On gray flint, 2.7 cm long, 1.3 wide and 0.4 thick.

The flake of the second notched piece, as a blank, is a partially cortical distal fragment with insignificant lateral cortex and is only characterized by bidirectional scar pattern, converging shape, incurvate medial general profile, feathering distal end and multifaceted profile at midpoint. On gray flint, 5.0 cm long, 3.1 cm wide and 0.9 cm thick.

Retouched pieces
These include 8 blades (7 with marginal and one more with irregular retouch) and a flake with irregular retouch.

The single retouched flake has lateral dorsal irregular continuous retouch. The flake, as a blank, is a non-cortical complete one with unidirectional scar pattern, irregular shape, "off-axis"

		Dufour	Pseudo-Dufour	Krems points	N	%
LEVEL Ga						
LEFT EDGE	MARGINAL	1			1	6,67
	SCALAR	2	1	1	4	26,66
	STEPPED	1			1	6,67
RIGHT EDGE	MARGINAL					
	SCALAR	4	1	1	6	40
	STEPPED	3			3	20
TOTAL		**11**	**2**	**2**	**15**	**100**
LEVEL Gb1-Gb2						
LEFT EDGE	MARGINAL	6	1		7	9,1
	SCALAR	19	5		24	31,17
	STEPPED	8	1		9	11,69
RIGHT EDGE	MARGINAL	5	1		6	7,79
	SCALAR	16			16	20,78
	STEPPED	14	1		15	19,48
TOTAL		**68**	**9**		**77**	**100**
LEVEL Gc1-Gc2						
LEFT EDGE	MARGINAL	8	2	1	11	5,82
	SCALAR	49	3		52	27,51
	STEPPED	26	1	2	29	15,34
RIGHT EDGE	MARGINAL	2	1	1	4	2,12
	SCALAR	38	1		39	20,64
	STEPPED	51	1	2	54	28,57
TOTAL		**174**	**9**	**6**	**189**	**100**
LEVEL Gd						
LEFT EDGE	MARGINAL	2			2	2,29
	SCALAR	24	11		35	40,23
	STEPPED	5			5	5,75
RIGHT EDGE	MARGINAL		4		4	4,59
	SCALAR	21	6		27	31,03
	STEPPED	14			14	16,1
TOTAL		**66**	**21**		**87**	**100**

Table 47 - Siuren-I. Unit G. Non-Geometric Microliths: Retouch Types.

removal direction, twisted general profile, feathering distal end, irregular profile at midpoint and crushed butt. On gray flint, 2.3 cm long, 2.4 cm wide (shortened transversal proportions), 0.3 cm thick.

Seven blades with marginal continuous and/or discontinuous retouch are subdivided by retouch placement: 3 lateral dorsal pieces, 1 lateral and distal end dorsal piece and 3 bilateral dorsal pieces. These blades, as blanks, are 1 complete, 2 proximal fragments, 3 distal fragments and 1 distal fragment; all, except for one proximal fragment with insignificant lateral cortex, are non-cortical ones with only unidirectional scar pattern; 1 parallel, 1 convergent and 4 unidentifiable shapes; 2 "off-axis" and 4 unidentifiable removal directions; 1 flat, 2 incurvate medial, 1 twisted and 3 unidentifiable general profiles; only unidentifiable distal ends; 3 triangular, 2 trapezoidal and 2 multifaceted profiles at midpoints; 1 plain 0.7 x 0.2 cm butt (semi-lipped, semi acute angle, questionable abrasion), 1 punctiform butt (semi-lipped, semi-acute angle, with abrasion), 1 linear 0.4 x 0.1 cm butt (semi-lipped, semi-acute angle, with abrasion) and 3 unidentifiable missing butts. Six of these blades are on gray flints and only one blade is on colored flint. One complete blade is 4.1 cm long, 1.3 cm wide and 0.4 cm thick. The remaining six broken blades have the following ranges: length 1.5-2.9 cm, width 1.4-1.8 cm, thickness 0.2-0.6 cm.

One blade with irregular retouch is a lateral ventral broken one with partial retouch. The blade, as a blank, is a non-cortical proximal fragment with identifiable unidirectional scar pattern, incurvate medial general profile, trapezoidal profile at midpoint and punctiform butt (semi-lipped, semi-acute angle, with abrasion). On gray flint, 2.7 cm long, 1.6 cm wide and 0.4 cm thick.

Unidentifiable Tool Fragments

These include 5 non-cortical pieces and 2 pieces with some cortex. In terms of raw material types, there are 4 pieces of gray flints and 3 on colored flints. It is also possible to note that there are two non-cortical specimens on gray flints with stepped

		Dufour	Pseudo-Dufour	Krems points	N	%
LEVEL Ga						
	FLAT	2			2	13,33
LEFT EDGE	SEMI-ABRUPT	2	1	1	4	26,67
	ABRUPT					
	FLAT					
RIGHT EDGE	SEMI-ABRUPT	7	1	1	9	60
	ABRUPT					
TOTAL		**11**	**2**	**2**	**15**	**100**
LEVEL Gb1-Gb2						
	FLAT	7	3		10	12,99
LEFT EDGE	SEMI-ABRUPT	26	4		30	38,96
	ABRUPT					
	FLAT	4			4	5,19
RIGHT EDGE	SEMI-ABRUPT	31	2		33	42,86
	ABRUPT					
TOTAL		**68**	**9**		**77**	**100**
LEVEL Gc1-Gc2						
	FLAT	37	2		39	20,63
LEFT EDGE	SEMI-ABRUPT	46	4	3	53	28,05
	ABRUPT					
	FLAT	17	2		19	10,05
RIGHT EDGE	SEMI-ABRUPT	74	1	3	78	41,27
	ABRUPT					
TOTAL		**174**	**9**	**6**	**189**	**100**
LEVEL Gd						
	FLAT	6	6		12	13,79
LEFT EDGE	SEMI-ABRUPT	25	5		30	34,48
	ABRUPT					
	FLAT	3	4		7	8,05
RIGHT EDGE	SEMI-ABRUPT	32	6		38	43,68
	ABRUPT					
TOTAL		**66**	**21**		**87**	**100**

Table 48 - Siuren-I. Unit G. Non-Geometric Microliths: Retouch Angle.

semi-steep retouch, which could be conventionally interpreted as lateral fragments either of Middle Paleolithic type unifacial scrapers or Upper Paleolithic type heavily retouched blades.

Non-Flint Tools

These include a battered piece (*pièce à mâchures*)-grinding tool on a limestone pebble fragment and a chopper-grinding tool on a limestone pebble.

The first tool is on a large longitudinally fragmented half of a limestone pebble (length – 10.9 cm, width – 8.1 cm, thickness – 3.0 cm) with battering bifacial wear around all edges, leading to its identification as a battered piece, as well as a series of long and shallow striations, and numerous traces of ochre on the natural primary surface of the pebble, suggesting possible use as a color grinding tool as well.

The second tool is on a large limestone pebble with transversal proportion (length – 7.7 cm, width – 11.5 cm, thickness – 5.4 cm). It has both chopper-like unifacial rough treatment on the wide transversal edge and evidence of its function in color grinding given the presence of long and shallow striations, numerous traces of ochre and battering traces on the natural primary surface of the pebble.

Thus, both of these non-flint tools appear to be multifunctional tools with specific uses that are not usually typical of "regular" flint tools.

Middle Paleolithic tool types

The Middle Paleolithic only tool (fig. 3:19) is a unifacial subtriangular dorsal point with basal ventral thinning on a complete flake. A sharp tip of the point was created by the convergence of two heavily retouched edges. Both of these edges have stepped retouch, one with semi-steep angle and the other with steep angle. The stepped steep edge is slightly concave, but does not create a hook-like shape for the point, as the stepped

		Dufour	Pseudo-Dufour	Krems points	N	%
LEVEL Ga						
LEFT EDGE	CONTINUOUS	4	1	1	6	40
	DISCONTINUOUS					
	PARTIAL					
RIGHT EDGE	CONTINUOUS	4	1	1	6	40
	DISCONTINUOUS					
	PARTIAL	3			3	20
TOTAL		**11**	**2**	**2**	**15**	**100**
LEVEL Gb1-Gb2						
LEFT EDGE	CONTINUOUS	24	5		29	37,66
	DISCONTINUOUS		1		1	1,3
	PARTIAL	9	1		10	12,99
RIGHT EDGE	CONTINUOUS	26	1		27	35,07
	DISCONTINUOUS	2			2	2,59
	PARTIAL	7	1		8	10,39
TOTAL		**68**	**9**		**77**	**100**
LEVEL Gc1-Gc2						
LEFT EDGE	CONTINUOUS	57	6	1	64	33,86
	DISCONTINUOUS	8		1	9	4,76
	PARTIAL	18		1	19	10,05
RIGHT EDGE	CONTINUOUS	63	3	3	69	36,51
	DISCONTINUOUS	5			5	2,65
	PARTIAL	23			23	12,17
TOTAL		**174**	**9**	**6**	**189**	**100**
LEVEL Gd						
LEFT EDGE	CONTINUOUS	21	5		26	29,89
	DISCONTINUOUS	5	1		6	6,89
	PARTIAL	5	5		10	11,49
RIGHT EDGE	CONTINUOUS	26	4		30	34,48
	DISCONTINUOUS	3	1		4	4,61
	PARTIAL	6	5		11	12,64
TOTAL		**66**	**21**		**87**	**100**

Table 49 - Siuren-I. Unit G. Non-Geometric Microliths: Retouch Features.

semi-steep edge is straight, not convex. The flake, as a blank, is a non-cortical one of converging shape, "off-axis" removal direction and flat general profile. On gray flint, 2.5 cm long, 3.2 cm wide (shortened, transversal proportions), 0.9 cm thick. In F. Bordes' terminology, this tool would be most likely defined as an "atypical" Mousterian point.

Level Gc1-Gc2

Tools are represented by 210 artifacts with distribution into seven groups: 1) Indicative Upper Paleolithic types – 22 pieces/10.5%; 2) Non-Geometric Microliths – 117 pieces/55.7%; 3) "Neutral" types – 5 pieces/2.4%; 4) Retouched Pieces – 39 pieces/18.6%; 5) Unidentifiable Tool Fragments – 12 pieces/5.7%; 6) Non-Flint Tools – 2 pieces/0.9%; 7) Middle Paleolithic types – 13 piece/6.2%.

Indicative Upper Paleolithic tool types
These include 5 end-scrapers, 7 burins, 2 composite tools, 2 truncations, 4 retouched blades and 2 scaled tools.

End-scrapers. These are represented by 3 simple, 1 double and 1 carinated.

All simple end-scrapers are on complete blades with lateral and/or bilateral dorsal irregular partial retouch (fig. 4:1-3). The three fronts are convex, located on the dorsal distal surface and in two cases were formed by convergent scalar semi-steep and steep retouch and the third by convergent sub-parallel steep retouch. The blades, as blanks, are partially cortical ones with insignificant lateral cortex and are morphologically characterized by the following features: 3 unidirectional scar patterns; 2 parallel and 1 expanding shapes; 3 "on-axis" removal directions; 2 incurvate medial and 1 twisted general profiles; 3 unidentifiable as retouched distal ends; 2 trapezoidal and 1 multifaceted profiles at midpoint; 2 linear (0.2 x 0.1 cm and 0.5 x 0.1 cm) butts (semi-lipped, semi-acute angles, with abrasion) and 1 crushed butt. All these 3 simple end-scrapers are on colored flints and have the following metrics: length – 6.1 cm, 4.9 cm, 4.0 cm; width – 2.1 cm, 1.6 cm, 1.3 cm; thickness – 0.5 cm, 0.6 cm, 0.6 cm, respectively.

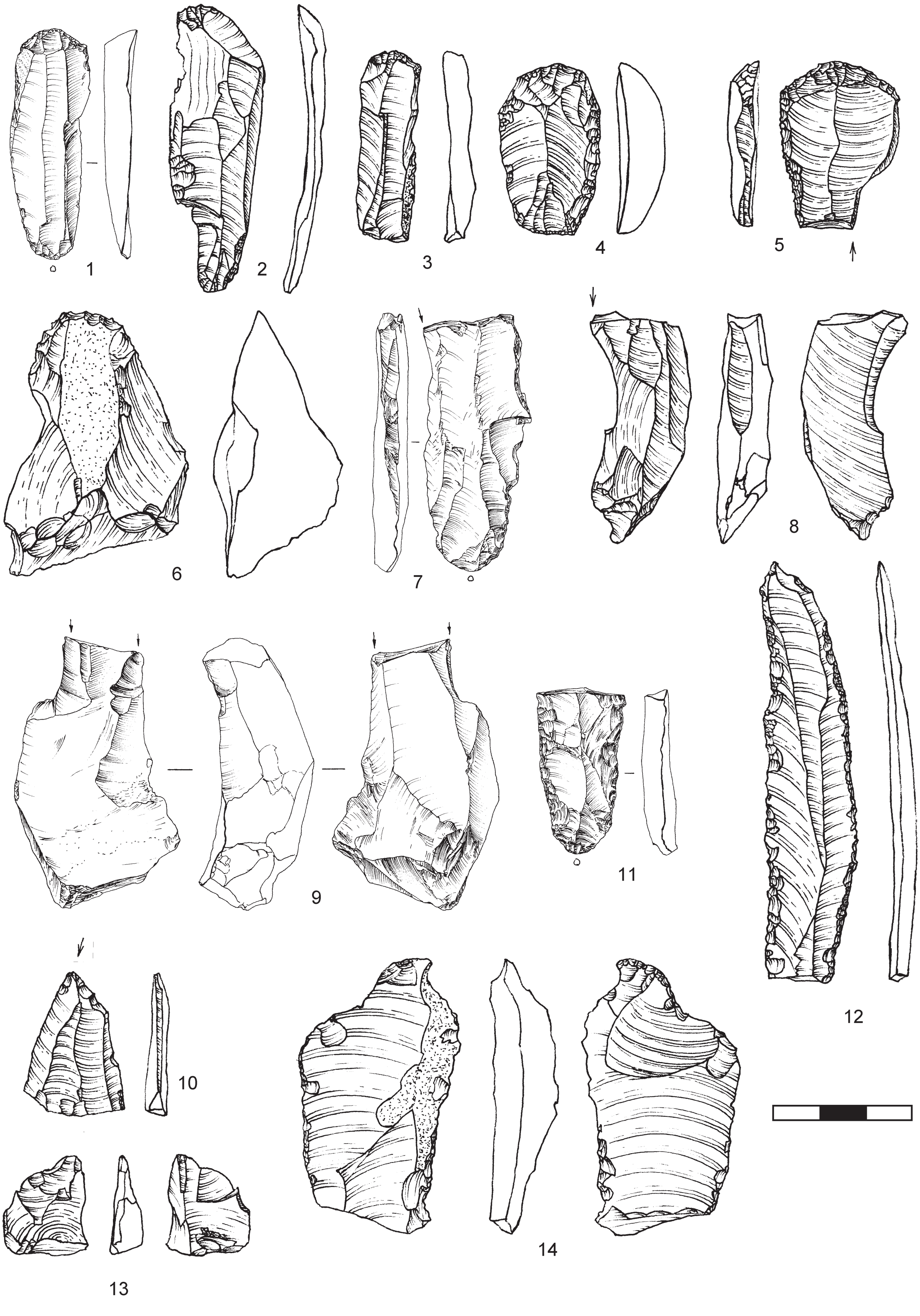

Figure 4 - Siuren I. Unit G, level Gc1-Gc2. Flint Artifacts – Tools. 1-3, flat simple end-scrapers on blades; 4, double end-scraper; 5, end-scraper/ burin; 6, carinated end-scraper; 7, angle burin; 8, perforator/burin; 9, double angle burin; 10, burin on truncation; 11, retouched blade with bilateral dorsal Aurignacian-like retouch; 12, retouched blade with bilateral dorsal marginal continuous and discontinuous retouch; 13-14, scaled tools.

The double end-scraper (fig. 4:4) is on a complete flake with lateral dorsal scalar semi-steep retouch. The two fronts (one convex and one straight) are located opposite one another at the proximal and distal ends of the flake's dorsal surface and both have convergent sub-parallel steep retouch. The flake, as a blank, is non-cortical with unidirectional scar pattern, expanding shape, "on-axis" removal direction, twisted general profile, distal end and butt unidentifiable as retouched, triangular profile at midpoint. On colored flint, 3.6 cm long, 2.2 cm wide and 1.0 cm thick.

The carinated end-scraper (fig. 4:6) is on a thick partially cortical chunk. The front is convex, formed by non-convergent sub-parallel steep lamellar retouch (microblade negatives). Secondary treatment of the tool is clearly unfinished, due to longitudinal breakage during the retouch phase (the broken parts were refitted). The chunk, as a blank, is on gray flint and 5.6 cm long, 3.5 cm wide, 2.5 cm thick.

Burins. These include 2 angle, 1 on truncation, 1 double angle and 3 broken specimens.

The first angle burin (fig. 4:7) is on a broken blade with lateral dorsal marginal continuous retouch. The burin termination is on the blade's distal break from which two burin blows were made along one retouched lateral edge. The blade, as a blank, is a non-cortical proximal fragment of a re-crested blade with unilateral partial crested ridge. It also has the following identifiable morphological features: unidirectional scar pattern, twisted general profile, multifaceted profile at midpoint and plain (0.6 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion). On gray flint, length – 5.4 cm, width – 2.2 cm, thickness – 0.6 cm.

The second angle burin is on a complete blade. The burin termination is on the proximal end (crushed butt) of a blade from which a single burin blow was made. The blade, as a blank, is non-cortical with bidirectional scar pattern, irregular shape, "on-axis" removal direction, flat general profile, unidentifiable distal end, trapezoidal profile at midpoint and crushed butt. On gray flint, 3.2 cm long, 1.3 cm wide, 0.5 cm thick.

The burin on truncation (fig. 4:10) is on a broken blade with lateral dorsal marginal partial retouch. The burin termination is a straight oblique truncation on the blade's distal end and has a single burin facet struck off the blade's unretouched lateral edge. The burin termination is also interesting as it was probably initially a pointed blade, by scalar semi-steep retouch, on which the burin was made. It is necessary to note that the case under discussion is not "a burin-like damage" of a pointed blade with projectile function. The blade, as a blank, is a non-cortical distal fragment with unidirectional scar pattern, convergent shape and multifaceted profile at midpoint. On slightly burnt colored flint, 3.1 cm long, 2.1 cm wide and 0.4 cm thick.

The double angle burin (fig. 4:9) is on a broken flake. The burin termination is on the flake's proximal break from which two burin blows each were made along both lateral edges. One of the detached burin spalls was refitted to the burin and it has all of the typical morphological features of a burin spall. The flake, as a blank, is a non-cortical distal fragment with unidirectional-crossed scar pattern, irregular shape, "off-axis" removal direction, incurvate medial general profile, blunt distal end and trapezoidal profile at midpoint. On gray flint, 5.4 cm long, 3.1 cm wide and 1.7 cm thick.

Three broken burins are characterized as such by the absence of burin terminations for two and the heavily burnt unidentifiable nature of the third piece. It is thus not possible to identify specific burin types for these broken burins. The blank of the third burin is a heavily burnt unidentifiable piece on colored flint. The blanks of the other two burins are partially cortical blades: medial and distal fragments. The medial fragment has insignificant lateral cortex and is characterized by unidirectional scar pattern, flat general profile and trapezoidal profile at midpoint. On gray flint, 3.9 cm long, 1.9 cm wide, 1.1 cm thick. The distal fragment has insignificant lateral/distal cortex and is characterized by bidirectional scar pattern, irregular shape, "on-axis" removal direction, incurvate medial general profile, blunt distal end and multifaceted profile at midpoint. On gray flint, 4.3 cm long, 1.9 cm wide, 1.6 cm thick.

Composite Tools are represented by an end-scraper/burin and a perforator/burin.

The *end-scraper/burin* (fig. 4:5) is on a broken flake. The end-scraper's front is convex, formed on the flake's dorsal surface proximal end by non-convergent scalar steep retouch. One lateral edge has a clear burin facet that evidences burin manufacture from the distal end of the flake. Unfortunately, the burin termination is missing due to breakage either during production or use and, therefore, this burin could only be identified as broken. The tool's other lateral edge (with no burin facet) has dorsal scalar steep continuous retouch that is probably necessary to consider along with the end-scraper part of this composite tool. If so, the end-scraper should be classified as an end-scraper on retouched piece. The flake, as a blank, is a non-cortical proximal part and is only morphologically characterized by unidirectional scar pattern and triangular profile at midpoint, as the proximal end (butt) is retouched. On colored flint, 3.6 cm long, 2.6 cm wide, 0.7 cm thick.

The *perforator/burin* (fig. 4:8) is on a broken blade. The retouch forming the perforator's tip is alternative scalar semi-steep and converges from both lateral edges at the distal end of the blade. The burin termination is on the blade's proximal break from which one burin blow was made. Thus, this is an angle type. The blade, as a blank, is a non-cortical truly secondary crested (with no preserved crested ridge) distal fragment with unidirectional scar pattern, converging shape, "off-axis" removal direction, twisted general profile, blunt distal end and multifaceted profile at midpoint. On gray flint, 5.0 cm long, 1.8 cm wide, 1.0 cm thick.

Truncations are represented by 2 pieces.

Both the tools have an oblique truncated termination formed by scalar steep retouch at the proximal end of a broken blade and the distal end of a complete flake. The blade, as a blank, is a non-cortical proximal fragment with only identifiable unidirectional scar pattern, flat general profile at midpoint. It is a gray flint, 2.1 cm long, 1.5 cm wide, 0.2 cm thick. The flake, as a blank, is partially cortical with significant lateral cortex and is morphologically characterized by unidirectional scar pattern, irregular shape, "on-axis" removal direction, incurvate distal profile at midpoint and punctiform (0.3 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion). On gray flint, 2.7 cm long, 1.9 cm wide, 0.5 cm thick.

Retouched Blades include 4 broken pieces with bilateral dorsal scalar semi-steep retouch.

One (fig. 4:11) can be defined as an Aurignacian-like retouched blade due to its regular continuous and invasive scalar semi-steep retouch. The blade, as a blank, is a non-cortical proximal fragment with unidirectional scar pattern, twisted general profile, triangular profile at midpoint and plain (0.5 x 0.2 cm) butt (lipped, semi-acute angle, with abrasion). On gray flint, 3.5 cm long, 1.9 cm wide and 0.6 cm thick.

Two more retouched blades, as blanks, are non-cortical and partially cortical with insignificant lateral cortex medial fragments. They have the following morphological features: 2 unidirectional scar pattern, 2 flat general profile, 1 triangular and 1 multifaceted profiles at midpoint. They are on colored flints, 1.5 cm long, 1.8 cm wide, 0.4 cm thick and 5.2 cm long, 2.4 cm wide, 0.6 cm thick.

Another retouched blade, as a blank, is a non-cortical distal fragment with the following morphological features: unidirectional scar pattern, twisted general profile and triangular profile at midpoint. On colored flint, 3.8 cm long, 1.6 cm wide, 0.3 cm thick.

Scaled Tools include 2 items differing in preservation.

One piece (fig. 4:13) is a typical example with two opposing extremities/poles at the proximal (near the butt) and distal ends of a small complete flake with pronounced bifacial scaling. The flake, as a blank, is non-cortical with, due to the heavy scaling, the following characteristics: irregular shape, "on-axis" removal direction, flat general profile and plain (1.3 x 0.6 cm) butt (semi-lipped, semi-acute angle, with no abrasion). On gray flint, 2.1 cm long, 1.7 cm wide, 0.6 cm thick.

The second piece (fig. 4:14) is on a large broken blade with missing proximal end. Nevertheless, the distal end has clear heavy bifacial scaling extremity/pole that points to its definite identification as a scaled tool type. The missing proximal part of the tool could be with caution explained by breakage during tool use. The blade, as a blank, is a partially cortical distal fragment with insignificant lateral cortex and has the following definable morphological features: unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile and triangular profile at midpoint. On colored flint: 6.0 cm long, 3.3 cm wide, 1.3 cm thick.

Non-Geometric Microliths

The assemblage of non-geometric microliths from level Gc1-Gc2 is the most abundant collection of microliths recovered during the 1990s excavations at Siuren I. They are represented by 117 items, or by 55.7% of all tools from level Gc1-Gc2. These are subdivided into Dufour bladelets – 91 pieces (77.8%); pseudo-Dufour bladelets – 11 pieces (9.4%); Krems points – 3 pieces (2.6%); bladelet with dorsal retouch at distal end – 1 (0.8%); bladelets with micro-notch – 6 pieces (5.1%); truncated bladelets – 2 pieces (1.7%); bitruncated bladelet – 1 piece (0.8%); microblade with micro-denticulated edge – 1 piece (0.8%); microblade with bilateral abrupt retouch – 1 piece (0.8%).

The Dufour bladelet type, on bladelets with alternate retouch (fig. 5:1-12) is composed of 26 pieces (22.2% of all microliths). All have dorsally retouched left edges and ventrally retouched right edges. Continuously retouched edges dominate – 31 edges of 52 available. Partially and discontinuously retouched edges are represented by 14 and 7 edges, respectively. Semi-abrupt retouch was identified on 30 edges, while flat retouch was used on 22 edges. Mainly flat retouch was employed for dorsally retouched left edges – 16 of 26 edges, while semi-abrupt retouch is more typical of ventrally retouched right edges – 20 of 26 edges. Micro-scalar and micro-stepped retouch were found in similar numbers of edges: 22 and 28 edges, respectively. In addition, two marginally retouched edges were identified.

In sum, edges with continuous semi-abrupt micro-stepped retouch combination (18 edges) are the most common for this microlith type. Other retouch combinations are represented by insignificant numbers of edges: continuous semi-abrupt micro-scalar – 2; continuous flat micro-stepped – 2; continuous flat micro-scalar – 9; continuous flat marginal –1; discontinuous semi-abrupt micro-scalar – 2; discontinuous flat micro-scalar – 2; discontinuous semi-abrupt micro-stepped – 2; discontinuous flat micro-stepped – 1; partial semi-abrupt micro-stepped – 4; partial flat micro-stepped – 3; partial flat marginal – 1; partial semi-abrupt micro-scalar – 2; partial flat micro-scalar – 3.

The Dufour bladelet type, on microblades with alternate retouch (fig. 5:13-29) is represented by 57 items. This includes about half of all non-geometric microliths – 48.7%. Except for one piece, Dufour bladelet on microblades have dorsally retouched left edges and ventrally retouched right edges. The exception is a piece with ventral retouch on both left (partial semi-abrupt micro-stepped) and right (partial semi-abrupt micro-scalar) edges. Its right edge was also dorsally treated by partial flat micro-scalar retouch. So, this tool appears to be a very unique combination of alternate and alternating methods of edge preparation. The other 56 microliths comprise 112 retouched edges. They are dominated by continuously retouched edges – 87 items. Discontinuously and partly retouched edges are represented by insignificant numbers: 6 and 19 edges. Also, semi-abrupt edges are dominant (84 items), while edges with flat retouch angle are relatively less common (28 items). Stepped and micro-scalar retouch were used in similar numbers of edges: 47 and 59. Marginal retouch was used in only 6 cases. So, there are two dominant combinations of retouch: continuous semi-abrupt stepped – 42 edges and continuous semi-abrupt micro-scalar – 28 edges. The other retouch combinations are rare: continuous flat micro-scalar – 14 edges; continuous flat marginal – 3; continuous semi-abrupt marginal – 1; discontinuous flat micro-scalar – 6; partial semi-abrupt micro-scalar – 8; partial semi-abrupt stepped – 5; partial flat micro-scalar – 4; and, partial flat marginal – 2.

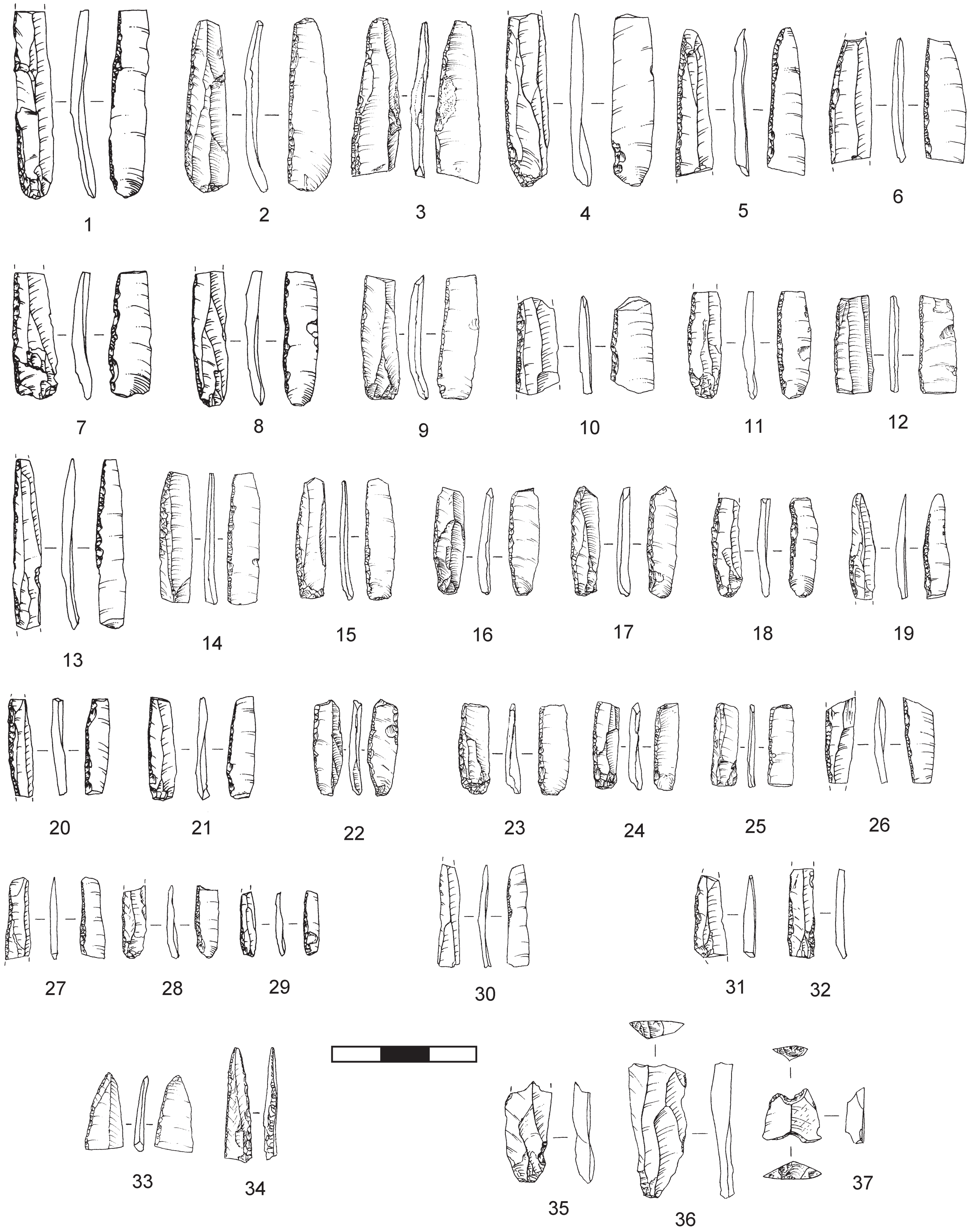

Figure 5 - Siuren I. Unit G, level Gc1-Gc2. Flint Artifacts – Tools ("Non-Geometric Microliths"). 1-12, Dufour type bladelet, on bladelets with alternate retouch; 13-29, Dufour type bladelet, on microblades with alternate retouch; 30, Dufour type bladelet, on microblade with ventral retouch; 31, pseudo-Dufour type bladelet, on microblade with dorsal retouch; 32, pseudo-Dufour type bladelet, on microblade with bilateral dorsal retouch; 33, Krems point, on bladelet with alternate retouch; 34, Krems point, on microblade with bilateral dorsal retouch; 35, bladelet with micro-notch; 36, truncated bladelet; 37, bitruncated bladelet.

The Dufour bladelet type, on bladelets with ventral retouch is represented by 3 pieces (2.6% of all microliths). All have retouch on right edge. Two edges are retouched by partial flat micro-scalar, and one more edge – by partial semi-abrupt micro-scalar retouch.

The Dufour bladelet type, on microblades with ventral retouch (fig. 5:30) is characterized 5 pieces (4.3% of all microliths). Left ventrally retouched edges demonstrate 5 different combinations of retouch types: continuous semi-abrupt micro-scalar; continuous semi-abrupt marginal; continuous flat micro-stepped; partial semi-abrupt micro-stepped; partial flat micro-scalar.

The Pseudo-Dufour bladelet type, on bladelets with dorsal retouch is composed of 2 pieces (1.7% of all microliths). These bladelets show both different placement and different combinations of retouch. One has continuous semi-abrupt marginal retouch on the left edge, while the other has continuous flat micro-scalar on the right edge.

The Pseudo-Dufour bladelet type, on microblades with dorsal retouch (fig. 5:31) is represented by 3 pieces (2.6% of all microliths). All have retouch on the left edge. Two microliths were made by continuous semi-abrupt micro-scalar retouch and the third microblade has continuous flat micro-scalar retouch.

The Pseudo-Dufour bladelet type, on bladelets with bilateral dorsal retouch is known through 4 pieces (3.4% of all microliths). All 8 edges of the four microliths are continuously retouched. Five edges have semi-abrupt retouch; one edge is abruptly retouched and two other edges have flat retouch. Micro-stepped (3 edges) and micro-scalar (3 edges) retouched edges are represented by the same number of items. Two other edges have by flat retouch. The following retouch combinations are identified: continuous semi-abrupt micro-stepped – 1 edge; continuous abrupt micro-scalar – 1 edge; continuous semi-abrupt micro-scalar – 2 edges; continuous semi-abrupt marginal – 2 edges; continuous flat micro-stepped – 2 edges.

The Pseudo-Dufour bladelet type, on microblades with bilateral dorsal retouch (fig. 5:32) is represented by 2 pieces (1.7% of all microliths). One of these microliths has partial flat micro-scalar retouch on both edges, while the other has continuous semi-abrupt micro-stepped retouch on both edges.

The Krems point type, on bladelet with alternate retouch (fig. 5:33) is represented by 1 piece (0.8% of all microliths). The left edge of the point is dorsally retouched by discontinuous abrupt micro-stepped retouch, while the right edge is inversely retouched by continuous semi-abrupt micro-stepped retouch.

The Krems point type, on microblades with bilateral dorsal retouch (fig. 5:34) is composed of 2 pieces (1.7 % of all microliths). Both edges of the first point have continuous semi-abrupt micro-stepped retouch. The left edge of the second point has partial semi-abrupt micro-stepped retouch, while the right edge has continuous semi-abrupt micro-stepped retouch.

Bladelets with dorsal retouch at distal end are represented by 1 piece. The distal end of this bladelet has continuous flat micro-scalar retouch.

Bladelets with micro-notch (fig. 5:35) are represented by 6 pieces. Three of these microliths have retouched notches on the dorsal side of their left edges. The other three have retouched notches on the ventral side of their right edges. Dorsal notches were produced by semi-abrupt micro-scalar (2 pieces) and flat micro-scalar (1 piece) retouch combinations. All of the ventral notches were made by a semi-abrupt micro-scalar combination of retouch.

Truncated bladelets (fig. 5:36) are represented by 2 pieces. Distal ends of these bladelets were truncated by abrupt micro-stepped retouch.

Bitruncated bladelet – l piece (fig. 5:37). Both its distal and proximal ends are truncated by abrupt micro-stepped retouch.

Microblade with micro-denticulated edge – 1 piece. The piece's left lateral edge has continuous semi-abrupt stepped wavy retouch.

Microblade with bilateral abrupt dorsal retouch – 1 item. Both lateral edges have a partial abrupt micro-scalar retouch combination.

Forty six bladelets and 71 microblades were used for non-geometric microlith production. The majority of selected blanks were removed "on-axis" – 103 pieces. Two blanks were removed "off-axis". For twelve other pieces, "axis" removal direction cannot be identified. Blanks with twisted general profile dominate – 54 pieces. In addition, there is an important number of bladelets and microblades with incurvate medial general profile – 37 pieces. Both flat and unidentifiable blanks' general profiles are rare and represented by 18 and 8 pieces.

Two microliths are represented by complete pieces. Both are Dufour bladelets on microblades with alternate retouch (lengths – 2.2 and 2.5 cm). The longest microlith is a broken Dufour bladelet on bladelet with alternate retouch (length is > 4.0 cm). Very few fragmented microliths are longer 3.0 cm, but include Dufour bladelets on bladelets with alternate retouch – 4 pieces and a Dufour bladelet on microblade with alternate retouch – 1 piece. The remaining broken microliths range from 0.5 cm to 2.9 cm long.

Of 204 retouched edges, represented by 114 microliths (excluding 3 truncated pieces), about 48% have micro-scalar retouch. Micro-stepped retouched edges are also important – about 44% of all edges. Marginal retouch was employed on 12 edges. The semi-abrupt retouch angles (138 items) clearly dominate among the retouch angles. Flat retouched edges (62 items) are also relatively common. On the other hand, abrupt retouch was identified on only 4 edges. About 70 % of edges (142 edges) are continuously retouched. Discontinuous and partial retouch are represented by 14 and 48 edges.

Overall, 18 retouch combinations were identified for 204 microlith edges. The most common is continuous semi-abrupt micro-stepped retouch – 67 edges. Next, we see continuous semi-abrupt micro-scalar retouched edges (35) and continuous flat marginal retouched edges (25). Also, partial semi-abrupt micro-scalar, partial semi-abrupt micro-stepped and partial flat micro-scalar retouched edges relatively numerous – 16, 11 and 13, respectively. The remaining retouch combinations are represented by insignificant numbers of edges: continuous flat marginal – 4; continuous semi-abrupt marginal – 5; continuous flat micro-stepped – 5; continuous abrupt micro-scalar – 1; discontinuous flat micro-scalar – 8; discontinuous semi-abrupt micro-stepped – 2; discontinuous flat micro-stepped – 1; discontinuous semi-abrupt micro-scalar – 2; discontinuous abrupt micro-stepped – 1; partial flat marginal – 3; partial flat micro-stepped – 3; partial abrupt micro-scalar – 2.

All 117 non-geometric microliths are made on the following raw material types: gray flints (82 pieces), colored flints (34 pieces), black flints (1 piece).

"Neutral" tool types
These tools are represented only by notched pieces (5 items).

Notched Pieces. There are 3 notched pieces on blades and 2 on flakes with scalar semi-steep retouch.

Three notched pieces on blades are represented by two types: 2 lateral dorsal and 1 lateral ventral. The blades, as blanks, are all non-cortical pieces but two are complete and one is a distal fragment. They have the following morphological features: 3 unidirectional scar patterns; 2 parallel and 1 irregular shapes; 3 "on-axis" removal directions; 1 incurvate medial, 1 incurvate distal and 1 convex general profiles; 2 feathering and 1 blunt distal ends; 2 triangular and 1 multifaceted profiles at midpoint; 2 finely faceted (0.8 x 0.3 and 0.6 x 0.2 cm) butts (2 semi-lipped, 2 right angles, 2 with abrasion) and 1 missing butt. All 3 pieces are on colored flints with the following metrics: 4.3 x 1.6 x 0.8 cm, 3.2 x 1.5 x 0.6 cm, 2.6 x 1.4 x 0.4 cm.

Two notched pieces on flakes differ by placement of retouch notches: distal dorsal and lateral ventral. The flakes, as blanks, are complete: a non-cortical item and a partially cortical item with insignificant lateral cortex. Morphologically, they have 1 unidirectional and 1 3-directional scar patterns; 1 parallel and 1 expanding shapes; 2 "on-axis" removal directions; 1 incurvate distal and 1 convex general profiles; 1 feathering and 1 hinged distal ends; 1 multifaceted and 1 irregular profiles at midpoint; 1 crushed and 1 finely faceted (1.7 x 0.5 cm) butt (semi-lipped, right angle, with abrasion). Both pieces are on gray flint with following dimensions: 2.5 x 1.5 x 0.4 cm and 3.3 x 3.7 x 0.9 cm.

Retouched pieces
There are 27 retouched blades, 11 retouched flakes and 1 retouched chunk. Taking into account such a large sample, the retouched pieces will be described by the three groups represented.

The retouched chunk has irregular partial retouch. On gray flint with insignificant cortex.

The retouched flakes are subdivided by retouch and placement. Four flakes have marginal continuous and/or partial retouch with only lateral dorsal placement. Seven other flakes have irregular continuous and/or partial retouch with the following placement: lateral dorsal – 4 pieces, bilateral dorsal – 1 piece, distal dorsal – 1 piece, distal + lateral ventral – 1 piece. Morphologically, all 11 retouched flakes are characterized by the following features: 9 complete and 2 distal fragments; 2 cortical, 5 partially cortical with only insignificant distal (3), lateral (1) and central (1) cortex, and 4 non-cortical pieces; 2 unidirectional, 3 unidirectional-crossed; 2 bidirectional, 1 lateral and 3 unidentifiable scar pattern; 5 expanding, 5 irregular and 1 unidentifiable shapes; 9 "off-axis" and 2 unidentifiable removal directions; 3 flat, 5 incurvate medial, 2 incurvate distal and 1 unidentifiable general profiles; 4 feathering, 2 hinged, 3 blunt, 1 overpassed and 1 unidentifiable distal ends; 5 irregular, 3 multifaceted, 1 triangular, 1 lateral steep and 1 unidentifiable profiles at midpoint; 2 plain (1.0 x 0.4 cm and 0.4 x 0.3 cm) butts (semi-lipped, semi-acute angle, with no abrasion), 1 crudely-faceted (4.0 x 1.0 cm) butt (semi-lipped, right angle, with no abrasion), 4 crushed butts, 3 missing butts and 1 core tablet. These 11 retouched flakes are on 10 gray flints and on 1 colored flint (the core tablet). Their dimensions have the following ranges: length – 2.3-6.5 cm, width – 2.5-5.5 cm (3 with shortened, transversal proportions) and thickness – 0.6-1.6 cm.

The retouched blades are typologically subdivided into 22 pieces with marginal continuous, discontinuous and partial retouch, 3 pieces with irregular partial retouch and 2 pieces with marginal and irregular partial retouch. Placement of these retouch types on the retouched blades is as follows: lateral dorsal – 15 pieces, lateral ventral – 5 pieces, bilateral dorsal – 4 pieces, distal dorsal – 2 pieces, proximal dorsal – 1 piece. Morphologically, all 27 retouched blades are characterized by the following features: 7 complete, 12 proximal fragments, 4 medial fragments and 4 distal fragments; 19 non-cortical pieces, 4 partially cortical pieces with significant amount of lateral (2) and proximal + lateral (2) cortex and 4 partially cortical pieces with insignificant proximal (1) and lateral (3) cortex; 21 unidirectional, 4 bidirectional and 2 lateral scar patterns; 5 parallel, 4 converging, 4 expanding and 14 unidentifiable shapes; 1 "on-axis", 8 "off-axis" and 18 unidentifiable removal directions; 2 flat, 5 incurvate medial, 1 incurvate distal, 12 twisted and 7 unidentifiable general profiles; 7 feathering, 2 blunt and 18 unidentifiable distal ends; 5 triangular, 13 trapezoidal, 8 multifaceted and 1 irregular profiles at midpoint; 8 plain butts (6 semi-lipped and 2 lipped; 5 semi-acute, 2 acute and one right angles; 7 with abrasion and one with no abrasion) with dimensions in the ranges – 0.7-0.3 x 0.4-0.2 cm; 1 punctiform butt (semi-lipped, semi-acute angle, with abrasion); 4 linear butts (only – semi-lipped, semi-acute angle, with abrasion) with dimensions 0.7-0.2 x 0.1 cm, 5 crushed and 9 missing butts. Fifteen retouched blades are on gray flints and other 12 retouched blades are on colored flints, including 2 burnt. Six complete blades have such sizes ranges: length – 3.1-5.2 cm, width – 1.5-1.8 cm and thickness – 0.3-0.6 cm, while one more non-complete non-cortical blade is significantly larger: length – 6.4 cm, width – 2.8 cm and thickness – 0.8 cm. Eighteen fragmented retouched blades have the following ranges: length – 1.2-5.7 cm, width – 1.2-1.9 cm for 16 blades, and 2.7 cm for two other blades, thickness – 0.3-0.6 cm for 16 blades, and 0.7 cm and 1.0 cm for two other blades. The remaining two fragmented retouched blades deserve some special comments due to their size that clearly stands apart from the others. One proximal fragment is 6.4 cm long, 3.3 cm wide (!) and 0.8 cm thick. One distal fragment with bilateral dorsal marginal continuous and discontinuous retouch is 9.1 cm long (!), 1.9 cm wide and 0.4 cm thick (fig. 4:12).

Unidentifiable Tool Fragments
They are represented by 12 items of which 8 are non-cortical and 4 have some cortex; nine are on gray flints, including one burnt, and three others are on burnt colored flints.

Non-Flint Tools
These include a limestone cortical flake from a grinding tool and a chopper/grinding tool on a limestone pebble. The first tool is identified as a small flake (length – 3.2 cm, width – 3.9 cm, thickness – 0.9 cm) from a limestone pebble which has a series of long and deep striations on its natural primary surface: evidence of its function as a grinding tool. The second tool is very similar to the chopper/grinding tool described in level Gd. So, on a large limestone pebble with transversal proportions (length – 7.9 cm, width – 8.7 cm, thickness – 3.5 cm) where the wide transversal edge is roughly prepared by unifacial treatment as a chopper and the natural pebble primary surface has a series of long and shallow striations, numerous marks of ochre and battering wear that evidence its additional function as a color grinding tool.

Middle Paleolithic tool types
There are 10 unifacial and 3 bifacial tools.

Unifacial tools include 3 points and 7 scrapers.

The unifacial points are represented by 1 complete piece and 2 distal tips.

The complete unifacial point (fig. 6:1) is a sub-leaf dorsal point with distal and basal ventral thinning on a shortened, transversal flake. This tool has heavy invasive scalar and stepped semi-steep retouch around the perimeter of the dorsal surface. The flake, as a blank, is non-cortical with only flat general profile identifiable, due to heavy retouch. On gray flint and 3.5 x 6.6 x 1.3 cm, although the flake's initial size was certainly reduced during retouching processes.

Both distal tips of unifacial points (fig. 6:2-3) could only be described by the presence of pointed termination formed by invasive scalar semi-steep dorsal retouch. They are on gray flints with length 2.6 and 1.9 cm.

The unifacial scrapers are represented by 4 complete pieces (all of *déjeté* type according to F. Bordes terminology), 2 fragmented pieces and 1 identifiable item. Taking into consideration clear differences in either shape or secondary treatment, all scrapers are described individually.

A semi-trapezoidal dorsal scraper (fig. 6:4) is on a complete bifacial shaping flake. This scraper has two retouched edges which are connected in a pointed but thick tip. One retouched edge (the blank's left lateral) bears a stepped semi-steep retouch, while another retouched edge (the blank's transversal edge) has a stepped steep retouch. The flake, as a blank, is a non-cortical one with 3-directional scar pattern, expanding (trapezoidal) shape, "off-axis" removal direction, incurvate medial general profile, unidentifiable because of retouch distal end, irregular profile at midpoint, finely faceted (2.7 x 0.7 cm) butt (lipped, acute angle, with no abrasion). Presence of finely faceted lipped butt with acute angle allow us to define this flake as bifacial treatment one and absence of the butt abrasion additionally points on its initial shaping characteristics of a bifacial tool production. On gray flint, 2.8 cm long, 4.0 cm wide (shortened, transversal proportions) and 1.0 cm thick.

An elongated semi-trapezoidal dorsal scraper with basal ventral and lateral dorsal thinning (fig. 6:5) is on a complete flake. The scraper's two retouched edges (left lateral and transversal) have the same kind of stepped semi-steep retouch. Additionally, the right lateral edge has dorsal thinning, and the basal end has ventral thinning. The flake, as a blank, is non-cortical with only morphologically identifiable expanding (elongated trapezoidal) shape and incurvate medial general profile, due to heavy invasive retouch and thinning. On gray flint, 4.6 cm long, 2.8 cm wide, 0.9 cm thick.

A semi-crescent dorsal scraper (fig. 6:7) is on a complete flake. The semi-crescent shape of this scraper is created by theconvergence of a more or less straight retouched edge (right lateral edge with a steep retouch) and a convex retouched edge (continuous stepped flat retouch the length of the left lateral edge and transversal edge). The flake, as a blank, is non-cortical with, because of heavy invasive retouch, only morphologically identifiable flat general profile and crudely faceted (2.1 x 0.9 cm) butt (not lipped, right angle, with no abrasion). On gray flint, 3.2 cm long, 3.4 cm wide (shortened, transversal proportions) and 1.2 cm thick.

The last *déjeté* scraper is a semi-trapezoidal ventral one (fig. 6:8) on a complete flake. This scraper has scalar flat retouch on the transversal edge and scalar semi-steep retouch on a lateral edge, both on the ventral surface of the blank. The flake, as a blank, is non-cortical with unidirectional scar pattern, expanding (trapezoidal) shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end, trapezoidal profile at midpoint and finely faceted (1.5 x 0.3 cm) butt (semi-lipped, right angle, with no abrasion. On colored flint and measuring 3.0 x 2.8 x 0.4 cm.

Two fragmented unifacial tools are conventionally classified as simple and double scrapers, although taking into account their fragmented nature, it is equally possible that they were originally points and/or convergent scrapers and then broken.

The simple straight dorsal scraper (fig. 6:6) is on the proximal part of a flake which is alsolongitudinally broken. The only preserved edge of the flake is the left lateral edge which has scalar flat retouch. The flake, as a blank, is fragmented and non-cortical with unidirectional dorsal scar pattern and crudely faceted (2.4 x 0.8 cm) butt (semi-lipped, right angle, with no abrasion). On gray flint and measuring 3.6 x 2.4 x 0.5 cm.

The double straight-convex dorsal scraper (fig. 6:9) has a truncated-faceted base and is on the proximal part of a flake. It has heavy secondary treatment. Two lateral edges have invasive scalar retouch which is semi-steep convex on the left lateral edge and flat straight on the right lateral edge. The base is truncated-faceted. The flake, as a blank, is a fragmented non-cortical one with no objectively identifiable morphological features. On gray flint and measuring 2.9 x 2.6 x 0.8 cm.

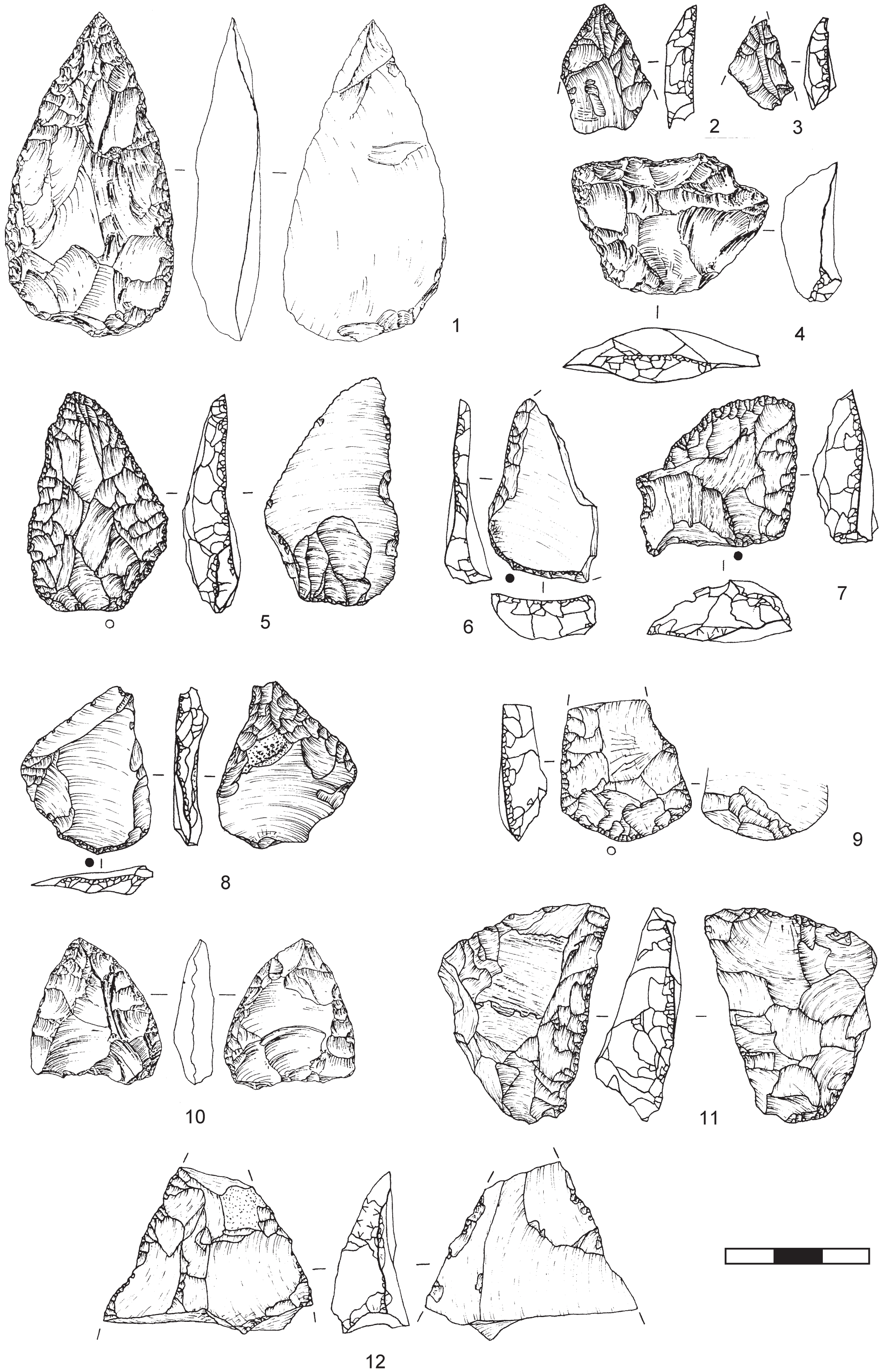

Figure 6 - Siuren I. Unit G, level Gc1-Gc2. Flint Artifacts – Tools (Middle Paleolithic types). 1, sub-leaf dorsal point with distal and basal ventral thinning (complete); 2-3, unifacial points (distal tips); 4, semi-trapezoidal dorsal scraper (complete); 5, elongated semi-trapezoidal dorsal scraper with basal ventral and lateral dorsal thinning (complete); 6, simple straight dorsal scraper (fragmented); 7, semi-crescent dorsal scraper (complete); 8, semi-trapezoidal ventral scraper (complete); 9, double straight-convex dorsal scraper (fragmented); 10, bifacial semi-leaf/triangular point with a concave base (complete); 11, bifacial single edged straight scraper (complete); 12, bifacial foliate tool (fragmented).

The unidentifiable unifacial scraper is a heavily burnt flint fragment with two connected retouched edges. One edge has stepped steep retouch. Flint type is not definable.

The sample of three bifacial tools consists of two complete pieces and one fragmented piece. All are quite unique, differing from one another.

One complete bifacial tool is a semi-leaf/triangular point with a concave base (fig. 6:10). At first sight, the point appears to have been treated using a bi-convex technique. This is not the case, however, when we look at the piece more closely. This shows that the tool was first shaped using the traditional Micoquian "plano-convex" technique and only after multiple reshaping and rejuvenation of the two sides does the point obtain a bi-convex form. The blank's (flake?) morphological features are unidentifiable apart from the absence of cortex, also due to complete bifacial treatment of the initial blank. On gray flint, 2.9 cm long, 2.6 cm wide, 0.6 cm thick.

Another bifacial complete tool is classified as a single edged straight scraper (fig. 6:11). This tool underwent intensive bifacial treatment which could be identified either as an exhausted core with one edge then retouched or, more likely, a piece which was heavily treated using the plano-convex technique with one edge retouched. The presence of only one retouched edge led to classification of the tool as a single-edged scraper and not as a complex tool with identification according to general shape. Retouch is stepped steep. The blank is a non-cortical piece (flake?) with unidentifiable morphological features, due to heavy secondary treatment. On gray flint and measuring 4.7 x 3.6 x 1.4 cm.

The fragmented bifacial tool is the medial part of a foliate piece made using the "plano-convex" technique (fig. 6:12). The tool was probably broken during initial bifacial shaping by rough treatment as no edge has regular retouch, and part of the ventral surface of the blank (a flake) remains on the plane side – additional evidence that bifacial treatment was incomplete. The flake, as a blank, has very minor presence of cortex on the convex side and was probably of shortened, transversal proportions, taking into considerations its removal direction and general supposed foliate shape of the tool. On gray flint and measuring 3.4 x 4.4 x 1.2 cm.

Level Gb1-Gb2

Here tools include 71 specimens subdivided into six groups (no Non-Flint Tools): 1) Indicative Upper Paleolithic types – 8 pieces/11.3%; 2) Non-Geometric Microliths – 46 pieces/64.8%; 3) "Neutral" types – 2 pieces/2.8%; 4) Retouched Pieces – 9 pieces/12.7%; 5) Unidentifiable Tool Fragments – 3 pieces/4.2%; 6) Middle Paleolithic types – 3 piece/4.2%.

Indicative Upper Paleolithic tool types
There are 2 end-scrapers, 4 burins, 1 composite tool and 1 retouched blade.

End-Scrapers include thick shouldered and carinated atypical pieces.

The thick shouldered end-scraper is on a chunk (fig. 7:1). The front is convex with a one-sided notch giving it a general shouldered shape – similar to the morphology of offset cores in plane, and wide (3.6 cm), formed by convergent sub-parallel lamellar (bladelet and microblade negatives with maximum length 3.0 cm) retouch. The chunk, as a blank, is a partially cortical one with insignificant lateral cortex on black flint, 3.9 cm long, 4.7 cm wide, 2.3 cm thick.

The carinated atypical end-scraper is on a broken flake (fig. 7:2). The front is quite convex, nearly ogival, formed on the flake's dorsal distal end by convergent stepped steep retouch. The absence of lamellar retouch is the basis for its classification as atypical. The flake, as a blank, is a partially cortical, partially longitudinally fragmented one with insignificant lateral cortex, unidirectional scar pattern, twisted general profile and blunt distal end. On colored flint and measuring 4.1 x 3.0 x 1.7 cm.

Burins are represented by 1 dihedral asymmetric, 1 double angle, 1 transverse and 1 on lateral preparation.

The dihedral asymmetric burin (fig. 7:3) is on a very unusual piece. This piece is in fact a secondary burin spall that, due to its removal being heavily overpassed, includes the entire distal end of the piece. This distal end has two burin facets (two facets on each verge) creating a dihedral burin. In this case, it would be important to determine which occurred first – the dihedral burin and then the opposite end of the blank treated as a new burin or *vice versa* –, but unfortunately, this cannot be determined. We have decided to identify this piece as a dihedral asymmetric burin on a secondary burin spall. Crushed butt of the burin spall makes identification of the burin from which it was detached impossible. Nevertheless, it is worth noting the multiple burin treatment of this piece. On colored flint and measuring 4.8 x 1.2 x 0.7 cm.

The double angle burin is on a broken medial blade fragment (fig. 7:4). Two burin terminations are on two opposite blade breaks. From each of these burin terminations two burin blows were made along one lateral edge toward one another. The blade, as a blank, is a non-cortical medial fragment with only identifiable unidirectional scar pattern and triangular profile at midpoint. On colored flint and measuring 2.7 x 2.1 x 0.5 cm.

The transverse burin on natural surface is on a blade with lateral dorsal marginal continuous retouch (fig. 7:5). The burin termination is on the distal end and was formed by a series of three transverse narrow burin blows (total width 0.4 cm) made from natural breakage on the blade's lateral edge. This burin is additionally multifaceted, but cannot be considered a carinated burin as it is not a dihedral burin type. The blade, as a blank, is a non-cortical one with probably significantly reduced length due to burin treatment; only identifiable unidirectional scar pattern, incurvate medial general profile, multifaceted profile at midpoint and crushed butt. On gray flint, 3.3 cm long, 1.9 cm wide, 0.4 cm thick.

The burin on a lateral preparation is on broken blade's distal fragment with lateral dorsal marginal continuous retouch (fig. 7:6). The burin termination has two burin facets removed trans-

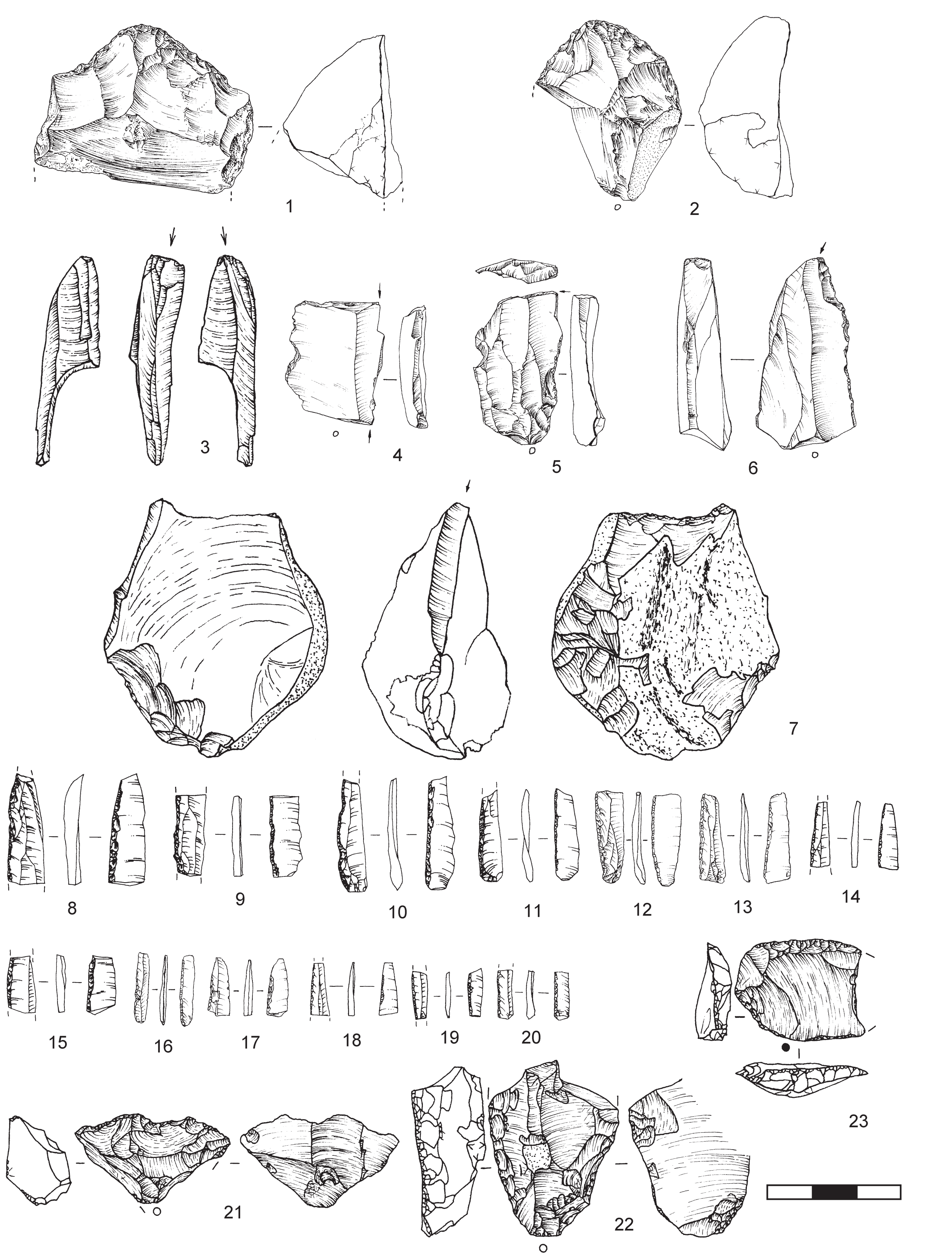

Figure 7 - Siuren I. Unit G, level Gb1-Gb2. Flint Artifacts – Tools. 1, thick shouldered end-scraper; 2, carinated atypical end-scraper; 3, dihedral asymmetrical burin; 4, double angle burin; 5, transverse burin on natural surface; 6, burin on a lateral preparation; 7, burin/scaled tool; 8-9, Dufour type bladelet, on bladelets with alternate retouch; 10-20, Dufour type bladelet, on microblades with alternate retouch; 21, Middle Paleolithic transversal convex dorsal denticulated piece (fragmented); 22, Middle Paleolithic double convex dorsal scraper with basal ventral thinning (fragmented); 23, Middle Paleolithic semi-trapezoidal dorsal scraper (fragmented).

versal to the axis of the blank sequentially from the distal limited lateral preparation formed by scalar steep retouch. Such limited lateral preparation is related to the lateral marginal retouch. The blade, as a blank, is a non-cortical distal fragment with only identifiable unidirectional scar pattern, flat general profile and trapezoidal profile at midpoint. On colored flint and measuring 4.1 x 2.2 x 1.1 cm.

The Composite Tool is quite unusual as it is a combination of a burin on concave truncation and a scaled tool (*pièce esquillée*). Such a composite tool, as well as the combination of any tool type with a scaled tool is not noted in type-lists for Upper Paleolithic assemblages (e.g. Sonneville-Bordes & Perrot 1953-1956; Hours 1974). Let us see how these two tool types fit together on one blank, which is a complete large cortical flake (fig. 7:7). The burin termination on concave truncation formed by scalar semi-steep retouch is on the flake's dorsal surface distal end and a single burin spall was struck from it. The scaled tool is identified based on the two extremities/ poles. The first pole is a typical one with bifacial scaling on the right lateral edge near the proximal end. The second pole is located opposite the first on the left lateral edge on the convex cortical dorsal surface ridge and is not at all typical as it only shows the heavy battering traces similar to those typical of hammerstones. Thus, use of the distal end for the burin and both lateral edges for the scaled tool made manufacture and use of such an unusual composite tool possible. The cortical flake, as a blank, is only characterized by ovoid shape, "on-axis" removal direction, incurvate general profile, crescent profile at midpoint and crushed butt. On colored flint, 6.0 cm long, 4.8 cm wide, 2.5 cm thick.

The Retouched Blade is a broken specimen with bilateral dorsal retouch which is light scalar flat continuous on one lateral edge and scalar semi-steep partial on the other lateral edge. The blade, as a blank, is a non-cortical proximal fragment with only identifiable unidirectional scar pattern, flat general profile, trapezoidal profile at midpoint and plain (0.4 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion). On colored flint and measuring 2.9 x 1.9 x 0.5 cm.

Non-Geometric Microliths

These are subdivided into three types: *Dufour bladelets* – 36 items (78.3%), *pseudo-Dufour bladelets* – 8 items (17.4%) and bladelets with dorsally retouched distal end – 2 items (4.3%).

The Dufour bladelet type, on bladelets with alternate retouch (fig. 7:8-9) is represented by 3 pieces (6.5 % of all microliths). The right edges of these microliths have a combination of continuous semi-abrupt stepped retouch. Three different retouch combinations have been defined at dorsally retouched left edges – continuous semi-abrupt micro-stepped, continuous flat micro-scalar and continuous semi-abrupt micro-scalar.

The Dufour bladelet type, on microblades with alternate retouch (fig. 7:10-20) is the dominant type of non-geometric microliths – 28 items (50.0% of all microliths). All 28 left edges were dorsally retouched, while all 28 right edges were ventrally retouched. For both left and right edge preparation, continuous retouch was employed in 43 cases. A single right edge has discontinuous retouch. Twelve more edges have partial retouch. Semi-abrupt retouch was employed for 49 edges. Flat retouch is known for 7 edges. Also, the majority of edges were retouched by micro-scalar and micro-stepped retouch: 30 and 18 edges, respectively. Marginal retouch is noted for 8 edges. Thus, the dominant retouch combinations are continuous semi-abrupt micro-scalar and continuous semi-abrupt micro-stepped. These were employed for 20 and 17 edges, respectively. Other possible retouch combinations are represented by a few pieces each: continuous semi-abrupt marginal – 4 edges; continuous flat marginal – 2 edges; discontinuous semi-abrupt micro-scalar – 1 edge; partial semi-abrupt marginal – 1 edge; partial flat marginal – 1 edge; partial flat micro-scalar – 3; partial semi-abrupt micro-scalar – 6 edges; partial semi-abrupt micro-stepped – 1 edge.

The Dufour bladelet type, on bladelet with alternating retouch is represented by a single item – (2.2% of all microliths). The left edge of the bladelet is both dorsally and ventrally retouched. The retouch combination on the ventral surface is partial semi-abrupt micro-stepped, while the dorsal surface has partial semi-abrupt micro-scalar retouch.

The Dufour bladelet type, on bladelet with bilateral ventral retouch – 1 piece (2.2% of all microliths). Both left and right edges of the bladelet were ventrally treated by two retouch combinations – partial semi-abrupt micro-scalar and discontinuous flat marginal, respectively.

The Dufour bladelet type, on bladelets with ventral retouch is represented by 2 pieces (4.3% of all microliths). The left edges of these microliths have combinations of partial semi-abrupt marginal and continuous flat micro-scalar retouch.

The Dufour bladelet type, on microblade with ventral retouch – 1 item (2.2% of all microliths). The left edge of the microblade has partial semi-abrupt marginal retouch.

The Pseudo-Dufour bladelet type, on bladelets with dorsal retouch is represented by 4 pieces (8.7% of all microliths). Three of the four bladelets have retouch on the left edge. The retouch combinations are as follows: partial semi-abrupt micro-scalar, discontinuous flat micro-scalar and continuous semi-abrupt micro-scalar. The only piece with retouch on right edge was produced by partial semi-abrupt marginal retouch.

The Pseudo-Dufour bladelet type, on microblades with dorsal retouch is represented by 3 pieces (6.5% of all microliths). All three microblades have retouch on the left edge. They have the following retouch combinations: continuous flat micro-scalar (2 items) and continuous semi-abrupt micro-stepped.

The Pseudo-Dufour bladelet type, on microblade with bilateral dorsal retouch – 1 item (2.2%). The left edge of the microlith has continuous semi-abrupt marginal retouch, while the right edge has continuous semi-abrupt micro-stepped retouch.

Bladelets with dorsal retouch at distal end – 2 pieces. The distal end of one bladelet is partially treated by flat micro-scalar retouch. The second piece is more similar to truncated pieces due to rather abrupt micro-scalar retouch at the distal end.

Thirteen bladelets and 33 microblades were selected for the production of non-geometric microliths. A single blank was removed "off-axis", three others are unidentifiable for this attribute, while the others were removed "on-axis". The dominant type of general profile is twisted, identified for 20 blanks. The other general profile types are flat (10 items), incurvate medial (12 items) and unidentifiable – 4 items.

The only microlith on a complete pieceis a *pseudo-Dufour bladelet* with dorsal retouch (length – 2.4 cm). The longest microlith is on a broken piece with the length 4.1 cm. It is a *Dufour bladelet* with alternate retouch. Eight other microliths on broken blanks have length more than 2.0 cm.

Overall, 77 edges of 46 microliths were retouched. More than 50% of edges have micro-scalar retouch, around 30% have micro-stepped retouch and around 17% have marginal retouch. More than 80% of edges have semi-abrupt retouch. The others are represented by flat retouched edges. Also, about 73% of edges were produced by continuous retouch, while partially and discontinuously retouched edges are represented by ca. 23% and 4%, respectively.

In sum, the dominant retouch combinations are continuous semi-abrupt micro-stepped and continuous semi-abrupt micro-scalar: 24 edges (31.2%) and 21edges (27.3%). The other retouch combinations are represented by insignificant numbers of edges: continuous flat micro-scalar, 5 (6.5%); continuous semi-abrupt marginal, 5 (6.5%); continuous flat marginal, 2 (2.6%); discontinuous flat micro-scalar, 1 (1.3%); discontinuous flat marginal, 1 (1.3%); partial semi-abrupt micro-scalar, 9 (11.7%); partial semi-abrupt micro-stepped, 2 (2.6%); partial flat micro-scalar, 2 (2.6%); partial semi-abrupt marginal, 4 (5.1%); partial flat marginal, 1 (1.3%).

By raw material types, the 46 non-geometric microliths were produced on gray (34 items) and colored (12) flints.

"Neutral" tool types
This tool group includes only 2 notched pieces.

Nothced Pieces. Both have single lateral dorsal notches formed by scalar semi-steep retouch, made on a complete flake and broken blade.

The flake of the first notched piece, as a blank, is a partially cortical one with insignificant lateral cortex and is characterized by bidirectional scar pattern, irregular shape, "on-axis" removal direction, convex general profile, blunt distal end, trapezoidal profile at midpoint and plain (1.7 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion). On gray flint and measuring 4.1 x 2.6 x 1.0 cm.

The blade of the second notched piece, as a blank, is a non-cortical medial fragment with only identifiable unidirectional-crossed scar pattern and triangular profile at midpoint. On colored flint, 2.0 cm long, 1.7 cm wide and 0.5 cm thick.

Retouched Pieces
These include 4 blades with marginal retouch, 2 flakes with marginal retouch and 3 flakes with irregular retouch.

All four blades have lateral dorsal marginal retouch which is continuous for three blades and discontinuous for the fourth. Two are complete with insignificant lateral cortex. They have the following morphological features: 2 unidirectional scar patterns, 2 parallel shapes, 2 "on-axis" removal directions, 2 incurvate medial general profiles, 1 feathering and 1 unidentifiable distal ends, 1 trapezoidal and 1 multifaceted profiles at midpoint, 1 crushed with abrasion butt and 1 punctiform (semi-lipped, semi-acute angle, with abrasion) butt. Both of these blades are on colored flints and measure as follows: length – 6.1 and 9.2 cm; width – 2.5 and 1,6 cm; thickness – 0.5 and 0.8 cm, respectively. The other two blades are broken and non-cortical: proximal and medial fragments on gray flints. The medial fragment is only characterized by multifaceted profile at midpoint and measures 1.8 x 2.6 x 0.5 cm. The proximal fragment has a unidirectional scar pattern, twisted general profile, trapezoidal profile at midpoint and crushed butt. It is 2.9 cm long, 1.8 cm wide and 0.4 cm thick.

Two flakes with marginal retouch are lateral dorsal, one with partial and the other with continuous retouch. Both are broken non-cortical items: distal and longitudinally fragmented pieces on gray flints. The longitudinally fragmented flake is only morphologically characterized by unidirectional scar pattern, flat general profile, multifaceted profile at midpoint and crushed butt. It is 2.2 cm long, 1.4 cm wide and 0.6 cm thick. The distal fragment has a feathering distal end and is 1.4 cm long, 2.1 cm wide and 0.6 cm thick.

Three flakes with irregular retouch include 1 lateral alternating, 1 bilateral dorsal and 1 bilateral alternate with only partial retouch. The flake with lateral alternating retouch is a longitudinally fragmented cortical piece with convex general profile, hinged distal end and plain damaged butt (semi-lipped, semi-acute angle, with no abrasion). On gray flint and measuring 3.2 x 2.4 x 1.3 cm. The other two flakes are complete: non-cortical and partially cortical with insignificant central cortex specimens on gray flints. Morphologically, they have unidirectional crossed and centripetal dorsal scar patterns, parallel and irregular shapes, "on-axis" and "off-axis" removal directions, flat and incurvate medial general profiles, feathering and unidentifiable distal ends, 2 irregular profiles at midpoint, 1 crudely faceted (2.0 x 1.9 cm) butt (semi-lipped, semi-acute angle, with abrasion) and 1 finely faceted (2.3 x 0.7 cm) butt (semi-lipped, right angle, with no abrasion). Metrics: 4.9 x 3.3 x 1.8 cm and 4.3 x 2.6 x 1.0 cm.

Unidentifiable Tool Fragments
These are represented by only 3 items on gray flints, including 1 burnt specimen. Two are non-cortical and one has some cortex.

Middle Paleolithic tool types
These include 1 denticulated piece and 2 scrapers with unifacial secondary treatment.

The denticulated piece is a transversal convex dorsal one on a flake broken during secondary treatment (fig. 7:21). The denticulated convex edge is formed by heavy scalar semi-steep dorsal retouch on the flake's transversal edge. This denticulated piece also has basal dorsal and ventral thinning which caused some damage to the tool's basal end. The presence of heavy (invasive) scalar retouch, as well as basal dorsal and ventral thinning allow us to consider this denticulated piece not as a "neutral" tool type but as one with Middle Paleolithic characteristics. The flake, as a blank, is non-cortical with only metrics identifiable, due to heavy retouch and basal damage – 2.1 x 3.5 (shortened, transversal proportions) x 1.3 cm and raw material type – on gray flint.

The scraper is a double convex dorsal one with basal ventral thinning on a broken flake (fig. 7:22). Both convex lateral retouched edges are formed by stepped steep retouch and these edges are connected at the proximal end by basal ventral thinning. The distal part of the scraper is missing – either the scraper was made on a broken flake or it was broken during the scraper's retouching process. The flake, as a blank, is a partially cortical proximal fragment with insignificant central cortex and no other morphological features identifiable due to heavy retouch, basal ventral thinning and distal breakage. On gray flint and measuring 4.0 x 3.0 x 1.5 cm.

The other scraper is a semi-trapezoidal dorsal one on a broken, longitudinally fragmented flake (fig. 7:23). It has retouched left lateral and transversal edge, while the right lateral edge is completely broken, quite likely during retouching. The transversal edge is convex and with scalar semi-steep retouch. The left lateral edge is slightly concave and has scalar flat retouch. The connection of these two retouched edges gives this tool its semi-trapezoidal shape. In Bordes's terminology, this scraper would be classified as a *racloir déjeté*. The flake, as a blank, is a non-cortical longitudinally fragmented one with only identifiable, due to transversal retouch and lateral breakage, lateral scar pattern, expanding (trapezoidal) shape, incurvate distal general profile, irregular profile at midpoint and finely faceted (2.4 x 0.6 cm) butt (semi-lipped, right angle, with no abrasion).On gray flint and of shortened transversal proportions by its metrics: 2.3 x 2.8 x 0.6 cm.

Level Ga

Tools (18 items) are subdivided into four groups (no "Neutral" tool types, Non-Flint Tools and Middle Paleolithic tool types): 1) Indicative Upper Paleolithic types – 5 pieces/27.8%; 2) Non-Geometric Microliths – 9 pieces/50%; 3) Retouched Pieces – 3 pieces/16.7%; 4) Unidentifiable Tool Fragments – 1 piece/5.5.

Indicative Upper Paleolithic tool types
These include 3 end-scrapers and 2 burins.

End-Scrapers. These include 1 simple, 1 unilateral/flake and 1 atypical. The simple end-scraper is on a broken blade with lateral dorsal irregular retouch (fig. 8A:1). The front is convex, formed on the blade's dorsal surface proximal end by convergent sub-parallel semi-steep retouch. The blade, as a blank, is a non-cortical proximal fragment with unidirectional scar pattern, flat general profile and triangular profile at midpoint. On gray flint and measuring 3.5 x 2.4 x 0.7 cm.

The unilateral/flake end-scraper is a very typical *grattoir sur éclat* of the de Sonneville-Bordes and Perrot type-list (1954: 330) on a complete flake (fig. 8A:2). The front is convex, formed on the flake's dorsal surface distal end and left lateral edge by non-convergent stepped steep retouch. The flake, as a blank, is a non-cortical one with only identifiable, due to heavy retouch, unidirectional scar pattern, incurvate distal general profile, multifaceted profile at midpoint and linear 1.2 x 0.1 cm butt (semi-lipped, semi-acute angle, with questionable abrasion). On gray flint, 2.9 cm long, 2.9 cm wide, 1.0 cm thick.

The atypical flat end-scraper is on a broken blade. The weakly developed front is convex, formed on the blade's dorsal surface distal end by partial non-convergent sub-parallel steep retouch. The blade, as a blank, is a partially cortical distal fragment with significant amount of lateral cortex and characterized by unidirectional scar pattern, "on-axis" removal direction, blunt distal end and trapezoidal profile at midpoint. On gray flint and measuring 2.7 x 1.6 x 0.8 cm.

Burins are represented by 1 dihedral symmetric and 1 dihedral angle.

The dihedral symmetric burin is on a complete blade. The burin termination is on the blade's distal end with two burin facets on each burin's verge. The blade, as a blank, is partially cortical, with insignificant lateral cortex and is characterized by unidirectional scar pattern, irregular shape, "on-axis" removal direction, twisted general profile, trapezoidal profile at midpoint and dihedral (1.3 x 1.0 cm) butt (semi-lipped, semi-acute angle, with questionable abrasion). On gray flint, 5.4 cm long, 2.4 cm wide and 1.1 cm thick.

The dihedral angle burin is on a complete blade (fig. 8A:3). The burin termination is on the blade's proximal end (butt) which was formed by one transversal burin facet from which was then struck off another burin facet along one of the lateral edges. The blade, as a blank, is a partially cortical one with significant amount of lateral cortex and is characterized by unidirectional-crossed scar pattern, irregular shape, "on-axis" removal direction, twisted general profile, hinged distal end and irregular profile at midpoint. On gray flint and measuring 3.3 x 1.2 x 0.5 cm.

Non-Geometric Microliths
These are represented by *Dufour bladelets* (5 pieces/55.6%), *pseudo-Dufour bladelets* (3 pieces/33.3%) and a single Krems point (11.1%).

Dufour bladelet type, on bladelets with alternate retouch – 2 items (fig. 8A:4). All have dorsal retouch on the left edges, while the right edges have ventral retouch. Three of four edges have continuous retouch. A single edge was partially retouched. All bladelets have semi-abrupt retouch. Two edges have micro-scalar retouch, one edge with micro-stepped retouch and another with marginal retouch. So, bladelets with alternate retouch were retouched using four different retouch combinations: continuous semi-abrupt micro-stepped, continuous semi-abrupt marginal, continuous semi-abrupt micro-scalar and partial semi-abrupt micro-scalar.

Dufour bladelet type, on microblades with alternate retouch – 2 items (fig. 8A:5). Three of four edges have continuous retouch. In a single

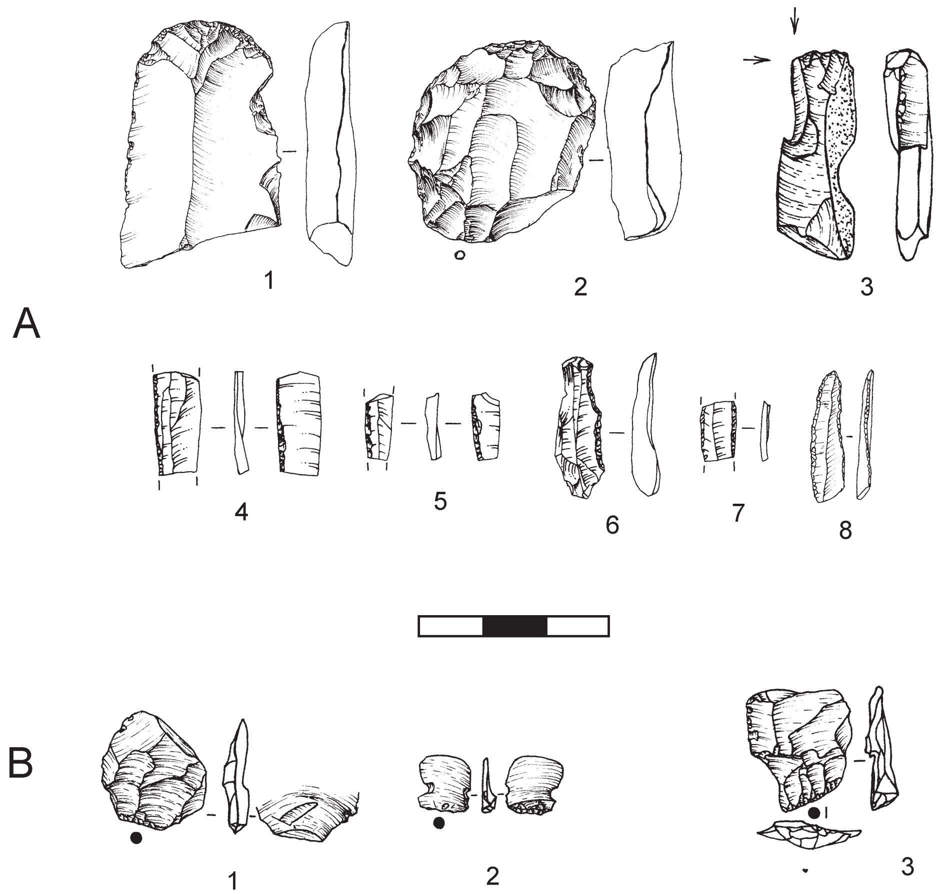

Figure 8 - Siuren I. Unit G, level Gb1-Gb2. Flint Artifacts. A: level Ga. Tools. 1, simple end-scraper; 2, unilateral/flake end-scraper; 3, dihedral angle burin; 4, Dufour type bladelet, on bladelet with alternate retouch; 5, Dufour type bladelet, on microblade with alternate retouch; 6, pseudo-Dufour type bladelet, on bladelet with dorsal retouch; 7, pseudo-Dufour type bladelet, on microblade with bilateral dorsal retouch; 8, Krems point, on microblade with bilateral dorsal retouch. B: levels Gd and Gc1-Gc2. Retouch flakes and chip from Middle Paleolithic tool types. 1, simple retouch flake (level Gd); 2, "Janus/Kombewa" chip (level Gd); 3, bifacial thinning flake (level Gc1-Gc2).

case partial retouch was also used. Flat and semi-abrupt retouch were used twice each. Three edges have micro-scalar retouch and one edge has micro-stepped retouch. In sum, the left edges have dorsal continuous flat micro-scalar retouch. Two different models of retouch combinations were used for the right edges: ventral partial semi-abrupt micro-scalar and ventral continuous semi-abrupt micro-stepped.

Dufour bladelet type, on microblade with ventral retouch – 1 item on which the right edge has ventral partial semi-abrupt micro-scalar retouch.

Pseudo-Dufour bladelet type, on bladelets with dorsal retouch – 2 pieces (fig. 8A:6). The right edges of both bladelets have a combination of continuous semi-abrupt micro-stepped retouch.

Pseudo-Dufour bladelet type, on microblade with bilateral dorsal retouch – 1 item (fig. 8A:7). Both edges of the microblade have continuous semi-abrupt micro-scalar retouch.

Krems point type, on microblade with bilateral dorsal retouch (1 piece) has continuous semi-abrupt micro-scalar retouch on both edges (fig. 8A:8).

Overall, 4 bladelets and 5 microblades were selected for non-geometric microlith production. The only microblade (Krems point) was removed "off-axis", while the rest bladelets and microblades were removed "on-axis". The majority of blanks have twisted profile (6 pieces). Blanks with flat and convex profiles are represented by 3 items: 2 microblades and 1 bladelet. The only complete microlith is a *pseudo-Dufour bladelet* with dorsal retouch (length – 2.2 cm). The other microliths are represented by medial (6 pieces) and distal (2 pieces) fragments. The longest broken microlith is the Krems point – the length of this distal fragment is 2.0 cm.

Of 15 retouched edges, represented by 9 microliths, one edge was retouched by marginal retouch, while the remaining 14 edges have micro-scalar (10) and micro-stepped (4) retouch. In four cases, micro-scalar retouch was used for ventral retouching of *Dufour bladelets'* right edges. Four additional edges were dorsally retouched by micro-scalar retouch, on the Krems point and a *pseudo-Dufour bladelet* on microblade with bilateral retouch. Micro-scalar retouch was also used for dorsal elaboration of the left edges of *Dufour bladelets* on microblades. Micro-stepped retouch was used for dorsal and ventral retouching of left and right edges of both *Dufour bladelets* and *pseudo-Dufour bladelets*.

A single case of marginal retouch was identified for the left dorsally retouched edge of a *Dufour bladelet* on bladelet. Semi-abrupt retouch is found on 13 cases of 15. Two other edges have flat retouch. The latter were identified on the dorsally retouched left edges of *Dufour bladelets* on microblades. Twelve of 15 edges are continuously retouched. Three more edges exhibit partial retouch – all are ventrally retouched right edges of *Dufour bladelets*.

Thus, two dominant combinations of retouch are observed: continuous semi-abrupt micro-scalar (5 edges) and continuous semi-abrupt micro-stepped (4 edges).

Of all 9 microliths, 1 is made on black flint, 3 on colored flints and 5 on gray flints.

Retouched Pieces
These include 2 blades with irregular and marginal retouch and 1 flake with irregular retouch.

Both blades have lateral dorsal partial retouch, but retouch is irregular for one and marginal for the other. Both are proximal fragments. One is non-cortical and the other one partially cortical with insignificant lateral cortex. Blades, as blanks, have the following identifiable morphological features: 2 unidirectional scar patterns; 1 triangular and 1 multifaceted profiles at midpoint; 1 crushed and 1 punctiform (semi-lipped, semi-acute angle, with abrasion) butt. Metrics: 1.1 x 1.6 x 0.2 cm and 1.8 x 1.2 x 0.3 cm. One blade is on gray flint and the other on colored flint.

The retouched flake also has lateral irregular partial retouch, but on the ventral surface. The flake, as a blank, is a non-cortical complete piece with unidirectional-crossed scar pattern, expanding shape, "off-axis" removal direction, incurvate distal general profile, hinged distal end, irregular profile at midpoint and small 0.5 x 0.3 cm plain butt (semi-lipped, acute angle, with questionable abrasion). On colored flint and measuring 2.4 x 3.7 x 0.5 cm.

Unidentifiable Tool Fragments
The single item is a non-cortical piece on gray flint.

Summarizing data for the Unit G tool-kit

These brief comments notes are presented as was done for the Unit H tools.

By raw material types representation, there are no significant differences for tool production processes between the four levels for use of two basic flint types – gray and colored flints (tabl. 50). Gray flints for tools are in the 66.7-74.0% range and colored flints 23.4-30.9%, with no clear increasing or decreasing patterns through the sequence from level Gd to levels Gb1-Gb2 and Ga. The only notable observation is that the occurrence of colored flints for tools is highest in level Gc1-Gc2, which also has the most abundant tool sample (30.9%), although it is still less than in Unit H – 37.7%. At the same time, colored flint tool percentages within the Unit G levels assemblages are higher than for average percentages for all pieces – 20.5-23.9% for levels Gd – Gc1-Gc2 – Gb1-Gb2 and 12.5% for level Ga. Accordingly, despite the lesser use of colored flints for tool production in Unit G in comparison to Unit H, we should note the same pattern of preference for colored flints for tool production.

At the same time, we should not forget that colored flints were used for production of both Indicative Upper Paleolithic tool types and Middle Paleolithic tool types. This raw material aspect will be further discussed during the analysis of the role of these two typological components found in the same layer.

The structure of tool blanks is as follows. First, we examine the blanks of Indicative Upper Paleolithic tool types and Middle Paleolithic tool types. The situation is the most clear for the latter because flakes are exceptionally characteristic for all Middle Paleolithic tools. The situation with Indicative Upper Paleolithic tools is not as uniform since flakes, blades and chunks were used as blanks. We thus need to take a closer look at blank types for each group and type within these tools. End-scrapers (12 items), by tool types and blanks, are distributed as follows: all 4 simple end-scrapers – on 4 blades; the single atypical end-scraper – on a blade; all 3 proper carinated types (2 carinated end-scrapers and 1 thick shouldered end-scraper) – on 3 chunks; the other 4 end-scrapers – on flakes (1 carinated atypical, 1 double, 1 on retouched piece and 1 unilateral – *grattoir sur éclat*). These data clearly evidence the strong dependence of the blank types used for the different end-scraper types and they are in good correspondence with the typical structure of blank type for end-scrapers in Aurignacian assemblages. Correspondingly, end-scrapers cannot be used to elucidate blade-flake preference. Burins (16 items), however, do show clear selection of blades – 14 blades, 1 heavily burnt piece and 1 flake (the double angle burin from level Gc1-Gc2). Composite tools (3 items) are on 2 flakes (a scaled tool/burin on truncation from level Gb1-Gb2 and an end-scraper/burin from level Gc1-Gc2) and 1 blade (a perforator/burin from level Gc1-Gc2) that shows use of both flakes and blades for different tool combinations on one debitage blank. Truncations (3 items) have a reverse order of blanks in comparison to composite tools – 2 blades and 1 flake that again does not point out any clear preference. Finally, the 2 scaled tools were produced on 1 flake and 1 blade, while, of course, all 6 retouched blades are on blades. Thus, the 42 Indicative Upper Paleolithic tool types were made on 29 blades (70.7%), 9 flakes (22.0%), 3 chunks (7.3%), and 1 unidentifiable heavily burnt piece. Such percentages allow us to conclude that despite the important presence of flake blanks, there is a clear dominance of blade blanks and flake occurrence is typical for Upper Paleolithic tool-kits. But now let us count all flake, blade, bladelet and microblade blanks for Indicative Upper Paleolithic tool types (38 items), Notched pieces (9 items), Retouched pieces (60 items) and Non-Geometric Microliths (221 items). For these together, there are 31 flakes (9.5%), 75 blades (22.9%), 79 bladelets (24.2%) and 142 microblades (43.4%), while they are as follows for only pieces with blady metric proportions: blades – 25.3%, bladelets – 26.7% and microblades – 48.0% with joint percentages for bladelets *sensu lato* to 74.7%. The latter indices are very similar to those for Unit H blady blanks for tools. This again points to the special preference of the Unit G Aurignacian inhabitants for bladelets *sensu lato* and especially

Level Gd							
	gray flints%	**colored flints%**	**black flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	2 / 50.0	2/50.0	0	0	4	0.5	1.0
Core Maintenance Products	20 / 83.3	3 / 12.5	1 / 4.2	0	24	2.8	5.8
Flakes	60 / 65.9	25 / 27.5	4 / 4.4	2 / 2.2	91	10.7	22.2
Blades	49 / 60.5	29 / 35.8	3 / 3.7	0	81	9.6	19.7
Bladelets	63 / 71.6	24 / 27.3	1 / 1.1	0	88	10.4	21.5
Microblades	24 / 61.5	15 / 38.5	0	0	39	4.6	9.5
Tools	57 / 74.0	18 / 23.4	0	2 / 2.6	77	9.1	18.8
Waste From Production & Rejuvenation of Tools	5 / 83.3	1 / 16.7	0	0	6	0.7	1.5
Chips	269 / 84.9	42 / 13.2	6 / 1.9	0	317	37.4	
Uncharacteristic Debitage Pieces	45 / 80.4	11 / 19.6	0	0	56	6.6	
Chunks	10 / 100.0	0	0	0	10	1.1	
Heavily Burnt Pieces					55	6.5	
TOTAL	**604 / 76.2**	**170 / 21.4**	**15 / 1.9**	**4 / 0.5**	**848**	**100.0**	**100.0**
Level Gc1-Gc2							
	gray flints%	**colored flints%**	**black flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	8 / 72.7	2 / 18.2	1 / 9.1	0	11	0.5	1.0
Core Maintenance Products	52 / 76.4	15 / 22.1	1 / 1.5	0	68	2.9	6.0
Flakes	185 / 73.7	57 / 22.7	9 / 3.6	0	251	10.7	22.3
Blades	115 / 63.2	67 / 36.8	0	0	182	7.8	16.2
Bladelets	189 / 71.0	76 / 28.6	1 / 0.4	0	266	11.4	23.7
Microblades	71 / 65.1	37 / 34.0	1 / 0.9	0	109	4.7	9.7
Tools	142 / 67.6	65 / 30.9	1 / 0.5	2 / 1.0	210	9.0	18.7
Waste From Production & Rejuvenation of Tools	20 / 74.1	7 / 25.9	0	0	27	1.2	2.4
Chips	712 / 79.3	173 / 19.3	13 / 1.4	0	898	38.5	
Uncharacteristic Debitage Pieces	86 / 74.8	26 / 22.6	3 / 2.6	0	115	4.9	
Chunks	71 / 93.5	3 / 3.9	2 / 2.6	0	76	3.3	
Heavily Burnt Pieces					119	5.1	
TOTAL	**1651 / 74.6**	**528 / 23.9**	**32 / 1.4**	**2 / 0.1**	**2332**	**100.0**	**100.0**
Level Gb1-Gb2							
	gray flints%	**colored flints%**	**black flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	6 / 75.0	1 / 12.5	1 / 12.5	0	8	0.6	1.7
Core Maintenance Products	16 / 57.1	11 / 39.3	0	1 / 3.6	28	2.2	6.0
Flakes	85 / 78.7	21 / 19.5	2 / 1.8	0	108	8.6	23.1
Blades	38 / 60.3	23 / 36.5	2 / 3.2	0	63	5.0	13.5
Bladelets	77 / 76.2	23 / 22.8	1 / 1.0	0	101	8.0	21.6
Microblades	54 / 71.0	22 / 29.0	0	0	76	6.0	16.3
Tools	49 / 69.0	21 / 29.6	1 / 1.4	0	71	5.6	15.2
Waste From Production & Rejuvenation of Tools	11 / 91.7	1 / 8.3	0	0	12	1.0	2.6
Chips	537 / 82.0	107 / 16.3	11 / 1.7	0	655	52.0	
Uncharacteristic Debitage Pieces	29 / 72.5	10 / 25.0	1 / 2.5	0	40	3.2	
Chunks	15 / 93.8	1 / 6.2	0	0	16	1.3	
Heavily Burnt Pieces					81	6.5	
TOTAL	**917 / 77.8**	**241 / 20.5**	**19 / 1.6**	**1 / 0.1**	**1259**	**100.0**	**100.0**
Level Ga							
	gray flints%	**colored flints%**	**black flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	0	0	0	0	0		
Core Maintenance Products	4 / 100.0	0	0	0	4	1.5	4.6
Flakes	23 / 82.2	3 / 10.7	2 / 7.1	0	28	10.4	32.2
Blades	7 / 53.8	5 / 38.5	1 / 7.7	0	13	4.8	14.9
Bladelets	10 / 71.4	4 / 28.6	0	0	14	5.2	16.1
Microblades	6 / 60.0	4 / 40.0	0	0	10	3.7	11.5
Tools	12 / 66.7	5 / 27.8	1 / 5.5	0	18	6.7	20.7
Waste From Production & Rejuvenation of Tools	0	0	0	0	0		
Chips	122 / 90.4	10 / 7.4	3 / 2.2	0	135	50.0	
Uncharacteristic Debitage Pieces	8 / 88.9	0	1 / 11.1	0	9	3.3	
Chunks	17 / 100.0	0	0	0	17	6.3	
Heavily Burnt Pieces					22	8.1	
TOTAL	**209 / 84.3**	**31 / 12.5**	**8 / 3.2**	**0**	**270**	**100.0**	**100.0**

Table 50 - Siuren-I. Unit G. Artifacts Totals by Raw Material Types as Percentages of Each Type.

microblades to produce non-geometric microliths. Adding here blades as the dominant blanks for the other tools, excluding the Middle Paleolithic tools, we have a clear bladelet *sensu lato*/blade technological base for both debitage and tool production for Siuren-I Unit G Early/Ancient Aurignacian of Krems-Dufour type assemblage, as was already estimated for Unit H. Flake role is of the following twofold character within the Aurignacian assemblage. First, flakes were produced as technological waste during bladelet and blade reduction processes, and, second, some were selected for tool manufacture. At the same time, regarding the Unit G Middle Paleolithic typological component, flakes were the only blank type used for tool production. All of these considerations are confirmed by the selection rates of different blanks for tool production: 43 possible flake-tools of all 561 flakes (7.7% of selection), 76 blade-tools of all 471 blades (16.1% of selection), 79 bladelet-tools of all 566 bladelets (14.0% of selection) and 142 microblade-tools of all 386 microblades (36.8% of selection).

Further data on blanks

Here we discuss some aspects based on comparisons between all pieces of debitage including tool-blanks and core maintenance products, and strictly debitage items (see tabl. 4-43), to highlight possible differences. Surprisingly, it is difficult to find such actual differences. Pieces with flake and bladelet metric proportions do not show any real statistical deviations for the two samples (see tabl. 4-13, 24-33), usually in the range of 5%. Pieces with blade metric proportions (see tabl. 14-23) show one notable distinction and this is because of the amount of core maintenance product features. It relates to shape (tabl. 15), where for level Gd the irregular type is the dominant one for the most complete sample, while it shares is in second-third position for debitage only. All the other attributes are again, as for the flakes and bladelets, in basic agreement – differences do not exceed 5-10%. The most surprising, however, is the fact that after adding to microblades-debitage the many tools on microblades, we do not find any radical differences between the two samples (see tabl. 34-43). The only attribute that can be mentioned is shape for level Gc1-Gc2: there is a dominance of parallel type over converging one, while there is a reverse order for these types for the debitage only sample (tabl. 35).

Thus, this comparison clearly shows that in Unit G, both samples of flakes, blades, bladelets and microblades can be equally used for different interpretative analyses and they correspond well to one another.

Waste from Production and Rejuvenation of Tools

This artifact category was recognized among flints of levels Gd, Gc1-Gc2 and Gb1-Gb2 and consists of two groups: 1) burin spalls and 2) retouch chips and flakes. As done above, waste from tool production will be analyzed after representing all from each level.

Level Gd

This level includes only one burin spall and 5 retouch chips and flakes.

The Burin Spall is a complete primary (simple unretouched) one on colored flint. It has twisted general profile and punctiform butt. The presence of such a butt makes it impossible to identify the burin type from which it was struck off. It is 1.8 cm long, 0.2 cm wide and 0.5 cm thick.

Retouch Flakes and Chips. There are 3 retouch flakes from Middle Paleolithic unifacial tool types (points and scrapers), 1 retouch chip of either a Middle Paleolithic or Upper Paleolithic unifacial tool and 1 retouch chip from basal ventral thinning of a Middle Paleolithic tool type. All are on gray flints.

Retouch Flakes
All 3 are simple complete non-cortical pieces with the following morphological features: 3 unidirectional scar patterns; 1 parallel and 2 expanding shapes; 1 "on-axis" and 2 "off-axis" removal directions; 3 incurvate medial general profiles; 2 feathering and 1 hinged distal ends; 1 trapezoidal and 2 multifaceted profiles at midpoint; 3 plain (0.8 x 0.2 cm, 0.4 x 0.2 cm, 0.2 x 0.2 cm) butts (1 lipped and 2 semi-lipped; 3 acute angles; 3 with abrasion). Metrics: length – 1.6-2.5-2.8 cm, width – 1.6-2.0-2.0 cm and thickness – 0.3-0.4-0.3 cm, respectively (fig. 8B:1).

Retouch Chips
The first retouch chip is a non-cortical complete one with linear butt (lipped, acute angle, with abrasion).

The second retouch ship (fig. 8B:2) is a very unusual piece and deserves a more detailed description. Morphologically, it is a "Janus/Kombewa" chip. It is a non-cortical complete piece with dorsal-plain scar pattern, ovoid shape, "on-axis" removal direction, flat general profile, feathering distal end, flat profile at midpoint with the following metrics: length and width – 0.8 cm each, thickness – 0.1 cm. A butt is not visible, but the piece has the remains of a faceted butt on the dorsal surface. With such features, especially the dorsal scar pattern and overall small size, this piece should be considered a retouch chip from the basal ventral thinning of a tool. Moreover, the presence of the remains of a faceted butt on the piece's dorsal surface and characteristic of basal ventral thinning for only Middle Paleolithic unifacial tool types, additionally evidences removal of this chip from the basal part of a Middle Paleolithic unifacial tool.

Level Gc1-Gc2

This level contains 14 burin spalls and 13 retouch chips and flakes.

Burin Spalls. There are 9 complete burin spalls (7 on gray flints and 2 on colored flints) and 5 broken burin spalls (2 on gray flints and 3 on colored flints). Nine complete burin spalls are subdivided into 7 primary and 2 secondary. Five complete primary burin spalls are simple unretouched. Three have plain butts, suggesting an origin from angle burins. Such an assumption is confirmed by the refitting of one spall to a double angle burin (fig. 4:9). Two complete primary simple unretouched burin spalls have crushed butts and, accordingly, unidentifiable origin. These 5 burin spalls are also characterized by 3 incurvate medial and 2 twisted general profiles, and the following metrics: length – 1.6 - 3.2 cm, width – 0.3 - 1.8 cm and thickness – 0.6 - 1.0 cm. Two complete primary burin spalls have partial lateral retouch: fine and irregular. Both have crushed butts that make burin type origin unclear. These 2 burin spalls are also characterized by twisted and convex general profiles, and the following dimensions: length – 1.3 and 2.4 cm, width – 0.3 and 0.4 cm, thickness 0.3 and 0.8 cm, respectively. Two complete secondary burin spalls have negatives of previously struck burin spalls, crushed butts (unclear origin), twisted general profiles and the following metrics: length – 2.8 and 3.5 cm, width – 0.8 and 1.3 cm, thickness – 1.1 and 1.8 cm, respectively. Broken burin spalls are represented only by distal fragments. Two are primary and 3 secondary. Two broken primary burin spalls have on their dorsal surfaces simple unretouched features for one and lateral irregular partial retouch for the other. They also have twisted and incurvate medial general profiles and the following metrics: length – 1.3 and 4.0 cm, width – 0.3 and 1.1 cm, thickness – 0.3 and 1.8 cm, respectively. Three broken secondary burin spalls are characterized by negatives of previously removed burin spalls, twisted general profiles and the following dimensions: length – 2.2, 2.3 and 2.8 cm; width – 0.2, 0.2 and 0.8 cm; thickness – 0.5, 0.4 and 1.1 cm, respectively.

Retouch Flakes and chips. There are 8 retouch flakes and 5 retouch chips.

Retouch Flakes. These are subdivided into 1 bifacial thinning flake and 7 simple retouch flakes.

Bifacial Thinning Flake (fig. 8B:3) is a non-cortical complete item with unidirectional scar pattern, expanding shape, "on-axis" removal direction, twisted general profile, hinged distal end, multifaceted profile at midpoint and finely faceted (1.2 x 0.4 cm) butt (lipped, acute angle, with abrasion). On gray flint and measuring 1.9 x 1.6 x 0.3 cm. The presence of a finely-faceted butt with pronounced abrasion and lack of dorsal cortex allow us to identify this piece as a thinning flake from a Middle Paleolithic type bifacial tool.

Seven simple retouch flakes are complete and have the following morphological features: 4 unidirectional and 3 unidirectional crossed scar patterns; 2 parallel, 2 expanding, 1 ovoid and 2 irregular shapes; 4 "on-axis" and 3 "off-axis" removal directions; 1 flat, 3 incurvate medial, 1 incurvate distal and 2 twisted general profiles; 7 feathering distal ends; 1 triangular, 2 trapezoidal, 1 multifaceted and 3 irregular profiles at midpoint; 2 linear (0.5 x 0.1 cm and 0.4 x 0.1 cm) butts (semi-lipped, acute angles, with abrasion) and 5 plain (0.7 x 0.2 cm, 0.8 x 0.3 cm, 1.3 x 0.2 cm, 0.8 x 0.3 cm, 2.4 x 0.6 cm) butts (3 semi-lipped and 2 lipped, 5 acute angles, 5 with abrasion). They have the following dimension ranges: length – 1.3-3.0 cm; width – 1.0-2.4 cm; thickness – 0.3-0.6 cm. Four retouched flakes have shortened, transversal proportions. Six pieces are on gray flints and 1 is on colored flint. Size and morphological features of these 7 retouched flakes (6 non-cortical and 1 partially cortical with insignificant lateral cortex) have in general the characteristics of simple retouch flakes from Middle Paleolithic unifacial tool types (points and scrapers).

Retouch Chips. Five retouch chips are non-cortical and complete. Four are on gray flints and one on colored flint. All have plain butts with lipping, acute angle and abrasion. Such butt features are typical of retouch chips originating from secondary treatment processes of either Middle Paleolithic or Upper Paleolithic tool types.

Level Gb1-Gb2

Waste from tool production and rejuvenation consists of 8 burin spalls and 4 simple retouch flakes.

Burin Spalls. There are 3 complete and 5 broken burin spalls on gray flint.

Two complete burin spalls are primary simple unretouched ones. The first has incurvate medial general profile and crushed butt that makes original burin type identification impossible. Dimensions: 0.6 x 0.2 x 0.3 cm. The second has incurvate distal general profile and plain butt, suggesting removal from an angle burin. It is 2.4 cm long, 0.8 cm wide and 0.9 cm thick. The third complete burin spall is a secondary one with both previously removed burin spall negatives and some lateral fine partial retouch at the distal ridge. It has twisted general profile and dihedral butt (unclear origin). It is 1.7 cm long, 0.3 cm wide and 0.6 cm thick. Five broken burin spalls are subdivided into 3 primary and 2 secondary. All are either distal or medial fragments that make identifications of their profiles and butt characteristics impossible, and thus the original burin types from which they were detached. Three primary broken burins spalls are 2 simple unretouched and 1 retouched (lateral fine partial). Metrics: 0.9 x 0.2 x 0.2 cm; 1.1 x 0.3 x 0.2 cm; 1.6 x 0.4 x 0.6 cm. Two secondary broken burin spalls have the following metrics: 2.0 x 0.5 x 0.6 cm and 2.1 x 1.0 x 1.2 cm.

Retouch Flakes. Three are on gray flints and another on colored flint. All four are defined as simple retouch flakes from secondary treatment processes of Middle Paleolithic unifacial tool types (points and scrapers). Three are non-cortical and one is partially cortical with insignificant distal cortex. Morphologically, they have the following features: 3 unidirectional and 1 unidirectional-crossed scar patterns; 3 expanding and 1 irregular shapes; 4 "off-axis" removal directions; 2 incurvate medial and 2 incurvate distal general profiles; 3 feathering and 1 hinged distal ends; 1 triangular, 1 trapezoidal and 2 multifaceted profiles at midpoint, 3 plain (1.1 x 0.3 cm, 0.7 x 0.2 cm, 0.4 x 0.2 cm) butts (1 lipped and 2 semi-lipped, 1 semi-acute and 2 acute angles, all 3 with abrasion) and 1 linear (1.0 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion). Metrics: 1.7 x 1.6 x 0.4 cm; 1.7 x 1.4 x 0.3 cm; 2.0 x 1.8 x 0.2 cm; 3.6 x 2.1 x 0.6 cm.

Summarizing data on tool waste

Level Gd. The single primary burin spall (original burin type unknown) serves as weak evidence for on-site burin manufacture in this level, taking into consideration of the presence three burins, of which is double. This allows us to speculate on the possible importation of finished burins to the rock-shelter and no evidence of burin rejuvenation at the site.

On the other hand, technological waste from Middle Paleolithic tools (four items, as one chip could have been removed from an end-scraper or a retouched blade) is very important. The presence of three simple retouch flakes clearly points to tool manufacture and/or rejuvenation. At the same time, the "Janus/Kombewa" chip is in good correspondence to the appearance of a sub-triangular dorsal point with basal ventral thinning (the sole Middle Paleolithic tool found in level Gd) from which such a chip could have been flaked, although our attempt to refit the chip onto the tool was unsuccessful.

In sum, we can conclude more intensive secondary treatment processes for Middle Paleolithic tools than for Upper Paleolithic burins.

Level Gc1-Gc2.
The situation differs for burin treatment in level Gc1-Gc2. Here we have 14 burin spalls and 7 burins. Moreover, the burin spall classification shows the presence of both primary (9 items) and secondary (5 items) examples. By the spalls' butt features and refitting, removal of three primary complete burin spalls from angle burins is evident. This is confirmed by the availability of three angle burins present in the assemblage where the one other identifiable burin is on truncation. Thus, we can indicate both the manufacture of angle burins at the site and general burin rejuvenation as well, given the occurrence of secondary burin spalls.

A series of 8 retouch flakes and 5 retouch chips allows us to discuss tool treatment processes for other tools. Seven simple retouch flakes are connected to general on-site treatment of Middle Paleolithic unifacial points and scrapers. The bifacial thinning flake is also a very indicative piece supporting Middle Paleolithic "deep treatment and/or re-treatment" processes at the site. All 8 retouch flakes correspond to the presence of 3 bifacial and 10 unifacial Middle Paleolithic tools in the Gc1-Gc2 assemblage. More than that, 5 simple retouch chips are evidence of production of both Indicative Upper Paleolithic tool types (end-scrapers and retouched blades) and Middle Paleolithic unifacial tool types (scrapers and points) on-site.

Level Gb1-Gb2.
Tool waste structure from this level is quite similar to level Gc1-Gc2.

Of 8 burin spalls, 5 are primary and 3 secondary. One is identified as struck from an angle burin that is in correspondence to presence of a double angle burin in the assemblage.

At the same time, identification of 4 simple retouch flakes from Middle Paleolithic unifacial tools is in accordance with 2 unifacial scrapers and 1 denticulated piece present in the tool-kit, again an illustration of treatment of Middle Paleolithic tools on-site.

In total, these tool waste products from three levels of Unit G mainly evidence different tool production and rejuvenation processes on-site and do not allow us to see direct evidence of tool transportation from the rock-shelter as is the case for Unit H.

Debris (see also table 1, 50)

Chips, Uncharacteristic debitage pieces and Chunks have been described only by presence/absence of cortex and raw material types, while Heavily burnt pieces are only counted.

Chips

Frequencies of chips in each level of Unit G are as follows: 317 pieces in level Gd; 898 pieces in level Gc1-Gc2; 655 pieces in level Gb1-Gb2; 135 pieces in level Ga.

Chips with some cortex: 41 pieces (12.9%) in level Gd; 130 pieces (14.5%) in level Gc1-Gc2; 67 pieces (10.2%) in level Gb1-Gb2; 21 pieces (15.6%) in level Ga.

Raw material types for chips are as follows.

Gray Flints: 269 pieces (84.9%) and 31 (11.5%) bear some cortex in level Gd; 712 pieces (79.3%) and 81 (11.4%) bear some cortex in level Gc1-Gc2; 537 pieces (82%) and 44 (8.2%) bear some cortex in level Gb1-Gb2; 122 pieces (90.4%) and 17 (13.9%) bear some cortex in level Ga.

Colored flints: 42 pieces (13.2%) and 6 (14.3%) bear some cortex in level Gd; 173 pieces (19.3%) and 43 (24.9%) bear some cortex in level Gc1-Gc2; 107 pieces (16.3%) and 15 (14%) bear some cortex in level Gb1-Gb2; 10 pieces (7.4%) and 1 (10%) bear some cortex in level Ga.

Black Flints: 6 pieces (1.9%) and 4 (66.6%) bear some cortex in level Gd; 13 pieces (1.4%) and 6 (46.2%) bear some cortex in level Gc1-Gc2; 11 pieces (1.7%) and 8 (72.7%) bear some cortex in level Gb1-Gb2; 3 pieces (2.2%) and all 3 (100%) bear some cortex in level Ga.

Uncharacteristic Debitage Pieces

Frequencies of uncharacteristic debitage pieces in each level of Unit G: 56 pieces in level Gd and 17 (30.4%) have some cortex; 115 pieces in level Gc1-Gc2 and 32 (27.8%) have some cortex; 40 pieces in level Gb1-Gb2 and 15 (37.5%) have some cortex; 9 pieces in level Ga and 3 (33.3%) have some cortex.

This artifact category is characterized by the following raw material types.

Gray Flint: 45 pieces (80.4%) and 14 (31.1%) have some cortex in level Gd; 86 pieces (74.8%) and 19 (22.1%) have some cortex in level Gc1-Gc2; 29 pieces (72.5%) and 8 (27.6%) have some cortex in level Gb1-Gb2; 8 pieces (88.9%) and 2 (25%) have some cortex in level Ga.

Colored flints: 11 pieces (19.6%) and 3 (27.3%) have some cortex in level Gd; 26 pieces (22.6%) and 11 (42.3%) have some cortex in level Gc1-Gc2; 10 pieces (25%) and 6 (60%) have some cortex in level Gb1-Gb2; none in level Ga.

Black Flints: none in level Gd; 3 pieces (2.6%) and 2 (66.6%) have some cortex in level Gc1-Gc2; 1 piece (2.5%) and it has some cortex (100%) in level Gb1-Gb2; 1 piece (11.1%) and it has some cortex (100%) in level Ga.

Chunks

Frequencies of chunks in each level of Unit G: 10 pieces in level Gd and 6 (60%) have some cortex; 76 pieces in level Gc1-Gc2 and 30 (39.5%) have some cortex; 16 pieces in level Gb1-Gb2 and 5 (31.3%) have some cortex; 17 pieces in level Ga and 6 (35.3%) have some cortex.

Chunks are also characterized according to raw material types.

Gray Flints: all 10 pieces (100%) in level Gd; 71 pieces (93.5%) and 26 (36.6%) have some cortex in level Gc1-Gc2; 15 pieces (93.8%) and 5 (33.3%) have some cortex in level Gb1-Gb2; all 17 pieces (100%) in level Ga.

Colored flints: 3 pieces (3.9%) and 2 (66.6%) have some cortex in level Gc1-Gc2; 1 non-cortical piece (6.2%) in level Gb1-Gb2.

Black Flints: 2 pieces (2.6%) with some cortex (100%) in level Gc1-Gc2.

Heavily Burnt Pieces are represented by the following number in each level of Unit G: 55 pieces in level Gd; 119 pieces in level Gc1 - Gc2; 81 pieces in level Gb1 - Gb2; 22 pieces in level Ga.

12 - UNIT F: LITHIC ARTIFACTS

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General artifact category representation

During the 1990s excavations, four archaeological levels from Unit F yielded the following lithic assemblages (stratigraphically from bottom to top): level Fc – 63 pieces, level Fb1-Fb2 – 6900 pieces, level Fa3 – 407 pieces, and level Fa1-Fa2 – 205 pieces. Levels Fb1-Fb2 and Fa1-Fa2 are each composed of two sub-levels, the number of artifacts and their categories from each sub-level is given in table 1. The three lower levels (Fc, Fb1-Fb2, Fa3) contain hearths/fireplaces and/or ashy lenses – strong evidence of human activities within the rock-shelter, while uppermost level Fa1-Fa2 lacks such features, probably due to natural disturbance. Aside from the artifact frequencies for each level, their proportional representation within the unit is much more indicative: level Fc – 0.8%, level Fb1-Fb2 – 91.1%, level Fa3 – 5.4%, and level Fa1-Fa2 – 2.7%. The clear overwhelming majority of level Fb1-Fb2 finds is once more confirmed by a good representation in this assemblage of core-like pieces and tools that constitute "a core sample" for all Unit F lithics. So, of all Unit F 23 core-like pieces, 20 (87%) are found in level Fb1-Fb2. In addition, 152 tools in this level comprise 83.5% of all Unit F 182 tools. At first sight, such distribution of Unit F artifacts between the four levels would not appear to allow us to carry out a comparative analysis between these levels, but this is not the case. Percentage intervals for basic artifact categories are as follows: core-like pieces – 0-0.5%, core maintenance products – 2.3-7.9%, debitage – 27.3-57.2%, tools – 2.2-6.3%, waste from tools production and rejuvenation (mainly, burin spalls) – 0-1.0%, debris – 28.6-67.2% (see tabl. 1). This shows insignificant variation in core maintenance products between levels, despite the absence of core-like pieces in level Fc. There are also just slight differences for tools and waste from tool production and rejuvenation (mainly burin spalls) between levels. In this connection, the lack of burin spalls in level Fc is readily explained by the lack of burins themselves there and, at the same time, the importance of the percentage of tools (6.3%) for level Fc should not be exaggerated as there are only four tools among the 63 flints here. Thus, the real differences are connected only to debitage and debris, but their representations are correlated (!). On one hand, level Fb1-Fb2 has the lowest debitage representation (27.3%) and the highest debris representation (67.2%). On the other hand, level Fc is known by the highest debitage rate (57.2%) and the lowest level of debris (28.6%). Given this and the small area excavated in the 1990s (12 sq. meters), we can assume that the small flint assemblages from levels Fc, Fa3 and Fa1-Fa2 represent merely small fractions or peripheral sections of human activities at the rock-shelter with quite limited primary and secondary flint treatment processes, while the large assemblage from level Fb1-Fb2 is evidence of intensive flint exploitation during multiple human occupations in this structurally complex level.

The observed differences in the representation of some artifact categories within Unit F are not accompanied by any techno-typological changes throughout the Unit F archaeological sequence. Aurignacian carinated cores for bladelet production are present in both level Fb1-Fb2 (7 of all 20 core-like pieces) and level Fa3 (both core-like pieces are carinated); their absence in level Fa1-Fa2 is not important, given the presence of a single multiplatform core there that may have originally been carinated before further heavy reduction and transformation into a multiplatform core. All main Aurignacian and Indicative Upper Paleolithic tool types and non-geometric microliths are observed in each of the Unit F four levels. We can therefore state that the finds from all four levels of Unit F represent a homogeneous Aurignacian assemblage.

Typological structure of artifacts

Core-like pieces

In total, this artifact category is represented in levels Fb1-Fb2, Fa3 and Fa1-Fa2 by 23 items (see tabl. 2).

Level Fb1-Fb2

The following 20 core-like pieces were identified: 1 pre-core, 17 cores and 2 core fragments. The 17 cores are typologically, subdivided into 1 blade/bladelet core, 10 bladelet cores, 3 flake/bladelet cores and 3 unidentifiable cores. All core-like pieces are made on gray flints. The core-like pieces' blank types will be noted below for each individual specimen.

	Level Fc			Level Fb1-Fb2					Level Fa3			Level Fa1-Fa2				
	N	%	*esse %*	Fb2	Fb1	N	%	*esse %*	N	%	*esse %*	Fa2	Fa1	N	%	*esse %*
Core-Like Pieces				11	9	20	*0.3*	*0.9*	2	*0.5*	*0.8*	1		1	*0.5*	*0.8*
Core Maintenance Products	5	*7.9*	*11.1*	110	47	157	*2.3*	*6.9*	30	*7.4*	*12.3*	13		13	*6.3*	*9.9*
D e b i t a g e :	36	*57.2*	*80.0*	1317	566	1883	*27.3*	*83.3*	192	*47.2*	*78.7*	94	12	106	*51.7*	*80.9*
Flakes	12	*19.1*	*26.7*	284	139	423	*6.1*	*18.7*	63	*15.5*	*25.8*	36	6	42	*20.5*	*32.1*
Blades	7	*11.1*	*15.6*	76	35	111	*1.6*	*5.0*	30	*7.4*	*12.3*	12	1	13	*6.3*	*9.9*
Bladelets	8	*12.7*	*17.7*	228	130	358	*5.2*	*15.8*	55	*13.5*	*22.6*	28	4	32	*15.6*	*24.4*
Microblades	9	*14.3*	*20.0*	729	262	991	*14.4*	*43.8*	44	*10.8*	*18.0*	18	1	19	*9.3*	*14.5*
Tools	4	*6.3*	*8.9*	115	37	152	*2.2*	*6.7*	17	*4.2*	*7.0*	8	1	9	*4.4*	*6.9*
Waste From Production & Rejuvenation of Tools				37	13	50	*0.7*	*2.2*	3	*0.7*	*1.2*	2		2	*1.0*	*1.5*
D e b r i s :	18	*28.6*		3500	1138	4638	*67.2*		163	*40.0*		70	4	74	*36.1*	
Chips	10	*15.9*		2885	1001	3886	*56.3*		128	*31.4*		50	3	53	*25.8*	
Uncharacteristic Debitage Pieces	8	*12.7*		129	55	184	*2.7*		19	*4.7*		16	1	17	*8.3*	
Chunks				11	9	20	*0.3*		11	*2.7*		1		1	*0.5*	
Heavily Burnt Pieces				475	73	548	*7.9*		5	*1.2*		3		3	*1.5*	
TOTAL	**63**	100.0	100.0	5090	1810	**6900**	100.0	100.0	**407**	100.0	100.0	188	17	**205**	100.0	100.0

Table 1 - Siuren-I. Unit F. General Lithic Artifacts Categories Representation by Level and Sub-Level.

Groups & Types	**Level Fc**	**Level Fb1-Fb2**	**Level Fa3**	**Level Fa1-Fa2**	**TOTAL**
PRE-CORES		**1**	**1**		**2**
CORES		**17**	**1**	**1**	**19**
Blade / Bladelet Cores					**1**
- double-platform bidirectional-adjacent sub-cylindrical		1			
Bladelet Regular Cores					**3**
- double-platform bidirectional rectangular		1			
- double-platform bidirectional-adjacent rectangular		1			
- double-platform bidirectional-alternate rectangular		1			
Bladelet Carinated Cores					**4**
- single-platform sub-cylindrical		1	1		
- single-platform sub-pyramidal		1			
- double-platform bidirectional-adjacent sub-cylindrical		1			
Bladelet "Advanced" Carinated Core					**1**
- single-platform pyramidal		1			
Bladelet Narrow Flaked Cores / "Carinated Burins"					**3**
- single-platform		3			
Flake-Bladelet Cores					**4**
- *multiplatform exhausted*		3		1	
Unidentifiable Cores		3			**3**
CORE FRAGMENTS		**2**			**2**
TOTAL	**0**	**20**	**2**	**1**	**23**

Table 2 - Siuren-I. Unit F. Core-like Pieces Classification.

The Pre-Core is an initial double-platform piece with bidirectional-adjacent disposition of two striking platforms (1 plain semi-acute and 1 crudely-faceted semi-acute) and two flaking surfaces. This pre-core reflects an initial attempt at regular core reduction after decortification/preparation of a nodule by removal of some flakes and blades, based on their negatives. Unfortunately, this attempt was unsuccessful, as seen by the fact that debitage pieces removed from both striking platforms are heavily hinged, reached only about one-third of the pre-core's overall length, and obviously spoiled the pre-core's flaking surfaces for any further reduction. Due to the hinged character of intentional removals, their identification (flakes/blades/bladelets?) remains unknown. The pre-core is 4.3 cm long, 3.5 cm wide and 3.1 cm thick.

The Blade/Bladelet Core (fig. 1:1) is a double-platform bidirectional-adjacent one of volumetric character with sub-cylindrical shape and two flaking surfaces. Platform types and angles: 1 plain semi-acute and 1 crudely-faceted acute. Platform abrasion: present for the plain semi-acute platform and absent for the crudely-faceted acute one. Platform morphology in plane and removal scars on flaking surfaces: 1 semicircular with no twisted scars and 1 straight with no twisted scars. Condition of flaking surfaces: both regular. Metrics: length – 5.3 cm, width – 2.2 cm, thickness – 1.5 cm. First platform's width and thickness: 1.7 cm and 0.8 cm. Second platform's width and thickness: 1.6 cm and 2.4 cm. Size of the plain platform indicates removal of a core tablet with flake proportions for possible rejuvenation. Platform negatives' maximum length: the same as the core's length

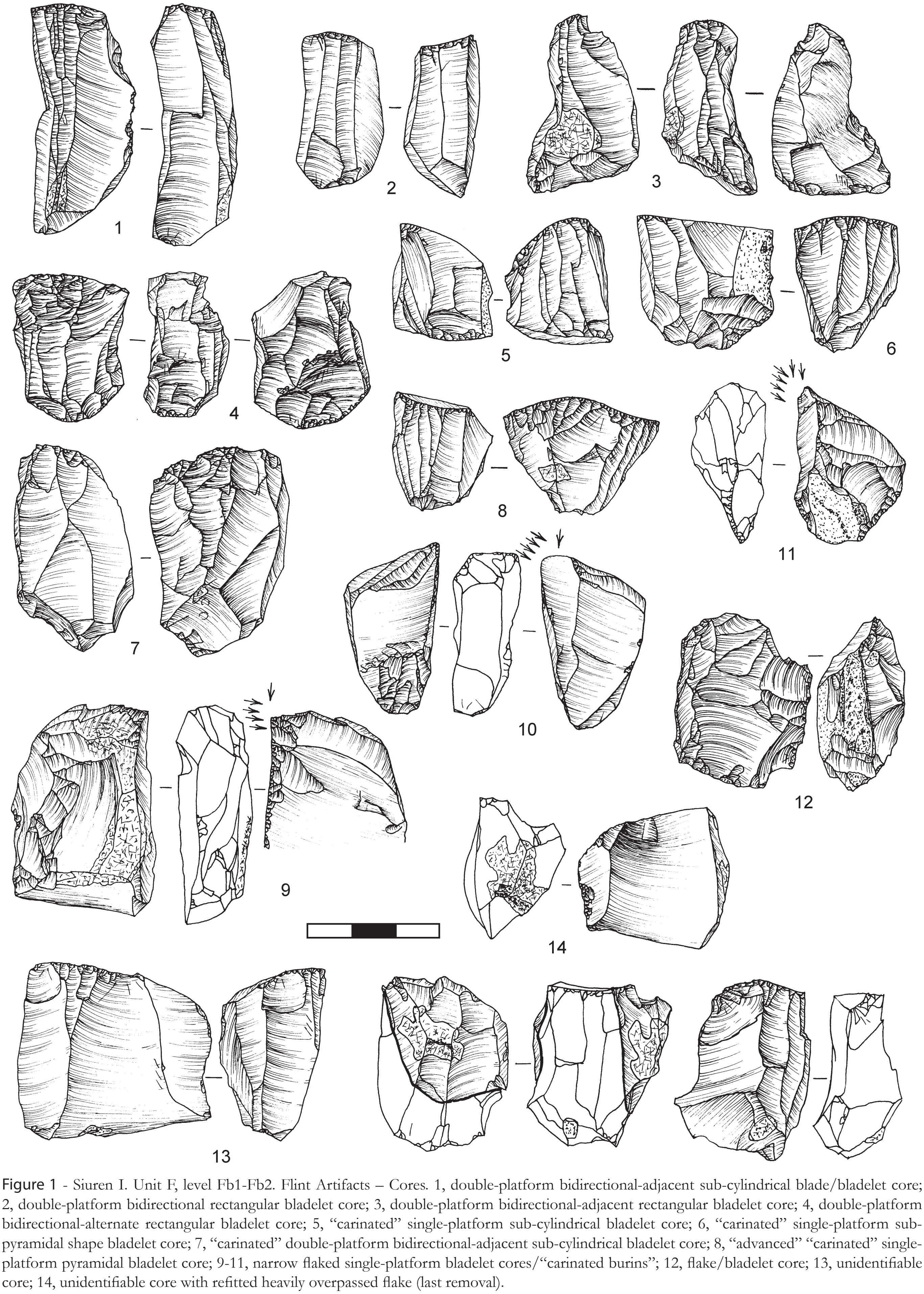

Figure 1 - Siuren I. Unit F, level Fb1-Fb2. Flint Artifacts – Cores. 1, double-platform bidirectional-adjacent sub-cylindrical blade/bladelet core; 2, double-platform bidirectional rectangular bladelet core; 3, double-platform bidirectional-adjacent rectangular bladelet core; 4, double-platform bidirectional-alternate rectangular bladelet core; 5, "carinated" single-platform sub-cylindrical bladelet core; 6, "carinated" single-platform sub-pyramidal shape bladelet core; 7, "carinated" double-platform bidirectional-adjacent sub-cylindrical bladelet core; 8, "advanced" "carinated" single-platform pyramidal bladelet core; 9-11, narrow flaked single-platform bladelet cores/"carinated burins"; 12, flake/bladelet core; 13, unidentifiable core; 14, unidentifiable core with refitted heavily overpassed flake (last removal).

– 5.3 cm. Reason for abandonment: small overall size and particularly thickness of the plain striking platform, as well as the small thickness of the core for further primary reduction. The blank type is likely a thick blade.

For bladelet cores in level Fb1-Fb2, 3 regular cores, 3 carinated cores, 1 "advanced" carinated core and 3 narrow flaked cores were identified. Descriptions of these 10 cores will be done separately for each of these four sub-groups.

Bladelet Regular Cores are all double-platform specimens of non-volumetric character with rectangular shape. Differences between the three cores are only in the disposition of two striking platforms and 1-2 flaking surfaces.

The first (fig. 1:2) is a double-platform bidirectional rectangular one with bladelets/microblades removed from two opposing striking platforms located on a single flaking surface. The core is quite exhausted, showing the last regular reduction of the small residual piece. Platform types and angles: 1 plain acute and 1 plain semi-acute. Platform abrasion: present on both platforms. Platform morphology in plane and removal scars on flaking surfaces: both straight with no twisted scars. Condition of flaking surfaces: both regular. Metrics: length – 3.6 cm, width and thickness – 1.5 cm each. First platform's width and thickness – 1.2 cm and 1.5 cm. Second platform's width and thickness – 1.5 cm and 1.4 cm. Such dimensions of both striking platforms indicate possible removal of core tablets with flake proportions for their rejuvenation. Platform negatives' maximum length: the same as the core's length – 3.6 cm. Reason for abandonment: no obvious reason, although the core is certainly small. The blank type is unknown because of heavy reduction.

The second core (fig. 1:3) is a double-platform bidirectional-adjacent rectangular one with two flaking surfaces. Platform types and angles: both plain acute. Platform abrasion: present on both platforms. Platform morphology in plane and removal scars on flaking surfaces: 1 semicircular with no twisted scars and 1 straight with no twisted scars. Condition of flaking surfaces: 1 regular and 1 hinged. Metrics: length – 3.8 cm, width and thickness – 2.3 cm each. First platform's width and thickness – 1.3 cm and 1.0 cm. Second platform's width and thickness – 2.3 cm and 2.1 cm. Such dimensions of both striking platforms indicate possible rejuvenation through removal of core tablets with flake proportions. Platform negatives' maximum length: 3.8 cm and 3.1 cm, which is exactly the whole length of each flaking surface. Reason for abandonment: one flaking surface is regular but the striking platform is too small (1.3 x 1.0 cm), while the second flaking surface is hinged, although its striking platform is still sizable (2.3 x 2.1 cm). The core is quite exhausted. The blank type is a nodule/chunk.

The third core (fig. 1:4) is a double-platform bidirectional-alternate rectangular one with two flaking surfaces (on one flaking surface on each of two core's sides). Platform types and angles: 1 crudely-faceted right and 1 crudely-faceted acute. Platform abrasion: present on both platforms. Platform morphology in plane and removal scars on flaking surfaces: both straight with no twisted scars. Condition of flaking surfaces: both hinged. Metrics: length – 3.3 cm, width – 2.6 cm, thickness – 1.7 cm (although without taking into account the convexity on flaking surfaces due to hinging parts, thickness is only 1.0 cm). First platform's width and thickness – 2.5 cm and 1.1 cm. Second platform's width and thickness: 1.9 cm and 0.6 cm. Platform negatives' maximum length: the same as the core's length – 3.3 cm. Reason for abandonment: both flaking surfaces hinged, small overall thickness of the core and small thickness of both striking platforms. The blank type is unknown but is probably a nodule/chunk.

Bladelet Carinated Cores of volumetric character include 2 single-platform and 1 double-platform specimens.

The first bladelet carinated single-platform core (fig. 1:5) has sub-cylindrical shape. Platform type and angle: plain acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: offset with twisted scars. Condition of flaking surface: regular. Metrics: 2.5 cm long, 2.4 cm wide and 2.4 cm thick. Platform width and thickness: 2.5 and 2.4 cm. Such platform size indicates removal of a core tablet with flake proportions for possible rejuvenation. Platform negatives' maximum length: the same as the core's length – 2.5 cm. Reason for abandonment: no obvious reason. The blank type is a nodule/chunk.

The second bladelet carinated single-platform core (fig. 1:6) has sub-pyramidal shape. Platform type and angle: plain semi-acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: offset with twisted scars. Condition of flaking surface: regular. Metrics: length – 3.0 cm, width – 2.4 cm, thickness – 3.1 cm. Platform width and thickness: 2.4 cm and 3.1 cm. This platform could also have rejuvenated by removal of a core tablet with flake proportions. Platform negatives' maximum length: the same as the core's length – 3.0 cm. Reason for abandonment: no obvious reason. The blank type is a nodule/chunk.

The bladelet carinated double-platform core (fig. 1:7) is a bidirectional-adjacent one with two flaking surfaces and sub-cylindrical shape. It has some unusual features. The presence of some rather wide and large negatives on its flaking surfaces indicates blade production (initial preparation?) prior to bladelet production. The main morphological features of the two striking platforms and flaking surfaces are similar. Platform types and angles: both plain acute. Platform morphology in plane and removal scars on flaking surfaces: both offset with twisted scars. Condition of flaking surfaces: both regular. Metrics: length – 5.1 cm, width – 3.1 cm, thickness – 2.6 cm. However, metric data on platform width/thickness and negatives' maximum length are very different and indicate different typological definitions. One part of the core (one striking platform and one flaking surface) is a bladelet carinated core. The other part (one striking platform and one flaking surface) would be a thick shouldered end-scraper. So, the first part has such the following dimensions: platform width – 2.9 cm and thickness – 4.0 cm, and negatives' maximum length – 3.1 cm that corresponds well to bladelet carinated cores with smaller indices for striking platform width in comparison to their negatives' maximum length. The other part is characterized by reverse metric indices for striking platform's width (1.8 cm)/thickness (2.8 cm) and negatives' maximum length (1.6 cm) that, in conjunction with its clear "one-sided notch"/"offset core morphology in plane", meets the parameters of thick shouldered end-scrapers. Such a combination of two metrically different part of the core show obvious artificial metric boundaries between carinated tools and bladelet carinated cores and strongly confirms the need for definite separation of "carinated pieces" in Aurignacian assemblages. Concluding the core's description, we also note that its blank type is a nodule/chunk and possible platform rejuvenation would likely have been done through removal of core tablets with flake proportions.

The bladelet "advanced" carinated core is a single-platform one of volumetric character with pyramidal shape (fig. 1:8). Strictly speaking, it is not a carinated core because of the pyramidal shape, as only sub-pyramidal and sub-cylindrical shapes are characteristic of "true" bladelet carinated cores. Nevertheless, we have decided to include this item with the carinated cores for the following reasons. This core shows morphological features typical for carinated cores, such as offset morphology in plane (two notches) and twisted scars on the flaking surface, as well as the presence of mainly scars with microblade width – evidence of not just general bladelet production but, indeed, mainly microblade reduction. Therefore, it was decided to place this piece in the bladelet carinated cores category under the conventional term "advanced carinated". Platform type and angle: plain right. Platform abrasion: present. Condition of flaking surface: regular. Metrics: length – 2.9 cm, width – 3.5 cm, thickness – 1.9 cm. Platform width and thickness – 3.5 cm and 2.2 cm. Forming of the striking platform was made by a single blow in longitudinal direction and such possible removal could have been a core tablet with blady proportions. Platform negatives' maximum length: the same as the core's length – 2.9 cm, which is less than platform width – 3.5 cm. In this case, if we exclude the pyramidal shape of the core, this matches the metric proportions of carinated end-scrapers. Accordingly, it also supports better attribution of this piece as a bladelet carinated core than simply a bladelet regular core. Reason for abandonment: no obvious reason. The blank type is a nodule/chunk.

Bladelet Narrow Flaked Single-Platform Cores/"Carinated Burins" (3 items: fig. 1:9-11) are very similar in morphological features which are summarized below. Platform type and angles: 2 plain acute and 1 plain right. Platform abrasion: present for all 3 cores. Platform morphology in plane and removal scars on flaking surfaces: all offset with twisted scars. Condition of flaking surfaces: all regular. Thus, this morphology corresponds well to bladelet carinated cores, but with the difference of the use of the narrow side for bladelet/microblade production. Metric data are given separately for each piece. The first (fig. 1:9) is 3.3 cm long, 1.6 cm wide, 4.7 cm thick; platform width and thickness are 1.3 cm and 4.7 cm (a core tablet with blade proportions may have been removed for rejuvenation), and platform negatives' maximum length is the same as the core's length – 3.3 cm, although the last removed bladelets/microblades were heavily hinged. The second (fig. 1:10) is 2.5 cm long, 1.5 cm wide and 3.4 cm thick. Its platform width and thickness are 1.5 cm and 3.1 cm (a core tablet with blade/bladelet proportions may have been removed for its formation) and platform negatives' maximum length is the same as the core's length – 2.5 cm. The third (fig. 1:11) is 2.9 cm long, 1.7 cm wide and 3.5 cm thick. Platform width and thickness are 1.7 cm and 3.4 cm (a core tablet with blade/bladelet proportions may have been removed), and platform negatives' maximum length is the same as the core's length – 2.9 cm. The greater thickness of all three cores in comparison to length is explained by using short wide flakes as blanks. Reasons for abandonment: there are no obvious reasons for any of the cores, but it can be noted that the final scars of first piece are hinged, that have led to its abandonment. So, all metric parameters, as well as morphology, support attribution as bladelet narrow flaked cores. There is, however, another typological choice for these three pieces – carinated burins. The formation of one striking platform by one blade/bladelet removal and then detachment from its negative a series of bladelets/ microblades could be interpreted as the removal of burin spalls; a detachment of pronounced twisted "burin spalls" similar to those from carinated cores and tools; manufacturing of all three pieces on flakes and not on nodules/chunks is less typical for cores; finally, the presence of a notch at the end of serial scars on the third piece may be interpreted as a typical notch for a carinated (busked) burin. Only the greater than 1.0 cm width for "burins multifaceted verges" (1.3-1.7 cm) contradicts such definition of these items as carinated burins. Thus, in sum, we strictly typologically identify these three pieces as bladelet narrow flaked cores with subsequent agreement to include them in the "broad" index of carinated burins and carinated pieces.

Flake/Bladelet Cores (3 pieces) are very exhausted ones after very certain multiple reductions because of which the cores' final forms have an unusual combination of flake/bladelet scars removed from more than two striking platforms.

The first Flake/Bladelet Core (fig. 1:12) may be strictly morphologically classified as a triple-platform sub-crossed one with ovoid shape and one flaking surface which is non-volumetric due to exhaustion. Two striking platforms are plain with acute angles and another striking platform is crudely-faceted with acute angle. Other striking platform characteristics would be too subjective, as well as other morphological features of the core. The core is 3.7 cm long, 3.0 cm wide and 1.7 cm thick. The blank type is a nodule/chunk.

Two more Flake/Bladelet Cores are multiplatform unsystematic/shapeless ones with removal scars all over their sides and with no special order of striking platforms and flaking surfaces, where flaking surfaces served as striking platforms and vice versa. Both blanks are nodules/chunks, one of which is also burnt. They are 5.2 cm and 3.5 cm long, 4.1 cm and 3.1 cm wide, 1.9 cm and 2.6 cm thick.

Unidentifiable Cores (3 pieces: fig. 1:13-14) are classified as such not because of their fragmentation or exhausted character as each one is complete, but with very special features of flaking surfaces. Indeed, each core's flaking surface is characterized by only a single large and wide negative that occupies more than three-quarters of the flaking area. Moreover, two such negatives on two cores' flaking surfaces are heavily overpassed that indicate considerable reducing of the cores' distal parts as well (fig. 1:13). Thus, any real sense of primary reduction on these three cores can only be understand through refitting several debitage pieces or the last removed flake or blade. The latter was possible for one of these cores (fig. 1:14). Refitting of such a flake shows flake/bladelet bidirectional-adjacent volumetric core reduction with sub-cylindrical shape on two flaking surfaces from two striking platforms. This refitting strengthens our definitions of these three cores as unidentifiable because their actual reduction could be of any kind and radically different from the final one which very conventionally may be typologically identified as flake/blade single-platform non-volumetric one that would not be not true at all. The blank types used for these three cores are nodules/chunks. Their overall sizes are as follows: length: 6.6 cm, 4.0 cm, 3.9 cm; width: 4.3 cm, 4.5 cm, 3. 1 cm; thickness: 2.5 cm, 2.2 cm, 2.8 cm.

Level Fa3

The two cores from this level include a bladelet pre-core and a bladelet carinated core made on gray flint nodules/chunks.

The Pre-Core (fig. 2:1) is quite unusual because it could be equally defined either as a bladelet pre-core or a carinated burin. Both of these possibilities will be discussed.

First, this piece, as a pre-core, is not an initial core or simply a tested piece of raw material. The blank is a broken blade core for which the striking platform's edge was then used for further narrow flaked reduction as a unilateral crested ridge, planned from a new plain acute striking platform prepared by a single blow at one end of this crested ridge. From this new striking platform an attempt was made to strike off a series of bladelets/microblades (no less than 4). All of these bladelets/microblades were heavily hinged and reaching a maximum length of only 2.5 cm based on the negatives on the 6.0 cm length of the crested ridge. After this, the pre-core was abandoned.

At the same time, the following use of a broken blade core is very similar to manufacture of a carinated burin where from a single facet's negative a series of burin spalls was removed along the other edge of the blank. The absence of abrasion at the "The burin termination" does not additionally contradict definition of this particular piece as a carinated burin, although pre-cores usually do not have traces of abrasion at their core striking platform edges.

On the other hand, the width of the single negative from which a series of "bladelets/microblades or burin spalls" was detached is too wide (1.2-2.2 cm) for a burin, given the proposed "arbitrary border" of 1.0 cm for core/burin platform width. Therefore, it was decided to identify this piece as a bladelet narrow flaked pre-core that otherwise would be included in the "broad" index of carinated burins and, as a whole, accepted as "a carinated piece". The same was proposed for three bladelet narrow flaked cores from level Fb1-Fb2.

The Bladelet Carinated Core (fig. 2:2) is a single-platform one of volumetric character with sub-cylindrical shape. Platform type and angle: plain semi-acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: semicircular with no twisted scars. Condition of flaking surface: regular. Metrics: length, 5.1 cm; width, 2.8 cm; thickness, 4.0 cm. Platform width and thickness: 2.7 cm and 4.4 cm. The following size of the platform means use of a core tablet with elongated flake (blady?) proportions for possible rejuvenation. Platform negatives' maximum length: the same as the core's length, 5.1 cm. Reason for core abandonment: no obvious reason.

Level Fa1-Fa2

A single core-like piece here is a Flake/Bladelet Multiplatform core (fig. 2:3). It has numerous heavily hinged flake and bladelet negatives removed non-systematically from four striking platforms on the core's two flaking surfaces. The following flaking features are clearly connected to the extreme exhaustion of the core after many attempts at regular, probably bladelet, reduction. It is on gray flint and is a nodule/chunk, 3.6 cm long, 3.0 cm wide and 2.2 cm thick.

Core-like pieces of Unit F can be generally and briefly characterized as follows. By debitage category production, cores are set apart by the complete absence of blade cores and, moreover, there is only a single blade/bladelet core among the 16 morphologically identifiable cores. On the other hand, the rest of the cores are represented by either cores with only bladelet removals (12 items) or flake/bladelet multiplatform exhausted cores (4 items) where the latter are interpreted as being multiply reshaped and reduced bladelet cores. Also, bladelet *sensu stricto* cores are notable for the presence of a series of narrow flaked items/"carinated burins" which differ from carinated burins by a wider flaking removal surface. At the same time, the presence of these specific cores once again underlines that carinated burins not an occasional occurrence among the tools, as will be shown below in the tool descriptions. Finally, the emphasis on bladelet production for cores is again in accordance with the presence of both carinated end-scrapers and burins, which are also objects for bladelet production, and non-geometric microliths within the tool samples of Unit F levels.

Core Maintenance Products (CMP)

This artifact category is well-represented in level Fb1-Fb2, while other three levels have fewer core maintenance products, although percentages are relative to the overall assemblage size of these levels. Taking core maintenance products from all four levels together, we have a sizeable sample of 205 the following items for the Unit F artifact assemblage (see tabl. 3A).

Level Fc

There are only 5 core maintenance products: 4 crested pieces and 1 core trimming element which are all on gray flints, including one burnt crested blade.

Crested Pieces. These include 2 crested flakes (50%) and 2 crested blades (50%).

Crested Flakes. There are a primary and a re-crested pieces with preserved crested ridge.

The primary piece is a complete (length: 2.5 cm, width: 1.4 cm, thickness: 0.3 cm) non-cortical one with unilateral wholly crest-

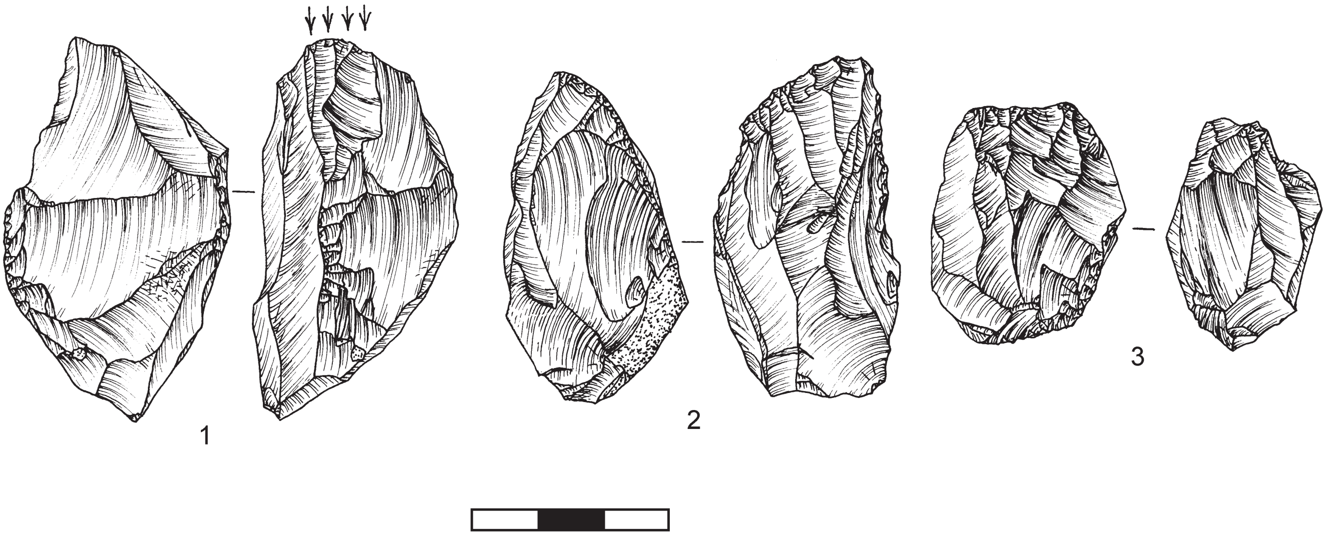

Figure 2 - Siuren I. Unit F, levels Fa3 and Fa1-Fa2. Flint Artifacts – Cores. 1, bladelet pre-core/carinated burin (level Fa3); 2, "carinated" single-platform sub-cylindrical bladelet core (level Fa3); 3, multiplatform flake/bladelet core (level Fa1-Fa2).

	Level Fc	Level Fb1-Fb2	Level Fa3	Level Fa1-Fa2	TOTAL
CRESTED PIECES	*4*	*126*	*19*	*9*	**158 / 77.1%**
- Crested Flakes	2	23	1	1	
- Crested Blades	2	28	9	4	
- Crested Bladelets		39	6	4	
- Crested Microblades		36	3		
CORE TABLETS	*0*	*24*	*9*	*2*	**35 / 17.1%**
- on Flakes		12	7		
- on Blades		11	2	2	
- on Bladelets		1			
CORE TRIMMING ELEMENTS	*1*	*7*	*2*	*2*	**12 / 5.8%**
TOTAL	**5 / 2.4%**	**157 / 76.7%**	**30 / 14.6%**	**13 / 6.3%**	**205 / 100.0%**

Table 3A - Siuren-I. Unit F. Core Maintenance Products Structure.

ed preparation and lateral steep profile at midpoint. Morphological features: dorsal-plain scar pattern, converging shape, "on-axis" removal direction, twisted general profile, feathering distal end and plain (0.2 x 0.2 cm) butt (semi-lipped, right angle, with no abrasion).

The re-crested piece is a complete (length – 2.8 cm, width – 1.9 cm, thickness – 0.5 cm) partially cortical one (non-significant proximal cortex) with bilateral partial crested preparation and lateral steep profile at midpoint. Morphology: unidirectional-crossed scar pattern, converging shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end and crushed butt.

The Crested Blades are both primary pieces with preserved crested ridge. They are non-cortical broken items: proximal and medial fragments of similar size: length – 2.3 cm for both, width – 1.4 cm and 1.5 cm, thickness – 0.8 cm for both. Their recognizable morphological features are limited to dorsal-plain scar patterns and 1 crushed and 1 missing butts.

Core Trimming Element. The Core Trimming Element is a complete non-cortical flake with transversal placement of bilateral partial crested preparation. It has a small plain (0.2 x 0.2 cm) butt (semi-lipped, right angle, with abrasion), 2.5 cm long, 1.3 cm wide and 0.4 cm thick.

Level Fb1-Fb2

The sample of this artifact category (157 pieces) is the largest one of all levels in Unit F. It is subdivided into crested pieces (126 items), core tablets (24 items) and core trimming elements (7 items).

Crested Pieces. These include crested flakes (23 pieces/18.2%), crested blades (28 pieces/22.2%), crested bladelets (39 pieces/31.0%) and crested microblades (36 pieces/28.6%).

Crested Flakes. These include 5 primary, 8 re-crested, 5 secondary pieces and 1 unidentifiable piece with preserved crested ridge, and 4 truly secondary pieces with no preserved crested ridge. All but one unidentifiable (brown flint) crested flakes were made on gray flints.

Five primary crested flakes are complete 3 of which are non-cortical and 2 partially cortical with insignificant proximal (1) and central (1) cortex with the following characteristics of crested ridges: unilateral (4)/bilateral (1) and wholly (2)/partially (3) crested preparation with 1 triangular and 4 lateral steep profiles at midpoint. Morphology: 2 dorsal-plain, 1 crested, 1 unidirectional-crossed and 1 unidentifiable scar patterns; 2 expanding, 1 ovoid and 2 irregular shapes; 1 "on-axis" and 4 "off-axis" removal directions; 1 flat, 1 incurvate distal and 3 twisted general profiles; 4 feathering and 1 unidentifiable distal ends; 2 plain (2.8-0.5 x 1.6-0.2 cm) butts (2 semi-lipped, 1 right and 1 semi-acute angles, 2 with no abrasion), 1 punctiform butt (semi-lipped, semi-acute angle, with no abrasion) and 2 crushed butts. They have the following dimension ranges: length – 1.8-5.1 cm, width – 1.1-3.6 cm and thickness – 0.3-2.1 cm.

Eight re-crested flakes are complete non-cortical ones with the following crested ridge characteristics: unilateral (7)/bilateral (1) and wholly (1)/partially (7) crested preparation with 2 triangular and 6 lateral steep profiles at midpoint. Morphologically, they have 4 unidirectional and 4 unidirectional-crossed scar patterns; 1 parallel, 1 converging, 4 expanding and 2 irregular shapes; 2 "on-axis" and 6 "off-axis" removal directions; 1 flat, 1 incurvate medial, 2 incurvate distal and 4 twisted general profiles; 3 feathering, 1 hinged, 2 blunt and 2 unidentifiable distal ends; 3 plain (1.1 – 0.8 – 0.4 x 0.4 – 0.3 – 0.2 cm) butts (2 semi-lipped and 1 not lipped, 1 right and 2 semi-acute angles, 2 with abrasion and 1 with no abrasion), 1 linear (0.3 x 0.1 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 2 dihedral (1.6-0.8 x 0.5-0.3 cm) butts (semi-lipped, semi-acute angles, with abrasion) and 2 crushed butts. Metrically, they are in the following ranges: length – 1.0-4.7 cm, width – 0.9-3.6 cm (2 with shortened, transversal proportions), thickness – 0.2-1.7 cm.

Five secondary pieces with preserved crested ridge are complete non-cortical ones with the following characteristics of crested ridges: all 5 unilateral partial, and 2 triangular and 3 lateral steep profiles at midpoint. Morphological features: 4 unidirectional and 1 bidirectional scar patterns; 3 converging and 2 expanding shapes; 5 "off-axis" removal directions; 1 convex and 4 twisted general profiles; 2 feathering, 2 hinged and 1 unidentifiable distal ends; 3 punctiform butts with abrasion, 1 linear (0.5 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion) and 1 crudely-faceted (1.2 x 1.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion). Metric ranges: length – 1.9-3.1 cm, width – 1.1-2.1 cm and thickness – 0.4-1.4 cm.

An unidentifiable piece is complete and non-cortical with unilateral wholly crested preparation and lateral steep profile at midpoint. It has unidentifiable scar pattern (the main reason for the piece's attribution as an unidentifiable crested flake), irregular shape, "off-axis" removal direction, flat general profile, feathering distal end and crushed butt. It is 1.9 cm long, 1.2 cm wide and 0.4 cm thick.

Four truly secondary pieces with no preserved crested ridge include 4 complete of which 2 are non-cortical (insignificant lateral (1) and distal (1) cortex) ones with the following morphological features: 1 lateral, 2 unidirectional-crossed and 1 bidirectional scar patterns; 2 expanding, 1 ovoid and 1 irregular shapes; 4 "off-axis" removal directions; 2 incurvate medial, 1 incurvate distal and 1 twisted general profiles; 1 feathering, 1 overpassed and 2 unidentifiable distal ends; 1 triangular and 3 irregular profiles at midpoint; 1 plain (0.2 x 0.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 1 dihedral (1.3 x 0.7 cm) butt (semi-lipped, semi-acute angle, with no abrasion) and 2 crushed butts. Dimension ranges: length – 1.9-5.1 cm, width – 1.7-3.8 cm (1 with shortened, transversal proportions) and thickness – 0.6-1.7 cm.

Crested Blades. There are 4 primary, 7 re-crested, 11 secondary and 4 unidentifiable pieces with preserved crested ridge and 2 truly secondary pieces with no preserved crested ridge. Aside from two pieces on brown flints, all other 26 crested blades are made on gray flints.

Four primary pieces are all complete, of which 2 are non-cortical and 2 partially cortical (with insignificant distal (1) and central + distal (1) cortex) ones with unilateral (2)/bilateral (2) and wholly (4) crested preparation. Morphologically, they have 1 cortical, 1 dorsal-plain and 2 crested scar patterns; 1 converging and 3 irregular shapes; 2 "on-axis" and 2 "off-axis" removal directions; 2 incurvate medial and 2 twisted general profiles; 1 feathering, 2 blunt and 1 unidentifiable distal ends; 1 plain (0.6 x 0.3 cm) butt (not lipped, right angle, with no abrasion), 1 crudely-faceted (0.9 x 0.6 cm) butt (semi-lipped, right angle, with no abrasion), 1 finely-faceted (0.9 x 0.6 cm) butt (semi-lipped, semi-acute angle, with no abrasion) and 1 crushed butt. Metrically, they have two different sizes: for 2 pieces – length – 3.9 and 3.1 cm, width – 1.4 and 1.5 cm, thickness – 1.1 – 0.8 cm, and for 2 more pieces – length – 12.2 and 12.1 cm, width – 2.7 and 2.6 cm, thickness – 1.9 and 1.8 cm.

Seven re-crested pieces have the following characteristics of crested ridges: 7 unilateral wholly (2)/partially (5) crested preparation and 7 lateral steep profiles at midpoint. Morphologically, they have the following features: 3 complete, 2 proximal and 2 distal fragments; 5 unidirectional and 2 unidentifiable scar patterns, 3 parallel, 1 converging, 1 expanding and 2 unidentifiable shapes; 3 "on-axis", 1 "off-axis" and 3 unidentifiable removal directions; 5 twisted and 2 unidentifiable general profiles; 4 feathering, 1 blunt and 2 unidentifiable distal ends; 1 plain (0.4 x 0.2 cm) butt (semi-lipped, right angle, with no abrasion), 1 linear (0.3 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion), 1 dihedral (1.5 x 0.3 cm) butt (semi-lipped, right angle, with abrasion), 2 crushed and 2 missing butts. They have the following dimensions ranges: length – 2.6-5.2 cm for three complete items and 1.9-3.2 cm for four broken items, width – 1.2-1.7 cm, thickness – 0.3-0.9 cm.

Eleven secondary pieces have the following characteristics of crested ridges: unilateral (10)/bilateral (1) and 11 partially crested preparation with 7 triangular and 4 lateral steep profiles at midpoint. Morphology: 7 complete, 1 proximal and 3 distal parts; 8 unidirectional, 1 unidirectional-crossed and 2 bidirectional scar patterns; 1 parallel, 5 converging, 2 expanding, 2 irregular and 1 unidentifiable shapes; 1 "on-axis", 7 "off-axis" and 3 unidentifiable removal directions; 1 flat, 2 incurvate medial, 7 twisted and 1 unidentifiable general profiles; 8 feathering, 2 blunt and 1 unidentifiable distal ends; 1 cortical (2.0 x 0.7 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 3 plain (0.9 – 0.7 – 0.4 x 0.4 – 0.2 cm) butts (3 semi-lipped, 1 right and 2 semi-acute angles, 2 with abrasion and 1 with no abrasion), 2 punctiform (1 with abrasion and 1 with no abrasion) butts, 1 linear (0.6 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion), 1 finely-faceted (0.4 x 0.3 cm) butt (semi-lipped, right angle, with no abrasion) and 3 missing butts. They have the following metric ranges: length – 3.2-6.4 cm for 7 complete items and 2.2-4.0 cm for 4 broken items, width – 1.2-1.5 cm for 7 pieces, 1.6 cm for 1 piece and 2.2-2.7 cm for 3 pieces, thickness – 0.4-1.1 cm for all 11 pieces.

Four unidentifiable pieces have unilateral partially crested preparation and 3 triangular and 1 lateral steep profiles at midpoint. They include one complete partially cortical piece with insignificant lateral cortex and 3 broken non-cortical pieces – 1 medial and 2 distal fragments. All have unidentifiable scar patterns, as well as other unclear morphological features. The complete item has a plain (0.7 x 0.3 cm) butt (semi-lipped, semi-acute angle, with abrasion) and is 4.4 cm long, 2.1 cm wide and 0.7 cm thick. Three broken specimens are 2.5-4.7 cm long, 1.2-1.3 cm and 2.7 cm wide, 0.7-0.9 cm and 1.2 cm thick.

Two truly secondary pieces with no preserved crested ridge include 1 proximal and 1 distal partially cortical items with insignificant lateral cortex. Their other morphological features are as follows: 1 unidirectional and 1 bidirectional scar patterns; 1 irregular and 1 unidentifiable shapes; 1 "off-axis" and 1 unidentifiable removal directions; 1 twisted and 1 unidentifiable general profiles; 1 blunt and 1 unidentifiable distal ends; 1 trapezoidal and 1 multifaceted profiles at midpoint; 1 plain (semi-lipped, semi-acute angle, with no abrasion) butt and 1 missing butt. Their sizes as follows: length – 4.2 and 2.2 cm, width – 1.8 and 2.3 cm, thickness – 0.9 cm for both.

Crested Bladelets. There are 12 primary, 3 re-crested, 14 secondary and 4 unidentifiable pieces with preserved crested ridge, and 6 truly secondary pieces with no preserved crested ridge. Aside from 1 piece on colored burnt flint, the other 38 crested bladelets are on gray flints, including 5 of them burnt.

Twelve primary pieces have the following characteristics of crested ridges: unilateral (11)/bilateral (1) and wholly (10)/partially (2) crested preparation with 11 triangular and 1 lateral steep profiles at midpoint. Morphologically, they have the following features: 7 complete, 3 proximal and 2 distal fragments; 9 dorsal-plain, 1 unidirectional, 1 crested and 1 unidentifiable scar patterns; 2 parallel, 5 converging, 2 expanding, 1 irregular and 2 unidentifiable shapes; 3 "on-axis", 7 "off-axis" and 2 unidentifiable axis of removal directions; 1 flat, 2 incurvate medial, 1 incurvate distal, 7 twisted and 1 unidentifiable general profiles; 9 feathering, 1 blunt and 2 unidentifiable distal ends; 9 non-cortical, 2 partially cortical pieces with significant lateral (1) and proximal (1) cortex and 1 partially cortical piece with insignificant lateral cortex; 1 plain (0.8 x 0.3 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 3 punctiform butts (2 semi-lipped and 1 unidentifiable, 2 semi-acute and 1 unidentifiable angles, 3 with no abrasion), 1 dihedral (0.5 x 0.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 5 crushed and 2 missing butts. They have the following dimension ranges: length – 1.7-4.6 cm for 7 complete items and 1.2-4.0 cm for 5 broken items; width – 0.7-0.9 cm for 8 items and 1.0-1.1 cm for 4 items; thickness – 0.3-0.8 cm.

Three re-crested pieces have unilateral partial crested preparation with 1 triangular and 2 lateral steep profiles at midpoint. They are 3 complete, 2 non-cortical and 1 partially cortical, pieces with insignificant lateral cortex and the following morphological features: 3 unidirectional scar patterns, 2 converging and 1 expanding shapes; 1 "on-axis" and 2 "off-axis" removal directions; 2 incurvate medial and 1 incurvate distal general profiles; 3 feathering distal ends; 1 punctiform butts with abrasion and 2 crushed butts. They have the following metric ranges: length – 1.7-2.5 cm, width – 0.8 for 2 items and 1.1 cm for 1 item; thickness – 0.3-0.7 cm.

Fourteen secondary pieces have the following crested ridge characteristics: all 14 unilateral partially with 7 triangular and 7 lateral steep profiles at midpoint. Morphologically, they have the following features: 11 complete, 1 proximal and 2 distal fragments; 14 unidirectional scar patterns; 8 converging, 1 expanding, 4 irregular and 1 unidentifiable shapes; 5 "on-axis", 8 "off-axis" and 1 unidentifiable removal directions; 1 flat, 3 incurvate medial and 10 twisted general profiles; 9 feathering, 1 overpassed, 2 blunt and 2 unidentifiable distal ends; 9 non-cortical and 5 partially cortical pieces with insignificant proximal (1), distal (1) and lateral (3) cortex; 1 cortical (0.6 x 0.3 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 5 punctiform butts (2 semi-lipped and 3 unidentifiable, 2 semi-acute and 3 unidentifiable angles; 2 with abrasion and 2 with no abrasion), 4 linear (0.3 x 0.1 cm) butts (4 semi-lipped, 4 semi-acute angles, 4 with abrasion), 1 crudely-faceted (0.6 x 0.4 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 1 crushed and 2 missing butts. Metrically, they are as follows: length – 1.6 – 3.7 cm for 11 complete items and 1.4 – 2.8 cm for 3 broken items; width – 0.7 – 0.9 cm – 9 items and 1.0 – 1.1 cm for 5 items; thickness – 0.2 – 0.7 cm.

Four unidentifiable pieces have 4 unilateral 1 wholly and 3 partially crested preparation with 3 triangular and 1 lateral steep profiles at midpoint. They are 1 medial and 3 distal fragments – 3 non-cortical and 1 partially cortical pieces with insignificant lateral cortex. Their morphology is as follows: 1 dorsal-plain and 3 unidentifiable scar patterns; 2 converging, 1 irregular and 1 unidentifiable shapes; 1 "off-axis" and 3 unidentifiable removal directions; 1 twisted and 3 unidentifiable general profiles; 3 feathering and 1 unidentifiable distal ends; 4 missing butts. Their size ranges are the following ones: length – 1.2 – 2.2 cm; width – 0.9 for 2 items and 1.0 – 1.1 cm for 2 items; thickness – 0.4 – 0.5 cm.

Six truly secondary pieces with no preserved crested ridges are 4 complete items and 2 proximal fragments which are 5 non-cortical and 1 partially cortical pieces with insignificant lateral cortex. Morphologically, they have 6 unidirectional scar patterns; 3 converging, 1 irregular and 2 unidentifiable shapes; 1 "on-axis", 3 "off-axis" and 2 unidentifiable removal directions; 2 incurvate medial and 4 twisted general profiles; 4 feathering and 2 unidentifiable distal ends; 1 triangular and 5 trapezoidal profiles at midpoint; 5 linear (0.4-0.2 x 0.1 cm) butts (5 semi-lipped, 1 right and 4 semi-acute angles, 5 with abrasion) and 1 punctiform butt with abrasion. Their dimension ranges are as follows: length – 2.7 – 3.7 cm for 4 complete items and 2.4 – 2.6 cm for 2 broken items; width – 0.7 – 0.9 cm for 5 items and 1.1 cm for one more item; thickness – 0.2 – 0.5 cm.

Crested Microblades. There are 20 primary, 6 re-crested, 5 secondary and 3 unidentifiable pieces with preserved crested ridge, and 2 truly secondary pieces with no preserved crested ridge. All of them are on gray flints.

Twenty primary pieces have the following crested ridge characteristics: unilateral (18)/bilateral (2) and wholly (18)/partially (2) crested preparation with 10 triangular and 10 lateral steep profiles at midpoint. Morphologically, they are as follows: 11 complete pieces, 1 proximal, 2 medial and 6 distal fragments; 16 dorsal-plain, 1 unidirectional, 2 crested and 1 unidentifiable scar patterns; 13 converging, 3 expanding, 1 irregular and 3 unidentifiable shapes; 3 "on-axis", 14 "off-axis" and 3 unidentifiable removal directions; 2 flat, 3 incurvate medial, 1 incurvate distal and 14 twisted general profiles; 14 feathering, 2 hinged and 4 unidentifiable distal ends; 1 cortical (0.4 x 0.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 1 plain (0.2 x 0.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 7 punctiform butts with no abrasion, 3 crushed and 8 missing butts. Metrically, they are in the following ranges: length – <= 1.5 cm – 5 complete items and > 1.5 cm (1.6-2.6 cm) – 6 complete items, 0.7-3.0 cm for 9 broken items; width – 0.5-0.6 cm – 10 items and 0.2-0.4 cm – 10 items; thickness – 0.1-0.6 cm.

Six re-crested pieces have the following characteristics of crested ridges: 6 unilateral and wholly (3)/partially (3) crested preparation with 2 triangular and 4 lateral steep profiles at midpoint. Morphology: 4 complete pieces and 2 proximal fragments; 6 unidirectional scar patterns; 1 parallel, 3 converging and 2 unidentifiable shapes; 2 "on-axis", 2 "off-axis" and 2 unidentifiable removal directions; 1 flat, 1 incurvate medial and 4 twisted general profiles; 2 feathering, 1 hinged and 3 unidentifiable distal ends; 1 plain (0.2 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion), 2 punctiform butts (semi-lipped, semi-acute angles, with abrasion), 1 linear (0.4 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion) and 2 crushed butts. Their size ranges are as follows: length – 1.0-2.4 cm for 4 complete items and 1.2-2.0 cm for 2 broken items; width – 0.5 cm for 2 items and 0.3-0.4 cm for 4 items; thickness – 0.2-0.3 cm.

Five secondary pieces have the following crested ridge characteristics: 5 unilateral partially with 3 triangular and 2 lateral steep profiles at midpoint. They include 2 complete pieces and 1 proximal, 1 medial and 1 distal fragments; all are non-cortical. Morphologically, they have 5 unidirectional scar patterns; 1 parallel, 2 converging and 2 unidentifiable shapes; 1 "on-axis", 2 "off-axis" and 2 unidentifiable removal directions; 1 flat, 1 incurvate medial and 3 twisted general profiles; 2 feathering, 1 hinged and 2 unidentifiable distal ends; 2 linear (0.3-0.2 x 0.1 cm) butts (semi-lipped, semi-acute angles, with abrasion), 1 crushed and 2 missing butts. Metrically, they have the following ranges: length – 1.9 and 2.0 cm for 2 complete items and 1.0-1.9 cm for 3 broken items; width – 0.5-0.6 cm for 3 items and 0.4 cm for 2 items; thickness – 0.2-0.5 cm.

Three unidentifiable pieces have 3 unilateral and 2 wholly/1 partially crested preparation with 1 triangular and 2 lateral steep profiles at midpoint. They include 2 distal non-cortical fragments and 1 medial partially cortical fragment with insignificant central cortex. They have the following morphological features: 3 unidentifiable scar patterns; 1 parallel and 2 unidentifiable shapes; 1 "on-axis" and 2 unidentifiable removal directions; 1 overpassed and 2 unidentifiable distal ends, and 3 missing butts. Their metric ranges are as follows: length – 1.2-1.5 cm, width – 0.3 – 0.4 – 0.5 cm and thickness – 0.3 cm.

Two truly secondary pieces with no preserved crested ridges are non-cortical: 1 complete item and 1 proximal fragment. Morphological features: 1 dorsal-plain and 1 unidentifiable scar patterns; 1 converging and 1 unidentifiable shapes; 1 "on-axis" and 1 unidentifiable removal directions; 2 twisted general profiles; 1 feathering and 1 unidentifiable distal ends; 2 lateral steep profiles at midpoint; 1 linear (0.4 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion) and 1 crushed butt. They are 1.6 cm long for complete piece and 1.4 cm long for broken item; 0.5 and 0.3 cm wide; 0.3 and 0.2 cm thick.

Core Tablets. There are 12 primary core tablets on flakes, 10 primary core tablets on blades, 1 secondary core tablet on blade (refitted to one primary core tablet on blade) and 1 primary core tablet on bladelet. All 24 are made on gray flints.

Twelve primary core tablets on flakes (9 complete pieces and 3 proximal fragments) include 8 non-cortical pieces, 3 partially cortical pieces with insignificant proximal (1), distal (1) and distal + lateral (1) cortex, and 1 partially cortical piece with significant distal + lateral cortex. Nine primary core tablets on flakes have remnants of cores striking platform in the butt area only. On the other hand, 2 other pieces have remnants of cores striking platform either in the butt area and one lateral edge (1 item) or in the butt area and two lateral edges (1 item). The final piece has in the butt area in the butt area and one lateral edge and additionally has a crested preparation on its dorsal surface. Thus, this piece is also a re-crested flake with unilateral partial crested preparation and lateral steep profile at midpoint. The dimensions of these primary core tablets on flakes are in the following ranges: length – 1.4-5.9 cm and width – 1.4-3.3 cm (1 with shortened, transversal proportions), thickness – 0.3-1.1 cm for 9 complete items; length – 1.9-3.5 cm, width – 1.7-2.9 cm and thickness – 0.4-0.5 cm for 3 broken items.

Ten primary core tablets on blades (5 complete pieces and 5 proximal fragments) include 6 non-cortical pieces, 3 partially cortical pieces with insignificant proximal (1), distal (1) and distal + lateral (1) cortex, and 1 wholly cortical item. Seven primary core tablets on blades have the following locations remnants of core striking platforms: in the butt area – 1 piece (refitted onto a secondary core tablet on blade), in the butt area and 1 lateral edge – 4 pieces, and in the butt area and 2 lateral edges – 2 pieces. Three additional primary core tablets on blades have remnants of core striking platforms in the butt area only and crested preparation on their dorsal surfaces as well. All three pieces are secondary crested items with preserved crested ridges which are all unilateral partial with lateral steep profiles at midpoint. Metrically, 10 primary core tablets on blades are in the following ranges: length – 4.9-6.2 cm, width – 1.4-2.7 cm, thickness – 0.3-1.9 cm for 5 complete items and length – 1.7-4.6 cm, width – 1.3-1.9 cm, thickness – 0.4-0.7 cm for 5 broken items.

A secondary core tablet on blade, to which the primary core tablet on blade was refitted, is a non-cortical proximal fragment with core striking platform remains in the butt area. It is 1.8 cm long, 1.7 cm wide and 0.3 cm thick.

A primary core tablet on bladelet is a complete non-cortical one with its core striking platform remains on the butt area. It is 4.7 cm long, 1.0 cm wide and 0.5 cm thick.

Core Trimming Elements. Core Trimming Elements include 6 complete flakes and 1 longitudinally fragmented distal part of a flake – 4 non-cortical, 2 partially cortical with insignificant distal (1) and lateral (1) cortex and 1 partially cortical with significant central cortex. All have transverse location of 6 unilateral partial and 1 bilateral wholly crested ridges. Six complete pieces have the following dimension ranges: length – 1.5-3.6 cm, width – 1.3-2.9 cm (2 with shortened, transversal proportions), thickness – 0.5-0.9 cm. The broken item is 4.3 cm long, 2.3 cm wide and 0.6 cm thick. All 7 pieces are on gray flints.

Level Fa3

This artifact category is represented by 30 specimens subdivided into crested pieces (19 items), core tablets (9 items) and core trimming elements (2 items). All core maintenance products are made on gray flints.

Crested Pieces. They include crested flakes (1 piece/5.3%), crested blades (9 pieces/47.3%), crested bladelets (6 pieces/31.6%) and crested microblades (3 pieces/15.8%).

Crested Flake is a complete partially cortical (insignificant lateral cortex) secondary item with unilateral partial crested preparation and triangular profile at midpoint. Other morphological features: unidirectional scar pattern, converging shape, “off-axis” removal direction, incurvate medial general profile, blunt distal end and dihedral (3.2 x 0.6 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is 4.9 cm long, 3.5 cm wide and 0.9 cm thick.

Crested Blades. There are 5 re-crested, 3 secondary pieces with preserved crested ridge and 1 truly secondary with no preserved crested ridge.

Five re-crested pieces have the following characteristics of crested ridges: 5 unilateral and wholly (1)/partially (4) crested preparation with 3 triangular and 2 lateral steep profiles at midpoint. Morphological features: 3 complete pieces and 2 distal parts; 4 unidirectional and 1 bidirectional scar patterns; 1 converging, 3 expanding and 1 irregular shapes; 4 “off-axis” and 1 unidentifiable axis of removal directions; 4 incurvate medial and 1 unidentifiable general profiles; 5 feathering distal ends; 4 non-cortical and 1 partially cortical with insignificant lateral cortex; 3 plain (0.6-0.6-0.3 x 0.2 cm) butts (3 semi-lipped, 1 semi-acute and 2 acute angles; 2 with abrasion and 1 with no abrasion) and 2 missing butts. Three complete items have the following dimensions: length – 4.5 – 3.7 – 3.3 cm, width – 1.7 – 1.3 – 1.6 cm and thickness – 0.9 – 0.7 – 0.6 cm. Two distal fragments are 4.2 and 1.9 cm long, 2.6 and 1.2 cm wide, 0.6 and 0.4 cm thick.

Three secondary pieces have the following crested ridge characteristics: unilateral partially crested preparation only with 1 triangular and 2 lateral steep profiles at midpoint. Morphological features: 2 complete pieces and 1 proximal part; 2 unidirectional and 1 unidentifiable scar patterns; 1 converging, 1 expanding and 1 irregular shapes; 3 “off-axis” removal directions; 2 twisted and 1 incurvate medial general profiles; 1 feathering, 1 blunt and 1 unidentifiable distal ends; 2 non-cortical pieces and 1 partially cortical piece with insignificant distal cortex; 1 linear (0.3 x 0.1 cm) butt with abrasion and 2 crushed butts. Two complete pieces have the following metrics: length – 5.6 and 4.1 cm, width – 1.4 and 1.6 cm, thickness – 1.4 and 0.8 cm. The proximal piece is 2.1 cm long, 1.2 cm wide and 0.3 cm thick.

A truly secondary piece with no preserved crested ridge is a non-cortical medial fragment (length – 3.7 cm, width – 1.5 cm, thickness – 0.3 cm) with unidirectional scar pattern, incurvate medial general profile and trapezoidal profile at midpoint.

Crested Bladelets. These include 1 primary, 3 re-crested and 2 truly secondary pieces with no preserved crested ridge.

The primary piece is a complete non-cortical one with unilateral crested preparation and triangular profile at midpoint. It has dorsal-plain scar pattern, irregular shape, “off-axis” removal direction, twisted general profile, feathering distal end and cortical (0.7 x 0.5 cm) butt (semi-lipped, semi-acute angle, with no abrasion). It is 4.5 cm long, 1.0 cm wide and 0.7 cm thick.

Three re-crested pieces have 3 unilateral and 2 wholly/1 partially crested ridges with 1 triangular and 2 lateral steep profiles at midpoint. Morphology: 1 complete piece and 2 distal parts; 3 unidirectional scar patterns; 2 converging and 1 irregular shapes; 3 “off-axis” removal directions; 3 twisted general profiles; 2 feathering and 1 hinged distal ends; 3 non-cortical items; 1 linear (0.3 x 0.1 cm) butt with abrasion and 2 missing butts. The complete piece is 2.1 cm long, 0.8 cm wide and 0.3 cm thick. Two distal fragments have the following dimensions: length – 2.2 and 3.2 cm, width – 0.8 and 1.1 cm, thickness – 0.4 and 0.3 cm.

Two truly secondary pieces have the following morphological features: 2 complete non-cortical items; 2 unidirectional scar patterns; 2 expanding shapes; 1 “on-axis” and 1 “off-axis” removal directions; 1 incurvate medial and 1 twisted general profiles; 2 feathering distal ends; 1 triangular and 1 trapezoidal profiles at midpoint; 2 small plain (0.4-0.3 x 0.3-0.2 cm) butts (2 semi-lipped, 2 semi-acute angles, 1 with abrasion and 1 with no abrasion). Their sizes are as follows: length – 2.8 and 2.1 cm, width – 0.8 and 1.0 cm, thickness – 0.2 and 0.5 cm.

Crested Microblades are represented by 3 primary complete non-cortical pieces. They include 3 unilateral and 1 wholly/2 partially crested preparation with 2 triangular and 1 lateral steep profiles at midpoint. Morphologically, they are characterized by 3 dorsal-plain scar patterns; 2 converging and 1 expanding shapes; 3 “off-axis” removal directions; 1 incurvate medial, 1 incurvate distal and 1 twisted general profiles; 2 feathering and 1 unidentifiable distal ends; 1 plain (0.3 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion), 1 punctiform butt (semi-lipped, semi-acute angle, with no abrasion) and 1 crushed butt. Metrically, they are 3.0 – 2.1 – 1.1 cm long, 0.6 – 0.6 – 0.5 cm wide and 0.4 – 0.3 – 0.4 cm thick.

Core Tablets. There are 7 primary core tablets on flakes and 2 primary core tablets on blades.

First, core tablets on flakes will be described. There are 3 non-cortical items, 3 partially cortical items with insignificant lateral cortex and 1 partially cortical item with significant proximal + lateral cortex. These 7 core tablets have the following location of remnants of core striking platforms: in the butt area for 3 pieces, in the butt area and 1 lateral edge for 2 pieces, and in the butt area and 2 lateral edges for 2 more pieces. They have the following metric ranges: length – 1.6 – 6.0 cm, width – 1.4 – 4.5 cm and thickness – 0.2 – 1.2 cm.

Two core tablets on blades are unusual complete non-cortical items, as they have, at the same time, crested preparation traces on their dorsal surfaces as well. Accordingly, one piece is additionally a secondary crested blade with unilateral partial crested preparation and lateral steep profile at midpoint, while another piece is a truly secondary crested blade with no preserved crested ridge. Both pieces have cores' striking platform remains on their butts' areas. Metrically, they are 5.7 and 5.4 cm long, 1.5 and 2.3 cm wide, 1.3 and 1.4 cm thick.

Core Trimming Elements. Core Trimming Elements include 2 broken (distal parts) non-cortical flakes with transversal location of unilateral partial crested ridge. They have the following dimensions: length – 2.1 and 1.3 cm, width – 3.1 and 1.0 cm, thickness – 0.7 and o.5 cm.

Level Fa1-Fa2

This artifact category is represented by 13 specimens – 9 crested pieces, 2 core tablets and 2 core trimming elements. All items are on gray flints.

Crested Pieces. These include 1 crested flake (11.1%), 4 crested blades (44.4%) and 4 crested bladelets (44.4%).

The Crested Flake is a re-crested complete non-cortical one with unilateral wholly crested preparation and lateral steep profile at midpoint. Morphological features: unidirectional scar pattern, expanding shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end and linear (0.3 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is 1.7 cm long, 1.0 cm wide and 0.3 cm thick.

Crested Blades. These include 1 re-crested item, 2 secondary pieces with preserved crested ridge and 1 truly secondary item with no preserved crested ridge.

The re-crested blade is a non-cortical proximal part (2.2 cm long, 1.3 cm wide and 0.3 cm thick) with unilateral wholly crested preparation and lateral steep profile at midpoint. Morphologically, it has identifiable unidirectional scar pattern, twisted general profile and crushed butt with abrasion.

Two secondary crested blades are complete non-cortical items with bilateral partial crested preparation and triangular profile at midpoint. Morphologically, they have 2 unidirectional scar patterns; 1 expanding and 1 irregular shapes; 2 "off-axis" removal directions; 2 incurvate medial general profiles; 1 feathering and 1 unidentifiable distal ends; 1 plain (0.4 x 0.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion) and 1 crushed butt. Their dimensions are as follows: length – 4.3 and 3.2 cm, width – 1.5 and 1.4 cm, thickness – 0.8 for both.

The truly secondary crested blade with no preserved crested ridge is a complete non-cortical piece with unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end, irregular profile at midpoint and plain (0.6 x 0.3 cm) butt (semi-lipped, semi-acute angle, with no abrasion). It is 3.6 cm long, 1.4 cm wide and 0.7 cm thick.

Crested Bladelets are represented by 1 primary, 1 re-crested and 2 secondary pieces with preserved crested ridge.

The primary crested bladelet is a complete non-cortical item with unilateral wholly crested preparation and lateral steep profile at midpoint. Morphology: dorsal-plain scar pattern, expanding shape, "on-axis" removal direction, twisted general profile, feathering distal end and crushed butt. It is 2.2 cm long, 0.8 cm wide and 0.4 cm thick.

The re-crested bladelet is a non-cortical proximal fragment (length: 1.6 cm, width: 0.9 cm, thickness: 0.3 cm) with unilateral partial crested preparation and lateral steep profile at midpoint. It has only the following identifiable morphological features: unidirectional scar pattern, flat general profile and crudely-faceted (0.3 x 0.3 cm) butt (semi-lipped, right angle, with no abrasion).

Two secondary crested bladelets are complete pieces with unilateral partial crested preparation and 1 triangular and 1 lateral steep profiles at midpoint. One is non-cortical, while the other is partially cortical with insignificant lateral cortex. Other morphological features: 2 unidirectional scar patterns; 1 parallel and 1 expanding shapes; 1 "on-axis" and 1 "off-axis" removal directions; 2 twisted general profiles; 2 feathering distal ends; 1 crushed and 1 linear (0.3 x 0.1 cm) butt with abrasion. Their sizes are as follows: length – 3.9 and 2.8 cm, width – 0.8 and 0.7 cm, thickness – 0.5 and 0.3 cm.

Core Tablets. The two primary core tablets are on non-cortical blades. One is complete (5.6 cm long, 2.2 cm wide, 0.7 cm thick) with remnants of the core striking platform in the butt area and on 1 lateral edge. Another piece is a distal fragment (4.0 cm long, 2.1 cm wide, 1.2 cm thick) with core striking platform remnants on 1 lateral edge.

Core Trimming Elements. Core Trimming Elements are 2 complete non-cortical flakes with transversal location of 2 unilateral ridges, 1 partial and 1 wholly crested. They have crushed butts and the following sizes: length – 3.6 and 2.8 cm, width – 2.7 and 2.0 cm, thickness – 1.0 and 1.2 cm.

In summarizing the Unit F core maintenance products, it is especially worth noting their similar and unique features that both unite them with and differentiate them from respective items from Units H and G. On one hand, core maintenance products in the Aurignacian assemblages of the three units are similar in the dominance of pieces with blady (blade, bladelet and microblade) metric proportions among crested pieces: 86.7% for Unit H, 85.4% for the four levels together for Unit G and 82.9% for four levels together for Unit F. In addition, each of the three units includes serial secondary and re-crested pieces, as well as core tablets, clearly showing intensive primary core and carinated piece reduction at the site. On the other hand, bladelet and microblade percentages among crested pieces in the core maintenance products differ between the three units: 13.3% for Unit H, 29.2% for Unit G and 55.7% for Unit F, demonstrating the more intensive bladelet *sensu lato* reduction at the site during the Unit F Aurignacian occupations. The same is also clear when we observe obvious differences between the units in percentages of core tablets on blades and bladelets: 25% for Unit H, 12.5% for Unit G and 45.7% for Unit F with a single core tablet on a bladelet in level Fb1-Fb2 of Unit F. These further "blady data" are in accordance with the presence of bladelet narrow flaked cores/"carinated burins" and carinated burins in Unit F that are absent in Units H and G.

Debitage

This artifacts category from the four archaeological levels of Unit F has the following internal structure for each assemblage (see tabl. 3B and 3C).

Debitage of level Fc (total 36 pieces) is composed of 12 flakes (33.3%), 7 blades (19.5%), 8 bladelets (22.2%) and 9 microblades (25.0%).

Debitage of level Fb1-Fb2 (total 1883 pieces) is composed of 423 flakes (22.5%), 111 blades (5.9%), 358 bladelets (19.0%) and 991 microblades (52.6%).

Debitage of level Fa3 (total 192 pieces) is composed of 63 flakes (32.8%), 30 blades (15.6%), 55 bladelets (28.7%) and 44 microblades (22.9%).

Debitage of level Fa1-Fa2 (total 106 pieces) is composed of 42 flakes (39.6%), 13 blades (12.3%), 32 bladelets (30.2%) and 19 microblades (17.9%).

Flakes

In terms of their condition, flakes from the archaeological levels of Unit F are subdivided into complete and broken pieces, with subsequent distribution of the latter into proximal, medial, distal and longitudinally fragmented ones.

12 flakes of level Fc consist of 9 complete pieces (75%) and 3 broken pieces (25%) – 2 proximal (16.7%) and 1 distal (8.3%) fragments.

423 flakes of level Fb1-Fb2 consist of 352 complete pieces (83.2%) and 71 broken pieces (16.8%) – 32 proximal (7.6%), no medial, 25 distal (5.9%) and 14 longitudinally fragmented (3.3%).

63 flakes of level Fa3 consist of 53 complete pieces (84.1%) and 10 broken pieces (15.9%) – 6 proximal (9.5%), no medial, 2 distal and longitudinally fragmented each (3.2% each).

42 flakes of level Fa1-Fa2 consist of 33 complete pieces (78.6%) and 9 broken pieces (21.4%) – 3 proximal (7.1%), no medial, 2 distal (4.8%) and 4 longitudinally fragmented (9.5%).

Dorsal Scar Pattern. Five scar pattern types are identified on all 12 flakes from level Fc and on 41 flakes from level Fa1-Fa2, all eight scar pattern types on 409 flakes from level Fb1-Fb2 and six scar pattern types on 62 flakes from level Fa3 (see tabl. 4).

	Level Fc	Level Fb1-Fb2	Level Fa3	Level Fa1-Fa2	TOTAL
FLAKES	12 / 33.3%	423 / 22.5%	63 / 32.8%	42 / 39.6%	**540 / 24.4%**
BLADES	7 / 19.5%	111 / 5.9%	30 / 15.6%	13 / 12.3%	**161 / 7.3%**
BLADELETS	8 / 22.2%	358 / 19.0%	55 / 28.7%	32 / 30.2%	**453 / 20.4%**
MICROBLADES	9 / 25.0%	991 / 52.6%	44 / 22.9%	19 / 17.9%	**1063 / 47.9%**
TOTAL	**36 / 1.6%**	**1883 / 84.9%**	**192 / 8.7%**	**106 / 4.8%**	**2217 / 100.0%**

Table 3B - Siuren-I. Unit F. Debitage Structure.

	Level Fc	Level Fb1-Fb2	Level Fa3	Level Fa1-Fa2	TOTAL
BLADES	7 / 29.2%	111 / 7.6%	30 / 23.3%	13 / 20.3%	**161 / %**
BLADELETS	8 / 33.3%	358 / 24.5%	55 / 42.6%	32 / 50.0%	**453 / %**
MICROBLADES	9 / 37.5%	991 / 67.9%	44 / 34.1%	19 / 29.7%	**1063 / %**
TOTAL	**24 / 100.0%**	**1460 / 100.0%**	**129 / 100.0%**	**64 / 100.0%**	**1677 / 100.0%**

Table 3C - Siuren-I. Unit F. Blady Debitage Structure.

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
cortical			4	4 / 26.7%
dorsal-plain			1	1 / 6.7%
lateral			1	1 / 6.7%
crested		3		3 / 20.0%
unidirectional			4	4 / 26.7%
unidirectional-crossed			2	2 / 13.3%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable	1			1
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical	2		23	25 / 5.4%
dorsal-plain	3		14	17 / 3.7%
lateral			16	16 / 3.5%
crested		30		30 / 6.5%
unidirectional	14		291	305 / 66.3%
unidirectional-crossed			39	39 / 8.5%
bidirectional	2		21	23 / 5.0%
3-directional			4	4 / 0.9%
centripetal			1	1 / 0.2%
core tablet		12		12
unidentifiable	4		14	18
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical	1		3	4 / 5.7%
dorsal-plain				
lateral	1		2	3 / 4.3%
crested		3		3 / 4.3%
unidirectional	1		44	45 / 64.3%
unidirectional-crossed	1		6	7 / 10.0%
bidirectional			5	5 / 7.1%
3-directional	1		2	3 / 4.3%
centripetal				
core tablet		7		7
unidentifiable			1	1
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical				
dorsal-plain				
lateral			1	1 / 2.2%
crested		3		3 / 6.5%
unidirectional	1		30	31 / 67.4%
unidirectional-crossed	1		7	8 / 17.4%
bidirectional			1	1 / 2.2%
3-directional			2	2 / 4.3%
centripetal				
core tablet	1			1
unidentifiable			1	1
N	3	3	42	48

DEBITAGE TOTAL (INCLUDING TOOLS & CMP)

4 mm	N	%
flakes	632	24.6%
blades	261	10.1%
bladelets	510	19.8%
microblades	1172	45.5%
TOTAL	2575	100.0

Table 4 - Siuren-I. Unit F. Flake Dorsal Scar Patterns as Percentages of Each Type.

Flakes from level Fc: unidirectional and cortical – 33.3% each, unidirectional-crossed – 16.7%, dorsal-plain and lateral – 8.3% each.

Flakes from level Fb1-Fb2: unidirectional – 71.3%, unidirectional-crossed – 9.5%, cortical – 5.6%, bidirectional – 5.1%, lateral – 3.9%, dorsal-plain – 3.4%, 3-directional – 1% and centripetal – 0.2%.

Flakes from level Fa3: unidirectional – 71.0%, unidirectional-crossed – 9.7%, bidirectional – 8.1%%, cortical – 4.8%, 3-directional and lateral – 3.2% each.

Flakes from level Fa1-Fa2: unidirectional – 73.3%, unidirectional-crossed – 17.1%, 3-directional – 4.8%, bidirectional and lateral – 2.4% each.

Thus, there is a great dominance of unidirectional scar pattern (reaching about three-quarters for all flakes – 71.0-73.3% for levels Fb1-Fb2, Fa3 and Fa1-Fa2) and an obviously poor representation of other scar pattern types in these levels.

Comparison of scar pattern types with presence/absence of cortex seems to be the most informative for the most abundant sample from level Fb1-Fb2 with 108 partially cortical items. The following percentages of pieces with some cortex are calculated for all defined scar pattern types in the level: unidirectional – 25.1%, unidirectional-crossed – 28.2%, bidirectional – 38.1%, lateral – 43.8% and dorsal-plain – 35.7%. These proportions point out a twofold subdivision of partially cortical flakes in accordance with scar pattern types. First, unidirectional and unidirectional-crossed types each have only about a quarter of flakes with cortex. Second, bidirectional, lateral and dorsal-plain types each account for about a third of flakes with cortex. The large number of partially cortical flakes among the latter three scar pattern types may indicate their more auxiliary and preparatory/repreparatory role in primary reduction processes in comparison to more "regular" reduction of flakes with unidirectional and unidirectional-crossed scar pattern types. On the other hand, flake samples from levels Fa3 and Fa1-Fa2 (level Fc is not examined as it has only 3 partially cortical pieces) show much higher percentages of cortical items for each scar pattern type than observed for level Fb1-Fb2. This may be due to the rather limited number (incomplete character) of partially cortical pieces there – 25 in level Fa3 and 16 in level Fa1-Fa2.

Surface Cortex Area and Location. All flakes from each level of Unit F were used for surface cortex area identification. Non-cortical flakes prevail: 50% in level Fc, 69.1% in level Fb1-Fb2, 55.6% in level Fa3 and 61.9% in level Fa1-Fa2. Wholly cortical flakes are poorly represented in the largest flake samples of levels Fb1-Fb2 (5.4%) and Fa3 (4.8%). On the other hand, no wholly cortical flake was found in level Fa10fa2, while the following pieces comprise 25% in the poor flake sample of level Fc. Other flakes are partially cortical – 25% in level Fc, 25.5% in level Fb1-Fb2, 39.6% in level Fa3 and 38.1% in level Fa1-Fa2. Only complete analyzed flakes show similar cortex area: level Fc (9 pieces) – non-cortical – 55.5%, partially cortical and wholly cortical – 22.2% each; level Fb1-Fb2 (352 pieces) – non-cortical – 69.3%, partially cortical – 25.0% and wholly cortical – 5.7%; level Fa3 (53 pieces) – non-cortical – 52.8%, partially cortical – 41.5% and wholly cortical – 5.7%; level Fa1-Fa2 (33 pieces) – non-cortical – 57.6% and partially cortical – 42.4%. Complete partially cortical flakes have the following internal cortex subdivision: pieces with significant cortex – none in level Fc, 21.6% (19 pieces) in level Fb1-fb2, 13.6% (3 pieces) in level Fa3 and 7.1% (1 piece) in level Fa1-Fa2; and pieces with insignificant cortex – 100% (2 pieces) in level Fc, 78.4% (69 pieces) in level Fb1-Fb2, 86.4% (19 pieces) in level Fa3 and 92.9% (13 pieces) in level Fa1-fa2. There is thus a clear dominance of partially cortical flakes with insignificant cortex.

The same samples of whole partially cortical flakes also offers the possibility of recording surface cortex location: level Fc (2 pieces) – lateral cortex – 100%; level Fb1-Fb2 (88 pieces) – lateral cortex – 39.9%, distal cortex – 32.9%, proximal cortex – 12.5%, distal + lateral cortex – 7.9%, proximal + distal cortex – 2.3%; level Fa3 (22 pieces) – distal cortex – 45.5%, lateral cortex – 31.8%, proximal and central cortex – 9.1% each, distal + lateral cortex – 4.5%; level Fa1-Fa2 (14 pieces) – distal cortex – 57.2%, lateral cortex – 28.6%, proximal and central cortex – 7.1% each. Thus, there is just a very minor prevalence of partially cortical pieces with lateral cortex over partially cortical pieces with distal cortex in the most abundant flake sample of level Fb1-Fb2, while, on the other hand, there is a significant prevalence of partially cortical pieces with distal cortex over partially cortical pieces with lateral cortex in the much smaller flake samples of levels Fa3 and Fa1-Fa2.

Shape. The following numbers of flakes with definable shapes were used from each level of Unit F: 11 pieces from level Fc, 370 pieces from level Fb1-Fb2, 58 pieces from level Fa3 and 36 pieces from level Fa1-Fa2 (see tabl. 5).

The expanding type is the most common for all four levels: 54.5% in level Fc, 44.0% in level Fb1-Fb2, 51.8% in level Fa3 and 52.9% in level Fa1-Fa2. The irregular shape type is the second most common in the three largest flake samples: 23.8% in level Fb1-Fb2, 24.1% in level Fa3 and 30.5% in level Fa1-Fa2, while it accounts for only 9.1% in level Fc. Other shape types are represented by variable but usually rare proportions in the different levels. Parallel type: 27.3% in level Fc, 10.0% in level Fb1-Fb2, 8.6% in level Fa3 and 8.3% in level Fa1-Fa2. Converging type: 9.1% in level Fc, 19.5% in level Fb1-Fb2, 10.3% in level Fa3 and none in level Fa1-Fa2. Ovoid type: none in level Fc, 2.7% in level Fb1-Fb2, 5.2% in level Fa3 and 8.3% in level Fa1-Fa2.

There is thus a dominance of expanding shape type (44.0-54.5%) and a moderate number of irregular shape type (23.8-30.5% in the three most representative flake samples of levels Fb1-Fb2, Fa3 and Fa1-Fa2). On the other hand, these three levels show the subordinate position of parallel and converging shape types together – 8.3-29.5%.

Axis. The following numbers of flakes with definable axis of removal direction were used from each level of Unit F: all 12 pieces in level Fc, 367 pieces in level Fb1-Fb2, 55 pieces in level Fa3 and 35 pieces in level Fa1-Fa2 (see tabl. 6).

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
parallel			3	3 / 21.4%
converging		2	1	3 / 21.4%
expanding	1		6	7 / 50.0%
ovoid				
irregular			1	1 / 7.2%
unidentifiable		1	1	2
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel	2	1	37	40 / 9.7%
converging		4	72	76 / 18.4%
expanding	4	10	163	177 / 43.0%
ovoid	3	2	10	15 / 3.6%
irregular	10	6	88	104 / 25.3%
unidentifiable	6	19	53	78
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel			5	5 / 7.8%
converging		1	6	7 / 11.0%
expanding	2		30	32 / 50.0%
ovoid	2		3	5 / 7.8%
irregular	1		14	15 / 23.4%
unidentifiable		9	5	14
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
parallel			3	3 / 7.7%
converging				
expanding		1	19	20 / 51.3%
ovoid			3	3 / 7.7%
irregular	2		11	13 / 33.3%
unidentifiable	1	2	6	9
N	3	3	42	48

Table 5 - Siuren-I. Unit F. Flake Shapes as Percentages of Each Type.

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
on-axis	1	2	7	10 / 66.7%
off-axis			5	5 / 33.3%
unidentifiable		1		1
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
on-axis	6	3	63	72 / 17.6%
off-axis	14	20	304	338 / 82.4%
unidentifiable	5	19	56	80
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
on-axis	1		13	14 / 23.0%
off-axis	4	1	42	47 / 77.0%
unidentifiable		9	8	17
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
on-axis	1		9	10 / 26.3%
off-axis	1	1	26	28 / 73.7%
unidentifiable	1	2	7	10
N	3	3	42	48

Table 6 - Siuren-I. Unit F. Flake Axis as Percentages of Each Type.

There is a clear prevalence of “off-axis” type (82.8 in level Fb1-Fb2, 76.4% in level Fa3 and 74.3% in level Fa1-Fa2) over “on-axis” type (17.2% in level Fb1-Fb2, 23.6% in level Fa3 and 25.7% in level Fa1-Fa2), while level Fc shows, in contrast, a slight dominance of “on-axis” type (58.3%) with a subordinate position of “off-axis” type (41.7%).

The good correspondence between the two clusters of axis types and the two clusters of shape types for flakes should be noted for all four levels of Unit F. The dominance of "off-axis" type (74.3 – 82.8%) corresponds to the high number of expanding and irregular shape types (67.8 – 83.4%) in levels Fb1-Fb2, fa3 and Fa1-Fa2, while the dominance of "on-axis" type (58.3%) in level Fc is linked to the lowest percentage of irregular shape type (9.1%) and the highest percentage of parallel shape type (27.3%) in this level.

General Profiles of Flakes. These data are recorded in separate analyses of the set of all definable flakes and the set of complete flakes only (see tabl. 7).

The three most representative levels (Fb1-Fb2, Fa3 and fa1-Fa2) show individual dominance of twisted type over any other type, although "regular" types (flat, incurvate medial and incurvate distal ones) taken together are either about equal to twisted type (level Fb1-Fb2) or slightly more representative (levels Fa3 and fa1-Fa2). In contrast, the flakes from level Fc are characterized, however, by an insignificant number of twisted profile, while "regular" types are much more common. The results obtained for all definable flakes and complete flakes only are generally similar and do not show any significant differences. These data are presented below.

Level Fc. There are all 12 definable flakes with the following general profile types: incurvate medial – 41.6%, flat, convex and twisted – 16.7% each, incurvate distal – 8.3%. For 9 complete flakes: incurvate medial – 44.4%, twisted – 22.2%, flat, incurvate distal and convex – 11.1% each.

Level Fb1-Fb2. There are 385 definable flakes with the following general profile types: 48.0% twisted type, 26.5% incurvate medial type, 11.4% incurvate distal type, 8.6% flat type and 5.5% convex type. For 352 complete flakes: 46.3% twisted type, 27.6% incurvate medial type, 12.2% incurvate distal type, 8.5% flat type and 5.4% convex type.

Level Fa3. There are 59 definable flakes with the following general profile types: twisted – 39.0%, incurvate medial – 27.1%, flat – 15.2%, incurvate distal – 11.9% and convex – 6.8%. For 53 complete flakes: 41.6% twisted type, 22.6% of incurvate medial type, 17.0% flat type, 11.3% incurvate distal type and 7.5% convex type.

Level Fa1-Fa2. There are 38 definable flakes with the following general profile types: twisted – 39.5%, incurvate medial – 34.2%, incurvate distal – 18.4% and convex – 7.9%. For 33 complete flakes: 39.4% incurvate medial type, 33.3% twisted type, 18.2% incurvate distal type and 9.1% convex type. No flat type was found for flakes in this level.

Level Fc	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat			2	2 / 13.3%
incurvate medial		1	5	6 / 40.0%
incurvate distal	1		1	2 / 13.3%
convex			2	2 / 13.3%
twisted		1	2	3 / 20.0%
unidentifiable		1		1
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat	4	3	33	40 / 9.3%
incurvate medial	3	3	102	108 / 25.1%
incurvate distal	2	4	44	50 / 11.6%
convex	4	1	21	26 / 6.1%
twisted	9	12	185	206 / 47.9%
unidentifiable	3	19	38	60
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat	1		9	10 / 15.4%
incurvate medial		1	16	17 / 26.2%
incurvate distal			7	7 / 10.7%
convex	2		4	6 / 9.2%
twisted	2		23	25 / 38.5%
unidentifiable		9	4	13
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat				
incurvate medial	2	1	13	16 / 39.0%
incurvate distal			7	7 / 17.1%
convex			3	3 / 7.3%
twisted			15	15 / 36.6%
unidentifiable	1	2	4	7
N	3	3	42	48

Table 7 - Siuren-I. Unit F. Flake General Profiles as Percentages of Each Type.

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
feathering	1	2	6	9 / 69.2%
hinged			4	4 / 30.8%
overpassed				
blunt				
unidentifiable		1	2	3
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering	11	11	273	295 / 73.4%
hinged	4	3	58	65 / 16.2%
overpassed	1	1	6	8 / 2.0%
blunt	3	2	29	34 / 8.4%
unidentifiable	6	25	57	88
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering	3		38	41 / 75.9%
hinged	1		3	4 / 7.4%
overpassed			1	1 / 1.9%
blunt		1	7	8 / 14.8%
unidentifiable	1	9	14	24
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
feathering	1	1	24	26 / 70.3%
hinged			2	2 / 5.4%
overpassed			2	2 / 5.4%
blunt	1		6	7 / 18.9%
unidentifiable	1	2	8	11
N	3	3	42	48

Table 8 - Siuren-I. Unit F. Flake Profiles at Distal End as Percentages of Each Type.

Profiles at Distal End. Data for these analyses are based on the following number of identifiable flakes from each level of Unit F: 10 from level Fc, 366 from level Fb1-Fb2, 49 from level Fa3 and 34 from level Fa1-Fa2. Data on the representation of the different types are given below (see tabl. 8).

Level Fc: feathering – 60% and hinged – 40%.
Level Fb1-Fb2: feathering – 74.6%, hinged – 15.9%, blunt – 7.9% and overpassed – 1.6%.
Level Fa3: feathering – 77.6%, blunt – 14.3%, hinged – 6.1% and overpassed – 2.0%.
Level Fa1-Fa2: feathering – 70.6%, blunt – 17.6%, hinged and overpassed – 5.9% each.

So, the three most representative flake samples from levels Fb1-Fb2, Fa3 and Fa1-Fa2 show very similar dominance of feathering type – 70.6-77.6%. Other types are represented by different proportions, although a moderate number of "not regular" types (hinged and overpassed – 17.5%) in the most abundant flake sample of level Fb1-Fb2 is notable.

Profiles at Midpoint. Data for these analyses were recorded on the following definable flakes from each level of Unit F: all 12 from level Fc, 403 from level Fb1-Fb2, 62 from level Fa3 and 40 from level Fa1-Fa2. Detailed data on the variety of types are represented below (see tabl. 9).

Level Fc: trapezoidal – 25.0%, flat, triangular, lateral steep and irregular – 16.7% each, crescent – 8.3%.
Level Fb1-Fb2: irregular – 27.5%, trapezoidal – 25.8%, triangular – 19.6%, multifaceted – 17.6%, flat – 6.0%, crescent – 2.5% and lateral steep – 1.0%.
Level Fa3: multifaceted – 30.7%, trapezoidal – 22.6%, irregular – 21.0%, triangular – 19.3%, flat and crescent – 3.2% each.
Level Fa1-Fa2: irregular – 32.5%, trapezoidal and multifaceted – 22.5% each, triangular – 17.5% and flat – 5.0%.

The variable representation of profiles at midpoint types in each level allows us, nonetheless, to note some regularities for the three most representative flake samples from levels Fb1-Fb2, Fa3 and Fa1-Fa2. First, triangular, trapezoidal and multifaceted types together occupy the dominant position – 62.5-72.6%, where the latter two types, as pronounced indicators of intensive primary reduction, together make up as much as 43.4-53.3%. At the same time, irregular type fluctuates from 21.0% to 32.5%. The quite different range of types in level Fc can be explained by insufficient sample size.

Butt Types. This analysis is based on the following number of flake butts from each level of Unit F: 11 from level Fc, 384 from level Fb1-Fb2, 59 from level Fa3 and 36 from level Fa1-Fa2. Their representation is quoted below (see tabl. 10).

Level Fc: plain – 36.3%, linear – 27.3%, dihedral, crudely-faceted, finely-faceted and crushed – 9.1% each.
Level Fb1-Fb2: plain – 24.5%, linear – 19.0%, punctiform – 16.1%, dihedral – 7.8%, crudely-faceted – 5.5%, finely-faceted – 2.6%, cortical – 0.5% and crushed – 24.0%.
Level Fa3: plain – 30.6%, punctiform – 22.0%, linear – 13.5%, dihedral – 8.5%, finely-faceted – 5.1%, cortical – 3.4%, crudely-

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
flat			2	2 / 13.3%
triangular			2	2 / 13.3%
trapezoidal			3	3 / 20.0%
multifaceted	1			1 / 6.7%
lateral steep		2	2	4 / 26.7%
crescent			1	1 / 6.7%
irregular			2	2 / 13.3%
unidentifiable		1		1
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat	4		24	28 / 6.2%
triangular	1	6	79	86 / 19.2%
trapezoidal	6		104	110 / 24.5%
multifaceted	6		71	77 / 17.1%
lateral steep		14	4	18 / 4.0%
crescent	1		10	11 / 2.4%
irregular	5	3	111	119 / 26.6%
unidentifiable	2	19	20	41
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat	1		2	3 / 4.4%
triangular	1	1	12	14 / 20.6%
trapezoidal			14	14 / 20.6%
multifaceted			19	19 / 28.0%
lateral steep				
crescent			2	2 / 2.9%
irregular	3		13	16 / 23.5%
unidentifiable		9	1	10
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
flat			2	2 / 4.7%
triangular	1		7	8 / 18.6%
trapezoidal			9	9 / 20.9%
multifaceted			9	9 / 20.9%
lateral steep		1		1 / 2.3%
crescent				
irregular	1		13	14 / 32.6%
unidentifiable	1	2	2	5
N	3	3	42	48

Table 9 - Siuren-I. Unit F. Flake Profiles at Midpoint as Percentages of Each Type.

faceted – 1.7% and crushed – 15.2%.
Level Fa1-Fa2: plain – 33.4%, linear – 16.7%, punctiform – 11.1%, dihedral and crudely-faceted – 8.3% each, crushed – 22.2%.

Thus, the most common group of flake butt types is "plain-punctiform-linear" – 59.6-66.1% for all four levels. At the same time, about 15.3-16.6% of all butts are dihedral or faceted in the three most representative flake samples of levels Fb1-Fb2, Fa3 and Fa1-Fa2. Cortical butts either do not occur at all (levels Fc and Fa1-Fa2) or are rare (0.5% in level Fb1-Fb2 and 3.4% in level Fa3).

Lipping. The following numbers of flake butts suitable for lipping identification in each level of Unit F were used: 10 in level Fc, 235 in level Fb1-Fb2, 42 in level Fa3 and 24 in level Fa1-Fa2. Lipping characteristics are represented below (see tabl. 11).
Level Fc: semi-lipped – 90% and lipped – 10%.
Level Fb1-Fb2: semi-lipped – 92.7%, lipped – 4.7% and not lipped – 2.6%.
Level Fa3: semi-lipped – 97.6% and lipped – 2.4%.
Level Fa1-Fa2: semi-lipped – 95.8% and not lipped – 4.2%.

So, semi-lipped butts are the obvious most characteristic type – 90.0-97.6% for flake butts in all four levels. Lipped and not lipped butts occur in levels Fc, Fa3 and Fa1-Fa2 in either as single or rare cases only and, therefore, their presence or absence is not insignificant. In contrast, there is a prevalence of lipped butts (11 examples) over not lipped butts (6 examples) – 1.8:1 in level Fb1-Fb2.

Butt Angle. The following numbers of flake butts suitable for angle identification in each level of Unit F were used: 10 in level Fc, 235 in level Fb1-Fb2, 50 in level Fa3 and 22 in level Fa1-Fa2. Their angle characteristics are as follows (see tabl. 12).

Level Fc	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical				
plain		2	4	6 / 40.0%
punctiform				
linear			3	3 / 20.0%
dihedral			1	1 / 6.7%
crudly-faceted			1	1 / 6.7%
finely-faceted			1	1 / 6.7%
crushed	1	1	1	3 / 20%
missing			1	1
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical			2	2 / 0.5%
plain	5	6	94	105 / 24.7%
punctiform	2	4	62	68 / 16.0%
linear	3	2	73	78 / 18.4%
dihedral	1	3	30	34 / 8.0%
crudly-faceted		1	21	22 / 5.2%
finely-faceted			10	10 / 2.3%
crushed	7	7	92	106 / 24.9%
missing	7	19	39	65
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical			2	2 / 3.1%
plain	2		18	20 / 30.8%
punctiform	1		13	14 / 21.5%
linear			8	8 / 12.3%
dihedral	1	1	5	7 / 10.8%
crudly-faceted	1		1	2 / 3.1%
finely-faceted			3	3 / 4.6%
crushed			9	9 / 13.8%
missing		9	4	13
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
cortical				
plain			12	12 / 31.6%
punctiform			4	4 / 10.5%
linear		1	6	7 / 18.4%
dihedral			3	3 / 7.9%
crudly-faceted			3	3 / 7.9%
finely-faceted				
crushed	1		8	9 / 23.7%
missing	2	2	6	10
N	3	3	42	48

Table 10 - Siuren-I. Unit F. Flake Butt Types as Percentages of Each Type.

Level Fc: semi-acute and right – 50% each.
Level Fb1-Fb2: semi-acute – 75.3%, right – 20.9% and acute – 3.8%.
Level Fa3: semi-acute – 83.3%, right – 14.3% and acute – 2.4%.
Level Fa1-Fa2: semi-acute – 68.2% and right – 31.8%.

Some patterns can be observed here. The poor flake samples of levels Fc and Fa1-Fa2 do not show any occurrence of butts with acute angle and, moreover, when they are present, they are much less represented in comparison to butts with right angle – 1:5.5 in level Fb1-Fb2 and 1:5.9 in level Fa3. On the other hand, butts with semi-acute angle are very common in levels Fb1-Fb2 and Fa3 – 75.3-83.3%.

Butt Abrasion. The following quantity of identifiable flake butts were used to record presence/absence of abrasion in the four levels of Unit F: 11 from level Fc, 268 from level Fb1-Fb2, 50 from level Fa3 and 23 from level Fa1-Fa2. Their abrasion data are as follows (see tabl. 13).

Level Fc: present – 9.1% and absent – 90.9%.
Level Fb1-Fb2: present – 74.6% and absent – 25.4%.
Level Fa3: present – 66.0% and absent – 34.0%.
Level Fa1-Fa2: present – 65.2% and absent – 34.8%.

Aside from the poor sample of level Fc, flakes in Unit F show a dominance of butts with abrasion (65.2-74.6%), although butts with no abrasion account for a significant number –

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
lipped			1	1 / 8.3%
semi-lipped		2	9	11 / 91.7%
not lipped				
unidentifiable	1	1	2	4
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped			11	11 / 4.2%
semi-lipped	11	12	218	241 / 93.1%
not lipped		1	6	7 / 2.7%
unidentifiable	14	29	188	231
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped			1	1 / 2.1%
semi-lipped	4	1	41	46 / 97.9%
not lipped				
unidentifiable	1	9	21	31
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
lipped				
semi-lipped		1	23	24 / 96%
not lipped			1	1 / 4%
unidentifiable	3	2	18	23
N	3	3	42	48

Table 11 - Siuren-I. Unit F. Flake Butt Lipping as Percentages of Each Type.

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
right		2	5	7 / 58.3%
semi-acute			5	5 / 41.7%
acute				
unidentifiable	1	1	2	4
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
right	1	2	49	52 / 20.0%
semi-acute	10	11	177	198 / 76.5%
acute			9	9 / 3.5%
unidentifiable	14	29	188	231
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
right	2		6	8 / 17.0%
semi-acute	1	1	35	37 / 78.7%
acute	1		1	2 / 4.3%
unidentifiable	1	9	21	31
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
right			7	7 / 30.4%
semi-acute		1	15	16 / 69.6%
acute				
unidentifiable	3	2	20	25
N	3	3	42	48

Table 12 - Siuren-I. Unit F. Flake Butt Angles as Percentages of Each Type.

from a quarter in level Fb1-Fb2 to a third in levels Fa3 and Fa1-Fa2.

Metrics (Length, Width, Thickness) of Flakes. Metric data are mainly based on the analysis of complete flakes from each level, with some additional comparable information also obtained from broken flakes.

Length. The most common group of complete flakes in terms of length is in the interval 1.6-2.5 cm – 77.7% for level Fc, 60.5% for level Fb1-Fb2, 49.0% for level Fa3 and 63.5% for level Fa1-Fa2. As a whole, flakes with length in the interval 0.5-3.0 cm compose the following number – 88.8% for level Fc, 90.1% for level Fb1-Fb2, 81.1% for level Fa3 and 69.6% for level Fa1-Fa2. The remaining rather small number of flakes

Level Fc	flakes-tools	flakes-CMP	flakes-debitage	Flakes Total
present		1	1	2 / 15.4%
absent		1	10	11 / 84.6%
unidentifiable	1	1	1	3
N	1	3	12	16
Level Fb1-Fb2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
present	9	5	200	214 / 73.3%
absent	2	8	68	78 / 26.7%
unidentifiable	14	29	155	198
N	25	42	423	490
Level Fa3	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
present	2	1	33	36 / 64.3%
absent	3		17	20 / 35.7%
unidentifiable		9	13	22
N	5	10	63	78
Level Fa1-Fa2	**flakes-tools**	**flakes-CMP**	**flakes-debitage**	**Flakes Total**
present		1	15	16 / 66.7%
absent			8	8 / 33.3%
unidentifiable	3	2	19	24
N	3	3	42	48

Table 13 - Siuren-I. Unit F. Flake Butt Abrasion as Percentages of Each Type.

have length more than 3 cm but pieces with length more than 5 cm among them account only 1-2 pieces – 11.1% for level Fc, 0.6% for level Fb1-Fb2, 1.9% for level Fa3 and none for level Fa1-Fa2. Moreover, no flake is longer than 6 cm. Mean length for complete flakes in each level is as follows: 2.5 cm for levels Fc and Fa1-Fa2, 2.4 cm for level Fa3 and 2.1 cm for level Fb1-Fb2. Taking into account that the most numerous flake sample of level Fb1-Fb2 has the lowest mean length for flakes (2.1 cm), we should accept this length as the most typical for flakes in Unit F. Unit F complete flakes are thus quite short.

The analysis of broken flakes shows that the great majority is in the interval 0.5-3.0 cm – 66.6% for level Fc, 86.0% for level Fb1-Fb2, 90.0% for level Fa3 and 88.8% for level Fa1-Fa2. Moreover, no broken flake in any of the four levels exceeds 5 cm.

Width. The most common group of complete flakes in terms of width is in the interval 1.6-2.5 cm – 77.7% for level Fc, 52.0% for level Fb1-Fb2, 51.0% for level Fa3 and 42.4% for level Fa1-Fa2. Complete flakes with width in the interval 0.5-3.0 cm comprise 88.8% for level Fc, 93.5% for level Fb1-Fb2, 86.8% for level Fa3 and 72.7% for level Fa1-Fa2. The remaining pieces have width of more than 3 cm but only one or two have width more than 5 cm – none for level Fc, 0.6% (including one piece with width 6.1 cm) for level Fb1-Fb2, 1.9% for level Fa3 and 3.0% for level Fa1-Fa2. Mean width for complete flakes in each level is as follows: 1.9 cm for levels Fc and Fb1-Fb2, 2.3 cm for level Fa3 and 2.5 cm for level Fa1-Fa2. Mean width of 1.9 cm for the largest flake sample from level Fb1-Fb2 should be considered the most typical width for flakes in Unit F.

Analysis of broken flakes confirms the results from complete flakes. Many broken flakes have width in the interval 0.5-3.0 cm – 100% for level Fc, 94.4% for level Fb1-Fb2, 80.0% for level Fa3 and 88.8% for level Fa1-Fa2. No broken flake has width of more than 5 cm.

Now let us look at the correlation between length and width of flakes from the four levels of Unit F. Only level Fa1-Fa2 has an "ideal complete flake" with shortened, transversal proportions – 2.5 cm L = 2.5 cm W. Flakes from the other three levels show the prevalence of mean length over mean width: 2.5 cm L > 1.9 cm for level Fc, 2.1 cm L > 1.9 cm W for level Fb1-Fb2 and 2.4 cm L > 2.3 cm W for level Fa3, although for the latter two levels the noted difference is only 1-2 mm. In contrast, the prevalence of mean length over mean width for flakes finds further support in only a moderate number of flakes with shortened, transversal proportions (L<= W) – 3 pieces/33.3% for level Fc, 146 pieces/41.5% for level Fb1-Fb2, 14 pieces/42.4% for level Fa1-Fa2 and only in level Fa3 do such flakes comprise half of all complete flakes – 27 pieces/50.9%. Along with this, the number of elongated flakes (L > 1.5 W) is rather moderate as well – 3 pieces/33.3% for level Fc, 95 pieces/27.0% for level Fb1-Fb2, 13 pieces/24.5% for level Fa3 and 7 pieces/21.2% for level Fa1-Fa2. Thus, length of complete flakes is generally more pronounced than flake width in Unit F.

Thickness. Mean thickness for both complete and broken flakes is as follows: 0.3 cm for level Fc and 0.4 cm for levels Fb1-Fb2, Fa3 and Fa1-Fa2. Flakes in the interval 0.1-0.5 cm comprise 88.8% for complete and 100% for broken flakes in level Fc, 85.8% for complete and 81.7% for broken flakes in level Fb1-Fb2, 67.9% for complete and 70% for broken flakes in level Fa3 and 69.7% for complete and 66.6% for broken flakes in level Fa1-Fa2. Moreover, just a few flakes have thickness more than 1.0 cm: 1.7% for complete and 2.8% for broken flakes in level Fb1-Fb2, 3.0% for complete and none for broken flakes in level Fa1-Fa2. None were noted in levels Fc and Fa3. Nonetheless, even the minimal presence of relatively thick flakes in worth mentioning. Thus, flakes of all four levels of Unit F are fairly thin.

Butt Sizes. Mean metric data for flake butts are similar for all four levels of Unit F. They are as follows for butt width: 0.7 cm for level Fc (10 butts), 0.9 cm for level Fb1-Fb2 (230 butts), 1.0 cm for both levels Fa3 (37 butts) and Fa1-Fa2 (24 butts). They are as follows for butt height: 0.3 cm for all four levels. Plain butts have the following width – 0.6 cm for level Fc (4 butts), 0.8 cm for level Fb1-Fb2 (94 butts) and level Fa1-Fa2 (12 butts), 1.0 cm for level Fa3 (18 butts) and have the following height – 0.3 cm for all four levels.

Thus, the flakes of Unit F on the basis of the most representative flake samples of levels Fb1-Fb2, Fa3 and Fa1-Fa2 can be generally characterized by:

- a great dominance of unidirectional scar pattern (71.0-73.3%) and a small representation of other scar pattern types (usually less than 10% each);
- surface cortex area and location data: a prevalence of non-cortical pieces (55.6-69.1%) and a low number of wholly cortical pieces (4.8-5.4% for levels Fb1-Fb2 and Fa3 only); a slight domination of lateral cortex for partially cortical flakes in level Fb1-Fb2 and significant predominance of distal cortex for partially cortical flakes in levels Fa3 and Fa1-Fa2 where few have significant cortex (7.1-13.6% in levels Fa1-Fa2 and Fa3, and 21.6% in level Fb1-Fb2);
- a presence of one cluster of flake samples based on shape and axis: a high number of expanding and irregular shape types (67.8-83.4% together) correspond to the dominance of "off-axis" type of removal direction (74.3-82.8%);
- a near-equal representation of "regular" (flat, incurvate medial and incurvate distal) types of general profiles (46.5% for all definable flakes and 48.3% for complete flakes) and twisted type (48.0% for all definable flakes and 46.3% for complete flakes) in level Fb1-Fb2, or a prevalence of the former types (52.6-54.2% for all definable flakes and 50.9-57.6% for complete flakes) over the latter type (39.0-39.5% for all definable flakes and 33.3-41.6% for complete flakes) in levels Fa3 and Fa1-Fa2;
- a dominance of feathering distal ends (70.6 – 74.6%) for flakes in all three levels, while "not regular" (hinged and overpassed) types show a moderate number (17.5% together) only for flakes in level Fb1-Fb2;
- a dominance of triangular, trapezoidal and multifaceted type of profiles at midpoint (62.5-72.6%) where the latter two types have a significant percentage (43.4-53.3%), although the irregular type is also important (21.0-32.5%);
- a dominance of the "plain-punctiform-linear" group of butt types (59.6-66.1%) with notable presence of all five other butt types, although cortical ones are the least common (0.5% in level Fb1-Fb2, 3.4% in level Fa3 and absent in level Fa1-Fa2);
- a dominance of semi-lipped butts with semi-acute angle with, at the same time, a low number of lipped butts with acute angle and unlipped butts with mainly right angle;
- a prevalence of flakes with butt abrasion (65.2-74.6%) over flakes with no butt abrasion (25.4-34.8%);
- a dominance of small pieces (2.1 cm L > 1.9 cm W for level Fb1-Fb2; 2.4 cm L > 2.3 cm W for level Fa3 and 2.5 cm L = 2.5 cm W for level Fa1-Fa2 using mean data) with no prevalence of flakes with shortened, transversal proportions (L <= W) - 41.5-42.4% for levels Fb1-Fb2 and Fa1-Fa2, and 50.9% for level Fa3, as well as a rather moderate quantity of elongated flakes (L > 1.5 W) – 21.2-27.0%, while mean thickness is 0.4 cm for flakes in all three levels.

Blades

Blades are rather poorly represented in levels Fc, Fa3 and Fa1-Fa2 and a statistically sufficient amount is found only in level Fb1-Fb2. In terms of their condition, blades from the four archaeological levels of Unit F are subdivided into complete and broken pieces, with further distribution of the latter into proximal, medial and distal fragments.

Seven blades in level Fc consist of 3 complete (42.9%) and 4 broken (all distal) pieces (57.1%).

111 blades of level Fb1-Fb2 consist of 34 complete (30.7%) and 77 broken pieces (69.3%) – 32 proximal (28.8%), 21 medial (18.9%) and 24 distal (21.6%).

30 blades of level Fa3 consist of 8 complete (26.7%) and 22 broken pieces (73.3%) – 11 proximal (36.6%), 5 medial (16.7%) and 6 distal (20.0%).

13 blades of level Fa1-Fa2 consist of 6 complete (46.1%) and 7 broken pieces (53.9%) – 4 proximal (30.8%), 2 medial (15.4%) and 1 distal (7.7%).

Dorsal Scar Pattern. Two scar pattern types have been identified on all 7 blades from level Fc, five on 110 definable blades from level Fb1-Fb2, four on all 30 blades from level Fa3 and three on all 13 blades from level Fa1-Fa2. Thus, there is a correlation between the number of blades and the number of scar pattern types identified in each level. Separately, blades from each level have the following scar pattern type representation (see tabl. 14).

Blades of level Fc: unidirectional – 85.7% and bidirectional – 14.3%.
Blades of level Fb1-Fb2: unidirectional – 70.0%, unidirectional-crossed – 20.0%, bidirectional – 5.5%, lateral – 3.6% and dorsal-plain – 0.9%.
Blades of level Fa3: unidirectional – 83.5%, unidirectional-crossed and bidirectional – 6.6% each, 3-directional – 3.3%.
Blades of level Fa1-Fa2: unidirectional – 76.9%, bidirectional – 15.4% and unidirectional-crossed – 7.7%.

Thus, there is a clear dominance of unidirectional scar pattern – 70.0-85.7%. The presence of one to four other defined scar pattern types is notable, although their occasional and/or preparatory/repreparatory character is the most probable.

Comparison of scar pattern types with presence/absence of cortex on blades revealed the following pattern. Aside from level Fb1-Fb2, all but three scar pattern types (unidirectional-crossed, bidirectional, 3-directional) lack dorsal cortex in levels Fc, Fa3 and Fa1-Fa2. At the same time, specimens with cortex among unidirectional blades comprise a rather stable moderate number – 16.7% in level Fc, 19.5% in level Fb1-Fb2, 24.0% in level Fa3 and 20.0% in level Fa1-Fa2. Additionally, level Fb1-Fb2 is characterized by the following partially cortical blades: 18.2% (4 pieces) with unidirectional-crossed scar pattern, 50.0% (3 pieces) with bidirectional scar pattern, 75.0% (3 pieces) with lateral scar pattern, while a single dorsal-plain blade is non-cortical. Thus, the number of unidirectional-crossed blades with

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
cortical				
dorsal-plain				
lateral				
crested		2		2 / 20%
unidirectional	1		6	7 / 70%
unidirectional-crossed				
bidirectional			1	1 / 10%
3-directional				
centripetal				
core tablet				
unidentifiable				
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical	1			1 / 0.6%
dorsal-plain			1	1 / 0.6%
lateral			4	4 / 2.3%
crested	2	28		30 / 17.4%
unidirectional	29		77	106 / 61.6%
unidirectional-crossed	2		22	24 / 14.0%
bidirectional			6	6 / 3.5%
3-directional				
centripetal				
core tablet		11		11
unidentifiable	3		1	4
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
dorsal-plain				
lateral				
crested		9		9 / 21.4%
unidirectional	3		25	28 / 66.6%
unidirectional-crossed			2	2 / 4.8%
bidirectional			2	2 / 4.8%
3-directional			1	1 / 2.4%
centripetal				
core tablet		2		2
unidentifiable	1			1
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
dorsal-plain				
lateral				
crested		4		4 / 21.0%
unidirectional	2		10	12 / 63.2%
unidirectional-crossed			1	1 / 5.3%
bidirectional			2	2 / 10.5%
3-directional				
centripetal				
core tablet				
unidentifiable				
N	2	4	13	19

Table 14 - Siuren-I. Unit F. Blade Dorsal Scar Patterns as Percentages of Each Type.

some cortex in level Fb1-Fb2 fits well with the proportion of partially cortical unidirectional blades for each of the Unit F four levels. On the other hand, bidirectional and lateral blades in level Fb1-Fb2 have cortex two to three times more often, which may indicate their auxiliary and preparatory/repreparatory role in primary reduction processes, especially given the total low number of blades with such scar pattern types.

Surface Cortex Area and Location. All blades from each level of Unit F were used for surface cortex area identification. Non-cortical blades prevail – 85.7% in level Fc, 76.6% in level Fb1-Fb2, 80.0% in level Fa3 and 84.6% in level Fa1-Fa2. Wholly cortical blades are absent. All other blades are partially cortical – 14.3% in level Fc, 23.4% in level Fb1-Fb2, 20.0% in level Fa3 and 15.4% in level Fa1-Fa2. Taken separately, complete

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
parallel			3	3 / 30%
converging		2		20 / 20%
expanding	1		2	3 / 30%
ovoid				
irregular			2	20 / 20%
unidentifiable				
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel	4	4	59	67 / 49.0%
converging	7	7	20	34 / 24.8%
expanding	2	3	10	15 / 10.9%
ovoid				
irregular	5	6	10	21 / 15.3%
unidentifiable	19	19	12	50
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel	1		4	5 / 20.8%
converging		2	5	7 / 29.2%
expanding		4	2	6 / 25.0%
ovoid				
irregular		2	4	6 / 25.0%
unidentifiable	3	3	15	21
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
parallel		1	7	8 / 57.2%
converging				
expanding		1	2	3 / 21.4%
ovoid				
irregular		1	2	3 / 21.4%
unidentifiable	2	1	2	5
N	2	4	13	19

Table 15 - Siuren-I. Unit F. Blade Shapes as Percentages of Each Type.

blades show the following cortex area data: level Fc (3 pieces) – non-cortical – 66.6% and partially cortical – 33.3%; level Fb1-Fb2 (34 pieces) – non-cortical – 67.6% and partially cortical – 32.4%; level Fa3 (8 pieces) – non-cortical –and partially cortical – 50% each; level Fa1-Fa2 (6 pieces) – non-cortical – 66.6% and partially cortical – 33.3%. Complete partially cortical blades have the following internal cortex subdivision: pieces with significant cortex – 100% (1 piece) in level Fc, 63.6% (7 pieces) in level Fb1-Fb2, none in levels Fa3 and Fa1-Fa2; and pieces with insignificant cortex – none in level Fc, 36.4% (4 pieces) in level Fb1-Fb2, 100% in levels Fa3 (4 pieces) and Fa1-Fa2 (2 pieces).

Surface cortex location was recorded on the same samples of complete partially cortical blades: distal cortex (1 piece) in level Fb1-Fb2, 25% (1 piece) in level Fa3 and 100% (2 pieces) in level Fa1-Fa2; lateral cortex – 81.8% (9 pieces) in level Fb1-Fb2 and 50% (2 pieces) in level Fa3; distal + lateral cortex – 100% (1 piece) in level Fc and 9.1% (1 piece) in level Fb1-Fb2; proximal cortex – 25% (1 piece) in level Fa3. Taking into account the largest blade samples for these analyses (levels Fb1-Fb2 and Fa3), lateral cortex location is the most common for blades.

Shape. The following blades with definable shapes were used from each level of Unit F: all 7 pieces of level Fc, 105 pieces of level Fb1-Fb2, 25 pieces of level Fa3 and 11 pieces of level Fa1-Fa2 (see tabl. 15). They have the following shape types:

Blades of level Fc: parallel – 42.9%, expanding and irregular – 28.6% each.
Blades of level Fb1-Fb2: parallel – 59.6%, converging – 20.2%, expanding and irregular – 10.1% each.
Blades of level Fa3: converging – 33.3%, parallel and irregular – 26.7% each, expanding – 13.3%.
Blades of level Fa1-Fa2: parallel – 63.6%, expanding and irregular – 18.2% each.

So, parallel shape dominates alone in levels Fb1-Fb2 and Fa1-Fa2, and together with converging shape in level Fa3, while level Fc is characterized by the dominance of expanding and irregular shapes.

Axis. The following blades with definable axis of removal direction were used from each level of Unit F: all 7 pieces in level Fc, 105 pieces in level Fb1-Fb2, 14 pieces in level Fa3 and 11 pieces in level Fa1-Fa2 (see tabl. 16).

There is a clear dominance of "on-axis" type of removal direction for blades in three levels: 80% in both levels Fc and Fb1-Fb2, and 90.9% in level Fa1-Fa2. On the other hand, blades of level Fa3 are characterized by the prevalence of "off-axis" type (64.3%) over "on-axis" type (35.7%).

The resulting difference between blades from level Fa3 and those of levels Fb1-Fb2 and Fa1-Fa2 corresponds to the high-

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
on-axis	1	2	5	8 / 80%
off-axis			2	2 / 20%
unidentifiable				
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis	8	6	84	98 / 68.1%
off-axis	14	11	21	46 / 31.9%
unidentifiable	15	22	6	43
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis	2		5	7 / 29.2%
off-axis	1	7	9	17 / 70.8%
unidentifiable	1	4	16	21
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
on-axis		1	10	11 / 73.3%
off-axis	1	2	1	4 / 26.7%
unidentifiable	1	1	2	4
N	2	4	13	19

Table 16 - Siuren-I. Unit F. Blade Axis as Percentages of Each Type.

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
flat			1	1 / 10%
incurvate medial		1		1 / 10%
incurvate distal			1	1 / 10%
convex				
twisted	1	1	5	7 / 70%
unidentifiable				
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	4	1	6	11 / 7.1%
incurvate medial	4	4	24	32 / 20.8%
incurvate distal	1		6	7 / 4.6%
convex			1	1 / 0.6%
twisted	20	15	68	103 / 66.9%
unidentifiable	8	19	6	33
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat			2	2 / 5.7%
incurvate medial	1	6	3	10 / 28.6%
incurvate distal				
convex			1	1 / 2.8%
twisted	1	2	19	22 / 62.9%
unidentifiable	2	3	5	10
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat			1	1 / 6.7%
incurvate medial		3		3 / 20.0%
incurvate distal				
convex			2	2 / 13.3%
twisted	1	1	7	9 / 60.0%
unidentifiable	1		3	4
N	2	4	13	19

Table 17 - Siuren-I. Unit F. Blade General Profiles as Percentages of Each Type.

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
feathering		2	5	7 / 70%
hinged	1		1	2 / 20%
overpassed				
blunt			1	1 / 10%
unidentifiable				
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering	7	13	36	56 / 63.7%
hinged			1	1 / 1.1%
overpassed	1		3	4 / 4.5%
blunt	4	6	17	27 / 30.7%
unidentifiable	25	20	54	99
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering	1	6	8	15 / 71.4%
hinged			1	1 / 4.8%
overpassed				
blunt		1	4	5 / 23.8%
unidentifiable	3	4	17	24
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
feathering		2	2	4 / 44.4%
hinged				
overpassed			3	3 / 33.3%
blunt			2	2 / 22.2%
unidentifiable	2	2	6	10
N	2	4	13	19

Table 18 - Siuren-I. Unit F. Blade Profiles at Distal End as Percentages of Each Type.

est rate of expanding and irregular shapes for blades of the former level (40% together). On the other hand, the most representative blade sample of level Fb1-Fb2 shows a strong correlation of parallel and converging shapes (79.8% together) and “on-axis” type of removal direction (80%).

General Profiles of Blades. These data are based on separate analyses of all definable blades (see tabl. 17) and complete blades only.

Level Fc. All 7 blades have the following general profile types: twisted – 71.4%, flat and incurvate distal – 14.3% each. The three complete blades have 66.6% of twisted type and 33.3% of incurvate distal type.
Level Fb1-Fb2. There are 105 definable blades with the following general profile types: twisted – 64.8%, incurvate medial – 22.9%, flat and incurvate distal – 5.7% each, convex – 0.9%. For 34 complete blades: 70.6% of twisted type, 20.6% of incurvate medial type, 5.9% of incurvate distal type and 2.9% of flat type.
Level Fa3. There are 25 definable blades with the following general profile types: twisted – 76%, incurvate medial – 12%, flat – 8% and convex – 4%. For 8 complete blades: 75% of twisted type and 12.5% of incurvate medial type and convex types each.
Level Fa1-Fa2. There are 10 definable blades with the following general profile types: twisted – 70%, convex – 20% and flat – 10%. For 6 complete blades: 66.6% of twisted type and 33.3% convex type.

These data show the great prevalence of twisted (64.8-76% for all definable blades and 66.6-75% for complete blades) over “regular” (flat, incurvate medial and incurvate distal) (10-34.3% for all definable blades and 0-33.3% for complete blades) general profile types of blades in all four levels of Unit F.

Profiles at Distal End. Data for the following analyses are based on the following numbers of definable blades from each level of Unit F: all 7 from level Fc, 57 from level Fb1-Fb2, 13 from level Fa3 and 7 from level Fa1-Fa2. The detailed data on their type representation are given below (see tabl. 18).

Level Fc: feathering – 71.4%, hinged and blunt – 14.3% each.
Level Fb1-Fb2: feathering – 63.2%, blunt – 29.8%, overpassed – 5.3% and hinged – 1.7%.
Level Fa3: feathering – 61.5%, blunt – 30.8% and hinged – 7.7%.
Level Fa1-Fa2: overpassed – 42.8%, feathering and blunt – 28.6% each.

Blades from three levels (Fc, Fb1-Fb2 and Fa3) show the dominance of feathering type – 61.5 – 71.4% with a poor representation of “not regular” (hinged and overpassed) types – 7-14.3%. On the other hand, the small sample of level Fa1-Fa2 shows a high proportion of “not regular” overpassed type – 42.8%.

Profiles at Midpoint. Data for these analyses were recorded from the following numbers of definable blades from each level of Unit F: all 7 from level Fc, all 111 from level Fb1-Fb2, all 30 from level Fa3 and all 13 from level Fa1-Fa2. Data on the range of types are represented below (see tabl. 19).

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
flat				
triangular	1		4	5 / 50%
trapezoidal			3	3 / 30%
multifaceted				
lateral steep		2		2 / 20%
crescent				
irregular				
unidentifiable				
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat	1			1 / 0.6%
triangular	7	14	43	64 / 37.4%
trapezoidal	10	1	39	50 / 29.2%
multifaceted	11	1	16	28 / 16.4%
lateral steep		12	12	24 / 14.0%
crescent	1		1	2 / 1.2%
irregular	2			2 / 1.2%
unidentifiable	5	11		16
N	37	39	11	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
flat				
triangular	1	4	6	11 / 25.6%
trapezoidal	2	1	16	19 / 44.2%
multifaceted	1		4	5 / 11.6%
lateral steep		4	2	6 / 14.0%
crescent				
irregular			2	2 / 4.6%
unidentifiable		2		2
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-c.pr.**	**blades-debitage**	**Blades Total**
flat				
triangular	1	2	7	10 / 52.6%
trapezoidal			5	5 / 26.3%
multifaceted			1	1 / 5.3%
lateral steep		1		1 / 5.3%
crescent				
irregular	1	1		2 / 10.5%
unidentifiable				
N	2	4	13	19

Table 19 - Siuren-I. Unit F. Blade Profiles at Midpoint as Percentages of Each Type.

Level Fc: triangular – 57.1% and trapezoidal – 42.9%.
Level Fb1-Fb2: triangular – 38.8%, trapezoidal – 35.1%, multifaceted – 14.4%, lateral steep – 10.8% and crescent – 0.9%.
Level Fa3: trapezoidal – 53.5%, triangular – 20.0%, multifaceted – 13.3%, lateral steep and irregular – 6.6% each.
Level Fa1-Fa2: triangular – 53.8%, trapezoidal – 38.5% and multifaceted – 7.7%.

The data above show the absolute dominance of three types (triangular, trapezoidal and multifaceted) – 86.8-88.3% in levels Fb1-Fb2 and Fa3, and 100% in both levels Fc and Fa1-Fa2. At the same time, the irregular type is rare and probably occasional, as it occurs only in level Fa3 (6.6%). Trapezoidal and multifaceted types, however, are of significant quantity – 42.9-49.5% in levels Fc, Fb1-Fb2 and Fa1-Fa2, 66.8% in level Fa3.

Butt Types. This analysis is based on the following numbers of definable blades' butts from each level of Unit F: 3 from level Fc, 66 from level Fb1-Fb2, 19 from level Fa3 and 10 from level Fa1-Fa2. Their type representation is represented below (see tabl. 20).

Level Fc: linear, crudely-faceted and crushed – 33.3% each.
Level Fb1-Fb2: plain – 27.3%, punctiform – 9.1%, linear – 22.7%, cortical – 1.5%, dihedral – 6.1%, crudely-faceted – 3%, finely-faceted – 1.5% and crushed – 28.8%.
Level Fa3: plain – 26.3%, punctiform and linear – 21% each, crushed – 31.7%.
Level Fa1-Fa2: plain, linear and dihedral – 20% each, crudely-faceted – 10% and crushed – 30%.

Definable blades' butts from levels Fc and Fa1-da2 are not suitable for any conclusions because of the small samples. The "plain-punctiform-linear" group of butt types is dominant in levels Fb1-Fb2 (59.1%) and Fa3 (68.3%), especially taking into account many crushed butts – 28.8% in level Fb1-Fb2 and

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
cortical				
plain	1	1		2 / 33.3%
punctiform				
linear			1	1 / 16.7%
dihedral				
crudly-faceted			1	1 / 16.7%
finely-faceted				
crushed		1	1	2 / 33.3%
missing			4	4
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical		1	1	2 / 1.9%
plain	7	7	18	32 / 31.1%
punctiform	3	2	6	11 / 10.7%
linear	3	2	15	20 / 19.4%
dihedral		1	4	5 / 4.9%
crudly-faceted	1	1	2	4 / 3.9%
finely-faceted		2	1	3 / 2.9%
crushed	4	3	19	26 / 25.2%
missing	19	20	45	84
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
plain		3	5	8 / 30.8%
punctiform			4	4 / 15.4%
linear	1	1	4	6 / 23.0%
dihedral				
crudly-faceted				
finely-faceted				
crushed		2	6	8 / 30.8%
missing	3	5	11	19
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
cortical				
plain		2	2	4 / 25.0%
punctiform				
linear			2	2 / 12.5%
dihedral	1		2	3 / 18.8%
crudly-faceted			1	1 / 6.2%
finely-faceted				
crushed	1	2	3	6 / 37.5%
missing			3	3
N	2	4	13	19

Table 20 - Siuren-I. Unit F. Blade Butt Types as Percentages of Each Type.

31.6% in level Fa3. Dihedral, crudely-faceted and finely-faceted types are characteristic for only one of ten butts (10.6% together) in level Fb1-Fb2, and are represented by 1-2 pieces in levels Fc and Fa1-Fa2 yet. Cortical type is noted for only a single butt in level Fb1-Fb2.

Lipping. The following numbers of blades' butts suitable for lipping identification from each level of Unit F were used: 2 in level Fc, 47 in level Fb1-Fb2, 9 in level Fa3 and 7 in level Fa1-Fa2. Their lipping characteristics are as follows (see tabl. 21).

Level Fc: semi-lipped – 100%.
Level Fb1-Fb2: semi-lipped – 89.4%, lipped – 6.4% and not lipped – 4.2%.
Level Fa3: semi-lipped – 88.8% and lipped – 11.1%.
Level Fa1-Fa2: semi-lipped – 71.4% and not lipped – 28.6%.

Thus, the semi-lipped type is the most typical blade butt type (71.4-100%), while lipped and not lipped butts are represented by 1-2 examples only each, if represented at all.

Butt Angle. The following numbers of blades' butts suitable for angle identification in each level of Unit F were used: 2 in level Fc, 47 in level Fb1-Fb2, 9 in level Fa3 and 7 in level Fa1-Fa2. Their angle characteristics are quoted below (see tabl. 22).

Level Fc: semi-acute and right – 50% each.
Level Fb1-Fb2: semi-acute – 66%, right – 25.5% and acute –

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
lipped				
semi-lipped		1	2	3 / 75%
not lipped	1			1 / 25%
unidentifiable		1	5	6
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped			3	3 / 4%
semi-lipped	14	13	42	69 / 92%
not lipped		1	2	3 / 4%
unidentifiable	23	25	64	112
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped			1	1 / 7.7%
semi-lipped	1	3	8	12 / 92.3%
not lipped				
unidentifiable	3	8	21	32
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
lipped				
semi-lipped	1	2	5	8 / 80%
not lipped			2	2 / 20%
unidentifiable	1	2	6	9
N	2	4	13	19

Table 21 - Siuren-I. Unit F. Blade Butt Lipping as Percentages of Each Type.

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
right	1	1	1	3 / 75%
semi-acute			1	1 / 25%
acute				
unidentifiable		1	5	6
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
right		6	12	18 / 24.0%
semi-acute	14	8	31	53 / 70.7%
acute			4	4 / 5.3%
unidentifiable	23	25	64	112
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
right			1	1 / 7.7%
semi-acute	1	1	7	9 / 69.2%
acute		2	1	3 / 23.1%
unidentifiable	3	8	21	32
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
right	1		2	3 / 30%
semi-acute		2	5	7 / 70%
acute				
unidentifiable	1	2	6	9
N	2	4	13	19

Table 22 - Siuren-I. Unit F. Blade Butt Angles as Percentages of Each Type.

8.5%.
Level Fa3: semi-acute – 77.7%, right and acute – 11.1% each.
Level Fa1-Fa2: semi-acute – 71.4% and right – 28.6% each.

Semi-acute angle is the most typical for blades' butts (66-77.7%) for the most representative samples of levels Fb1-Fb2 and Fa3. Right and acute angles are known by single pieces in levels Fc, Fa3 and Fa1-Fa2, but in the most abundant sample of level Fb1-Fb2, right angle prevails over acute angle in a 3:1 correlation.

Butt Abrasion. The following numbers of identifiable blades' butts for presence/absence of abrasion identification in four levels of Unit F were used: 2 from level Fc, 60 from level Fb1-Fb2, 13 from level Fa3 and 10 from level Fa1-Fa2. Their abrasion identifications are the following (see tabl. 23).

Level Fc	blades-tools	blades-CMP	blades-debitage	Blades Total
present	1			1 / 25%
absent		1	2	3 / 75%
unidentifiable		1	5	6
N	1	2	7	10
Level Fb1-Fb2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
present	13	7	41	61 / 67.8%
absent	1	9	19	29 / 32.2%
unidentifiable	23	23	51	97
N	37	39	111	187
Level Fa3	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
present	1	3	10	14 / 77.8%
absent		1	3	4 / 22.2%
unidentifiable	3	7	17	27
N	4	11	30	45
Level Fa1-Fa2	**blades-tools**	**blades-CMP**	**blades-debitage**	**Blades Total**
present			6	6 / 46.2%
absent	1	2	4	7 / 53.8%
unidentifiable	1	2	3	6
N	2	4	13	19

Table 23 - Siuren-I. Unit F. Blade Butt Abrasion as Percentages of Each Type.

Level Fc: absent – 100%.
Level Fb1-Fb2: present – 68.3% and absent – 31.7%.
Level Fa3: present – 76.9% and absent – 23.1%.
Level Fa1-Fa2: present – 60% and absent – 40%.

Aside from the two pieces of level Fc, blades of Unit F show a dominance of butts with abrasion (60-76.9%), although butts with no abrasion are also fairly well-represented (23.1-40%).

Metrics (Length, Width, Thickness) of Blades. Detailed metric data are mainly based on the analysis of complete blades from each level with some additional comparable information on broken blades.

Length. Given the rarity of complete blades in levels Fc, Fa3 and Fa1-Fa2 (less than 10 specimens in each level), the most informative blade sample is from level Fb1-Fb2.

Level Fb1-Fb2. There are two clusters of 34 complete blades in terms of length intervals: 2.1-4.5 cm – 73.6% and 5.1-5.5 cm – 17.6%, with a relative "metric gap" at 4.6-5.0 cm – only 5.9% (2 pieces) and a single blade (2.9%) with length more than 5.5 cm (6.1 cm). Mean length for blades is 4.0 cm. The following data on 77 broken blades can be noted – 72.8% are in the 0.5-3.0 cm interval and only one fragment (1.3%) exceeds 6.0 cm (7.7 cm).
Level Fc. Three complete blades have the following length: 2.1 – 3.3 – 3.5 cm. Accordingly, mean length is only 3.0 cm. Four broken blades are all in the interval 2.0-3.5 cm
Level Fa3. As in level Fb1-Fb2, there are again two clusters of complete blades (8 pieces) in terms of length: 2.5-4.0 cm – 62.5% (5 pieces) and 4.6-5.0 cm – 25% (2 pieces), with none in the 4.1-4.5 cm interval and the presence of just one blade (12.5%) which exceeds 5.0 cm (6.4 cm). Mean length is 4.2 cm. 86.4% of 22 broken blades are in the 1.1-3.0 cm interval and no blade is longer than 5.0 cm.
Level Fa1-Fa2. Five (83.3%) of 6 complete blades are in the 2.5-4.5 cm interval and one blade (16.7%) is 5.3 cm long. Mean length is 3.8 cm. Six (85.7%) of 7 broken blades are in the 1.1-4.0 cm interval and one fragment (14.3%) is 5.5 cm long.

Blades of Unit F are thus rather short with mean data for the four levels between 3.0 and 4.2 cm with a very probable real mean index of 4.0 cm as this comes from the richest sample of level Fb1-Fb2. No complete blade is longer than 6.5 cm. Moreover, most complete blades do not exceed 4.5 cm in length.

Width. The following width distribution of complete blades is observed: level Fc – 1.2-1.5 cm – 66.7%, 1.6-2.0 cm – 33.3%; level Fb1-Fb2 – 1.2-1.5 cm – 64.7%, 1.6-2.0 cm – 26.5%, 2.1-2.5 cm – 8.8%; level Fa3 – 1.2-1.5 cm – 50%, 1.6-2.0 cm – 37.5%, 2.1-2.5 cm – 12.5%; level Fa1-Fa2 – 1.2-1.5 cm – 50%, 1.6-2.0 cm – 33.3%, 2.1-2.5 cm – 16.7%. No blade is wider than 2.5 cm. Mean width for complete blades are as follows: 1.5 cm for level Fc, Fb1-Fb2 and Fa1-Fa2 and 1.6 cm for level Fa3.

The width data for broken blades of all four levels are similar to complete blades, but with somewhat more wider pieces: level Fc – 1.2-1.5 cm – 50%, 1.6-2.0 cm – 25%, 2.1-2.5 cm – none, > 2.5 cm – just a single piece (25%) of 2.7 cm; level Fb1-Fb2 – 1.2-1.5 cm – 67.5%, 1.6-2.0 cm – 24.7%, 2.1-2.5 cm – 2.6%, 2.6-3.0 cm – 3.9%, 3.1-3.5 cm – 1.3%; level Fa3 – 1.2-1.5 cm – 63.7%, 1.6-2.0 cm – 22.7%, 2.1-2.5 cm – 13.6%; level Fa1-Fa2 – 1.2-1.5 cm – 57.2%, 1.6-2.0 cm – 42.8%. Five of 110 broken blades (4.5%) have width greater than 2.5 cm in the 2.5-3.5 cm interval. But, at the same time, mean indices, aside from level Fc, remained the same – 1.8 cm for level Fc and 1.5 cm for levels Fb1-Fb2, Fa3 and Fa1-Fa2.

Overall, width data for all complete and broken blades together are as follows: 1.2-1.5 cm – 57.1% for level Fc, 66.7% for level Fb1-Fb2, 60% for level Fa3 and 53.8% for level Fa1-Fa2; 1.6-2.0 cm – 28.6% for level Fc, 25.2% for level Fb1-Fb2, 26.7% for level Fa3 and 38.5% for level Fa1-Fa2; 2.1-2.5 cm – none for level Fc, 4.5% for level Fb1-Fb2, 13.3% for level Fa3 and 7.7% for level Fa1-Fa2; 2.6-3.0 cm – 14.3% for level Fc and 2.7% for level

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
cortical				
dorsal-plain				
lateral				
crested				
unidirectional			7	7 / 87.5%
unidirectional-crossed			1	1 / 12.5%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
dorsal-plain				
lateral				
crested		39		39 / 9.7%
unidirectional	6		274	280 / 69.5%
unidirectional-crossed			56	56 / 13.9%
bidirectional			28	28 / 6.9%
3-directional				
centripetal				
core tablet		1		1
unidentifiable				
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
dorsal-plain				
lateral				
crested		6		6 / 9.8%
unidirectional			48	48 / 78.7%
unidirectional-crossed			4	4 / 6.6%
bidirectional			2	2 / 3.3%
3-directional			1	1 / 1.6%
centripetal				
core tablet				
unidentifiable				
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
dorsal-plain				
lateral			1	1 / 2.7%
crested		4		4 / 10.8%
unidirectional	1		26	27 / 73.0%
unidirectional-crossed			5	5 / 13.5%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	1	4	32	37

Table 24 - Siuren-I. Unit F. Bladelet Dorsal Scar Patterns as Percentages of Each Type.

Fb1-Fb2; 3.1-3.5 cm – only 0.9% for level Fb1-Fb2. Mean indices: 1.7 cm for level Fc, 1.6 cm for level Fa3 and 1.5 cm for both levels Fb1-Fb2 and Fa1-Fa2. Given the most abundant blade sample from level Fb1-Fb2, this level is more representative. There is a great dominance of really narrow blades with width 1.2-1.5 cm (66.7%), while blades with width more than 2.5 cm are extremely rare (3.6%). Mean width indices for both complete and broken blades of 1.5 cm again confirm this interval's data.

Thickness. These data are also given separately for complete and broken blades and then for both samples together from each level of Unit F.

Complete blades have the following mean thickness indications: 0.4 cm for both levels Fc and Fb1-Fb2, 0.5 cm for level Fa3 and 0.6 cm for level Fa1-Fa2. Broken blades are characterized by the following mean thickness indices: 0.4 cm for 3 levels – Fc, Fb1-Fb2 and Fa1-Fa2, and 0.3 cm for level Fa3. overall, mean thickness index for three levels (Fc, Fb1-Fb2, Fa3) is 0.4 cm and mean thickness index for level Fa1-Fa2 is 0.5 cm. According to these mean data, the most typical thickness interval is 0.1-0.5 cm – 66.6% for complete and 75% for broken blades in level Fc, 76.5% for complete and 93.5% for broken blades in level Fb1-Fb2, 95.5% for complete and 86.7% for broken blades in level Fa3, 50% for complete and 100% for broken blades in level Fa1-Fa2. At the same time, only a single blade from level Fb1-Fb2 has thickness more than 1.0 cm (1.2 cm) among all 161 blades (0.6%) of Unit F. So, blades are rather thin in Unit F.

Butt Sizes. Given the rarity of definable butts for this analysis in levels Fc (2 items), Fa3 (9 items) and Fa1-Fa2 (7 items), the important data come only from level Fb1-Fb2 (41 items) which should be regarded as a significant level for any technological analysis.

Mean metric data for blades' butts are represented below. Butt width: 0.6 cm for level Fb1-Fb2, 0.5 cm for level Fa3, 0.7 cm for level Fa1-Fa2 and 0.5 and 0.9 cm for the two pieces in level Fc. Butt height: 0.2 cm for both levels Fb1-Fb2 and Fa3, 0.3 cm for level Fa1-Fa2, and 0.1 and 0.2 cm for the two pieces in level Fc. Plain butts have the following width – 0.8 cm for level Fb1-Fb2 (18 pieces), 0.6 cm for level Fa3 (5 pieces) and 0.7 and 0.6 cm for the two pieces in level Fa1-Fa2 and have the following height – 0.4 cm for level Fb1-Fb2, 0.2 cm for level Fa3 and 0.2 cm each for the two pieces in level Fa1-Fa2. Level Fc does not contain any blade with plain butt.

Thus, the blades of the four levels of Unit F should be better considered on the basis of the most abundant sample from level Fb1-Fb2. They can be generally characterized by:

- a dominance of unidirectional scar pattern (70%), a subordinate position of unidirectional-crossed scar pattern (20%) and a rare representation of bidirectional, lateral and dorsal-plain scar patterns;
- a prevalence of non-cortical pieces (76.6%) over partially cortical pieces with no representation of wholly cortical items, as well as an absolute dominance of lateral cortex (81.8%) for partially cortical pieces which mostly have significant cortex (63.6%);
- a correlation between parallel and converging shape types (79.8% together) and "on-axis" type of removal direction (80%);
- a great prevalence of twisted type of general profile (64.8%) over "regular" (flat, incurvate medial and incurvate distal) types of general profiles (34.3% together);
- a dominance of feathering distal end (63.2%) with a poor representation of "not regular" (hinged and overpassed) types (7% together);
- a great dominance of triangular, trapezoidal and multifaceted profiles at midpoint (88.3%) where the latter two comprise a significant, but not prevailing position – 49.5%;
- a dominance of the "plain-punctiform-linear" group of butt types (59.1%) with a notable presence (10.6%) of dihedral and faceted butts;
- a great dominance of semi-lipped butts (89.4%) with mainly semi-acute angle (66%) and a moderate number of right angle (25.5%), a low number of both lipped butts (6.4%) with acute angle (8.5%) and not lipped butts (4.2%) with right angle (some of 25.5%);
- twice as many butts with abrasion (68.3%) over butts with no abrasion (31.7%);
- a dominance of rather short (mean index in 4.0 cm), narrow (mean index in 1.5 cm) and overall thin (0.4 cm mean) blades.

Bladelets

Bladelets are poorly represented in levels Fc, Fa3 and Fa1-Fa2, especially in comparison to their large quantity in level Fb1-Fb2. Therefore, main morphological and technological information and conclusions should be drawn on the basis of the sample from the latter level, although all descriptions of bladelets are given below for each of the four levels. In terms of condition, bladelets from the four levels of Unit F are subdivided into complete and broken pieces, with further distribution of the latter specimens into proximal, medial and distal fragments.

8 bladelets of level Fc consist of a single complete piece (12.5%) and 7 broken pieces (87.5%) – 2 proximal (25%), a medial (12.5%) and 4 distal (50%).

358 bladelets of level Fb1-Fb2 consist of 131 complete pieces (36.6%) and 227 broken pieces (63.4%) – 101 proximal (28.2%), 48 medial (13.4%) and 78 distal (21.8%).

55 bladelets of level Fa3 consist of 12 complete pieces (21.8%) and 43 broken pieces (78.2%) – 21 proximal (38.2%), 18 medial (32.7%) and 4 distal (7.3%).

32 bladelets of level Fa1-Fa2 consist of 5 complete pieces (15.6%) and 27 broken pieces (84.4%) – 14 proximal (43.8%), 7 medial (21.9%) and 6 distal (18.7%).

Dorsal Scar Pattern. Two scar pattern types have been identified on all 8 bladelets from level Fc, three on all 358 bladelets from level Fb1-Fb2 and all 32 bladelets from level Fa1-Fa2 and four scar pattern types on all 55 bladelets from level Fa3.

Separately, bladelets from each level have the following scar pattern type representations (see tabl. 24).

Bladelets of level Fc: unidirectional – 87.5% and unidirectional-crossed – 12.5%.
Bladelets of level Fb1-Fb2: unidirectional – 76.6%, unidirectional-crossed – 15.6% and bidirectional – 7.8%.
Bladelets of level Fa3: unidirectional – 87.3%, unidirectional-crossed – 7.3%, bidirectional – 3.6% and 3-directional – 1.8%.
Bladelets of level Fa1-Fa2: unidirectional – 81.3%, unidirectional-crossed – 15.6% and lateral – 3.1%.

Thus, there is a great dominance of unidirectional scar pattern (76.6-87.5%), a moderate representation of unidirectional-crossed scar pattern (12.5-15.6% in levels Fc, Fb1-Fb2 and

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
parallel			6	6 / 75%
converging				
expanding			2	2 / 25%
ovoid				
irregular				
unidentifiable				
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel	2	2	88	92 / 36.8%
converging	1	20	80	101 / 40.4%
expanding	1	4	30	35 / 14.0%
ovoid			4	4 / 1.6%
irregular		7	11	18 / 7.2%
unidentifiable	2	7	145	154
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel			26	26 / 57.8%
converging		2	9	11 / 24.4%
expanding		2	3	5 / 11.1%
ovoid				
irregular		2	1	3 / 6.7%
unidentifiable			16	16
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
parallel		1	14	15 / 50%
converging			3	3 / 10%
expanding	1	2		3 / 10%
ovoid				
irregular			9	9 / 30%
unidentifiable		1	6	7
N	1	4	32	37

Table 25 - Siuren-I. Unit F. Bladelet Shapes as Percentages of Each Type.

Fa1-Fa2 and 7.3% in level Fa3), a subordinate position of bidirectional scar pattern (3.6-7.8% in the largest samples of levels Fa3 and Fb1-Fb2, and none in the poor samples of levels Fc and Fa1-Fa2), while the presence of 3-directional and lateral scar patterns certainly seems to be occasional as they are known only on a single piece each from levels Fa3 and Fa1-Fa2.

Comparison of scar pattern types with presence/absence of cortex on bladelets shows a much greater proportion of partially cortical pieces among "non-unidirectional" bladelets in comparison to the proportion among unidirectional bladelets. In level Fb1-Fb2, pieces with some primary cortex comprise only 5.8% among unidirectional bladelets, while unidirectional-crossed and bidirectional bladelets include pieces with some cortex (14.2% and 17.9% respectively). Moreover, in level Fa3 all bidirectional (2 items) and 3-directional (1 item) pieces (100%) have some cortex, as well as 50% of unidirectional-crossed bladelets (2 pieces), while only a single piece (2.1%) among unidirectional bladelets is partially cortical. A single lateral bladelet in level Fa1-Fa2 is also partially cortical (100%). On the other hand, unidirectional bladelets in level Fa1-Fa2 and Fc have some cortex only in 11.5% and 14.3% of the cases. So, the data additionally point out auxiliary and preparatory roles of "non-unidirectional" bladelets in primary reduction processes of the Unit F lithic industries.

Surface Cortex Area and Location. All bladelets from each level of Unit F were used for surface cortex area identification. Non-cortical bladelets comprise more than 7/8 of all bladelets: 87.5% in levels Fc and Fa1-Fa2, 91.9% in level Fb1-Fb2 and 89.1% in level Fa3. Wholly cortical bladelets are completely absent. Partially cortical pieces comprise the following percentages: 12.5% in levels Fc and Fa1-Fa2, 8.1% in level Fb1-Fb2 and 10.9% in level Fa3. Taken separately, complete bladelets show the following cortex data: level Fc – a single complete piece is non-cortical (100%); level Fb1-Fb2 (131 pieces) – non-cortical (89.4%) and partially cortical (10.6%); level Fa3 (12 pieces) – non-cortical (83.3%) and partially cortical (16.7%); level Fa1-Fa2 (5 pieces) – non-cortical (80%) and partially cortical (20%, a single piece). Complete partially cortical bladelets also allow us to see an interval subdivision into pieces with significant cortex – 28.6% (4 pieces) in level Fb1-Fb2, 100% (both pieces) in level Fa3 and 100% (a single piece) in level Fa1-Fa2, and pieces with insignificant cortex – 71.4% (10 pieces) in level Fb1-Fb2 and none in levels Fa3 and Fa1-Fa2.

Data on surface cortex location for complete partially cortical bladelets are given below. All 3 pieces from levels Fa3 and Fa1-Fa2 have only lateral cortex. Fourteen pieces of level Fb1-Fb2 have the following cortex location: lateral – 50% (7 items), distal – 42.9% (6 pieces) and central – 7.1% (1 piece).

Shape. The following numbers of bladelets with definable shapes were used from each level of Unit F: all 8 pieces of level Fc, 213 pieces of level Fb1-Fb2, 39 pieces of level Fa3 and 26 pieces of level Fa1-Fa2. They are characterized by the following shape types (see tabl. 25).

Level Fc: parallel – 75% and expanding – 25% (a single piece).
Level Fb1-Fb2: parallel – 41.3%, converging – 37.5%, expanding – 14.1%, irregular – 5.2%, ovoid – 1.9%.
Level Fa3: parallel – 66.6%, converging – 23.1%, expanding – 7.7%, irregular – 2.6%.
Level Fa1-Fa2: parallel – 53.9%, irregular – 34.6%, converging – 11.5%.

Parallel shape is the dominant type for bladelets in all four levels (41.3-75%), which additionally in conjunction with converging type constitute more than three fourths of all bladelets in levels Fb1-Fb2 (78.8%) and Fa3 (89.7%). Expanding and irregular shape types are characteristic for relatively few bladelets in levels Fb1-Fb2 (19.3%) and Fa3 (10.3%). Only level Fa1-Fa2 shows a significant percentage of bladelets with irregular shape (34.6%), although there are only 9 pieces.

Axis. The following numbers of bladelets with definable axis of removal directions were used from each level of Unit F: all 8 pieces in level Fc, 332 pieces in level Fb1-Fb2, 49 pieces in level Fa3 and 28 pieces in level Fa1-Fa2 (see tabl. 26).

Three levels with a small number of bladelets are characterized by the significant prevalence of "on-axis" type (87.5% in level Fc, 79.6% in level Fa3 and 64.3% in level Fa1-Fa2) over "off-axis" type (12.5% in level Fc, 20.4% in level Fa3 and 35.7% in level Fa1-Fa2). On the other hand, the largest bladelet sample from level Fb1-Fb2 shows only a very minor predominance of "on-axis" type (53%) over "off-axis" type (47%). Taking into account these proportions in the lattermost representative level, these data should serve as the most objective ones for axis of removal directions for bladelets in the Unit F lithic industry.

General Profiles. These data are based on separate analysis of all definable bladelets (see tabl. 27) and only complete bladelets.

Level Fc. All 8 bladelets have the following general profile types: twisted – 50%, flat – 25%, incurvate medial and incurvate distal – 12.5% each. A single complete bladelet has twisted general profile.
Level Fb1-Fb2. There are 335 definable bladelets with the following general profile types: twisted – 73.2%, incurvate medial – 14.3%, flat – 8.9%, incurvate distal and convex – 1.8% each. For 131 complete bladelets there are recognized 80.9% of twisted type, 12.2% of incurvate medial type, 6.1% of flat type, 0.8% of incurvate distal type (a single piece) and none for convex type.
Level Fa3. There are 53 definable bladelets with the following general profile types: twisted – 73.6%, incurvate medial – 15.1% and flat – 11.3%. For 12 complete bladelets there are recognized 75% of twisted type, 16.7% of incurvate medial type (2 items) and 8.3% of flat type (a sole piece).
Level Fa1-Fa2. There are 31 definable bladelets with the following general profile types: twisted – 77.5%, incurvate medial – 16.1%, flat and convex – 3.2% each. For 5 complete bladelets there are 80% of twisted type and 20% of incurvate medial type (1 item only).

These data show that about three quarters of all bladelets have twisted profiles in levels Fb1-Fb2, Fa3 and Fa1-fa2 (73.2 – 77.5%), about three to four times more numerous than "regular" (flat, incurvate medial and incurvate distal) types in these levels (19.3-26.4%). Data on complete bladelets only make the observed twisted type prevalence more evident as well – 75-80.9 versus 19.1-25%.

Profiles at Distal End. Data for the following analysis were based on the following numbers of definable bladelets from each level

Level Fc	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis			7	7 / 87.5%
off-axis			1	1 / 12.5%
unidentifiable				
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis	3	10	176	189 / 51.4%
off-axis	2	21	156	179 / 48.6%
unidentifiable	1	9	26	36
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis		1	39	40 / 72.7%
off-axis		5	10	15 / 27.3%
unidentifiable			6	6
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
on-axis		2	18	20 / 62.5%
off-axis	1	1	10	12 / 37.5%
unidentifiable		1	4	5
N	1	4	32	37

Table 26 - Siuren-I. Unit F. Bladelet Axis as Percentages of Each Type.

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
flat			2	2 / 25%
incurvate medial			1	1 / 12.5%
incurvate distal			1	1 / 12.5%
convex				
twisted			4	4 / 50%
unidentifiable				
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat		2	30	32 / 8.5%
incurvate medial	2	9	48	59 / 15.7%
incurvate distal		2	6	8 / 2.1%
convex			6	6 / 1.6%
twisted	4	22	245	271 / 72.1%
unidentifiable		5	23	28
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat			6	6 / 10.2%
incurvate medial		1	8	9 / 15.2%
incurvate distal				
convex				
twisted		5	39	44 / 74.6%
unidentifiable			2	2
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat			1	1 / 2.9%
incurvate medial			5	5 / 14.2%
incurvate distal				
convex			1	1 / 2.9%
twisted	1	3	24	28 / 80.0%
unidentifiable		1	1	2
N	1	4	32	37

Table 27 - Siuren-I. Unit F. Bladelet General Profiles as Percentages of Each Type.

of Unit F: 5 from level Fc, 209 from level Fb1-Fb2, 17 from level Fa3 and 11 from level Fa1-Fa2. Data on their type representation are given below (see tabl. 28).

Level Fc: feathering – 80% and blunt – 20% (a single piece).
Level Fb1-Fb2: feathering – 66%, blunt – 15.8%, hinged – 12.9% and overpassed – 5.3%.
Level Fa3: feathering – 82.4% and blunt – 17.6% (3 pieces).
Level Fa1-Fa2: feathering – 81.8% and blunt – 18.2% (2 pieces).

Three levels (Fc, Fa3 and Fa1-Fa2) with a limited number of bladelets with definable distal ends are characterized by only two types – a very dominant feathering one (80-82.4%) and a subordinate blunt one (17.6-20%). On the other hand, bladelets in level Fb1-Fb2 are characterized by all five profiles of distal end types with feathering (66%) still dominant and a moderate number of "not regular" (hinged and overpassed) types – 18.2% together.

Profiles at Midpoint. Data for this analysis are recorded on all bladelets from each level of Unit F. Data on the range of types are represented below (see tabl. 29).

Level Fc: triangular – 75% and trapezoidal – 25% (2 pieces).
Level Fb1-Fb2: trapezoidal – 43.3%, triangular – 31.6%, multifaceted – 16.7%, lateral steep – 8.1%, flat – 0.3%.
Level Fa3: trapezoidal – 45.5%, triangular – 38.2%, multifaceted – 10.9%, lateral steep – 5.4%.
Level Fa1-Fa2: trapezoidal – 59.5%, triangular – 28.1%, multifaceted and lateral steep – 6.2% each.

Thus, aside from the poorest bladelet sample from level Fc, bladelets from the other three levels (Fb1-Fb2, Fa3 and Fa1-Fa2) show the dominant position of trapezoidal type alone in the each level (43.3-59.5%). Moreover, trapezoidal and multifaceted types together make up almost two-thirds of all bladelets – 56.4-65.7%. Three main types together (triangular, trapezoidal, multifaceted) absolutely dominate (91.6-94.6%), while irregular type of profile at midpoint is completely unknown.

Butt Types. This analysis is based on the following numbers of definable bladelet butts from each level of Unit F: 3 from level Fc, 231 from level Fb1-Fb2, 33 from level Fa3 and 19 from level Fa1-Fa2. Their type representation is listed below (see tabl. 30).

Level Fc: linear – 66.6% (2 pieces) and crushed – 33.3% (1 piece).
Level Fb1-Fb2: plain – 12.1%, punctiform – 3.9%, linear – 49.4%, dihedral – 2.6%, crudely-faceted – 0.4% (1 piece) and crushed – 31.6%.

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
feathering			4	4 / 80%
hinged				
overpassed				
blunt			1	1 / 20%
unidentifiable			3	3
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering		28	138	166 / 68.9%
hinged			27	27 / 11.2%
overpassed		1	11	12 / 5.0%
blunt		3	33	36 / 14.9%
unidentifiable	6	8	149	163
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering		5	14	19 / 82.6%
hinged		1		1 / 4.3%
overpassed				
blunt			3	3 / 13.1%
unidentifiable			38	38
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
feathering		3	9	12 / 85.7%
hinged				
overpassed				
blunt			2	2 / 14.3%
unidentifiable	1	1	21	23
N	1	4	32	37

Table 28 - Siuren-I. Unit F. Profiles at Distal End as Percentages of Each Type.

Level Fa3: plain and punctiform – 6.1% each, linear – 51.4%, dihedral – 9.1% and crushed – 27.3%.
Level Fa1-Fa2: linear – 36.8%, punctiform and finely-faceted – 5.3% each (1 piece each), dihedral – 10.5% and crushed – 42.1%.

Linear butt type is the most common in all four levels – 36.8-66.6%. Overall, the "plain-punctiform-linear" group of butt types is of great importance excluding crushed butt type (27.3-31.6%) – 63.6-65.4% in levels Fb1-Fb2 and Fa3 where all three types are represented. At the same time, other butt types (dihedral and faceted) are noted for only several pieces.

Lipping. The following numbers of bladelet butts suitable for lipping identification in each level of Unit F are used: 2 in level Fc, 158 in level Fb1-Fb2, 23 in level Fa3 and 11 in level Fa1-Fa2. Their lipping characteristics are as follows (see tabl. 31).

Level Fc: semi-lipped – 100%.
Level Fb1-Fb2: semi-lipped – 75.4%, lipped – 24% and not lipped – 0.6%.
Level Fa3: semi-lipped – 87% and lipped – 13%.
Level Fa1-Fa2: semi-lipped – 81.8%, lipped and not lipped – 9.1% (1 piece each).

The great dominance of semi-lipped butts (75.4-100%) can be observed, the subordinate position of lipped butts (9.1-24%) and the occasional occurrence of not lipped butts represented by single pieces only in levels Fb1-Fb2 and Fa1-Fa2.

Butt Angle. The following numbers of bladelet butts suitable for angle identification in each level of Unit F are used: 2 in level Fc, 158 in level Fb1-Fb2, 23 in level Fa3 and 11 in level Fa1-Fa2 with data presented below (see tabl. 32).

Level Fc: semi-acute – 100%.
Level Fb1-Fb2: semi-acute – 86.7%, acute – 10.1% and right – 3.2%.
Level Fa3: semi-acute – 95.7% and acute – 4.3%.
Level Fa1-Fa2: semi-acute – 90.9% and right – 9.1%.

Semi-acute angle is the most common – 86.7-100%. Acute and right angles are represented only by single pieces in levels Fa3 and Fa1-Fa2, while acute angle prevails over right angle in level Fb1-Fb2in the following proportion: 3.2:1.

Butt Abrasion. The following numbers of identifiable bladelet butts for the presence/absence of abrasion are used in the four levels of Unit F: 3 from level Fc, 231 from level Fb1-Fb2, 32 from level Fa3 and 17 from level Fa1-Fa2. Abrasion data are as follows (see tabl. 33).

Level Fc: present – 100%; Level Fb1-Fb2: present – 95.2% and absent – 4.8%; Level Fa3: present – 93.8% and absent – 6.2%; Level Fa1-Fa2: present – 88.2% and absent – 11.8%.

Nearly all bladelets have butts with abrasion (88.2-100%). Butts with no abrasion are certainly rare;, for example, in the largest sample from level Fb1-Fb2, for one butt with no abrasion there are 20 butts with abrasion.

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
flat				
triangular			6	6 / 75%
trapezoidal			2	2 / 25%
multifaceted				
lateral steep				
crescent				
irregular				
unidentifiable				
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat			1	1 / 0.2%
triangular	1	23	113	137 / 34.0%
trapezoidal	2	5	155	162 / 40.3%
multifaceted	3		60	63 / 15.6%
lateral steep		11	29	40 / 9.9%
crescent				
irregular				
unidentifiable		1		1
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat				
triangular		3	21	24 / 39.4%
trapezoidal		1	25	26 / 42.6%
multifaceted			6	6 / 9.8%
lateral steep		2	3	5 / 8.2%
crescent				
irregular				
unidentifiable				
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
flat				
triangular		1	9	10 / 27.0%
trapezoidal			19	19 / 51.4%
multifaceted	1		2	3 / 8.1%
lateral steep		3	2	5 / 13.5%
crescent				
irregular				
unidentifiable				
N	1	4	32	37

Table 29 - Siuren-I. Unit F. Bladelet Profiles at Midpoint as Percentages of Each Type.

Metrics (Length, Width, Thickness) of Bladelets. Detailed metric data are mainly based on the analysis of complete bladelets from each level with some additional comparable information on broken bladelets.

Length. The main source for length data is the analysis of bladelets from level Fb1-Fb2 as the number of complete bladelets in the other three levels is very low: 1, 12 and 5 pieces.

There is a great dominance of "short" complete bladelets with length no more than 3.0 cm: 1 piece/100% in level Fc, 120 pieces/91.6% in level Fb1-Fb2, 10 pieces/83.4% in level Fa3 and 5 pieces/100% in level Fa1-Fa2. Accordingly, "long" bladelets (with length more than 3.0 cm) account for a very low number of pieces – only 11 pieces/8.4% in level Fb1-Fb2 and 2 pieces/16.6% in level Fa3. There are no complete bladelets with length more than 5 cm. The longest bladelets in Unit F are as follows: 3.7 cm, 4.1 cm and 4.3 cm in level Fb1-Fb2, and 3.4 cm and 3.7 cm in level Fa3. The shortest bladelets: 1.7 cm in level Fc, 1.4 cm in level Fb1-Fb2, 1.7 cm in level Fa3 and 1.9 cm in level Fa1-Fa2. Mean length for complete bladelets from the four levels: 2.3 cm in levels Fb1-Fb2 and Fa1-Fa2, 2.5 cm for level Fa3. Number of broken bladelets with length more than 3 cm: 1 piece/14.3% in level Fc, 8 pieces/3.5% in level Fb1-Fb2, 2 pieces/4.6% in level Fa3 and none in level Fa1-Fa2. The longest broken bladelets: 4.0 cm in level Fc, 3.6 cm and 4.1 cm in level Fb1-Fb2, 3.1 and 3.2 cm in level Fa3 and 3.0 cm in level Fa1-Fa2. At the same time, there is also a moderate number of broken bladelets in the length interval 2.1-3.0 cm – 4 pieces/57.1% in level Fc, 37 pieces/16.3% in level Fb1-Fb2, 10 pieces/23.2% in level Fa3 and 6 pieces/22.2% in level Fa1-Fa2.

Bladelets in Unit F are most typically of "short" length with just a few pieces with length more than 3.0 cm, confirmed by mean indices of 2.3 and 2.5 cm.

Width. The following width distribution of complete bladelets is noted: level Fc – 0.7-0.9 cm (0.8 cm) – 1 piece/100%; le-

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
cortical				
plain				
punctiform				
linear			2	2 / 66.6%
dihedral				
crudly-faceted				
finely-faceted				
crushed			1	1 / 33.3%
missing			5	5
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical		1		1 / 0.4%
plain	1	1	28	30 / 11.3%
punctiform	1	10	9	20 / 7.5%
linear	2	9	114	125 / 47.0%
dihedral		1	6	7 / 2.6%
crudly-faceted		1	1	2 / 0.7%
finely-faceted				
crushed		8	73	81 / 30.5%
missing	2	9	127	138
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical		1		1 / 2.7%
plain		2	2	4 / 10.8%
punctiform			2	2 / 5.4%
linear		1	17	18 / 48.7%
dihedral			3	3 / 8.1%
crudly-faceted				
finely-faceted				
crushed			9	9 / 24.3%
missing		2	22	24
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
cortical				
plain				
punctiform			1	1 / 4.2%
linear	1	1	7	9 / 37.5%
dihedral			2	2 / 8.3%
crudly-faceted		1		1 / 4.2%
finely-faceted			1	1 / 4.2%
crushed		2	8	10 / 41.6%
missing			13	13
N	1	4	32	37

Table 30 - Siuren-I. Unit F. Bladelet Butt Types as Percentages of Each Type.

vel Fb1-Fb2 – 0.7-0.9 cm – 90 pieces/68.7%, 1.0-1.1 cm – 41 pieces/31.3%; level Fa3 – 0.7-0.9 cm – 9 pieces/75%, 1.0-1.1 cm – 3 pieces/25%; level Fa1-Fa2 – 0.7-0.9 cm – 4 pieces/80%, 1.0-1.1 cm – 1 piece/20%. Width of broken bladelets is very similar to complete bladelets: level Fc – 0.7-0.9 cm – 6 pieces/85.7%, 1.0-1.1 cm – 1 piece/14.3%; level Fb1-Fb2 – 0.7-0.9 cm – 149 pieces/65.6%, 1.0-1.1 cm – 78 pieces/34.4%; level Fa3 – 0.7-0.9 cm – 32 pieces/74.4%, 1.0-1.1 cm – 11 pieces/25.6%; level Fa1-Fa2 – 0.7-0.9 cm – 20 pieces/74.1%, 1.0-1.1 cm – 7 pieces/25.9%.

Mean width for both complete and broken bladelets, as well as mean indices for all bladelets from three levels of Unit F (Fb1-Fb2, Fa3 and Fa1-Fa2), is identical – 0.9 cm. The limited bladelet sample in level Fc shows mean width of 0.8 cm.

There is thus a dominance of "medium" width for bladelets.

Thickness. Mean thickness is 0.2 cm for all bladelet categories (complete, broken and all together) in all four levels of Unit F. Aside from 4 pieces with thickness of 0.5 cm in level Fb1-Fb2 and 2 pieces with thickness of 0.5 cm in level Fa3, all other bladelets (447 items from all four levels together) have thickness in the 0.1-0.4 cm interval.

Thus, bladelets of Unit F are quite thin.

Butt Sizes. Mean metric data for bladelet butts are similar in the four levels of Unit F. Butt width: 0.4 cm for levels Fb1-Fb2 (150 butts) and Fa1-fa2 (10 butts), 0.3 cm for level Fa3 (22 butts). Two identifiable butts in level Fc have width of 0.2 and 0.3 cm.

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
lipped				
semi-lipped			2	2 / 100%
not lipped				
unidentifiable			6	6
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped			38	38 / 21.2%
semi-lipped	4	17	119	140 / 78.2%
not lipped			1	1 / 0.6%
unidentifiable	2	23	200	225
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped			3	3 / 11.5%
semi-lipped		3	20	23 / 88.5%
not lipped				
unidentifiable		3	32	35
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
lipped			1	1 / 7.7%
semi-lipped	1	1	9	11 / 84.6%
not lipped			1	1 / 7.7%
unidentifiable		3	21	24
N	1	4	32	37

Table 31 - Siuren-I. Unit F. Bladelet Butt Lipping as Percentages of Each Type.

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
right				
semi-acute			2	2 / 100%
acute				
unidentifiable			6	6
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right	1	1	5	7 / 3.9%
semi-acute	3	16	137	156 / 87.2%
acute			16	16 / 8.9%
unidentifiable	2	23	200	225
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right				
semi-acute		3	22	25 / 96.2%
acute			1	1 / 3.8%
unidentifiable		3	32	35
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
right		1	1	2 / 15.4%
semi-acute	1		10	11 / 84.6%
acute				
unidentifiable		3	21	24
N	1	4	32	37

Table 32 - Siuren-I. Level Fc. Bladelet Butt Angles as Percentages of Each Type.

Butt height: 0.1 cm for all four levels, including 2 butts from level Fc of 0.1 cm each. Plain butts have the following dimensions in level Fb1-Fb2 – 0.5 cm mean width and 0.2 cm mean height for 28 butts. Level Fa3 has only 2 plain butts for bladelets with widths of 0.4 cm and 0.5 cm and height of 0.2 cm for both pieces, while no plain butt was noted for bladelets in levels Fc and Fa1-Fa2.

Thus, the bladelets from the four levels of Unit F can be generally characterized on the basis of the analysis of level Fb1-Fb2, the most abundant sample, as follows:

- a great dominance of unidirectional scar pattern (76.6%), a moderate number of unidirectional-crossed scar pattern (15.6%) and a subordinate position of bidirectional scar pattern (7.8%);

Level Fc	bladelets-tools	bladelets-CMP	bladelets-debitage	Bladelets Total
present			3	3 / 100%
absent				
unidentifiable			5	5
N	0	0	8	8
Level Fb1-Fb2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present	2	13	220	235 / 91.4/ %
absent	2	9	11	22 / 8.6%
unidentifiable	2	18	127	147
N	6	40	358	404
Level Fa3	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present		2	30	32 / 88.9%
absent		2	2	4 / 11.1%
unidentifiable		2	23	25
N	0	6	55	61
Level Fa1-Fa2	**bladelets-tools**	**bladelets-CMP**	**bladelets-debitage**	**Bladelets Total**
present	1	1	15	17 / 85%
absent		1	2	3 / 15%
unidentifiable		2	15	17
N	1	4	32	37

Table 33 - Siuren-I. Unit F. Bladelet Butt Abrasion as Percentages of Each Type.

- a very low number (8.1%) of partially cortical pieces with no representation of wholly cortical items;
- a dominance of parallel and converging shape types (78.8% together) in association with "on-axis" removal direction (53%) and partially "off-axis" removal direction (47%), although expanding and irregular shape types (19.3% together) in association with mainly "off-axis" removal direction (47%)occupy a notable position;
- a great prevalence of twisted type (73.2% for all identifiable bladelets and 80.9% for complete bladelets only) over "regular" (flat, incurvate medial and incurvate distal) types of general profile (25% for all identifiable bladelets and 19.1% for complete bladelets only);
- a dominance of feathering distal ends (66%) with a moderate number (18.2%) of "not regular" (hinged and overpassed) types;
- a dominance of trapezoidal and multifaceted types of profiles at midpoint (60% together) which in conjunction with triangular type make up 91.6%, and notable is the dominant position of trapezoidal type (43.3%) over any other type;
- a dominance of "plain-punctiform-linear" group of butt types (65.4%) with the separate significant prevalence of linear type (49.4%) over any other butt type, and the rare (1-2 pieces) occurrence of dihedral and faceted butts;
- a significant dominance of semi-lipped butts (75.4%) with semi-acute angle (86.7%), a moderate number of lipped butts (24%) with acute (10.1%) and some semi-acute angles and no unlipped butts;
- a highly dominant presence of butts with abrasion (95.2%);
- a dominance of "short length" (mean 2.3 cm), a medium width (mean 0.9 cm) and thin thickness (mean 0.2 cm).

Microblades

The large sample of microblades in level Fb1-Fb2 comprises the main basis for the analysis of the Unit F microblade morphological and metric features, while the rare microblades in levels Fc, Fa3 and Fa1-fa2 are simply described.

In terms of condition, microblades from the four levels of Unit F are subdivided into complete and broken pieces, with further distribution of the latter specimens into proximal, medial and distal fragments.

9 microblades of level Fc consist of 6 complete pieces (66.6%) and 3 broken pieces (33.3%) – 1 medial (11.1%) and 2 distal (22.2%).

991 microblades of level Fb1-Fb2 consist of 265 complete pieces (26.7%) and 726 broken pieces (73.3%) – 328 proximal (33.1%), 226 medial (22.8%) and 172 distal (17.4%).

44 microblades of level Fa3 consist of 8 complete pieces (18.2%) and 36 broken pieces (81.8%) – 19 proximal (43.2%), 11 medial (25%) and 6 distal (13.6%).

19 microblades of level Fa1-Fa2 consist of 5 complete pieces (26.3%) and 14 broken pieces (73.7%) – 4 proximal (21%), 6 medial (31.6%) and 4 distal (21%).

Dorsal Scar Pattern. Two scar pattern types have been identified on all microblades in levels Fc, Fa3 and Fa1-Fa2 and three on all microblades in level Fb1-Fb2.

Separately, microblades from each level have the following scar pattern type representation.

Microblades of level Fc: unidirectional – 88.8% and unidirectional-crossed – 11.1%.
Microblades of level Fb1-Fb2: unidirectional – 95.7%, unidirectional-crossed – 4% and bidirectional – 0.3%.
Microblades of level Fa3: unidirectional – 93.2% and unidirectional-crossed – 6.8%.
Microblades of level Fa1-Fa2: unidirectional – 94.7% and bidirectional – 5.3%.

The unidirectional scar pattern is the most common for microblades of Unit F. This is especially clearly seen in the sample

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
cortical				
dorsal-plain				
lateral				
crested				
unidirectional	1		8	90 / 90%
unidirectional-crossed			1	1 / 10%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
dorsal-plain				
lateral				
crested		36		36 / 3.3%
unidirectional	65		948	1013 / 92.8%
unidirectional-crossed			40	40 / 3.7%
bidirectional			3	3 / 0.2%
3-directional				
centripetal				
core tablet				
unidentifiable	1			1
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
dorsal-plain				
lateral				
crested		3		3 / 6.1%
unidirectional	2		41	43 / 87.8%
unidirectional-crossed			3	3 / 6.1%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
dorsal-plain				
lateral				
crested				
unidirectional	1		18	19 / 95%
unidirectional-crossed			1	1 / 5%
bidirectional				
3-directional				
centripetal				
core tablet				
unidentifiable				
N	1	0	19	20

Table 34 - Siuren-I. Unit F. Microblade Dorsal Scar Patterns as Percentages of Each Type.

from level Fb1-Fb2, where of 991 microblades, only 43 items have "non-unidirectional" scar patterns.

Comparison of scar pattern types with presence/absence of primary cortex on microblades is only possible for level Fb1-Fb2, as no partially cortical item is known in level Fc, and there is just one (unidirectional) in level Fa1-Fa2 and two (unidirectional and unidirectional-crossed) in level Fa3. The level Fb1-Fb2 pieces with some cortex comprise only 2.3% of the unidirectional microblades, while 20% of unidirectional-crossed and 33.3% of bidirectional microblades have some cortex (8 of 40).

Surface Cortex Area and Location. All microblades from each level of Unit F were used for surface cortex area identification. Non-

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
parallel	1		2	3 / 30%
converging			3	3 / 30%
expanding			2	2 / 20%
ovoid				
irregular			2	2 / 20%
unidentifiable				
N	1	0	9	10
Level Fb1-Fb2	**microblade-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	35	3	320	358 / 54.6%
converging	13	19	209	241 / 36.8%
expanding	1	3	42	46 / 7.0%
ovoid			1	1 / 0.2%
irregular		1	8	9 / 1.4%
unidentifiable	17	10	411	438
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	1		32	33 / 71.7%
converging		2	9	11 / 23.9%
expanding		1		1 / 2.2%
ovoid				
irregular			1	1 / 2.2%
unidentifiable	1		2	3
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
parallel	1		11	12 / 63.2%
converging			5	5 / 26.3%
expanding			2	2 / 10.5%
ovoid				
irregular				
unidentifiable			1	1
N	1	0	19	20

Table 35 - Siuren-I. Unit F. Microblade Shapes as Percentages of Each Type.

cortical microblades are highly dominant in three levels: 96.9% in level Fb1-Fb2, 95.4% in level Fa3 and 94.7% in level Fa1-Fa2. Level Fc is characterized by exclusively non-cortical microblades (9 pieces/100%). Wholly cortical specimens are completely absent from all levels. Partially cortical pieces comprise the following percentages: 3.1% in level Fb1-Fb2, 4.6% in level Fa3 and 5.3% in level Fa1-Fa2. Separately analyzed complete microblades show the following cortex data: level Fb1-Fb2 (265 pieces) – non-cortical – 97.3% and partially cortical – 2.7%; levels Fa3 (8 pieces) and Fa1-Fa2 (5 pieces) – only non-cortical (100% each). Seven partially cortical microblades of level Fb1-Fb2 are also subdivided into pieces with significant cortex – 28.8% (2 items) and pieces with insignificant cortex – 71.2% (5 items). These 7 partially cortical microblades of level Fb1-Fb2 are characterized by distal cortex (57.1% - 4 items) and lateral cortex (42.9% - 3 items).

Shape. The following numbers of microblades with definable shapes were used from each level of Unit F: all 9 pieces of level Fc, 580 pieces of level Fb1-Fb2, 42 pieces of level Fa3 and 18 pieces of level Fa1-Fa2. Shape types are presented below.

Level Fc: parallel, expanding and irregular – 22.2% each, and converging – 33.3%.
Level Fb1-Fb2: parallel – 55.2%, converging – 36%, expanding – 7.2%, irregular – 1.4% and ovoid – 0.2%.
Level Fa3: parallel – 76.2%, converging – 21.4% and irregular – 2.4%.
Level Fa1-Fa2: parallel -61.1%, converging – 27.8% and expanding – 11.1%.

Thus, apart from the poorest sample of level Fc, parallel shape is the dominant type for the other three levels (55.2-76.2%). Taken together, parallel and converging shape types are typical in these three levels (88.9-97.6%). On the other hand, expanding and irregular shape types are fairly rare: 8.6-11.1%.

Axis. The following numbers of microblades with definable axis of removal directions was used from each level of Unit F: all 9 pieces in level Fc, 946 pieces in level Fb1-Fb2, 42 pieces in level Fa3 and al 19 pieces in level Fa1-Fa2. Data are as follows.

Level Fc: on-axis – 66.6% and off-axis – 33.3%.
Level Fb1-Fb2: on-axis – 59.6% and off-axis – 40.4%.
Level Fa3: on-axis – 76.2% and off-axis – 23.8%.
Level Fa1-Fa2: on-axis – 31.6% and off-axis – 68.4%.
The data on three levels with small numbers of microblades are quite different from one another and only the large sample from level Fb1-Fb2 can serve as a source of objective information. These data show that "the on-axis" type is about 1.5 times more common than the "off-axis" type, which is not a very significant prevalence.

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
on-axis off-axis unidentifiable	1		6 3	6 / 60% 4 / 40%
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis off-axis unidentifiable	21 41 4	9 18 9	564 382 45	594 / 57.4% 441 / 42.6% 58
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis off-axis unidentifiable	1 1	3	32 10 2	32 / 69.6% 14 / 30.4% 3
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
on-axis off-axis unidentifiable	1		6 13	6 / 30% 14 / 70%
N	1	0	19	20

Table 36 - Siuren-I. Unit F. Microblade Axis as Percentages of Each Type.

General Profiles of Microblades. These data are based on separate analysis of all definable microblades and complete microblades taken separately.

Level Fc. All 9 microblades have the following general profile types: twisted – 88.8% and incurvate medial – 11.1%. On the other hand, all 6 complete microblades are twisted (100%).
Level Fb1-Fb2. There are 954 definable microblades with the following general profile types: twisted – 76.9%, incurvate medial – 13.3%, flat – 7.5%, incurvate distal – 1.5% and convex – 0.8%. For 265 complete microblades: 75.5% of twisted type, 14% of incurvate medial type, 7.9% of flat type, 1.5% of incurvate distal type and 1.1% of convex type.
Level Fa3. All 44 microblades have the following general profile types: twisted – 86.4%, incurvate medial and flat – 6.8% each. All 8 complete microblades are twisted (100%).
Level Fa1-Fa2. All 19 microblades have the following types of general profile: twisted – 89.4%, flat and incurvate medial – 5.3% each. All 5 complete microblades are twisted (100%).

The twisted type dominates over "regular" (flat, incurvate medial and incurvate distal) types of general profile. The percentage of twisted type fluctuates from 76.9% to 89.4% for all identifiable pieces in all four levels, and for level Fb1-Fb2 it remains practically the same (75.5%) for only complete items, while in the other three levels complete microblades are always twisted (100%). On the other hand, "regular" types are only in ranges 10.6 – 22.3% for all definable pieces in all four levels and 23.4% (about in 3 times lower than the twisted type) for only complete items in level Fb1-Fb2.

Profiles at Distal End. Data for these analyses are recorded on 7 definable microblades of level Fc, 438 definable microblades of level Fb1-Fb2, 14 definable microblades of level Fa3 and 9 definable microblades of level Fa1-Fa2. Data on the range of types are summarized below.

Level Fc: feathering – 57.1%, hinged – 28.6%, blunt – 14.3% (a single piece); Level Fb1-Fb2: feathering – 81.5%, blunt – 9.1%, hinged – 8.7%, overpassed – 0.7%; Level Fa3: feathering – 71.4%, blunt and hinged – 14.3% each; Level Fa1-Fa2: feathering – 88.8% and blunt – 11.1% (a single piece).

All four levels demonstrate the dominance of feathering distal ends for microblades. Real type structure is seen for the microblades of level Fb1-Fb2, where there is a great dominance of feathering type (81.5%) while "not regular" (hinged and overpassed) types together comprise only 9.4%.

Profiles at Midpoint. Data for the following analysis were based on all microblades from each level of Unit F. The detailed data on their type representations are given below.
Level Fc: triangular – 88.8% and trapezoidal – 11.1% (a single piece).
Level Fb1-Fb2: trapezoidal – 45.1%, triangular – 43.9%, multifaceted – 7.5% and lateral steep – 3.5%.
Level Fa3: trapezoidal – 52.4%, triangular – 29.5%, multifaceted – 13.6% and lateral steep – 4.5%.
Level Fa1-Fa2: trapezoidal – 47.4%, triangular – 42.1% and multifaceted – 10.5%.

Thus, only four types of profiles at midpoint were identified for microblades of Unit F where, aside from the poorest sample of level Fc, the trapezoidal type is dominant – 45.1-52.4% in levels Fb1-Fb2, Fa3 and Fa1-Fa2. Moreover, trapezoidal and multifaceted types together are common in these levels (52.6-66%). Aside from the very minor presence of lateral steep profiles at midpoint for microblades in levels Fb1-Fb2 and Fa3, all other microblades have triangular profiles at midpoint (29.5-43.9%).

Butt Types. This analysis is based on the following numbers of definable microblade butts from each level of Unit F: 6 from level Fc, 593 from level Fb1-Fb2, 27 from level Fa3 and 9 from level Fa1-Fa2. Their type representation is listed below.

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat				
incurvate medial			1	1 / 10%
incurvate distal				
convex				
twisted	1		8	9 / 90%
unidentifiable				
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat	2	4	72	78 / 7.4%
incurvate medial	3	5	127	135 / 12.8%
incurvate distal		1	14	15 / 1.4%
convex			8	8 / 0.8%
twisted	59	23	733	815 / 77.6%
unidentifiable	2	3	37	42
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat			3	3 / 6.1%
incurvate medial		1	3	4 / 8.2%
incurvate distal		1		1 / 2.0%
convex				
twisted	2	1	38	41 / 83.7%
unidentifiable				
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
flat			1	1 / 5%
incurvate medial			1	1 / 5%
incurvate distal				
convex				
twisted	1		17	18 / 90%
unidentifiable				
N	1	0	19	20

Table 37 - Siuren-I. Unit F. Microblade General Profiles as Percentages of Each Type.

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
feathering			4	4 / 57.1%
hinged			2	2 / 28.6%
overpassed				
blunt			1	1 / 14.3%
unidentifiable	1		2	3
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering	16	19	357	392 / 82.0%
hinged		4	38	42 / 8.8%
overpassed		1	3	4 / 0.8%
blunt			40	40 / 8.4%
unidentifiable	50	12	553	615
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering		2	10	12 / 75%
hinged			2	2 / 12.5%
overpassed				
blunt			2	2 / 12.5%
unidentifiable	2	1	30	33
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
feathering			8	8 / 88.8%
hinged				
overpassed				
blunt			1	1 / 11.1%
unidentifiable	1		10	11
N	1	0	19	20

Table 38 - Siuren-I. Unit F. Microblade Profiles at Distal End as Percentages of Each Type.

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat				
triangular			8	8 / 80%
trapezoidal	1		1	2 / 20%
multifaceted				
lateral steep				
crescent				
irregular				
unidentifiable				
N	1	0	9	10
Level Fb1-Fb2	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat				
triangular	26	16	435	477 / 43.7%
trapezoidal	34		447	481 / 44.0%
multifaceted	5		74	79 / 7.2%
lateral steep		20	35	55 / 5.1%
crescent				
irregular				
unidentifiable	1			1
N	66	36	991	1093
Level Fa3	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat				
triangular		2	13	15 / 30.6%
trapezoidal	2		23	25 / 51.1%
multifaceted			6	6 / 12.2%
lateral steep		1	2	3 / 6.1%
crescent				
irregular				
unidentifiable				
N	2	3	44	49
Level Fa1-Fa2	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
flat				
triangular			8	8 / 40%
trapezoidal	1		9	10 / 50%
multifaceted			2	2 / 10%
lateral steep				
crescent				
irregular				
unidentifiable				
N	1	0	19	20

Table 39 - Siuren-I. Unit F. Microblade Profiles at Midpoint as Percentages of Each Type.

Level Fc: linear – 66.6%, dihedral and crushed – 16.7% each (a single piece each).
Level Fb1-Fb2: linear – 47.4%, punctiform – 9.1%, plain – 3.2%, cortical – 0.2% (a single piece), dihedral – 2.4%, finely-faceted – 0.3% and crushed – 37.4%.
Level Fa3: linear – 40.8%, punctiform – 18.5%, plain – 11.1%, dihedral – 3.7% (a single piece) and crushed – 25.9%.
Level Fa1-Fa2: linear – 55.5%, punctiform – 11.1% (a single piece) and crushed – 33.3%.

The linear butt type is the most common for microblades in all four levels – 40.8-66.6%. The "plain-punctiform-linear" group of butt types is almost exclusive in levels Fc, Fa3 and Fa1-Fa2 excluding crushed butts and a single dihedral butt. This is also true for microblades of level Fb1-Fb2 as well, where the "plain-punctiform-linear" group of butt types makes up 59.7%, dihedral and finely-faceted types are represented by less than 3% together, a single cortical butt and a fair number of crushed butts (37.4%).

Lipping. The following numbers of microblade butts suitable for lipping identification were used in each level of Unit F: 5 in level Fc, 373 in level Fb1-Fb2, 20 in level Fa3 and 6 in level Fa1-Fa2. Their lipping characteristics are as follows.

Level Fc: semi-lipped – 60% and lipped – 40%; Level Fb1-Fb2: semi-lipped – 85.3%, lipped – 13.9% and not lipped – 0.8%; Level Fa3: semi-lipped – 85%, lipped – 10% and not lipped – 5% (a single piece); Level Fa1-Fa2: semi-lipped – 100%.

Thus, there is a common dominance of semi-lipped butts (60-100%), a subordinate position of lipped butts (10-13.9% in levels Fb1-Fb2 and Fa3) and an occasional presence of not lipped butts. The ratio of lipped to not lipped butts (17.3:1) in level Fb1-Fb2 firmly confirms the latter observation.

Butt Angle. The following numbers of microblades butts suitable for angle identification were used in each level of Unit F: 5 in level Fc, 371 in level Fb1-Fb2, 20 in level Fa3 and 6 in level

Level Fc	microblades-tools	microblade-CMP	microblade-debitage	Microblades Total
cortical				
plain				
punctiform				
linear	1		4	5 / 71.4%
dihedral			1	1 / 14.3%
crudly-faceted				
finely-faceted				
crushed			1	1 / 14.3%
missing			3	3
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical		1	1	2 / 0.3%
plain	1	2	19	22 / 3.3%
punctiform	3	9	54	66 / 10.0%
linear	31	4	281	316 / 47.9%
dihedral	1		14	15 / 2.3%
crudly-faceted				
finely-faceted			2	2 / 0.3%
crushed	8	7	222	237 / 35.9%
missing	22	13	398	433
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain		1	3	4 / 12.9%
punctiform		1	5	6 / 19.4%
linear	1		11	12 / 38.7%
dihedral			1	1 / 3.2%
crudly-faceted				
finely-faceted				
crushed		1	7	8 / 25.8%
missing	1		17	18
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
cortical				
plain	1			1 / 10%
punctiform			1	1 / 10%
linear			5	5 / 50%
dihedral				
crudly-faceted				
finely-faceted				
crushed			3	3 / 30%
missing			10	10
N	1	0	19	20

Table 40 - Siuren-I. Unit F. Microblade Butt Types as Percentages of Each Type.

Fa1-Fa2, with their characteristics given below.

Level Fc: semi-acute – 80% and acute – 20% (a sole piece).
Level Fb1-Fb2: semi-acute – 91.6%, acute – 5.4% and right – 3%.
Level Fa3: semi-acute – 75%, right – 15% and acute – 10%.
Level Fa1-Fa2: semi-acute – 100%.

There is a clear dominance of semi-acute angle (75-100%). Level Fb1-Fb2 shows a slight prevalence of acute angle over right angle (1.8:1) that, with the very high percentage of semi-acute angle (91.6%) in this level, evidences the occasional occurrence of both acute and right angles there.

Butt Abrasion. The following numbers of identifiable microblade butts for presence/absence of abrasion were used from the four levels of Unit F: 6 in level Fc, 587 in level Fb1-Fb2, 27 in level Fa3 and 8 in level Fa1-Fa2. Abrasion data are as follows.

Level Fc: present – 100%.
Level Fb1-Fb2: present – 96.3% and absent – 3.7%.
Level Fa3: present – 88.9% and absent – 11.1% (3 pieces).
Level Fa1-Fa2: present – 87.5% and absent – 12.5% (1 piece).

Nearly all microblade butts have abrasion (87.5-100% in four levels), especially observed in the high prevalence of butts with abrasion over butts with no abrasion in level Fb1-Fb2 in the following ratio – 25.7:1.

Metrics (Length, Width, Thickness) of Microblades. Detailed metric data are mainly based on the analysis of complete pieces (es-

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
lipped			2	2 / 33.3%
semi-lipped	1		3	4 / 66.7%
not lipped				
unidentifiable			4	4
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped	7		52	59 / 14.1%
semi-lipped	29	9	318	356 / 85.2%
not lipped			3	3 / 0.7%
unidentifiable	30	27	618	675
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped			2	2 / 8.7%
semi-lipped	1	2	17	20 / 87.0%
not lipped			1	1 / 4.3%
unidentifiable	1	1	24	26
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
lipped				
semi-lipped	1		6	7 / 100%
not lipped				
unidentifiable			13	13
N	1	0	19	20

Table 41 - Siuren-I. Unit F. Microblade Butt Lipping as Percentages of Each Type.

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
right				
semi-acute	1		4	5 / 83.3%
acute			1	1 / 16.7%
unidentifiable			4	
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right	1		11	12 / 2.9%
semi-acute	27	9	340	376 / 90.4%
acute	8		20	28 / 6.7%
unidentifiable	30	27	620	677
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right			3	3 / 13.0%
semi-acute	1	2	15	18 / 78.3%
acute			2	2 / 8.7%
unidentifiable	1	1	24	26
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
right				
semi-acute	1		6	7 / 100%
acute				
unidentifiable			13	13
N	1	0	19	20

Table 42 - Siuren-I. Unit F. Microblade Butt Angles as Percentages of Each Type.

pecially from level Fb1-Fb2) with some additional comparable data on broken microblades.

Length. These data are given separately for each level.

Level Fc. All 6 complete microblades have length more than 1.5 cm (100%) and one is even longer 3.0 cm – 3.6 cm. Mean length is 2.3 cm. All 3 broken microblades are in the interval 1.6-3.0 cm (100%) with the longest piece 2.6 cm.

Level Fb1-Fb2. There are 175 pieces/66.1% in metric interval 0.6-1.5 cm and 90 pieces/33.9% with length more than 1.5 cm among 265 complete microblades. There are only 3 pieces longer 3.0 cm (1.1%) with the longest 3.4 cm. Mean length is 1.4 cm.

Level Fc	microblades-tools	microblades-CMP	microblades-debitage	Microblades Total
present	1		6	7 / 100%
absent				
unidentifiable			3	3
N	1	0	9	10
Level Fb1-Fb2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present	44	7	565	616 / 95.2%
absent		9	22	31 / 4.8%
unidentifiable	22	20	404	446
N	66	36	991	1093
Level Fa3	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present	1	1	24	26 / 86.7%
absent		1	3	4 / 13.3%
unidentifiable	1	1	17	19
N	2	3	44	49
Level Fa1-Fa2	**microblades-tools**	**microblades-CMP**	**microblades-debitage**	**Microblades Total**
present	1		7	8 / 88.8%
absent			1	1 / 11.1%
qustionable				
unidentifiable			11	11
N	1	0	19	20

Table 43 - Siuren-I. Unit F. Microblade Butt Abrasion as Percentages of Each Type.

Broken microblades with length less than or equal to 1.5 cm account for 651 pieces/89.7% and only 75 pieces/10.3% have length more than 1.5 cm with the longest one 2.9 cm among all 726 broken microblades.

Level Fa3. There are 6 pieces/75% with length less than or equal to 1.5 cm and only 2 pieces/25% with length more than 1.5 cm with the longest piece 1.8 cm among all 8 complete microblades. Mean length is 1.4 cm. There are also 26 pieces/72.2% with length less than or equal to 1.5 cm and 10 pieces/27.8% with length more than 1.5 cm (the longest one 2.1 cm) among all 36 broken microblades.

Level Fa1-Fa2. Only 1 complete microblade is less than 1.5 cm in length (1.2 cm) that is 20%, while the other 4 complete microblades (80%) are longer than 1.5 cm with the longest piece 2.6 cm. Mean length is 2.1 cm. On the other hand, 8 broken pieces/57.1% have length less than or equal to 1.5 cm, while 6 other broken pieces/42.9% are longer than 1.5 cm with the longest item 1.8 cm.

Thas, taking into account the largest sample of 265 specimens from the level Fb1-Fb2 complete microblades, it is clear that "short" microblades dominate in Unit F.

Width. The following width distribution of complete microblades is observed: 0.6 cm – 5 pieces/83.3% in level Fc, 70 pieces/26.4% in level Fb1-Fb2, 4 pieces/50% in level Fa3 and 5 pieces/100% in level Fa1-Fa2; 0.5 cm – 1 piece/16.7% in level Fc, 80 pieces/30.2% in level Fb1-Fb2 and 2 pieces/25% in level Fa3; 0.4 cm – 67 pieces/25.3% in level Fb1-Fb2 and 2 pieces/25% in level Fa3; 0.3 cm – 48 pieces/18.1% in level Fb1-Fb2. Mean width for complete microblades are as follows: 0.6 cm for levels Fc and Fa1-fa2, 0.5 cm for levels Fb1-Fb2 and Fa3.

The width data for broken microblades are as follows: 0.6 cm – 2 pieces/66.6% in level Fc, 242 pieces/33.3% in level Fb1-Fb2, 12 pieces/33.3% in level Fa3 and 7 pieces/50% in level Fa1-Fa2; 0.5 cm – 1 piece/33.3% in level Fc, 187 pieces/25.8% in level Fb1-Fb2, 10 pieces/27.8% in level Fa3 and 3 pieces/21.4% in level Fa1-Fa2; 0.4 cm – 183 pieces/25.2% in level Fb1-Fb2, 12 pieces/33.3% in level Fa3 and 2 pieces/14.3% in level Fa1-Fa2; 0.3 cm – 106 pieces/14.6% in level Fb1-Fb2, 2 pieces/5.6% in level Fa3 and 1 piece/7.1% in level Fa1-Fa2; 0.2 cm – 8 pieces/1.1% in level Fb1-Fb2 and 1 piece/7.1% in level Fa1-Fa2. Mean width for broken microblades are the following: 0.6 cm for level Fc and 0.5 cm for levels Fb1-Fb2, Fa3 and Fa1-Fa2.

Overall, mean width for all microblades are comparable to means for broken microblades: 0.6 cm for level Fc and 0.5 cm for levels Fb1-Fb2, Fa3 and Fa1-Fa2. At the same time, it is worth noting the presence of a large number of microblades with width 0.2-0.4 cm – 412 pieces/41.5% in level Fb1-Fb2, 16 pieces/36.3% in level Fa3 and 4 pieces/21.1% in level Fa1-Fa2, where pieces with width of 0.3 cm comprise the following: – 154 pieces/15.5% in level Fb1-Fb2, 2 pieces/4.5% in level Fa3 and 1 piece/5.3% in level Fa1-Fa2 and even a minimal presence of pieces 0.2 cm wide is notable – 8 pieces/0.8% in level Fb1-Fb2 and 1 piece/5.3% in level Fa3.

Thus, although mean width of 0.6-0.5 cm shows the dominance of rather "wide" microblades, the presence of many "narrow" microblades should be kept in mind.

Thickness. Mean thickness subdivides the microblades of Unit F into two groups. One includes levels Fc and Fa1-Fa2 where mean thickness of 0.2 cm is the same for all microblade categories – complete, broken and all microblades together. On the other hand, microblades from levels Fb1-Fb2 and Fa3 (complete, broken and all together) have mean thickness of 0.1 cm. Microblades of each level have thickness in the following intervals: 0.1-0.3 cm – for levels Fc, Fa3 and Fa1-Fa2 and 0.1-0.4 cm for level Fb1-Fb2, although pieces with thickness 0.3-0.4 cm comprise only 2.9% in the latter level.

Microblades of Unit F are thus “feather-shaped” or “string-like”.

Butt Sizes. Mean width for microblade butts are as follows: 0.4 cm in level Fc (5 butts) and 0.3 cm in levels Fb1-Fb2 (317 butts), Fa3 (15 butts) and Fa1-Fa2 (5 butts). Mean microblade butt height is the same for all levels (0.1 cm), connected to the great predominance of linear butts among all butts appropriate for measurement. No plain butt is noted for microblades in levels Fc and Fa1-Fa2 as well. Plain butts have the following mean width – 0.3 cm in level Fb1-Fb2 (19 butts) and 0.4 cm in in level Fa3 (3 butts) and mean height of 0.2 cm for both levels.

In total, the microblades of the four levels of Unit F would be better summarized on the basis of the analysis of the level Fb1-Fb2 microblade sample and, accordingly, can be generally characterized by:
- an almost exclusive presence of unidirectional scar pattern (95.7%) and a very rare representation of unidirectional-crossed (4%) and bidirectional (0.3%) scar patterns;
- a presence of very few partially cortical pieces (3.1%);
- a great dominance of parallel and converging shape types (91.2%) with near-equal association of “on-axis” (59.6%) and “off-axis” (40.4%) removal directions;
- an absolute prevalence of twisted type (76.9-75.5%) over “regular” (flat, incurvate medial and incurvate distal) types (22.3-23.4%) of general profiles;
- a dominance of feathering distal ends (81.5%) and a minor presence of “not regular” (hinged and overpassed) types (9.4%);
- a dominance of trapezoidal type of profile at midpoint (45.1%), which in conjunction with multifaceted type, prevails as half of all pieces – 52.6%;
- a great dominance of the “plain-punctiform-linear” group of butt types (59.7% where linear type alone is 47.4%) with, at the same time, a poor representation of dihedral and finely-faceted butts (2.7%), occasional presence of a single cortical butt (0.2%) and a significant portion of crushed butts (37.4%);
- a great dominance of semi-lipped butts (85.3%) with semi-acute angle (91.6%), a subordinate position of lipped butts (13.9%) with acute (5.4%) and some semi-acute angles, and an occasional presence of not lipped butts (0.8%) with right angle (3%);
- a dominant presence of butt abrasion (96.3%);
- a dominance of “short” length (1.4 cm in mean), medium width (0.5 cm in mean, although pieces 0.4-0.2 cm wide are also numerous – 41.5%) and “feathering-like” thickness (0.1 cm in mean).

Some summarizing data on the debitage

A very short debitage summary is presented here (see also tabl. 3B-3C, 4-43). At the very general artifact category level, debitage samples from the four levels of Unit F show some surprising correlations with frequencies of debris in these levels (tabl. 1). The lowest debitage percentage is known for level Fb1-Fb2 (27.3%) but the level is also characterized by the highest representation of debris there (67.2%). On the other hand, level Fc shows the highest debitage index (57.2%) and the lowest debris level (28.6%). Accordingly, it is possible to use these data to consider flint exploitation patterns at the site during human occupations of the different archaeological levels in Unit F. At the same time, debitage of level Fb1-Fb2 comprises 84.9% of all Unit F debitage pieces (2217 items altogether) while none of the other three levels has a debitage percentage of more than 10%: 1.6% for level Fc, 8.7% for level Fa3 and 4.8% for level Fa1-Fa2. Level Fb1-Fb2 is thus the most characteristic one for discussion of debitage pieces. The internal debitage structure within this level (22.5% flakes, 5.9% blades, 19.0% bladelets, 52.6% microblades) shows the very dominant microblade production at the site, while bladelets are almost three times less represented, with a very poor blade occurrence in comparison to microblades: 0.11:1.0. The much lower numbers of debitage pieces for the other three levels with somewhat different internal structure again evidences differences in flint exploitation in the excavated areas. Another interesting debitage situation is shown by the different flint types used for the various debitage categories. Colored flints were more frequently used for bladelet and microblade production than for flakes and blades (see tabl. 49).

Tools

Data on tools are represented first by level and and then summarized together for the entire Unit F archaeological sequence to attempt to identify possible features in common and differences. There are 182 pieces with retouch and/or use-wear in all assemblages of the Unit F four levels (see tabl. 44-48).

Level Fc

Tools include only four specimens that are subdivided into three groups: 1) retouched pieces – 2 items/50%; 2) non-geometric microliths – 1 item/25%; 3) non-flint tools – 1 item/25%. No indicative Upper Paleolithic tool types or unidentifiable tool fragments, as well as waste from tool production and rejuvenation, were found in the lithic assemblage of level Fc.

Retouched pieces. These include 1 blade and 1 flake, both with marginal continuous retouch.

The retouched blade has lateral dorsal retouch. This is a complete non-cortical piece on gray flint, 4.1 cm long, 1.7 cm wide and 0.5 cm thick. Morphology: unidirectional scar pattern, expanding shape, “on-axis” removal direction, twisted general profile, hinged distal end, triangular profile at midpoint and plain (0.6 x 0.3 cm) butt (not lipped, right angle, with abrasion).

The retouched flake is a complete non-cortical piece on gray flint with distal dorsal retouch and the following dimensions: length – 1.7 cm, width – 2.1 cm (shortened, transversal proportions), thickness – 0.4 cm. Morphologically, it has an unidentifiable scar pattern, expanding shape, “on-axis” removal direction, incurvate distal general profile, feathering distal end, multifaceted profile at midpoint and crushed butt.

Non-geometric microliths. A single artifact belongs to the non-geometric microlith group. It is Dufour bladelet on microblade with inverse retouch on gray flint. The left edge of this piece has partial semi-abrupt marginal retouch. The microblade, as a blank, is a distal part (length – 1.9 cm) of an “on-axis” piece with twisted profile.

Groups & Types	Fa1-Fa2	Fa3	Fb1-Fb2	Fc	TOTAL	
	N	N	N	N	N	%
INDICATIVE UPPER PALEOLITHIC TOOL TYPES	**5** / *55.5%*	**5** / *29.4%*	**31** / *20.4%*		**41**	22.5%
END-SCRAPERS	*2*	*1*	*15*		*18*	*9.9%*
Simple flat		1	4		5	
Atypical			1		1	
Ogival			1		1	
Circular			1		1	
Carinated			2		2	
Thick shouldered	1		1		2	
Flat shouldered	1		1		2	
Fragments of flat end-scrapers' working fronts			4		4	
BURINS	*2*	*4*	*13*		*19*	*10.4%*
Dihedral symmetrical		1			1	
Dihedral asymmetrical		1	2		3	
Dihedral angle			2		2	
Double dihedral symmetrical			1		1	
Double dihedral asymmetrical		1			1	
Carinated	1	1	1		3	
Angle			2		2	
On oblique straight truncation			2		2	
On oblique concave truncation	1		1		2	
Transverse on lateral preparation			1		1	
Broken (unidentifiable)			1		1	
COMPOSITE TOOLS			*2*		*2*	*1.1%*
End-scraper simple / Burin dihedral asymmetrical			1		1	
End-scraper simple / Burin carinated (busquoid)			1		1	
TRUNCATIONS	*1*		*1*		*2*	*1.1%*
NON-GEOMETRIC MICROLITHS	**2** / *22.2%*	**2** / *11.8%*	**72** / *47.4%*	**1** / *25%*	**77**	42.3%
"NEUTRAL" TOOL TYPES			**3** / 2.0%		**3**	1.7%
NOTCHED PIECES			*2*		*2*	
DENTICULATED PIECES			*1*		*1*	
RETOUCHED PIECES (with marginal and/or irregular retouch)	**1** / *11.1%*	**6** / 35.3%	**36** / *23.7%*	**2** / *50%*	**45**	24.7%
UNIDENTIFIABLE TOOL FRAGMENTS	**1** / *11.1%*	**4** / *23.5%*	**9** / *5.9%*		**14**	7.7%
NON-FLINT TOOLS			**1** / *0.6%*	**1** / *25%*	**2**	1.1%
GRINDING TOOLS				*1*	*1*	*0.55%*
RETOUCHERS			*1*		*1*	*0.55%*
TOTAL	**9** / *100%*	**17** / *100%*	**152** / *100%*	**4** / *100%*	**182**	100.0%

Table 44 - Siuren-I. Unit F. Tools General Structure & Classification.

Non-flint tool. The non-flint tool is a small limestone cortical flake (length – 2.7 cm, width – 2.9 cm, thickness – 0.7 cm) with a series of long shallow striations on its natural pebble primary surface. This wear is typical of grinding tools during which use the tool was probably broken. Because of such breakage, this flake is part of the lithic assemblage of level Fc.

Level Fb1-Fb2

Tools include 152 specimens subdivided into five groups: 1) indicative tool types – 34 pieces/22.4%; 2) retouched pieces – 36 pieces/23.7%; 3) unidentifiable tool fragments – 9 pieces/5.9%; 4) non-geometric microliths – 72 pieces/47.4%; 5) non-flint tools – 1 piece/0.6%.

Indicative tool types. These tools include 15 end-scrapers, 13 burins, 2 composite tools, 1 truncation, 2 notched pieces and 1 denticulated piece.

End-scrapers are represented by 4 simple, 1 atypical, 1 ogival, 1 circular, 2 carinated, 1 thick shouldered, 1 flat shouldered specimens and 4 fragments of flat end-scraper working fronts. All are made on gray flint.

All 4 *simple end-scra*pers have convex working fronts located on the dorsal surface distal ends with the following retouch characteristics: 1 non-convergent sub-parallel semi-steep (fig. 3:1), 1 non-convergent scalar steep (fig. 3:4) and 2 convergent sub-parallel semi-steep (fig. 3:3 and fig. 3:2). All are on complete non-cortical blades (3) and 1 flake which as blanks have the following morphological features and metric parameters. The first simple end-scraper (fig. 3:1) is on a blade 4.2 cm long, 1.9 cm wide and 0.5 cm thick with unidirectional scar pattern, expanding shape, "off-axis" removal direction, twisted general profile, unidentifiable as retouched distal end, multifaceted profile at midpoint and linear (0.4 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion). The second simple end-

Groups & Types	Fa1-Fa2	Fa3	Fb1-Fb2	Fc	TOTAL
Pieces with flat and/or semi-abrupt retouch	**2 / 100%**	**2 / 100.0%**	**69 / 95.8%**	**1 / 100%**	**74 / 96.1%**
Dufour, *microblades with alternate retouch*	1		8		9
Dufour, *microblades with ventral retouch*			25	1	26
TOTAL:	1 / 50%		33 / 45.8%	1 / 100%	35 / 45.5%
Pseudo-Dufour, *bladelets with dorsal retouch*			3		3
Pseudo-Dufour, *microblades with dorsal retouch*		2	22		24
Pseudo-Dufour, *microblades with bilateral dorsal retouch*			6		6
TOTAL:		2 / 100%	31 / 43.1%		33 / 42.8%
Bladelets *with dorsal retouch at distal end*	1				1
Microblades *with lateral dorsal micro-notch*			1		1
Truncated Bladelets			3		3
Truncated Microblades			1		1
TOTAL:	1 / 50%		5 / 6. 9%		6 / 7.8%
Pieces with backed lateral retouch			**3 / 4.2%**		**3 / 3.9%**
Backed Microblades			3		3
TOTAL	**2**	**2**	**72**	**1**	**77**

Table 45 - Siuren-I. Unit F. Non-Geometric Microliths Classification.

		Dufour	Pseudo-Dufour	Backed Microblades	N	%
LEVEL Fa1-Fa2						
LEFT EDGE	MARGINAL					
	SCALAR	1			1	50%
	STEPPED					
RIGHT EDGE	MARGINAL					
	SCALAR	1			1	50%
	STEPPED					
TOTAL		2			2	100%
LEVEL Fa3						
LEFT EDGE	MARGINAL					
	SCALAR					
	STEPPED					
RIGHT EDGE	MARGINAL		2		2	100%
	SCALAR					
	STEPPED					
TOTAL			2		2	100%
LEVEL Fb1-Fb2						
LEFT EDGE	MARGINAL	6	4	1	11	13.4%
	SCALAR	3	4		7	8.5%
	STEPPED					
RIGHT EDGE	MARGINAL	22	16		38	46.4%
	SCALAR	8	11		19	23.2%
	STEPPED	3	1	3	7	8.5%
TOTAL		42	36	4	82	100%
LEVEL Fc						
LEFT EDGE	MARGINAL	1			1	100%
	SCALAR					
	STEPPED					
RIGHT EDGE	MARGINAL					
	SCALAR					
	STEPPED					
TOTAL		1			1	100%

Table 46 - Siuren-I. Unit F. Non-Geometric Microliths: Retouch Types.

		Dufour	Pseudo-Dufour	Backed Microblades	N	%
LEVEL Fa1-Fa2						
LEFT EDGE	FLAT	1			1	50%
	SEMI-ABRUPT					
	ABRUPT					
RIGHT EDGE	FLAT					
	SEMI-ABRUPT	1			1	50%
	ABRUPT					
TOTAL		2			2	100%
LEVEL Fa3						
LEFT EDGE	FLAT					
	SEMI-ABRUPT					
	ABRUPT					
RIGHT EDGE	FLAT					
	SEMI-ABRUPT		2		2	100%
	ABRUPT					
TOTAL			2		2	100%
LEVEL Fb1-Fb2						
LEFT EDGE	FLAT		3	1	4	4.9%
	SEMI-ABRUPT	7	5		12	14.6%
	ABRUPT	2			2	2.4%
RIGHT EDGE	FLAT	5	5		10	12.2%
	SEMI-ABRUPT	28	23		51	62.2%
	ABRUPT			3	3	3.7%
TOTAL		42	36	4	82	100%
LEVEL Fc						
LEFT EDGE	FLAT					
	SEMI-ABRUPT	1			1	100%
	ABRUPT					
RIGHT EDGE	FLAT					
	SEMI-ABRUPT					
	ABRUPT					
TOTAL		1			1	100%

Table 47 - Siuren-I. Unit F. Non-Geometric Microliths: Retouch Angles.

scraper (fig. 3:2) is on a primary crested blade 5.2 cm long, 1.7 cm wide and 1.5 cm thick with a bilateral central wholly crested ridge and irregular shape, "off-axis" removal direction, twisted general profile, unidentifiable as retouched distal end, triangular profile at midpoint and crushed butt. The third simple end-scraper (fig. 3:3) is on a truly secondary crested blade (no preserved crested ridge) with unidirectional scar pattern, parallel shape, "off-axis" removal direction, twisted general profile, unidentifiable as retouched distal end, triangular profile at midpoint, plain (0.5 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion) and is 4.0 cm long, 1.7 cm wide, 0.9 cm thick. The fourth simple end-scraper (fig. 3:4) is on a flake (length – 4.5 cm, width – 2.9 cm, thickness – 0.7 cm) with unidirectional scar pattern, expanding shape, "on-axis" removal direction, twisted general profile, unidentifiable as retouched distal end, trapezoidal profile at midpoint and crushed butt.

An *atypical end-scraper* is characterized by a weakly developed and partially broken convex working front, formed on a non-cortical complete blade's dorsal surface distal end by irregular partial steep retouch. The blade, as a blank, is characterized by unidirectional scar pattern, converging shape, "off-axis" removal direction, incurvate medial general profile, blunt distal end, multifaceted profile at midpoint and plain (1.3 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is 4.5 cm long, 2.0 cm wide and 1.0 cm thick.

An *ogival end-scraper* is on the tool's distal end (length – 2.1 cm, width – 2.2 cm, thickness – 1.2 cm) – an unidentifiable blank that only allows us to make its typological definition as ogival with non-convergent scalar steep retouch.

A *circular end-scraper* (fig. 3:5) is on a complete wholly cortical small flake (length – 3.0 cm, width – 2.5 cm, thickness – 1.3 cm) with a front formed by non-convergent scalar steep and partially thick (non-lamellar scars) retouch, encircling the entire perimeter of the flake. The flake, as a blank, is also characterized by ovoid shape, "off-axis" removal direction and flat general profile.

		Dufour	Pseudo-Dufour	Backed Microblades	N	%
LEVEL Fa1-Fa2						
LEFT EDGE	CONTINUOUS					
	DISCONTINUOUS					
	PARTIAL	1			1	50%
RIGHT EDGE	CONTINUOUS					
	DISCONTINUOUS					
	PARTIAL	1			1	50%
TOTAL		2			2	100%
LEVEL Fa3						
LEFT EDGE	CONTINUOUS					
	DISCONTINUOUS					
	PARTIAL					
RIGHT EDGE	CONTINUOUS		2		2	100%
	DISCONTINUOUS					
	PARTIAL					
TOTAL			2		2	100%
LEVEL Fb1-Fb2						
LEFT EDGE	CONTINUOUS	5	3	1	9	11.0%
	DISCONTINUOUS					
	PARTIAL	4	5		9	11.0%
RIGHT EDGE	CONTINUOUS	23	14	2	39	47.5%
	DISCONTINUOUS	1	2		3	3.7%
	PARTIAL	9	12	1	22	26.8%
TOTAL		42	36	4	82	100%
LEVEL Fc						
LEFT EDGE	CONTINUOUS					
	DISCONTINUOUS					
	PARTIAL	1			1	100%
RIGHT EDGE	CONTINUOUS					
	DISCONTINUOUS					
	PARTIAL					
TOTAL		1			1	100%

Table 48 - Siuren-I. Unit F. Non-Geometric Microliths: Retouch Features.

Two *carinated end-scrapers* are on complete partially cortical chunks. Both are similar. They are characterized by a rather limited width of generally convex fronts – 2.2 cm (fig. 3:6) and 3.2 cm (fig. 3: 7), formed by non-convergent sub-parallel lamellar retouch (microblade scars)with maximum length of only 1.8 and 1.9 cm. To one carinated end-scraper (fig. 3:6) were refitted a twisted bladelet and a twisted microblade with no retouch showing both the formation of carinated pieces and twisted bladelet/microblade production in this assemblage. The first carinated end-scraper (fig. 3:6) is 3.4 cm long, 2.1 cm wide and 2.0 cm thick. The second carinated end-scraper (fig. 3:7) is 4.6 cm long, 2.9 cm wide and 2.2 cm thick.

A *thick shouldered end-scraper* (fig. 3:8) is on a broken blade. The end-scraper's front is narrow (1.0 cm wide) with a one-sided notch giving it a clear shouldered shape – similar to offset core morphology in plane, located on the blade's dorsal surface distal end and formed by convergent sub-parallel lamellar retouch (very narrow 0.2 – 0.3 cm microblade scars with maximum length 1.6 cm). The blade, as a blank, is a partially cortical distal fragment with significant cortex on both lateral edges and with unidirectional scar pattern, irregular shape, "on-axis" removal direction, incurvate distal general profile, blunt distal end, flat profile at midpoint. It is also 6.3 cm long, 2.7 cm wide and 2.4 cm thick.

A *flat shouldered end-scraper* (fig. 3:9) is on a complete wholly cortical flake. The end-scraper's front is of ogival-like general shape but with an additional clear left notch, giving it a particular shouldered shape. It is located on the flake's dorsal surface proximal end, formed by non-convergent sub-parallel retouch. The flake, as a blank, is also characterized by ovoid shape, "on-axis" removal direction, flat general profile, feathering distal end, crescent profile at midpoint and unidentifiable as retouched butt. It is 3.8 cm long, 2.2 cm wide and 0.9 cm thick.

Four *fragments of flat end-scraper working fronts* are the products of either intentional repreparation or breakage of the end-scrapers during manufacture and/or use.

Level Fc							
	gray flints%	**brown flints%**	**colored flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces							
Core Maintenance Products	5 / 100%	0	0	0	5	7.9%	11.1%
Flakes	12 / 100%	0	0	0	12	19.1%	26.7%
Blades	7 / 100%	0	0	0	7	11.1%	15.6%
Bladelets	8 / 100%	0	0	0	8	12.7%	17.7%
Microblades	9 / 100%	0	0	0	9	14.3%	20.0%
Tools	3 / 75%	0	0	1 / 25%	4	6.3%	8.9%
Waste From Production & Rejuvenation of Tools	0	0	0	0	0		
Chips	10 / 100%	0	0	0	10	15.9%	
Uncharacteristic Debitage Pieces	8 / 100%	0	0	0	8	12.7%	
Chunks	0	0	0	0	0		
Heavily Burnt Pieces					0		
TOTAL	62 / 98.4%	0	0	1 / 1.6%	63	100.0	100.0
Level Fb1-Fb2							
	gray flints%	**brown flints%**	**colored flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	20 / 100%	0	0	0	20	0.3%	0.9%
Core Maintenance Products	153 / 97.5%	3 / 1.9%	1 / 0.6%	0	157	2.3%	6.9%
Flakes	412 / 97.4%	11 / 2.6%	0	0	423	6.1%	18.7%
Blades	111 / 100%	0	0	0	111	1.6%	5.0%
Bladelets	333 / 93.0%	1 / 0.3%	24 / 6.7%	0	358	5.2%	15.8%
Microblades	883 / 89.1%	5 / 0.5%	103 / 10.4%	0	991	14.4%	43.8%
Tools	143 / 94.2%	1 / 0.6%	7 / 4.6%	1 / 0.6%	152	2.2%	6.7%
Waste From Production & Rejuvenation of Tools	49 / 98%	0	1 / 2%	0	50	0.7%	2.2%
Chips	3767 / 96.9%	121 / 3.1%	0	0	3886	56.3%	
Uncharacteristic Debitage Pieces	177 / 96.2%	5 / 2.7%	2 / 1.1%	0	184	2.7%	
Chunks	17 / 85%	3 / 15%	0	0	20	0.3%	
Heavily Burnt Pieces					548	7.9%	
TOTAL	6065 / 95.4%	150 / 2.4%	138 / 2.2%	1 / 0.02%	6900	100.0	100.0
Level Fa3							
	gray flints%	**brown flints%**	**colored flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	2 / 100%	0	0	0	2	0.5%	0.8%
Core Maintenance Products	30 / 100%	0	0	0	30	7.4%	12.3%
Flakes	61 / 96.8%	0	2 / 3.2%	0	63	15.5%	25.8%
Blades	30 / 100%	0	0	0	30	7.4%	12.3%
Bladelets	52 / 94.6%	0	3 / 5.4%	0	55	13.5%	22.6%
Microblades	40 / 90.9%	0	4 / 9.1%	0	44	10.8%	18.0%
Tools	17 / 100%	0	0	0	17	4.2%	7.0%
Waste From Production & Rejuvenation of Tools	3 / 100%	0		0	3	0.7%	1.2%
Chips	122 / 95.3%	0	6 / 4.7%	0	128	31.4%	
Uncharacteristic Debitage Pieces	19 / 100%	0	0	0	19	4.7%	
Chunks	11 / 100%	0	0	0	11	2.7%	
Heavily Burnt Pieces					5	1.2%	
TOTAL	387 / 96.3%	0	15 / 3.7%	0	407	100.0	100.0
Level Fa1-Fa2							
	gray flints%	**brown flints%**	**colored flints%**	**limestones%**	**TOTAL #**	**%**	**esse %**
Core-Like Pieces	1 / 100%	0	0	0	1	0.5%	0.8%
Core Maintenance Products	13 / 100%	0	0	0	13	6.3%	9.9%
Flakes	41 / 97.6%	0	1 / 2.4%	0	42	20.5%	32.1%
Blades	12 / 92.3%	0	1 / 7.7%	0	13	6.3%	9.9%
Bladelets	32 / 100%	0	0	0	32	15.6%	24.4%
Microblades	17 / 89.5%	0	2 / 10.5%	0	19	9.3%	14.5%
Tools	9 / 100%	0	0	0	9	4.4%	6.9%
Waste From Production & Rejuvenation of Tools	2 / 100%	0	0	0	2	1.0%	1.5%
Chips	50 / 94.3%	0	3 / 5.7%	0	53	25.8%	
Uncharacteristic Debitage Pieces	17 / 100%	0	0	0	17	8.3%	
Chunks	1 / 100%	0	0	0	1	0.5%	
Heavily Burnt Pieces					3	1.5%	
TOTAL	195 / 96.5%	0	7 / 3.5%	0	205	100.0	100.0

Table 49 - Siuren-I. Unit F. Artifacts Totals by Raw Material Types as Percentages of Each Type.

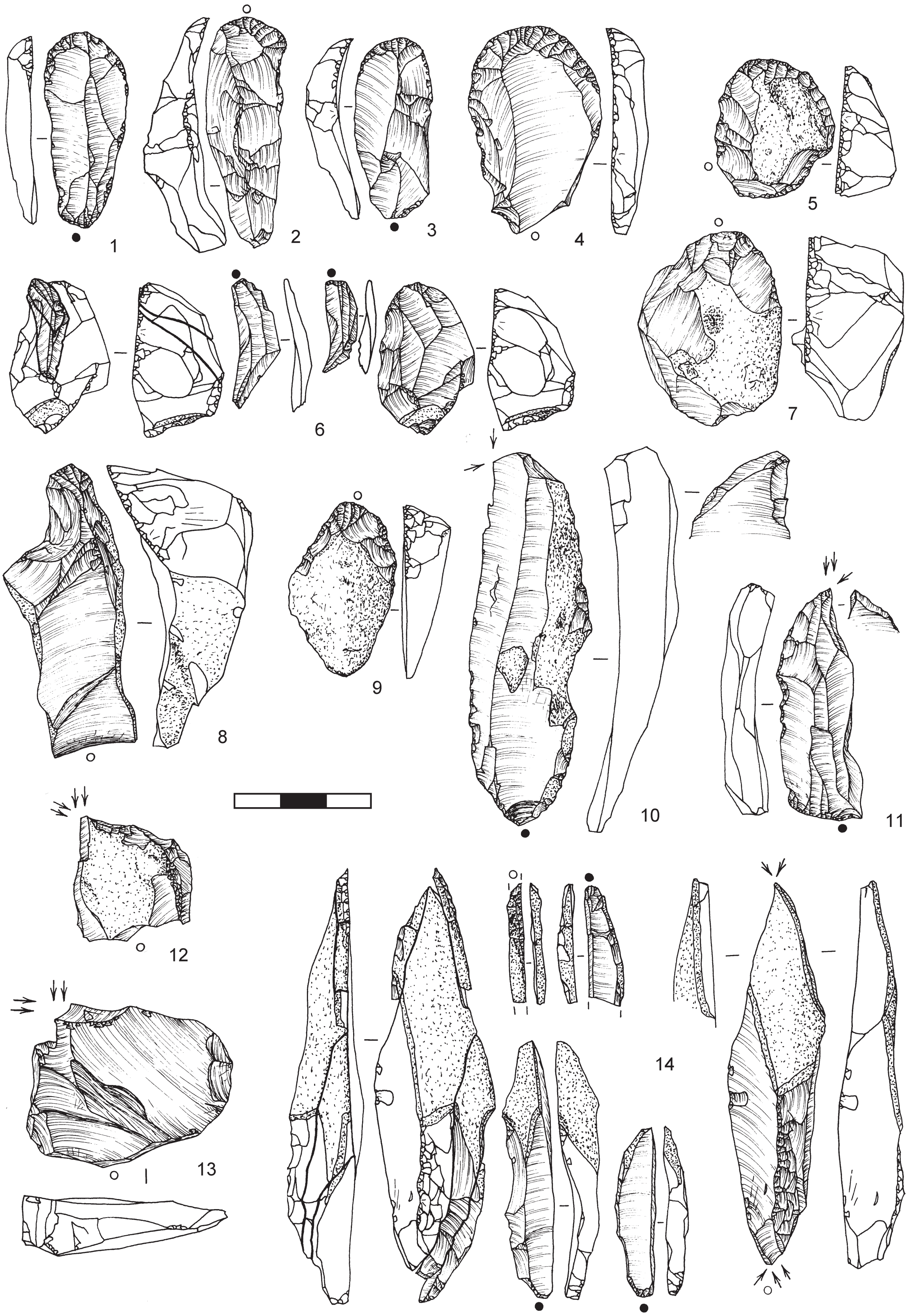

Figure 3 - Siuren I. Unit F, level Fb1-Fb2. Flint Artifacts – Tools. 1-4, simple flat end-scrapers; 5, circular end-scraper; 6, carinated end-scraper with refitted twisted bladelet and twisted microblade; 7, carinated end-scraper; 8, thick shouldered end-scraper; 9, flat shouldered end-scraper; 10-11, dihedral asymmetrical burins; 12-13, dihedral angle burins; 14, double dihedral symmetrical burin with 5 refitted burin spalls.

Burins include 2 dihedral asymmetric, 2 dihedral angle, 1 double dihedral symmetric, 1 carinated, 2 angle, 3 on truncation, 1 on lateral preparation and 1 broken specimens.

The two *dihedral asymmetric burins* (fig. 3:10-11) are made on complete blades of gray flint with some lateral/bilateral dorsal irregular retouch. Both pieces have burin terminations on the blades' distal ends and the asymmetric disposition of these burin terminations is connected to their formation by burin facets. The first blade (fig. 3:10), as a blank, is partially cortical with significant lateral cortex and unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, unidentifiable as having burin facets distal end, trapezoidal profile at midpoint and linear (0.4 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is 8.1 cm long, 2.6 cm wide and 1.1 cm thick. Additionally, the burin has reddish spots of ochre on both dorsal and ventral surfaces. The second blade (fig. 3:11), as a blank, is non-cortical with unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, unidentifiable as having burin facets distal end, multifaceted profile at midpoint and plain (1.3 x 0.5 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is 5.1 cm long, 1.7 cm wide and 0.8 cm thick.

Two *dihedral angle burins* (fig. 3:12-13) are made on broken flakes of gray flint. Their burin terminations are located on the distal ends formed by 2-3 transversal burin facets from which were then struck off 2-3 additional burin facets along one of the flakes' laterals edges. The first flake (fig. 3:12), as a blank, is a wholly cortical distal fragment with "on-axis" removal direction, blunt distal end, flat profile at midpoint and the following metrics: length – 2.8 cm, width – 2.7 cm and thickness – 1.3 cm. The second flake (fig. 3:13), as a blank, is a non-cortical distal fragment with incurvate medial general profile, hinged distal end and irregular profile at midpoint. It is 3.5 cm long, 4.4 cm wide and 1.2 cm thick.

A *double dihedral symmetric burin* (fig. 3:14) is on a complete blade of gray flint. Burin terminations are located on the two opposing proximal and distal blade ends. Each burin termination is symmetric, formed by only a single burin facet on each verge. So, this burin would appear to have had very simple and accurate secondary treatment. This is, however, not the case as there were refitted 5 burin spalls to 3 of 4 verges of this double dihedral burin, showing its "long reduction history and probable use". Moreover, only 2 of the 5 burin spalls morphologically correspond to characteristic "burin spall features" while 3 other burin spalls correspond well to morphological features of "regular" bladelets and microblades. This situation was already noted in Chapter # 9 ("Classification and attribute analysis system applied for Siuren I artifacts") as an example of the difficulty in distinguishing between burin spalls and "regular" bladelets and microblades, as well as problems understanding bladelet/microblade production in Unit F. Therefore, not only did carinated end-scrapers and burins *sensu lato* serve as "core-like sources" for bladelet/microblade primary reduction, but also some typologically "very regular burins" as well. The blade, as a blank, is a partially cortical secondary crested one (unilateral lateral partial crested ridge) with significant distal cortex and with "on-axis" removal direction, flat general profile and the following metrics: length – 8.5 cm, width – 1.9 cm and thickness – 1.3 cm.

A *carinated atypical burin* (fig. 4A:1) is made on an unidentifiable partially cortical flake of gray flint with insignificant distal cortex and the following metrics: length – 3.4 cm, width – 3.0 cm and thickness – 1.9 cm. A series of burin spalls (more than three) was struck off from a part of the natural acute surface (0.8 cm width) and, as this surface was not created by a burin facet, this carinated burin would be better considered as atypical.

The *first angle burin* (fig. 4A:2) is on a broken blade. The burin termination is on the blade's medial break from which a single narrow burin spall was struck off along ne lateral edge. The blade, as a blank, is a non-cortical distal fragment with unidirectional-crossed scar pattern, irregular shape, "off-axis" removal direction, incurvate medial general profile and triangular profile at midpoint. It is on gray flint, 4.5 cm long, 2.3 cm wide and 0.6 cm thick.

The *second angle burin* is on a complete blade. The burin termination is on the distal end of the blade from which two burin spalls were struck off along one lateral edge. The blade, as a blank, is partially cortical with significant lateral cortex and is morphologically characterized by unidirectional scar pattern, converging shape, "off-axis" removal direction, twisted general profile, unidentifiable as bearing burin facets distal end, trapezoidal profile at midpoint and crudely-faceted (1.5 x 0.7 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is on gray flint, 5.1 cm long, 1.5 cm wide and 0.7 cm thick.

Three burins on truncation are typologically subdivided into two examples on oblique straight truncation (fig. 4A:3) and the third on oblique concave truncation (fig. 4A:4). The first burin on oblique straight truncation is on a broken blade with the burin termination formed by irregular dorsal retouch on the proximal end (butt area), from which 2 plain burin facets were struck off - 1 on the dorsal surface and 1 on the ventral surface of the blade. The blade, as a blank, is morphologically an unidentifiable small non-cortical proximal fragment on gray flint with the following metrics: length – 2.1 cm, width – 1.4 cm and thickness – 0.8 cm. The second burin on oblique truncation (fig. 4A:3) is on a complete blade with irregular dorsal retouch on one lateral edge. The burin termination is on the blade's proximal end (butt area), formed by scalar steep retouch and 1 burin spall was struck off from it. The blade, as a blank, is partially cortical with insignificant lateral cortex and is morphologically characterized by unidirectional-crossed scar pattern, expanding shape, "off-axis" removal direction, twisted general profile, feathering distal end and irregular profile at midpoint. It is on brown flint, 4.1 cm long, 1.8 cm wide and 0.6 cm thick. The burin on oblique concave truncation (fig. 4A:4) is produced on a complete non-cortical flake of gray flint with bilateral dorsal stepped steep retouch. The burin termination is on the flake's dorsal end, formed by scalar semi-steep retouch, from which 2 burin spalls were detached along one of the flake's retouched lateral edges. The flake, as a blank, has unidirectional scar pattern, unidentifiable shape, axis removal and distal end because of heavy retouch modification, twisted general profile, multifaceted profile at midpoint and plain (1.5 x 0.6 cm) butt (semi-lipped, semi-

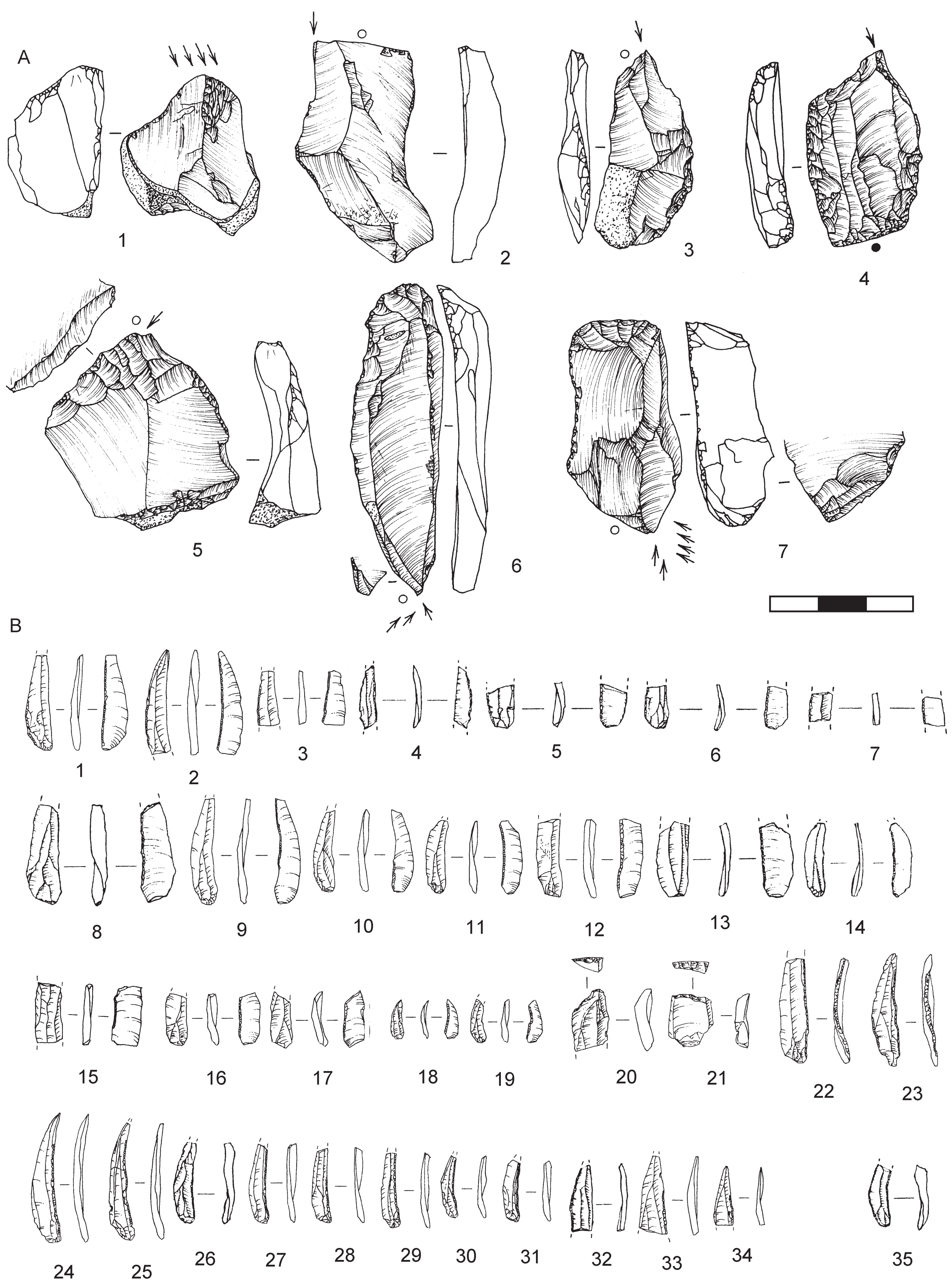

Figure 4 - Siuren I. Unit F, level Fb1-Fb2. Flint Artifacts – Tools. A: 1-7, Burins and Composite Tools. 1, carinated atypical burin; 2, angle burin; 3, burin on oblique straight truncation; 4, burin on oblique concave truncation; 5, burin on a lateral retouch; 6, simple end-scraper/dihedral asymmetrical burin; 7, simple end-scraper/carinated (busked) burin. B: 1-35, Non-Geometric Microliths. 1-7, Dufour type bladelets, on microblades with alternate retouch; 8-19, Dufour bladelets, on microblades with ventral retouch; 20-21, truncated bladelets; 22-23, backed microblades; 24-34, pseudo-Dufour type bladelets, on microblades with dorsal retouch; 35, pseudo-Dufour type bladelet, on microblade with bilateral dorsal retouch.

acute angle, with abrasion). It has the following metrics: length – 3.9 cm, width – 2.3 cm and thickness – 1.0 cm.

Burin on a lateral retouch (fig. 4A:5) is on a complete flake with a unique secondary treatment. The burin termination is on the flake's proximal end (butt area) bearing a burin facet struck off transversal to the axis of the flake from dorsal lateral concave preparation, formed by scalar steep retouch. Moreover, the burin facet's edge was additionally rather heavily retouched by scalar flat retouch on the flake's dorsal surface. The complex secondary treatment of this burin on lateral preparation could be explained as rejuvenation of an end-scraper by a "chamfer-like spall" with subsequent retouch modification that is observed on many "chamfered pieces" from levels XXV-XXII at Ksar Akil in Lebanon (Newcomer 1970:181, 186) and sometimes noted in European Upper Paleolithic contexts (see Otte 1979:153 for some Central European Gravettian assemblages with illustration of such a tool from Dolni Vestonice). The flake, as a blank, is partially cortical with insignificant distal cortex with only morphologically identifiable twisted general profile, blunt distal end and triangular profile at midpoint. It is on gray flint, 3.8 cm long, 3.4 cm wide and 1.5 cm thick.

A *broken burin* is made on a fragmented blade of gray flint with a clearly visible burin spall negative on one of its lateral edges, but absence of the burin termination makes its type identification impossible. The blade, as a blank, is a non-cortical medial fragment with unidirectional scar pattern and metrics: length – 3.6 cm, width – 1.9 cm and thickness – 0.7 cm.

Composite Tools. These include two end-scraper/burins. The first (fig. 4A:6) is a simple end-scraper/dihedral asymmetric burin on a complete blade. The end-scraper's working front is convex, formed on the blade's dorsal surface distal end by convergent sub-parallel semi-steep retouch. The burin termination is on the blade's proximal end, formed asymmetrically by 1 burin facet on each verge of the burin. The blade, as a blank, is non-cortical with only identifiable, because of its secondary treatment, unidirectional scar pattern, "off-axis" removal direction, twisted general profile and trapezoidal profile at midpoint. It is on gray flint, 6.5 cm long, 1.9 cm wide and 0.8 cm thick. The second composite tool (fig. 4A:7) is a simple end-scraper/carinated (busked) burin on a complete blade. The end-scraper's working front is convex, formed on the blade's dorsal surface distal end by convergent sub-parallel steep retouch. The burin termination is on the blade's proximal end and formed by 1 wide burin facet from which a series of burin spalls (more than 5) was then struck off oblique to the axis of the blade, making the burin's verge 1.0 cm wide. Moreover, the burin spall scars ended at a relatively poorly developed but nevertheless definite notch on the ventral surface of the blade, making its typological attribution not only carinated burin but busked as well. The blade, as a blank, is a truly secondary crested non-cortical one (no preserved crested ridge) with "on-axis" removal direction, flat general profile and irregular profile at midpoint. It is on gray flint, 4.6 cm long, 2.3 cm wide and 1.5 cm thick.

The *truncation* is oblique on a broken blade of gray flint. The truncated edge is formed by scalar dorsal retouch at the distal end of the blade. The blade, as a blank, is a non-cortical distal fragment with unidirectional scar pattern, "off-axis" removal direction, trapezoidal profile at midpoint and the following dimensions: length – 2.8 cm, width – 1.7 cm and thickness – 0.6 cm.

Notched Pieces. Both are lateral dorsal ones with a single notch each, formed by stepped steep retouch for one and scalar steep retouch for the other. The first piece, as a blank, is a partially cortical complete flake with insignificant proximal cortex and is characterized by unidirectional scar pattern, irregular shape, "on-axis" removal direction, incurvate distal general profile, overpassed distal end, multifaceted profile at midpoint and plain (2.9 x 0.4 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is on gray flint, 3.5 cm long, 4.7 cm wide (shortened, transversal proportions) and 1.3 cm thick. The second piece, as a blank, is a partially cortical complete flake with insignificant proximal and distal cortex and is characterized by unidirectional scar pattern, irregular shape, "off-axis" removal direction, twisted general profile, blunt distal end, irregular profile at midpoint and plain (1.8 x 0.5 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is on gray flint, 4.5 cm long, 3.2 cm wide and 0.7 cm thick.

The *Denticulated Piece* is a lateral straight one made on a complete flake of gray flint with alternate scalar flat retouch forming a rather light denticulated edge. The flake, as a blank, is non-cortical with dorsal-plain scar pattern, expanding shape, "on-axis" removal direction, convex general profile, hinged distal end, flat profile at midpoint, crushed butt and the following metrics: length – 2.7 cm, width – 3.8 cm (shortened, transversal proportions) and thickness – 0.9 cm.

Retouched Pieces. There are 21 retouched blades and 15 retouched flakes. Their further separate description will be done according to retouch characteristics and placement.

Retouched Blades are typologically subdivided into 15 items with marginal continuous, discontinuous and partial retouch, and 6 items with irregular partial retouch. Placement of these retouch types on the retouched blades is as follows: lateral dorsal – 14 pieces, lateral ventral – 1 piece, lateral and distal dorsal – 1 piece, bilateral dorsal – 3 pieces, bilateral ventral – 1 piece and bilateral alternate – 1 piece. Morphologically, all 21 retouched blades are characterized by the following features: 6 complete, 5 proximal, 5 medial and 5 distal; 20 non-cortical and 1 wholly cortical pieces; 1 cortical, 19 unidirectional and 1 unidentifiable scar patterns; 1 parallel, 5 converging, 2 irregular and 13 unidentifiable shapes; 3 "on-axis", 5 "off-axis" and 13 unidentifiable removal directions; 2 flat, 14 twisted and 5 unidentifiable general profiles; 6 feathering, 1 overpassed, 2 blunt and 12 unidentifiable distal ends; 4 triangular, 6 trapezoidal, 8 multifaceted, 1 crescent and 2 unidentifiable profiles at midpoint; 4 plain butts (4 semi-lipped, 4 semi-acute angles, 4 with abrasion) with dimensions in the following ranges: 0.9-0.3 x 0.8-0.2 cm, 3 punctiform butts (3 semi-lipped, 3 semi-acute angles, 2 with abrasion and 1 with no abrasion), 1 linear (0.8 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion), 3 crushed and 10 missing butts. All 21 retouched blades are on gray flint, including 4 burnt. Six complete blades have the following size ranges: length – 3.5-4.0 cm for 5 pieces and 8.1 cm for much longer sixth piece, width – 1.3-

1.6 cm and thickness – 0.2-0.5 cm. Fifteen broken blades have the following metric ranges: length – 1.7-3.9 cm, width – 1.2 -2.0 cm for 14 blades and 3.2 cm for one more exceptionally wide blade, thickness – 0.2-1.0 cm for 13 blades and more than 1.0 cm (1.1 and 1.2 cm) for two other blades.

Retouched Flakes are typologically characterized by 11 pieces with marginal continuous, discontinuous and partial retouch and 4 pieces with irregular partial retouch. Retouch type placement: lateral dorsal – 4 pieces, lateral ventral – 5 pieces, lateral alternating – 1 piece, distal dorsal – 4 pieces and distal ventral – 1 piece. Morphologically, all 15 retouched flakes are characterized by the following features: 13 complete, 1 medial and 1 longitudinally fragmented piece; 10 non-cortical and 5 partially cortical with only insignificant proximal (1), distal (1) and lateral (3) cortex; 2 dorsal-plain, 10 unidirectional, 2 bidirectional and 1 unidentifiable scar patterns; 2 parallel, 2 expanding, 1 ovoid, 8 irregular and 2 unidentifiable shapes; 1 "on-axis", 12 "off-axis" and 2 unidentifiable removal directions; 2 flat, 2 incurvate medial, 1 incurvate distal, 3 convex, 5 twisted and 2 unidentifiable general profiles; 10 feathering, 2 hinged and 3 unidentifiable distal ends; 2 flat, 5 trapezoidal, 4 multifaceted, 3 irregular and 1 unidentifiable profiles at midpoint; 2 plain butts (2 semi-lipped, 1 right and 1 semi-acute angles, 2 with abrasion) with the following sizes: 0.7-0.2 cm x 0.6 x 0.2 cm, 2 punctiform butts (2 semi-lipped, 2 semi-acute angles, 1 with abrasion and 1 with no abrasion), 3 linear butts (3 semi-lipped, 3 semi-acute angles, 2 with abrasion and 1 with no abrasion) having the following dimensions – 1.0-0.4 – 0.3 x 0.1 cm, 1 dihedral (0.9 x 0.2 cm) butt (semi-lipped, semi-acute angle, with abrasion), 1 butt with core tablet morphology, 5 crushed butts and 1 missing butt. All 15 retouched flakes are on gray flints including one of them burnt. Thirteen complete flakes have the following dimension ranges: length – 1.6-3.3 cm for 11 pieces and 4.9 cm and 6.4 cm for 2 more pieces; width – 1.4-3.2 cm for 12 pieces and 4.0 cm for one more piece (6 pieces have shortened, transversal proportions) and thickness – 0.2-0.7 cm. two broken flakes have the following metrics: length – 1.5 and 1.9 cm, width – 1.8 and 2.4 cm, thickness – 0.2 and 0.6 cm.

Unidentifiable Tool Fragments. There are 8 non-cortical pieces and a single piece with some cortex. In terms of raw material type, there are 8 pieces on gray flint, including 3 burnt, and one piece on colored flint, also burnt.

Non-geometric microliths. Non-geometric microliths of level Fb1-Fb2 are represented by 72 pieces, or 47.4 % of all tools. Non-geometric microliths are subdivided into: Dufour bladelet – 33 items (45.8 % of microliths); pseudo-Dufour bladelet – 31 items (43.1 %); microblade with micro-notch – 1 item (1.4 %); truncated pieces – 4 items (5.5 %); backed microblades – 3 items (4.2 %). While 6 microliths are on colored flints, the rest 66 microliths are on gray flints.

The *Dufour bladelet type, on microblades with alternate retouch* (fig. 4B:1-7) is represented by 8 pieces, or 11.1 % of non-geometric microliths. Microliths of this type have dorsal retouch on left edges and ventral retouch on right edges. Thirteen edges were made by continuous retouch. The other three edges were partially retouched. The majority of edges (14 items) have semi-abrupt retouch. The edges retouched by flat and abrupt retouch are represented each by a single item. The majority of edges (12 items) were produced by marginal retouch. Edges made by micro-scalar and stepped retouch are represented by 3 and 1 items. In sum, the continuous semi-abrupt marginal retouch combination is dominant – 9 edges. The other retouch combinations are represented by insignificant numbers of edges: continuous semi-abrupt stepped – 1; continuous semi-abrupt micro-scalar – 2; continuous abrupt marginal – 1; partial semi-abrupt marginal – 2; partial semi-abrupt micro-scalar – 1.

The *Dufour bladelet type, on microblades with ventral retouch* (fig. 4B:8-19) is represented by 25 pieces, or 34.7 % of non-geometric microliths. This is the most common type of non-geometric microlith. Fifteen are continuously retouched. Nine others are partially retouched and a single piece has discontinuous retouch. Also, 20 edges have semi-abrupt and 5 edges – flat retouched angles. Marginally retouched edges are clearly dominant – 16 of 25 edges, followed by edges with micro-scalar (7) and stepped (2) retouch. Overall, the most representative are continuous semi-abrupt marginal (8 edges) and partial semi-abrupt marginal (6 edges) combinations of retouch. The other retouch combinations are represented by a few edges each: continuous flat marginal – 1; continuous flat micro-scalar – 2; continuous semi-abrupt micro-scalar – 3; continuous semi-abrupt stepped – 2; discontinuous flat marginal – 1; partial flat micro-scalar – 2; and, partial semi-abrupt micro-scalar – 1.

The *Pseudo-Dufour bladelet type, on bladelets with lateral dorsal retouch* is composed of 3 pieces – 4.2 % of all non-geometric microliths. One has dorsal retouch on the left edge. The other two have dorsal retouch on the right edge. The left edge was produced by a partial flat micro-scalar retouch combination while the right edges were made by discontinuous semi-abrupt micro-scalar and partial flat micro-scalar combinations of retouch.

The *Pseudo-Dufour bladelet type, on microblades with dorsal retouch* (fig. 4B:24-34) is represented by 22 pieces, that is 30.5 % of non-geometric microliths. Two microblades have retouch on the left edge and 20 on the right edge. Continuously retouched edges comprise 13 items. Discontinuous and partial retouch were used for production of 1 and 8 edges. Flat retouch angles were defined for 3 edges; 19 other edges have semi-abrupt retouch angles. Marginally retouched edges comprise 14 items. Micro-scalar and stepped retouch were used for 7 and 1 edges. The majority of edges were produced by continuous semi-abrupt marginal (7) and continuous semi-abrupt micro-scalar (5) combinations of retouch. The other edges were made by the following retouch combinations: continuous flat marginal – 1; discontinuous semi-abrupt marginal – 1; partial flat marginal – 2; partial semi-abrupt marginal – 3; partial semi-abrupt micro-scalar – 2; partial semi-abrupt stepped – 1.

The *Pseudo-Dufour bladelet type, on microblades with bilateral dorsal retouch* (fig. 4B:35) is represented by 6 pieces, or 8.3 % of all non-geometric microliths. Six microliths have 12 retouched edges. Eight are partially retouched and four continuously retouched. Three edges have flat retouch angle and 9 edges are semi-abruptly retouched. Marginal (6) and micro-scalar (6) retouch are represented by the same number of edges. So, there are no clearly dominant combinations of retouch among microliths of this type: continuous flat marginal – 1 edge; continuous semi-abrupt marginal – 1; continuous semi-abrupt micro-scalar – 2; partial flat marginal – 2; partial semi-abrupt marginal –2; partial semi-abrupt micro-scalar – 4.

Microblades with micro-notch are represented by 1 piece (1.4 % of non-geometric microliths). The micro-notch is produced by flat micro-scalar retouch on the dorsal side of the right edge.

Truncated bladelets (fig. 4B:20-21) are represented by 3 pieces – 4.2% of non-geometric microliths. The distal ends of these bladelets are truncated by continuous abrupt micro-scalar retouch.

Truncated microblades are represented by 1 piece (1.4 % of non-geometric microliths). The distal end of this microblade has a continuous abrupt stepped truncation.

Backed microblades (fig. 4B:22-23) are represented by 3 pieces or 4.2 % of non-geometric microliths. Two have dorsal continuous abrupt stepped retouch on the right edge. The third piece has both right and left retouched edges, the right edge produced by partial abrupt stepped retouch and the left by partial flat marginal retouch.

Sixty-six microblades and only six bladelets were used for non-geometric microlith production. The majority of blanks – 43 pieces (64.2% of all identifiable microliths) were removed "off-axis". "On-axis" blanks are represented by 24 pieces (35.8%). Five other pieces are unidentifiable for "axis" removal direction. Blanks with twisted profiles comprise 63 pieces (90% of all identifiable microliths). The other types of profiles are not rare: flat – 2 pieces; incurvate medial – 5; unidentifiable – 2. The most specific feature of blanks selected for non-geometric microliths production is the combination of attributes "profiles of blanks" and "axis of removal direction". All "off-axis" blanks (43 pieces) have twisted profiles. That is, about 60% of all, including unidentifiable items, non-geometric microliths were made on "off-axis" twisted blanks.

Eleven non-geometric microliths are complete. The longest is a truncated bladelet – 2.9 cm. Among the other non-geometric microliths on microblades the longest item is a pseudo-Dufour bladelet with dorsal retouch – 2.7 cm. The following complete pieces include 2 pseudo-Dufour bladelet on microblades with bilateral dorsal retouch – 2.5 and 2.3 cm long; a pseudo-Dufour bladelet with dorsal retouch – 1.1 cm; a backed microblade – 2.4 cm; a microblade with micro-notch – 1.8 cm; a truncated microblade – 1.0 cm; and 3 Dufour bladelet on microblades with ventral retouch – 1.5, 1.2 and 0.8 cm long.

Sixty eight non-geometric microliths (excluding four truncated pieces) are represented by 83 retouched edges. Continuously (47) and partially (33) retouched edges comprise the majority of edges with secondary treatment. Three other edges are discontinuously retouched. Semi-abrupt retouch angles are clearly dominant. Flat and abrupt edges are represented by 16 and 4 items. Marginally retouched edges (50) prevail over micro-scalar (27) and stepped (6) retouched edges. In sum, the most representative combinations of retouch are: continuous semi-abrupt marginal – 25 edges; continuous semi-abrupt micro-scalar – 12 edges; and partial semi-abrupt marginal – 13 edges. The other retouch combination variants are represented by insufficient numbers of edges: continuous flat marginal – 3; continuous flat micro-scalar – 1; continuous flat stepped – 1; continuous semi-abrupt stepped – 2; continuous abrupt marginal – 1; continuous abrupt stepped – 2; discontinuous flat marginal – 1; discontinuous abrupt marginal – 1; discontinuous semi-abrupt micro-scalar – 1; partial flat marginal – 5; partial flat micro-scalar – 5; partial semi-abrupt micro-scalar – 8; partial semi-abrupt stepped – 1; and, partial abrupt stepped – 1.

Non-flint tools. The single non-flint item is a retoucher on a tuff-like limestone pebble which was partially reconstructed through conjoining of six fragments with the following overall dimensions: length – 8.2 cm, width – 2.8 cm and thickness – 1.9 cm. It is identifiable by the presence of short shallow striations (small battering-like traces) on both tips and one lateral surface. Additionally, the retoucher has some ochre reddish spots on its surface.

Level Fa3

Tools include 17 specimens with subdivision into the four following groups: 1) indicative tool types – 5 pieces/29.4%; 2) retouched pieces – 6 pieces/35.3%; 3) unidentifiable tool fragments – 4 pieces/23.5%; 4) non-geometric microliths – 2 pieces/11.8%. Non-flint tools were not identified in the lithic assemblage of level Fa3.

Indicative tool types. These tools are represented by 1 end-scraper and 4 burins.

The *End-scraper* is a simple one (fig. 5:1) on a complete non-cortical blade of gray flint, 4.1 cm long, 2.0 cm wide and 0.5 cm thick. The end-scraper's working front is convex, formed on the blade's dorsal surface distal end by non-convergent scalar steep retouch. The blade, as a blank, has a unidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, unidentifiable as retouched distal end, trapezoidal profile at midpoint and linear (0.5 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion).

Burins. There are 2 dihedral, 1 double dihedral and 1 carinated specimens made on gray flint.

The *first dihedral burin* is an asymmetric one on a fragment of an unidentifiable non-cortical blank with the following metrics: length – 3.1 cm, width – 1.6 cm and thickness – 1.1 cm. The burin termination is formed asymmetrically by only 1 burin facet on each burin's verge.

The *second dihedral burin* (fig. 5:2) is a symmetric one on a broken blade. The burin termination is on the blade's distal end and formed by only 1 very narrow burin facet on each burin's verge. The blade, as a blank, is a non-cortical distal fragment with unidirectional scar pattern, "on-axis" removal direction and triangular profile at midpoint, and the following metrics: length – 3.6 cm, width – 1.5 cm and thickness – 0.7 cm.

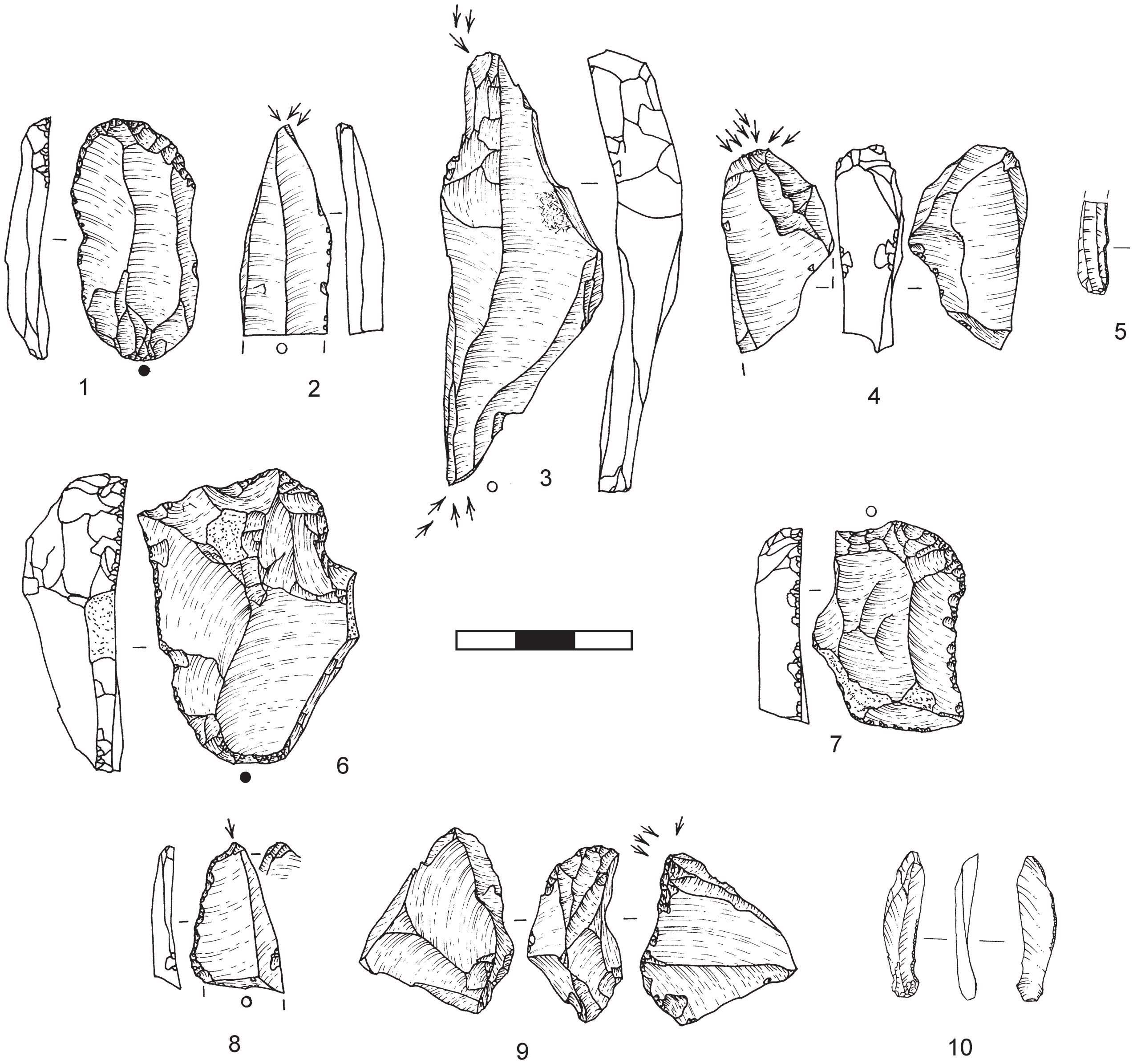

Figure 5 - Siuren I. Unit F, levels Fa3 and Fa1-Fa2. Flint Artifacts – Tools. 1, simple flat end-scraper (level Fa3); 2, dihedral symmetrical burin (level Fa3); 3, double dihedral asymmetrical burin (level Fa3); 4, carinated burin (level Fa3); 5, pseudo-Dufour type bladelet, on microblade with dorsal retouch (level Fa3); 6, thick shouldered end-scraper (level Fa1-Fa2); 7, flat shouldered end-scraper (level Fa1-Fa2); 8, burin on oblique concave truncation (level Fa1-Fa2); 9, carinated burin (level Fa1-Fa2); 10, Dufour type bladelet, on microblade with alternate retouch (level Fa1-Fa2).

The *double dihedral burin* is a double asymmetric one on a complete blade (fig. 5:3). The burin terminations are located on the two opposing proximal and distal ends. Each burin termination was formed by 2 burin facets on each of the 4 burin's verges. The blade, as a blank, is a complete non-cortical truly secondary crested one (no preserved crested ridge) with a limited number of identifiable morphological features because of intensive burin treatment – unidirectional scar pattern, twisted general profile and trapezoidal profile at midpoint. It is 7.4 cm long, 2.7 cm wide and 1.0 cm thick.

The *carinated burin* (fig. 5:4) is on a fragment of an unidentifiable non-cortical blank with the following dimensions: length – 3.5 cm, width – 1.8 cm and thickness – 1.2 cm. The burin termination is formed rather asymmetrically by a series of burin facets (no less than 5 with total maximum width of the verge of 0.9 cm) struck from another burin spall's negative detached along the burin's other verge. Both the burin's fragmentation and its heavy secondary treatment prevent identification of the original blank type used.

Retouched pieces. These items are represented by 1 blade with marginal partial retouch and 5 flakes with the following retouch types: 2 with marginal partial retouch and 3 with irregular continuous or partial retouch.

The *retouched blade* is a non-cortical distal fragment on gray flint (length – 1.4 cm, width – 2.0 cm, thickness – 0.5 cm) with distal dorsal retouch. Morphologically, it has an "off-axis" removal direction, feathering distal end and multifaceted profile at midpoint.

The *retouched flakes* are characterized by the following retouch: lateral dorsal – 1 piece, lateral ventral – 1 piece, distal dorsal – 2 pieces and distal ventral – 1 piece. Morphologically, these 5 retouched flakes are characterized by these features: all 5 complete; 3 non-cortical, 1 wholly cortical and 1 partially cortical with significant proximal cortex; 1 cortical, 1 lateral, 1 unidirectional, 1 unidirectional-crossed and 1 3-directional scar patterns; 2 expanding, 2 ovoid and 1 irregular shapes; 1 "on-axis" and 4 "off-axis" removal directions; 1 flat, 2 convex and 2 twisted general profiles; 3 feathering, 1 hinged and 1 unidentifiable distal ends; 1 flat, 1 triangular and 3 irregular profiles at midpoint; 2 plain (0.9 – 0.5 x 0.4 – 0.2 cm) butts (2 semi-lipped, 1 right and 1 acute angles; 2 with abrasion), 1 punctiform butt with no abrasion; 1 dihedral (1.6 x 0.4 cm) butt (semi-lipped, semi-acute angle, with no abrasion) and 1 crudely-faceted (1.8 x 0.5 cm) butt (semi-lipped, right angle, with no abrasion). All 5 retouched flakes are on gray flints. All 5 complete flakes have the following size ranges: length – 1.8-4.0 cm, width – 2.6-3.2 cm (3 pieces with shortened, transversal proportions) and thickness – 0.4-0.7 cm.

Unidentifiable tool fragments. These items are 3 non-cortical pieces and 1 more piece with some cortex on gray flint.

Non-geometric microliths. Two non-geometric microliths of only pseudo-Dufour type on gray flints were defined in artifact assemblage of this level.

Pseudo-Dufour bladelets on microblades with dorsal retouch (fig. 5:5) have secondary treatment on right edges. Both microblades were retouched by the same combination of retouch: continuous semi-abrupt marginal. The microblades, as blanks, are represented by proximal (length – 1.6 cm) and medial (length – 0.8 cm) fragments. Both have twisted general profile. The proximal fragment was removed "off-axis", while the medial one is too small to be identifiable for this attribute.

Level Fa1-Fa2

Tools are represented by 9 specimens that are subdivided into four groups: 1) indicative tool types – 5 pieces/55.5%; 2) retouched pieces – 1 piece/11.1%; 3) unidentifiable tool fragments – 1 piece/11.1%; 4) non-geometric microliths – 2 pieces/22.2%. Non-flint tools were not identified in the lithic assemblage of level Fa1-Fa2.

Indicative tool types. These tools include 2 end-scrapers, 2 burins and 1 truncation.

End-Scrapers. There are 1 thick shouldered and 1 flat shouldered specimens.

The *thick shouldered end-scraper* (fig. 5:6) is made on a complete and quite thick flake of gray flint. The end-scraper's front is convex and wide (4.0 cm) with a one-sided notch formed on the flake's dorsal surface distal end by non-convergent scalar steep non-lamellar retouch (chip scars). The flake, as a blank, is a partially cortical primary core tablet (a core striking platform remains on its butt area) with insignificant lateral and central cortex and the following size: length 5.0 cm, width 3.5 cm and thickness 1.8 cm.

The *flat shouldered end-scraper* (fig. 5:7) is made on a complete flake of gray flint. The end-scraper's front is convex with a one-sided notch produced on the flake's dorsal surface proximal end by non-convergent scalar steep retouch. The flake, as a blank, is partially cortical with insignificant distal cortex and has a unidirectional scar pattern, irregular shape, "on-axis" removal direction, incurvate medial general profile, blunt distal end, irregular profile at midpoint and unidentifiable as retouched butt. It is 3.6 cm long, 2.5 cm wide and 0.9 cm thick.

Burins. There are 1 on truncation and 1 carinated specimens.

The *gurin on truncation* (fig. 5:8) is an oblique concave one made on a broken blade of gray flint with lateral dorsal marginal ("micro-denticulated") continuous retouch. The burin termination is on the blade's distal end, has a single very narrow burin facet negative coming from the dorsal truncation, formed by light scalar steep retouch along the blade's unretouched lateral edge. The blade, as a blank, is a non-cortical distal fragment with unidirectional scar pattern and triangular profile at midpoint. It is 2.6 cm long, 1.5 cm wide and 0.4 cm thick.

The *carinated burin* (fig. 5:9) is on an unidentifiable non-cortical blank of gray flint. The burin termination is formed by a series of burin facets (no less than 5 with total maximum width of the verge of 1.0 cm) originating from the negative of a wide (1.0 cm) burin spall. It cannot be excluded, however, that this typologically carinated burin represents the final stage of a primary reduction of a bladelet core along one of its narrow edges and its exhausted state explains the unidentifiable character of the original blank used for its manufacture.

The *truncation* is a concave ventral one made on the proximal end of a broken blade of gray flint by scalar steep retouch. The blade, as a blank, is a non-cortical proximal fragment with unidirectional scar pattern, "off-axis" removal direction, twisted general profile, irregular profile at midpoint and dihedral (1.6 x 0.5 cm) butt (semi-lipped, right angle, with no abrasion). It is 3.6 cm long, 2.4 cm wide and 0.8 cm thick.

Retouched Piece. The single retouched piece is a complete non-cortical flake with irregular partial dorsal retouch at the distal end. The flake, as a blank, has unidirectional-crossed scar pattern, irregular shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end, triangular profile at midpoint, crushed butt and is also 3.3 cm long, 2.3 cm wide and 0.7 cm thick, made on gray flint.

Unidentifiable Tool Fragment. An unidentifiable tool fragment is a non-cortical piece on gray flint.

Non-geometric microliths. Non-geometric microliths are represented in this level by only two pieces on gray flint.

The *Dufour bladelet type, on microblade with alternate retouch* (fig. 5:10) includes a single piece. The left edge of the microblade is ventrally retouched by partial flat micro-scalar retouch while the right edge is dorsally treated by partial semi-abrupt micro-scalar retouch. This microblade is a proximal (2.6 cm long), "off-axis", twisted profile fragment.

Bladelets with dorsal retouch at distal end are also represented by a single item. The distal end of this microlith is treated by partial abrupt micro-scalar retouch. The bladelet, as a blank, is a complete 1.7 cm long piece, which was removed "off-axis" and has twisted profile.

Some summarizing data on the Unit F tool-kit

The summary is done in the same way as was done for the tools from Units H and G with, at the same time, an important comment on the complete absence of Middle Paleolithic tool types in Unit F assemblages.

There are no significant differences in flint type representation among the tool-kits between the four levels of Unit F. (tabl. 49). Gray flints dominate in all level – 100% for levels Fc, Fa3 and Fa1-Fa2 and 94.7% for level Fb1-Fb2. Some single brown and colored flints (5.3% altogether) among tools in level Fb1-Fb2 may be probably explained by more intensive habitation indices for the level, where flint exploitation was more "wide and deep" in use for level Fb1-Fb2, in comparison to the other three levels of Unit F.

By tool groups, Unit F tools taken together can be characterized as follows in terms of blank types. Indicative Tool Types (44 specimens) with 18 end-scrapers, 19 burins, 2 composite tools, 2 truncations, 3 notched and denticulated pieces show the following tendencies for the blanks in each tool class.

End-scraper types show a rather consistent situation with their blanks. Four of 5 simple end-scrapers and one atypical end-scraper are on blades and the fifth simple end-scraper is on a flake. One circular and both flat shouldered end-scrapers are on flakes, while one of two thick shouldered end-scrapers is on blade and another on a flake. The two carinated end-scrapers are on chunks. Finally, the single ogival end-scraper and all 4 fragments of flat end-scrapers' working fronts are unidentifiable in blank type. Accordingly, we see a diversity in blank types for 13 identifiable end-scrapers: 6 blades (46.1%), 5 flakes (38.5%) and 2 chunks (15.4%).

Burins also have a diversified blank type structure. On one hand, the most common types, with some prevalence of blades, also include flake blanks: 8 dihedral burins with 5 blades, 2 flakes and 1 unidentifiable blank; 5 burins on truncation/lateral preparation with 3 blades and 2 flakes. On the other hand, both angle burins are on blades and of the 3 carinated burins, the only identifiable blank is a flake. Finally, the single broken, typologically unidentifiable burin is on a blade as well. In total, there are twice as many blade blanks (11 items/68.75%) over flake blanks (5 items/31.25%) for all identifiable 16 burins.

Both composite tools (a simple end-scraper/dihedral asymmetric burin and a simple end-scraper/carinated (busked) burin) are on blades. The latter composite piece with a carinated burin is notable as no other carinated burin was made on a blade. Also, both truncations were made on blades, while all 3 notched and denticulated pieces are on flakes.

Summing up all blank data for identifiable Indicative Tool Types (35 specimens), we see the basic dominance of blades (21 items/60.0%), about a third flakes (12 items/34.3%) and a few chunks (2 items/5.7%). But noting the restriction of chunks to only carinated end-scrapers and production of 3 notched and denticulated pieces on only flakes, it is possible to state indeed the great prevalence of blade blanks over other blanks for Indicative Upper Paleolithic Tool Types. Adding blank data for Retouched Pieces (45 specimens) and Non-Geometric Microliths (77 specimens) to Indicative Tool types, we also obtain the following general tool blank data for Unit F tool-kits with a total number of 157 items. There are 44 blades (28.0%), 34 flakes (21.7%), 2 chunks (1.3%), 7 bladelets (4.4%) and 70 microblades (44.6%). At the same time, taking only 121 tool blanks with blady metric proportions, we obtain the following results: 36.4% blades, 5.8% bladelets and 57.8% microblades with the two latter categories together, as bladelets *sensu lato*, reaching 63.6%. Accordingly, these data on tool blanks allow us to propose the great role of bladelet *sensu lato* production and use by Siuren I Unit F Aurignacian groups with some certain differences in comparison to those characteristic of the Units H and G assemblages. Also, different blank selection rates should be considered: 34 possible flake-tools of all 632 flakes (5.4% of selection), 44 blade-tools of all 471 blades (16.9% of selection), 7 bladelet-tools of all 510 bladelets (1.4% of selection) and 70 microblade-tools of all 1172 microblades (6.0% of selection).

Finally, the fact that nearly 90% of all lithic artifacts of Unit F were recovered from level Fb1-Fb2 deserves special attention and consideration, although by basic artifact categories and tool types, all four levels of Unit F show very similar structures.

Waste from Production and Rejuvenation of Tools

Level Fb1-Fb2

This artifact category consists of 3 piece groups: burin spalls – 47 specimens; retouch chips – 2 specimens and "chamfer-like spalls" – 1 specimen.

Burin Spalls. Aside from one piece on colored flint, all the other 46 burin spalls are on gray flint, including 4 burnt. The description of burin spalls will be done separately for 42 burin spalls, none of which were refitted to any burins, and for 5 other burin spalls which were refitted onto the double dihedral symmetric burin (fig. 3:14).

The 42 unrefitted burin spalls are subdivided into 20 complete and 22 fragmented specimens.

The complete burin spalls include 14 primary and 6 secondary pieces. Eleven complete primary burin spalls are simple unretouched ones. Five have crushed butts and 4 others have punctiform butts. Burin types from which these 9 complete primary simple unretouched burin spalls were detached are unknown. They have the following general profiles – 7 twisted, 2 incurvate medial and 2 convex, as well as the following dimension ranges: length – 1.1-2.0 cm, width – 0.1-0.4 cm, thickness – 0.1-0.4 cm. One complete primary simple unretouched burin spall has a finely-faceted butt (detached from a burin on truncation), twisted general profile and is 0.9 cm long, 0.2 cm wide and thick. The final complete primary simple unretouched burin spall has a plain butt (probably originating from an angle burin), twisted general profile, length in 2.0 cm, width in 0.4 cm and thickness in 0.9 cm. Two more complete primary burin spalls have fine partial lateral retouch at its ridge. One has a punctiform butt (unclear burin type origin), twisted general profile and the following metrics: length – 1.0 cm, width and thickness – 0.2 cm. The second burin spall has a kind of linear butt that in reality is a breakage of the distal end of a blank from which this burin spall was struck off (fig. 6:1). Accordingly, it is certain that the burin spall came from an angle burin. It also has twisted general profile, length – 2.3 cm, width – 0.2 cm and thickness – 0.5 cm. The final complete primary burin spall (length – 3.9 cm, width – 1.0 cm, thickness – 1.2 cm) has lateral scalar/denticulated retouch at its ridge (evidence of its detachment during burin manufacture from a heavily retouched blank's lateral edge) and twisted general profile.

All 6 complete secondary burin spalls have negatives of previously struck off burin spalls and one also has lateral scalar partial retouch at its distal ridge. Five of these complete secondary burin spalls are characterized by unknown burin type origin (2 with crushed and 3 with punctiform butts), 3 twisted and 2 incurvate medial general profiles and the following metric ranges: length – 1.2-2.3 cm, width – 0.2-1.0 cm, thickness – 0.3-1.2 cm. Another complete secondary burin spall is characterized by specific butt and distal end treatment and, therefore, deserves special attention (fig. 6:2). This piece has a longitudinal facet on its generally plain butt from which 3 very short hinged burin spalls were detached along a burin's verge. So, this treatment shows that the burin spall under consideration was detached from a dihedral angle burin during continuous rejuvenation. Moreover, the burin spall's distal end has remains of a burin's truncation with light scalar steep retouch from which was struck off a short and long burin spall opposite three hinged ones from a dihedral angle burin termination. Thus, this particular burin spall gives us an opportunity to see evidence of a double dihedral angle + on truncation burin's secondary treatment at the site, when the edge of the truncated termination of the burin was removed as well during the dihedral angle termination's rejuvenation. This complete secondary burin spall also has an incurvate medial general profile and it is 6.7 cm long, 0.6 cm wide and 1.2 cm thick.

Twenty-two broken burin spalls are subdivided into 15 primary and 7 secondary pieces. Fifteen broken primary burin spalls are represented by 10 distal fragments, 3 medial fragments and 2 proximal fragments. 13 items with missing butts (the distal and medial fragments) are of unknown burin type origin, as well as another piece with punctiform butt. The proximal fragment with plain butt was probably detached from an angle burin. All 15 broken primary burin spalls are also subdivided into simple unretouched ones (8 specimens) and with lateral retouch at their ridge (7 specimens). They have the following general profiles: 1 flat, 3 incurvate medial, 1 incurvate distal, 2 convex, 6 twisted and 2 unidentifiable types. Their dimension ranges are as follows: length – 0.7-2.7 cm, width – 0.1-0.6 cm and thickness – 0.2-1.0 cm. Seven broken secondary burin spalls are represented by 5 proximal and 2 medial fragments. Five proximal fragments have 3 crushed butts (unknown burin type origin), 1 plain butt and 1 crudely-faceted butt, and the two latter pieces, aside from negatives of previously removed burin facet typical for secondary spalls, have some lateral partial retouch at the ridge. These 5 proximal fragments of secondary burin spalls are also characterized by 1 flat, 1 incurvate medial, 2 twisted and 1 unidentifiable general profiles, and the following metric ranges: length – 1.7-2.6 cm, width – 0.4-0.8 cm, thickness – 0.5-1.5 cm. It is worth noting in a more detailed way the crudely-faceted butt on the proximal fragment of one of these five secondary burin spalls (fig. 6:3). This butt shows 4 small negatives of facets struck off longitudinally to the butt orientation. The butt's treatment, along with no less than 2 hinged facet scars at the edge of the burin spall (the lateral verge of a burin), allows us to interpret the burin spall as one that was removed during radical rejuvenation of a carinated burin with a number of burin facets.

Now let us describe the arrangement, removal order, morphology and metrics of the five refitted burin spalls which were struck from the double dihedral symmetric burin (fig. 3:14). First, the burin should be oriented in accordance with its proximal and distal ends' disposition. Two complete burin spalls (removed one after another) were refitted onto a single negative of the verge that goes from the burin termination at the proximal end. No burin spall was refitted, however, onto another verge of this burin termination with two facet scars, because of the very short length of these scars. The two refitted burin spalls have the following particular features which morphologically exclude them strictly typologically from traditionally recognized burin spalls. The first has a punctiform butt with abrasion, incurvate medial general profile, 3.7 cm long, 0.9 cm wide and 0.4 cm thick. The second piece looks exactly like a core tablet on bladelet with core-like striking platform remains on its butt area and it also has incurvate medial general profile and the following metrics: length – 5.6 cm, width – 1.1 cm and thickness – 0.8 cm. Thus, morphologically, the first piece is a typical "regular" bladelet and the second piece is a core tablet. Unfortunately, at least one more burin spall struck off before the first of these two refitted spalls was not found and refitted to show the initial stage of this burin verge's manufacture/reduction. But this is the case for another burin termination (at the distal end) where onto a single negative of one verge were successively refitted both burin spalls. The first is a proximal fragment of a morphologically truly primary burin spall with lateral fine partial retouch at its ridge, punctiform butt (no abrasion), unidentifiable as fragmented general profile, 1.5 cm long, 0.3 cm wide and 0.5 cm thick. This piece fits onto the second and final burin spall removal from this burin's verge which morphologically is an exact copy of the first of the two burin spalls discussed above –punctiform butt with abrasion and incurvate medial general profile, 2.7 cm long, 0.7 cm wide and 0.3 cm thick. It should also be noted that this is the proximal part of the burin spall conjoined from proximal and medial fragments. Another burin spall was also refitted onto another verge of the second burin termination. This is a proximal part (conjoined from proximal and medial fragments) of a truly primary burin spall with lateral fine partial retouch at its ridge, crushed butt, flat general profile and the following metrics: length – 2.6 cm, width and thickness – 0.3 cm each. It is worth noting that this burin spall is the only spall struck from this verge. The arrangement of these three refitted burin spalls on the second burin termination shows that the last described burin spall was struck

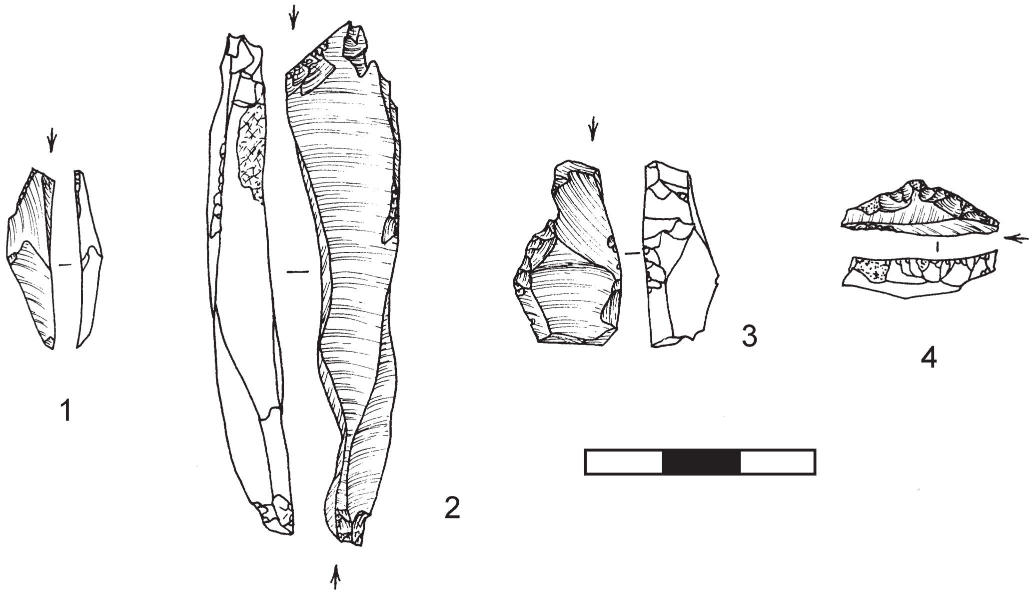

Figure 6 - Siuren I. Unit F, level Fb1-Fb2. Flint Artifacts – Tool Waste. 1, complete primary burin spall from an angle burin; 2, complete secondary burin spall from a mixed burin – double dihedral angle and on truncation; 3, proximal fragment of a secondary burin spall from a carinated burin; 4, "chamfer-like spall".

first and only then the two other burin spalls detached from the another verge.

Thus, a "summa summarum" of the burin spalls' arrangement and order of refitting for the double dihedral symmetric burin can be made as follows. First, according to both negatives of all burin spalls (including two missing in refitting for the first burin termination at the proximal end) and the arrangement and order of the refitted burin spalls, at least 8 burin spalls in total were struck off from 4 burin's verges instead of only 5 detached spalls, which would take into account only the negatives on the burin's verges. Second, the initial manufacture of all burin's verges took place with the same technology – by removing primary spalls with lateral fine retouch at their ridges (so-called "micro-crested" bladelets and microblades), whose butts (crushed and punctiform) do not show any visible indications of their detachment from a dihedral burin. Third, further manufacture became a kind of bladelet production with application of technological reception as butt abrasion and core tablet technique. Accordingly, this second stage of burin manufacture produces morphologically and metrically (width is always bigger than thickness) not burin spalls but rather both "regular" bladelets *sensu lato* and core tablets. So, this refitted block (the burin itself and its burin spalls) gives us an opportunity to conclude that unrefitted burin spalls morphologically identified by us are limited to supposedly almost all primary items and to just part of only very evident secondary items, when some of the latter specimens are placed in the category of "regular" bladelets/microblades and core tablets on bladelets. This is really true for our real classification of level Fb1-Fb2 unrefitted burin spalls: 29 primary and 13 secondary spalls. If we do not focus a "very strong morphological eye" at secondary burin spalls, another much more complicated danger appears – no morphological "borders" between "regular" bladelets/microblades and secondary burin spalls and many "regular" bladelets/microblades would be placed into the category of burin spalls. The latter possibility would make the structure of small debitage different and with no good typological grounds, especially when we keep in mind the intensive production of bladelets/microblades from mainly carinated pieces (cores, end-scrapers and burins).

Retouch Chips. These two pieces are non-cortical complete ones on gray flint. They have plain butts with lipping, acute angle and intensive abrasion. Taking into consideration their morphology and tools' structure of level Fb1-Fb2, it is probable that they-retouch chips originated from secondary retreatment of end-scrapers.

"Chamfer-like Spall". This piece represents the tip of an end-scraper's working front with scalar steep retouch removed by a transversal "chamfer-like" blow during rejuvenation of an end-scraper's front (fig. 6:4). The quite unusual rejuvenation by-product seems not to be an occasional piece as we have already observed a similar "chamfer-like" rejuvenation method for the burin on lateral preparation in level Fb1-Fb2 (fig. 4A:5). The spall is on gray flint, 2.0 cm long, 0.5 cm wide and 0.7 cm thick.

Level Fa3

This artifact category consists of only burin spalls – 3 specimens.

Burin Spalls. There are 2 complete and 1 broken pieces on gray flint. Both complete items are primary simple unretouched ones with twisted general profiles. One has a finely-faceted butt that may indicate its detachment from a burin on truncation/lateral retouch, and with the following metrics: length – 3.0 cm, width – 0.8 cm and thickness – 0.9 cm. The second complete burin spall (length – 2.9 cm, width – 1.2 cm, thickness – 0.3 cm) has a plain butt suggesting an origin from an angle burin. The broken burin spall (distal fragment) is a secondary one with a previously removed burin spall scar, has no butt and thus unclear burin type origin, twisted general profile and the following dimensions: length – 3.3 cm, width – 1.1 cm and thickness – 2.8 cm.

Level Fa1-Fa2

Only 2 burin spalls are identified for the artifact category in this level.

Burin spalls. Both burin spalls are complete ones on gray flint. The first is a primary one (length – 1.9 cm, width – 0.5 cm, thickness – 0.6 cm) with lateral scalar steep retouch, removing a blank's retouched edge during burin manufacture, with a punctiform butt (unclear burin type origin) and incurvate medial general profile. The second burin spall is a secondary one both with three burin spalls' negatives and some retouch at its distal ridge. It has a crushed butt (unclear burin type origin), twisted general profile and the following dimensions: length – 3.5 cm, width – 0.6 cm and thickness – 0.7 cm.

Debris

Chips, uncharacteristic debitage pieces and chunks are only analyzed through presence/absence of cortex and raw material types, whereas heavily burnt pieces are only counted.

Chips

This artifact category is represented as follows in each level of Unit F:

- 10 pieces in level Fc;
- 3886 pieces in level Fb1-Fb2;
- 128 pieces in level Fa3;
- 53 pieces in level Fa1-Fa2.

The following numbers of chips have some cortex:

- 2 pieces (20%) in level Fc;
- 276 pieces (7.1%) in level Fb1-Fb2;
- 11 pieces (8.6%) in level Fa3;
- 5 pieces (9.4%) in level Fa1-Fa2.

Raw material types for chips are as follows.

Gray flints:
- all 10 pieces (100%), 2 (20%) of which have some cortex in level Fc;
- 3767 pieces (96.9%), 274 (7.3%) of which have some cortex in level Fb1-Fb2;
- 122 pieces (95.3%), 9 of them (7.4%) of which have some cortex in level Fa3;
- 50 pieces (94.3%), 5 of them (10%) of which have some cortex in level Fa1-Fa2.

Brown flints occurred only in level Fb1-Fb2:
- 121 pieces (3.1%), 2 (1.7%) of which have some cortex.

Colored flints are noted in levels Fa3 and Fa1-Fa2:
- 6 pieces (4.7%), 2 (33.3%) of which have some cortex in level Fa3;
- 3 pieces (5.7%), none with cortex in level Fa1-Fa2.

Uncharacteristic Debitage Pieces

These pieces are represented as follows in each level of Unit F:

- 8 pieces (all on gray flint) in level Fc;
- 184 pieces in level Fb1-Fb2;
- 19 pieces (all on gray flints) in level Fa3;
- 17 pieces (all on gray flints) in level Fa1-Fa2.

Uncharacteristic debitage pieces with some cortex are as follows by level:

- 1 piece (12.5%) in level Fc;
- 40 pieces (21.7%) in level Fb1-Fb2;
- 3 pieces (15.8%) in level Fa3;
- 6 pieces (35.3%) in level Fa1-Fa2.

While uncharacteristic debitage pieces exclusively occur on gray flint in levels Fc, Fa3 and Fa1-Fa2, the following pieces in level Fb1-Fb2 are characterized by three raw material types.

Gray flint:
- 177 pieces (96.2%), 39 (22%) of which have have some cortex.

Brown flint:
- 5 non-cortical pieces (2.7%).

Colored flints:
- 2 pieces (1.1%), 1 (50%) of which has some cortex.

Chunks

Chunks are represented as follows in each level of Unit F:

- none in level Fc;
- 20 pieces in level Fb1-Fb2;
- 11 pieces on gray flints of which 2 specimens (18.2%) have some cortex in level Fa3;
- 1 non-cortical piece on gray flint in level Fa1-Fa2.

Raw material type representation for chunks of level Fb1-Fb2 is as follows.

Gray flint:
- 17 pieces (85%), 12 (70.6%) of which have some cortex.

Brown flint:
- 3 pieces (15%), 1 (33.3%) of which has some cortex.

Heavily Burnt Pieces are represented by the following in each level of Unit F:

- none in level Fc;
- 548 pieces in level Fb1 - Fb2;
- 5 pieces in level Fa3;
- 3 pieces in level Fa1-Fa2.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 281-285.

13 - UNITS E-A: LITHIC ARTIFACTS

Yuri E. DEMIDENKO

The lithic assemblages of Units E, D, C and A are small, ranging from only a single find in Unit C, 7-8 artifacts in Units E and D and 82 artifacts in Unit A. Thus, none of these four archaeological units exceeds 100 flints. Considering such scarcity, we first describe all finds in each unit with a maximum representation of core and tool illustrations and then discuss the technological and typological characteristics of each unit, as well as their industrial similarities and differences.

Unit E: Artifacts

The lithic assemblage of Unit E comprises 7 pieces: 2 cores, 4 flakes and 1 chip.

Cores

These are represented by 1 bladelet "advanced carinated" core and 1 bladelet narrow flaked core/"carinated burin".

The bladelet "advanced carinated" core (fig. 1:1) has a single-platform and is volumetric with a pyramidal shape. By its metric proportions (platform width 4.2 cm greater than maximum length of platform scars 2.9 cm), this piece would easily fit into the carinated end-scraper category. However, the irregularity of the platform edges, sometime appearing "denticulate-like", contradicts such an attribution and instead supports classification as a bladelet core. The pyramidal shape of the core additionally places it in the "advanced carinated" category. Its other morphological and metric features are as follows. Platform type and angle: plain right. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: offset with twisted scars. Condition of flaking surface: regular and partially hinged. Metrics: 2.9 cm long, 4.2 cm wide, 3.5 cm thick. Platform width and thickness: 4.2 and 3.5 cm, the same as the core's overall width and thickness. Such platform size indicates removal of a core tablet with flake proportions for possible rejuvenation. Reason for core abandonment: no obvious reason, although partial hinged character of the flaking surface may have been a factor. The blank type is a gray flint nodule/chunk. This piece, by its main morphological characteristics and metric proportions, is very similar to the bladelet "advanced carinated" core from level Fb1-Fb2.

The bladelet narrow flaked core/"carinated burin" has a single-platform (fig. 1:2). Platform type and angle: plain acute. Platform abrasion: present. Platform morphology in plane and removal scars on flaking surface: offset with twisted scars. Condition of flaking surface: regular. Metrics: 3.2 cm long, 1.3 cm wide, 2.2 cm thick. Platform width and thickness: 0.8 and 2.0 cm. Such platform size indicates removal of a core tablet with bladelet proportions for possible rejuvenation. Platform scars maximum length: 2.8 cm. Reason for core abandonment: no obvious reason. The blank type is a burnt gray flint nodule/chunk. At the same time, reduction of this core is also the same as that used for making carinated burins. Only the greater width of the platform/"multifaceted verge" of 1.3 cm formally puts it into the core category. On the other hand, from the point of view of broad typological definitions, this piece should also be included in the carinated pieces category.

Flakes

All 4 flakes are small broken and non-cortical (length-1.5-2.4 cm, width-1.2-3.5 cm, thickness-0.3-0.7 cm) on gray flints: 2 distal and 2 longitudinally fragmented. Their morphological features are not described, as they would to be too subjective for such fragmented "non-expressive" flakes.

A single chip is a non-cortical piece on a gray flint.

Unit D: artifacts

Lithic assemblage of this Unit D accounts 8 flint items: 2 cores, 5 flakes and 1 bladelet.

Cores

These are represented by 1 blade core and 1 bladelet core. The blade core (fig. 1:3) has a bidirectional double-platform and is non-volumetric and rectangular. Platform types and angles: both crudely-faceted acute. Platform abrasion: weakly represented on both platforms. Platform morphology in plane and removal scars on flaking surface: both straight with no twisted scars. Condition of flaking surface: regular. Metrics: length

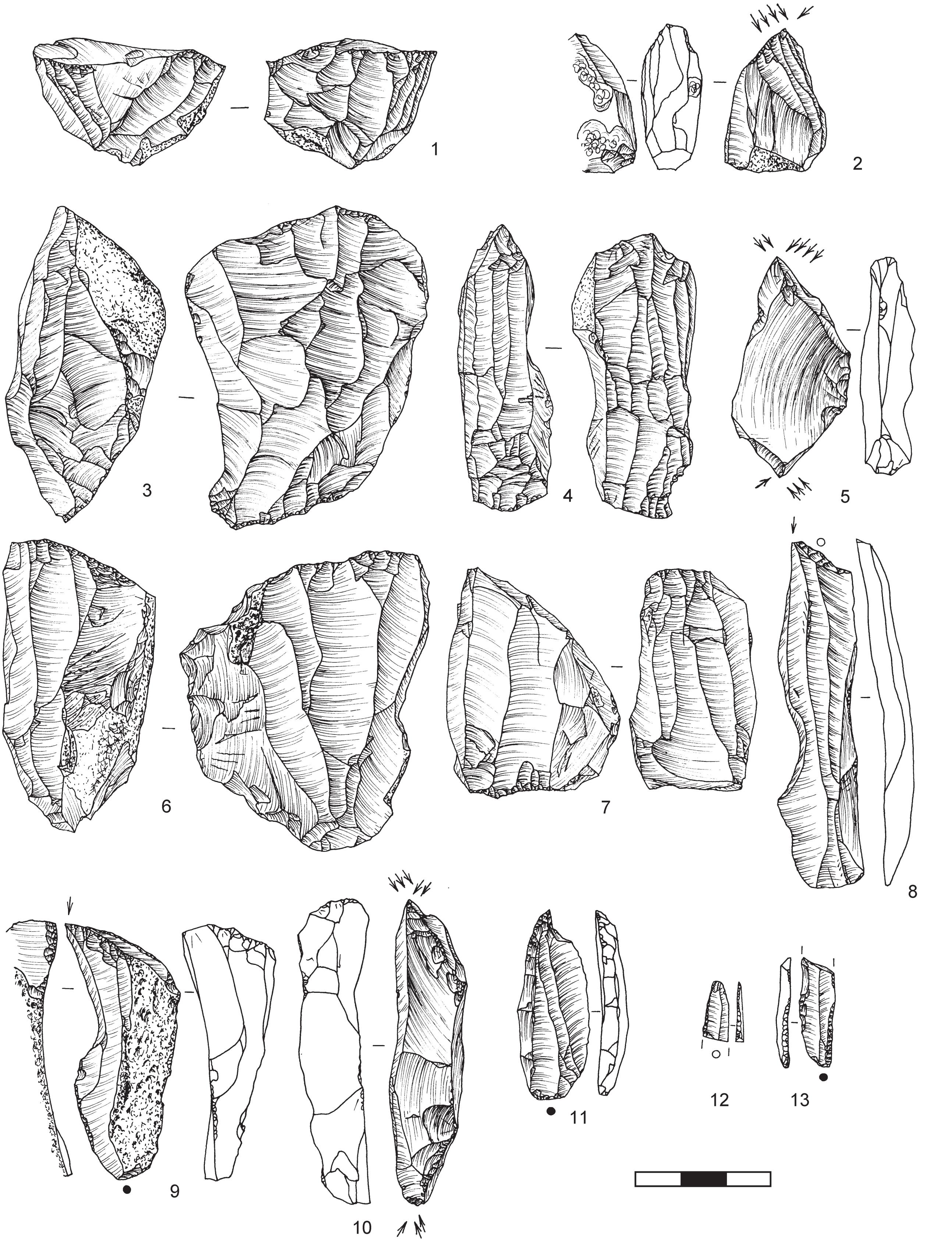

Figure 1 - Siuren I. Units E through A. Flint Artifacts – Cores and Tools. 1, "advanced carinated" bladelet core (Unit E); 2, narrow flaked bladelet core/"carinated burin" (Unit E); 3, double-platform bidirectional rectangular blade core (Unit D); 4, double-platform bidirectional sub-cylindrical bladelet core (Unit D); 5, double carinated (busked) burin (Unit C); 6, single-platform narrow flaked blade core (Unit A, sub-level Aa); 7, double-platform bidirectional-adjacent sub-cylindrical blade/bladelet core (Unit A, sub-level Aa); 8, burin on oblique straight truncation (Unit A, sub-level Aa); 9, burin on oblique convex truncation (Unit A, sub-level Ab3); 10, double dihedral symmetrical burin (Unit A, sub-level Ab2); 11, perforator (Unit A, sub-level Aa); 12, backed microblade (Unit A, sub-level Aa); 13, backed bladelet (Unit A, sub-level Aa).

6.6 cm, width 5.2 cm, thickness 3.2 cm. First platform width and thickness 4.2 and 2.0 cm. Second platform width and thickness 2.9 and 1.2 cm. Reason for core abandonment: no obvious reason.

The bladelet core (fig. 1:4) is also a double-platform bidirectional one, but of volumetric character and sub-cylindrical. Platform types and angles: 1 plain semi-acute and 1 crudely-faceted acute. Platform abrasion: weakly represented for 1st platform and absent for 2nd platform. Platform morphology in plane and removal scars on flaking surface: both semicircular with no twisted scars. Condition of flaking surface: mainly regular and partially hinged for the removal scars from the 1st platform. Metrics: length - 6.5 cm, width - 2.9 cm, thickness - 2.0 cm. First platform width and thickness - 1.7 and 1.9 cm. Second platform width and thickness - 2.3 and 0.9 cm. Reason for core abandonment: last removals hinged from the 1st platform and obvious exhaustion (minimal thickness) of the 2nd platform.

Flakes

These include 2 complete and 3 broken (1 proximal, 1 medial and 1 distal fragments) flakes. Their morphological features are as follows: 1 unidirectional, 1 unidirectional-crossed, 1 bidirectional and 2 unidentifiable scar patterns; 2 expanding and 3 unidentifiable shapes; 2 "off-axis" and 3 unidentifiable axis of removal direction; 1 flat, 3 incurvate medial and 1 unidentifiable profiles; 5 unidentifiable distal ends; 3 triangular, 1 irregular and 1 unidentifiable profiles at midpoint; 4 non-cortical and 1 partially cortical with non-significant amount of central cortex; 1 dihedral (0.9 x 0.2 cm) butt (semi-lipped, semi-acute angle, with no abrasion), 2 crushed and 2 missing butts. Two complete flakes are 3.0 and 2.6 cm long, 2.1 and 2.0 cm wide, both 0.3 cm thick. Three broken flakes have metric data in such ranges: length - 2.6-4.2 cm, width - 2.7-3.1 cm, thickness - 0.6-1.1 cm. Four flakes are made on gray flints and another is on black flint.

The single bladelet is complete and non-cortical on gray flint with a bidirectional scar pattern, parallel shape, "off-axis" removal direction, incurvate medial profile, feathering distal end, trapezoidal profile at midpoint, punctiform butt with no abrasion. It is 3.5 cm long, 0.9 cm wide, 0.3 cm thick.

Unit C: artifacts

The single flint piece from Unit C is a double carinated (buskoid) burin (fig. 1:5) on a gray flint partially cortical blade with insignificant lateral cortex. It is 4.9 cm long, 2.4 cm wide, 0.8 cm thick. The burin's two terminations are formed on the blade's proximal and distal ends in the same manner: by removing a series of burin facets (no less than 5 with total maximum width of 0.7 and 0.9 cm) from a negative of one burin facet each. Because of such termination of the burin at both ends of the blade, the blade's original length was greater than 4.9 cm. It is also worth noting the presence of a small lateral dorsal notch at the end of most of the burin facet scars originating from the burin termination at the proximal end of the blank: a feature of a busked burin.

Unit A: artifacts

The lithic assemblage of Unit A is composed of flint artifacts (n=82) from four sub-levels: Aa, Ab1, Ab2 and Ab3. It has the following structure:

Core-like pieces	2	2.4%	4.2%
Core Maintenance Products	1	1.2%	2.1%
Debitage	37	45.1%	77.1%
Tools	8	9.8%	16.6%
Debris	34	41.5%	-

Core-like pieces

These are composed of 1 blade core and 1 blade/bladelet core, both of which were recovered from uppermost sub-level Aa.

The blade core (fig. 1:6) is a single-platform narrow flaked one of non-volumetric character on a large flake of brown flint. Platform type and angle: plain semi-acute. Platform abrasion: present. Platform morphology in plane and removal scars of flaking surface: semicircular with no twisted scars. Condition of flaking surface: regular. Metrics: length - 6.8 cm, width - 3.9 cm, thickness - 5.3 cm. Platform width and thickness: 3.3 and 4.1 cm. Platform negatives' maximum length - 6.4 cm. The core's undersurface is also characterized by the presence of a unilateral crested ridge. Reason for core abandonment: no obvious reason.

The blade/bladelet core (fig. 1:7) is a double-platform one of sub-cylindrical shape and volumetric character with two bidirectional-adjacent flaking surfaces. Platform types and angles: 1st plain acute and 2nd crudely-faceted right. Platform abrasion: present on both platforms. Platform morphology in plane and removal scars on flaking surfaces: 1st semicircular with no twisted scars and 2nd straight with no twisted scars. Condition of flaking surface: both regular, although the 1st is partially hinged. Metrics: length-5.4 cm, width-2.5 cm, thickness-4.0 cm. First platform width and thickness-1.8 and 5.0 cm. Such platform size indicates removal of a core tablet with blade proportions for possible rejuvenation. Second platform width and thickness-1.8 and 2.0 cm. Platform negatives' maximum length: the same as core length-5.4 cm. Reason for core abandonment: no obvious reason. The blank type is a gray flint nodule/chunk.

The core maintenance product is a core trimming element which is a complete non-cortical flake with transversal placement of a unilaterally wholly treated crested ridge on a gray flint. It has a crushed butt, 2.3 cm long, 3.4 cm wide and 0.9 cm thick.

Debitage

This category is composed of 12 flakes (32.5%), 7 blades (18.9%), 11 bladelets (29.7%) and 7 microblades (18.9%).

Flakes are subdivided into 8 complete and 4 broken ones (1 proximal, 1 distal and 2 longitudinally fragmented). One is on a black flint, while the rest are on gray flints. Their morphological features are as follows. Scar patterns: 7 unidirectional, 1 unidirectional-crossed, 1 bidirectional, 1 cortical, 1 lateral and 1 unidentifiable. Shape: 2 parallel, 2 converging, 3 expanding, 1 irregular and 4 unidentifiable. Axis ofremoval directtion: 3 "on-axis", 5 "off-axis" and 4 unidentifiable. Profile: 1 flat, 4 incurvate medial, 6 twisted and 1 unidentifiable. Profiles at midpoint: 7 feathering, 3 hinged and 2 unidentifiable distal ends; 1 flat, 2 triangular, 4 trapezoidal, 1 lateral steep, 1 crescent, 2 irregular and 1 unidentifiable. Cortex: 6 non-cortical, 1 wholly cortical, 2 partially cortical with significant amount of distal cortex and 3 partially cortical with non-significant amount of proximal (2) and lateral (1) cortex. Butt: 2 plain (1.7 and 1.2 cm x 0.6 and 0.3 cm) (both semi-lipped, semi-acute angles, with abrasion), 1 linear (0.5 x 0.1 cm) (semi-lipped, semi-acute angle, with no abrasion), 1 dihedral (1.0 x 0.2 cm) (semi-lipped, semi-acute angle, with abrasion), 1 crudely-faceted (1.2 x 0.6 cm) (semi-lipped, right angle, with no abrasion), 6 crushed and 1 missing. Eight complete flakes are in the following ranges: length - 1.1-5.1 cm, width - 1.2-3.8 cm (2 with shortened, transversal proportions), thickness - 0.1-1.1 cm.

Blades are represented by 2 complete and 5 broken pieces: 1 proximal, 2 medial and 2 distal fragments. Five are on gray flints and 2 more on brown flints. Morphologically, blades have the following features: 5 unidirectional, 1 unidirectional-crossed and 1 bidirectional scar patterns; 1 parallel, 2 converging, 1 irregular and 3 unidentifiable shapes; 3 "on-axis", 1 "off-axis" and 3 unidentifiable axis of removal directions; 2 flat, 2 incurvate medial, 2 twisted and 1 unidentifiable general profiles; 3 feathering, 1 hinged and 4 unidentifiable distal ends; 4 triangular and 3 trapezoidal profiles at midpoint; 5 non-cortical and 2 partially cortical with non-significant amount of lateral cortex; 2 linear (both 0.3 x 0.1 cm) butts with abrasion, 1 crushed and 4 missing butts. Two complete blades are 6.1 and 4.0 cm long, 1.5 and 1.2 cm wide, 0.5 and 0.3 cm thick, respectively. Five broken blades are in the following ranges: length - 2.6-4.2 cm, width - 1.3-1.5 cm for 3 pieces, 1.6 cm for 1 piece and 2.2 cm for the last 5th piece; thickness - 0.3-0.5 cm.

Bladelets include 1 complete and 10 broken pieces: 4 proximal, 2 medial and 4 distal fragments. All are on gray flints. Morphologically, they are as follows: 10 unidirectional and 1 dorsal-plain scar patterns; 2 converging, 2 irregular and 7 unidentifiable shapes; 3 "off-axis" and 8 unidentifiable axis of removal directions; 1 incurvate medial, 3 twisted and 7 unidentifiable general profiles; 4 feathering, 1 hinged and 6 unidentifiable distal ends; 1 flat, 5 triangular, 4 multifaceted and 1 unidentifiable profiles at midpoint; 9 non-cortical and 2 partially cortical with non-significant amount of lateral cortex; 3 linear (0.5 - 0.3 x 0.1 cm) butts (all semi-lipped, semi-acute angles, with abrasion), 2 crushed and 6 missing butts. The sole complete bladelet is 2.0 cm long, 0.8 cm wide and 0.2 cm thick. Ten broken bladelets in the following ranges: length - 0.7-2.5 cm, width - 0.7-0.9 cm for 5 pieces and 1.0 - 1.1 cm for other 5 pieces; thickness - 0.1-0.3 cm.

Microblades are represented by 1 complete and 6 broken specimens: 1 proximal, 4 medial and 1 distal fragments. All are non-cortical on gray flints. Their morphological features are as follows: 7 unidirectional scar patterns; 2 converging and 5 unidentifiable shapes; 2 "off-axis" and 5 unidentifiable axis of removal directions; 2 flat, 3 twisted and 2 unidentifiable general profiles; 1 feathering and 6 unidentifiable distal ends; 5 triangular and 2 trapezoidal profiles at midpoint; 1 punctiform butt with no abrasion, 1 crushed and 5 missing butts. The single complete microblade is 1.8 cm long, 0.5 cm wide and 0.1 cm thick. Six broken microblades in the following ranges: length - 0.7-2.4 cm, width - 0.3-0.6 cm, thickness - 0.1-0.2 cm.

Tools

The eight tools include 3 burins, 1 perforator, 2 retouched pieces and 2 non-geometric microliths.

Burins are represented by 2 pieces on truncation and 1 double dihedral item. The first burin on truncation is from sub-level Aa (fig. 1:8) and is oblique straight where the truncation was made by scalar retouch at the proximal end from which one burin spall was struck. The blank is a complete non-cortical blade on a gray flint with a bidirectional scar pattern, parallel shape, "on-axis" removal direction, incurvate medial general profile, feathering distal end, multifaceted profile at midpoint and unidentifiable as retouched proximal end. It is 7.7 cm long, 1.7 cm wide and 0.7 cm thick. The second burin on truncation is oblique convex from sub-level Ab3 (fig. 1:9). Its termination is formed by slight scalar retouch at the distal end from which one wide burin spall was detached. The blank is a complete partially cortical blade with a significant amount of lateral cortex on a brown flint. Morphologically, it has a bidirectional scar pattern, expanding shape, "off-axis" removal direction, incurvate medial general profile, overpassed distal end, trapezoidal profile at midpoint and linear (0.4 x 0.1 cm) butt (semi-lipped, semi-acute angle, with abrasion). It is 5.8 cm long, 2.4 cm wide and 1.3 cm thick. The third burin is a double dihedral symmetric burin from sub-level Ab2 (fig. 1:10) on a complete non-cortical crested blade on gray flint. The burin's terminations are formed by two burin facets at the proximal and distal ends of the blade. The blade is a crested blade with unilateral wholly crested treatment and with an incurvate medial general profile. It is 6.7 cm long, 1.5 cm wide and 1.3 cm thick.

The *perforator* is a single dorsal one from sub-level Aa (fig. 1:11) formed by steep scalar dorsal retouch at the distal end of a complete secondary crested blade. It has a unidirectional scar pattern, converging shape, "on-axis" removal direction, twisted general profile, unidentifiable as retouched distal end, multifaceted profile at midpoint and plain (0.6 x 0.2 cm) butt (lipped, acute angle, with abrasion). It is 4.2 cm long, 1.6 cm wide, 0.5 cm thick and made on gray flint.

The *retouched pieces* are represented by a blade with irregular partial lateral dorsal retouch from sub-level Ab1 and a flake with irregular discontinuous lateral dorsal retouch from sub-level Ab2. The blade is a partially cortical distal fragment with a significant amount of lateral cortex. It has a bidirectional scar pattern, irregular shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end and triangular profile at midpoint. It is 9.0 cm long, 2.1 cm wide, 0.8 cm thick and was made on gray flint. The flake is partially cortical and complete with an insignificant amount of distal + lateral cortex and a unidirectional scar pattern, ovoid shape, "off-axis" removal direction, incurvate medial general profile, feathering distal end, triangular profile at midpoint and plain (1.8 x 0.7 cm) butt (semi-lipped, semi-acute angle, with abrasion).

Non-geometric microliths include 2 unilaterally backed microblade and bladelet with fine very thin abrupt dorsal retouch from sub-level Aa made on gray flints (fig. 1:12-13). The microblade (fig. 1:12) is a non-cortical distal fragment with a unidirectional scar pattern, converging shape, flat general profile, feathering distal end and triangular profile at midpoint. It is 1.2 cm long, 0.5 cm wide, 0.2 cm thick. The bladelet (fig. 1:13) is a non-cortical proximal fragment with a unidirectional scar pattern, incurvate medial general profile, triangular profile at midpoint and punctiform butt with abrasion. It is 2.3 cm long, 0.7 cm wide, 0.2 cm thick.

Debris

These include 29 chips (35.4%), 2 uncharacteristic debitage pieces (2.4%) and 3 chunks (3.7%). All are made on gray flints. Debris with cortex is rare: 5 chips and 2 chunks, while both uncharacteristic debitage pieces are non-cortical.

Techno-typological characteristics and specificities of the assemblages from Units E-A

Unit E

There are only two indicative pieces in Unit E: a bladelet "advanced carinated" core and a bladelet narrow flaked core/"carinated burin". These pieces are very similar to the carinated cores and burins from Unit F that clearly show the direct techno-typological affinity between the assemblages from Units E and F, and therefore the Aurignacian character of the Unit E lithics.

Unit D

There are three indicative forms in Unit D: 2 blade and bladelet double-platform bidirectional cores and one complete non-cortical bidirectional bladelet. Needless to say the double-platform bidirectional cores with blade removal from two opposite striking platforms on one flaking surface are not typical of the core-like pieces from Units F and E (only one such core was observed among 23 pre-cores and cores), while all Unit D 2 cores are of this type. Moreover, the single bladelet also has a bidirectional scar pattern that is in good correspondence with primary reduction of the bladelet core. Taking into consideration the fact that these pieces differ from those in Units F and E and the absence of any Aurignacian-like forms in Unit D, we suggest an industrial attribution for the Unit D lithics different from the Aurignacian. In this regard, we propose a general Gravettian attribution, because bidirectional core reduction is the most characteristic for the Gravettian technocomplex in the European Upper Paleolithic.

Unit C

The single find of the unit is surely of an Aurignacian type: the double carinated (buskoid) burin and, accordingly, Unit C must be considered as Aurignacian and close to Units F and E, which also contain carinated and busked burins. Some caution is needed here because of the only one artifact forms the basis for such a conclusion. Therefore, for further analysis of the entire Siuren I archaeological sequence and context, the Unit C find has been excluded.

Unit A

Lithics of Unit A are more abundant than those from Units E, D and C, but, unfortunately, this does not facilitate its industrial attribution. The two cores are neither Aurignacian bladelet "carinated" ones or of any double-platform bidirectional type with a single flaking surface. At the same time, it is worth noting the presence of a large blade narrow flaked core with a unilateral crested ridge at its undersurface: a core type that is completely different from all core-like pieces from Units H through D. Debitage shows the dominance of blades and bladelets/microblades over flakes: 2.1:1 proportion, with a considerable number of bladelets and microblades (48.9%) among all debitage pieces. Morphological features of debitage understood through attribute analysis does not reveal any clear patterns of differences. Tools do not contain any Aurignacian types. However, tool types very typical of other Upper Paleolithic technocomplexes with unifacial tools treatment traditions (e.g. Gravettian) are also absent, although presence of three burins on elongated blades (5.8-7.7 cm) and two unilaterally backed bladelets *sensu lato* is notable and would not contradict known common Gravettian/Epi-Gravettian industrial features.

Thus, the assemblages from upper cultural deposits at Siuren I (archaeological Units E-A) definitely leave a twofold impression of their industrial attributions. On one hand, lithics from Units E and C are clearly of Aurignacian nature with cores and tool types very similar to characteristic pieces in Unit F. On the other hand, lithics from Units D and A show no "Aurignacian influence", having only "non-Aurignacian" cores and tool types. Their industrial attribution seems to be possible only with comparisons to artifacts from the 1920s excavations Upper layer, although a Gravettian/Epigravettian attribution is the most likely.

On the whole, archaeological comparisons between the 1990s excavations Units E-A and the 1920s Upper layer assemblages are needed for to understand their complete industrial characteristics.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.* Liège, ERAUL 129, 2012, p. 287-303.

14 - INTER-UNIT AND INTER-LEVEL COMPARISONS OF ASSEMBLAGES FROM THE 1990s UNITS H, G AND F

Yuri E. DEMIDENKO

Introduction

The three archeological Units H, G and F excavated at Siuren I in the 1990s are composed of stratigraphicly distinct *in situ* archeological levels in which the different lithic and bone assemblages were recovered. Detailed analysis and description of the artifacts clearly indicate that the three Units have a twofold archeological subdivision. On one hand, lower Units H and G contain Upper Paleolithic flint assemblages with numerous Aurignacian Dufour bladelets of Dufour sub-type mainly with alternate retouch and completely lack carinated burins. On the other hand, Unit F, stratigraphically above H and G, contains Upper Paleolithic assemblages that are technologically and typologically quite different. They include a different set of Aurignacian microliths – Dufour and pseudo-Dufour microblades of Roc de Combe sub-type with either ventral or dorsal retouch and, at the same time, bladelet narrow-flaked cores/"carinated burins" and carinated burins *sensu stricto* are present. Moreover, Units H and G, aside from the dominance of Aurignacian artifacts, also contain a few, but morphologically characteristic, Middle Paleolithic Micoquian lithic tools, associated shaping and especially reshaping (rejuvenation) elements and bone retouchers, used for intensive secondary treatments of lithic tools, whereas the lithic and bone artifacts from Unit F are Upper Paleolithic Aurignacian only, although this Aurignacian differs from that present in Units H and G.

These basic conclusions are strongly supported by detailed comparative data that establish the inter-Unit artifact differences through the analysis of technological, typological and statistical data.

Moreover, in addition to inter-Unit variability, there is also variability in artifact types within the two sets of Units with respect to the specific levels. First of all, for Units G and F, each of which has four archeological levels, the relative distribution of lithic artifacts in the different levels is significant. In Unit G, almost 50% lithic artifacts and 7 of 8 bone artifacts were found in level Gc1-Cc2. Even more striking is the distribution of artifacts in Unit F in which 91% all lithics come from level Fb1-Fb2, as well as 4 of 5 worked bone artifacts. Thus, the comparisons needed cannot be short and limited, as even very basic artifact frequency and distribution data immediately show a great degree of variability and which is understandable given varying intensity of human occupation for each level in the two Units throughout the sequence.

Artifact comparisons between Units H and G, and their levels

It is logical to start the analysis with comparisons between the lithic assemblages in Units H and G; no worked bone artifacts were recovered from Unit H. This comparison is critical because Unit H is an entirely new archeological subdivision in the Siuren I chronological sequence as it was not identified during the 1920s excavations.

Despite the relatively small assemblage for Unit H (n= 682), the artifacts include easily identifiable Upper Paleolithic Aurignacian and Middle Paleolithic Micoquian items, suggesting that we were quite lucky to excavate possibly one of the best Unit H find spots in the whole rock-shelter area. Moreover, when we see great similarity between Units H and G, we are able to use the Unit H lithic data for lithic variability analysis of the site's lower stratigraphic sequence, for five actual archeological levels there (*sic!*). It should also be pointed out that various morphological, metric, technological and typological data for each Unit and its level(s) will be also analyzed in detail during comparative studies, providing strong support for industrial summaries of both Units with their specific features.

It is also important to compare the Upper Paleolithic and Middle Paleolithic industrial components in Units H and G through separate studies.

Comparisons of Units H and G: Upper Paleolithic Aurignacian component

To examine the Aurignacian component, all Micoquian tools and blanks were excluded from Aurignacian tool and debitage analyses. This excluded 20 tools (3 – Unit H, 1 – level Gd, 13 – level Gc1-Gc2 and 3 – level Gb1-Gb2) and 20 blanks.

The overall structure of blanks is as follows: 9 complete flakes, 6 fragmented flakes and 5 heavily fragmented unidentifiable pieces. The unidentifiable pieces are all from level Gc1-Gc2, 3 flakes from Unit H, 1 from level Gd, 8 from level Gc1-Gc2 and 3 from level Gb1-Gb2.

Technologically, the Unit H artifacts are very similar to those in Unit G. This is clear by the presence of serial bladelet cores in both assemblages. In particular, the following core type subdivision for Units H and G should be mentioned. The only three morphologically defined Unit H cores are a bladelet "carinated" single-platform core of volumetric character with sub-cylindrical shape (see fig. 1:2, p. 110), a bladelet multiplatform core (see fig. 1:3, p. 110) and a blade/bladelet double-platform core with two bidirectional-adjacent flaking surfaces (see fig. 1:1, p. 110). In Unit G, identical types of serial bladelet cores are also present. For example, level Gd also has a morphologically and metrically identical bladelet "carinated" core (a single-platform one of volumetric character with sub-cylindrical shape) (see fig. 1:2, p. 136). The Unit H blade/bladelet core is similar to two exhausted blade/bladelet cores again from level Gd. The Unit H bladelet multiplatform core is a good example of multiple bladelet reduction carried out on a very good flaking quality nodule/chunk, again reflecting the intention for continuous bladelet reduction throughout the "core history". The latter piece is thus comparable to three bladelet "carinated" double-platform cores in level Gc1-Gc2 (see fig. 1:3-5, p. 136), where more than one bladelet reduction sequence was performed on each. It is also of interest to note that the Unit H cores are very similar to level Gd cores with the presence of only blade/bladelet and bladelet cores with no exhausted flake/blade and/or flake multiplatform cores present in levels Gc1-Gc2 and Gb1-Gb2. Such reduction focused on bladelet production in both Unit H and level Gd may indicate purposeful, limited and very similar primary flaking by Aurignacian human inhabitants at the site during a single occupational episode for each. At the same time, the presence of exhausted flake-blade or flake multiplatform cores in levels Gc1-Gc2 and Gb1-Gb2, and the occurrence of one blade core and two pre-cores in level Gb1-Gb2, suggest broader reduction repertoires applied by the Aurignacian inhabitants of these levels, caused by overall more intensive flint exploitation during occupation, it is highly likely that several occupational episodes are represented by these levels. Levels Gc1-Gc2 and Gb1-Gb2 contain the largest flint assemblages in Units H and G (2332 and 1259 artifacts, respectively); it is thus reasonable to expect greater variability in the occurrence of particular type pieces. The proposed explanation for core variability in Units H and the three lower levels in Unit G is also well supported by the complete absence of any core-like pieces in level Ga, which also has the smallest assemblage in comparisons with the other four subdivisions of Units H and G.

Thus, blade/bladelet and bladelet core reduction in Unit H and level Gd is supplemented by additional bladelet core variability in level Gc1-Gc2, as shown by a series of bladelet "carinated" double-platform cores there, as well as by flake and blade core reduction in levels Gc1-Gc2 and Gb1-Gb2.

The emphasis on bladelet primary reduction and their common features in Units H and G finds is further supported by core maintenance products (CMP) blank and morphology data. First, the presence of even some crested bladelets and microblades is indicative of intensive bladelet *sensu lato* production at the site for the two Units' Aurignacian occupations (see tabl. 3A, p. 141). But, at the same time, contrary to possible expectations suggested by the cores, crested bladelets and microblades occur less in Unit H (13.3% and only bladelets with no microblades) and level Gd (23.6% with equal representation of both bladelets and microblades) than in level Gc1-Gc2 (33.9% - 13 bladelets and 6 microblades), while level Gb1-Gb2 (10.5% with presence of bladelets only) is about the same as for Unit H. Also, level Ga crested piece blank composition is unique for Units H and G with 75% crested bladelets *sensu lato*, again emphasizing its "incomplete" flint artifact representation. Thus, there is not simply a one-way connection between frequencies of bladelet cores and crested bladelet *sensu lato*, which is why consideration of "intensity data" should also be included. Again, the suggested intensity of flint exploitation is the highest for level Gc1-Gc2. Second, it is also important to differentiate between primary, secondary and re-crested crested bladelets *sensu lato*. The presence of primary crested bladelets *sensu lato* is a strong argument for initial and intentional bladelet reduction, meaning that at least some bladelet cores were only used for bladelet production. Primary crested bladelets *sensu lato* are represented by the following proportions in Unit H and the four levels of Unit G: 100% all identifiable items in Unit H, 75% in level Gd, 73.3% in level Gc1-Gc2, 50% in level Gb1-Gb2 and none in level Ga. Therefore, the presence of both serial bladelet cores and primary crested bladelets *sensu lato* attest to strict bladelet production for Aurignacian assemblages in Units H and G. And indeed, looking at the bladelet "carinated" cores (see fig. 1:2, p. 110 and fig. 1:2-5, p. 136), it is hard to imagine that any other sort of reduction could have taken place before the last bladelet stage. At the same time, the occurrence of secondary crested and re-crested bladelets in levels Gd, Gc1-Gc2 and Gb1-Gb2, one secondary crested microblade in level Gc1-Gc2 and two secondary and re-crested microblades in level Ga clearly demonstrates the application of recurrent cresting processes during continuous and intensive bladelet core reduction. Continuing the CMP analysis, the importance of crested blades in Units H and G should be noted. Aside from level Ga with only 25% the crested blades, Unit H and the other Unit G levels show dominating proportions of crested blades among all crested pieces: 73.4% in Unit H, 70.5% in level Gd, 55.4% in level Gc1-Gc2 and 52.7% in level Gb1-Gb2. Recalling the absence of blade cores and the presence of only bladelet and blade/bladelet cores in Unit H and level Gd, it can only be concluded that, in addition to strict bladelet reduction, continuous common blade/bladelet reduction also took place, indicated by the good representation of crested primary and secondary blades. The same also relates to levels Gc1-Gc2 and Gb1-Gb2 where the lesser presence of various crested blades can be explained by increased intensity of bladelet reduction, despite the fact that other reduction strategies were also used. Finally, it is of interest to note the presence of one core tablet on blade in each of the following levels: Unit H, levels Gd and Gb1-Gb2 attesting in our opinion to core with two or more flaking surfaces for blade/bladelet and/or bladelet reduction.

So, both core and CMP data suggest the same basic technological features of primary reduction for Units H and G; their variability can be explained by differences in intensity of flint exploitation.

The Units H and G debitage data follow show a similar pattern. And again, there is no one-way technological connection for them. First, it is worth examining the internal composition of basic debitage types.

Debitage *sensu stricto* (excluding tools and CMP blanks) totaling 1787 artifacts has the following internal structure for Unit H and the four Unit G levels in stratigraphic order from bottom to top:
Flakes - 46.4% - 30.5% - 31.1% - 31.1% - 43.1%;
Blades - 18.4% - 27.1% - 22.5% - 18.1% - 20%;
Bladelets - 25.1% - 29.4% - 32.9% - 29% - 21.5%;
Microblades - 10.1% - 13% - 13.5% - 21.8% - 15.4%.

Adding tools and CMP data to the debitage *sensu lato* indices for a total amount of 2317 items, the entire debitage assemblage structure is as follows:
Flakes - 38.5% - 26.1% - 27.7% - 30.2% - 34.9%;
Blades - 21.6% - 27.7% - 24.3% - 19% - 23.2%;
Bladelets - 25% - 27.2% - 30.5% - 26.2% - 22.1%;
Microblades - 14.9% - 19% - 17.5% - 24.6% - 19.8%.

Comparing the two pairs of statistical data for each of the four debitage classes using debitage *sensu stricto* and *sensu lato* indices, we obtain some very indicative changes, although the certain validity of both samples for any independent studies should be acknowledged. Flake indices decrease for all the five subdivisions, meaning that the added flake-tools and flake-CMPs were very low in comparison to all other blady debitage classes. It is thus reasonable to say that both technologically (for core flaking surface cresting preparation and re-preparation, and core platform radical tablet rejuvenation) and typologically (flake blank selection for tool production), flakes played a minor role: being mostly simple and basic core surface preparation and re-preparation pieces and not intentional blanks. Blade indices, contrary to flakes, increase slightly for a maximum of 3% for all five subdivisions. This clearly demonstrates the importance of CMP on blades for core exploitation, as was shown above, and some blade tool production. Turning to the bladelet indices, a similar pattern is seen to the flake data, decreasing for all but level Ga, but less than 3%. This is explained as follows. The CMP on bladelets are well-represented, while retouched microliths on bladelets are about in 2 ½ and 3 times less common on average (see below) in comparison to the larger number of retouched microliths on microblades. There is thus some balance for bladelet frequencies in the two debitage sets, when CMP increase, bladelet-tools decrease, affecting the final common index of bladelets for debitage *sensu lato*. Finishing with the microblade indices, we see up to 6% increase of indices for microblades in debitage *sensu lato*. Recalling the single presence of crested microblades, such increase mostly occurred because of the addition of many microblade-tools – retouched microliths produced on microblades.

Summing up these results from both debitage samples, it is certain that all blade-like pieces were intentional products in primary flaking processes for the Aurignacian groups at Siuren I lower cultural bearing sedimentation processes. As already shown and will be shown again below, blades have been used for core maintenance processes and Indicative Upper Paleolithic tool type production, while bladelets and microblades were mainly used in different proportions for to make retouched microliths. These assemblages reflect this twofold pattern in exploitation of blady products. On one hand, strict blade indices alone are rather low for Upper Paleolithic assemblages (ILam = 18.1 – 27.1% for debitage *sensu stricto* and ILam = 19.1-27.8% for debitage *sensu lato* with the respective indices of 18.4% and 21.7% for Unit H and average respective indices of 22.3% and 23.9% for Unit G). On the other hand, adding bladelets and microblades to blades, the final results are very high for joint blade/bladelet *sensu lato* indications – 53.6-69.5% for debitage *sensu stricto* and 62.0-74.0% for debitage *sensu lato* having the respective indices of 53.6 and 62.0% for Unit H and average respective indices of 68.5 and 72.2% for Unit G. Therefore, these Siuren I assemblages are surely blade *sensu lato*-dominated with the following decreasing frequencies of the three debitage classes for all five stratigraphic subdivisions: bladelets – blades – microblades. The lower Unit H blade/bladelet indices are explained by the highest values for flakes and the rather low blade values compared with the respective data for Unit G levels. The most important feature is that the Unit H data are completely within the statistically insignificant range of variability values for all Unit H and G indices, repeatedly showing that this is a single homogeneous Aurignacian complex composed of several artifact assemblages from different occupations of the site. Also, the third place for microblades can be also easily understood from a technological point of view by the obvious rarity of carinated tools: carinated end-scrapers *sensu lato* (including thick shouldered/nosed ones), number only one or two in each stratigraphic subdivision, while carinated burins are entirely absent. The importance of this observation is technologically related to the fact that bladelet cores were mainly the source of bladelets and to a lesser extent, microblades, while typologically defined carinated tools were basically a "core source" of microblades than bladelets. Given these data and technological considerations, it becomes clear why taken separately bladelets and even blades each outnumber microblades in the five stratigraphic subdivisions, except for level Gb1-Gb2 which has more microblades than blades, and also two carinated scrapers *sensu lato*, while levels Gd and Gc1-Gc2 in Unit G have only a single carinated scraper each.

Thus, these comparisons and technological considerations lead to the following basic technological conclusions regarding the Aurignacian finds in the Siuren I lower sequence

Two basic reduction strategies were applied: blade/bladelet and strictly bladelet. The blade/bladelet reduction strategy was based first on reduction of blade cores (a single example of such a core is present in level Gb1-Gb2) with the application of the *lame à crête technique* to detach crested blades and for initial blade removal. Core tablets on flakes were used to rejuvenate the core striking platform during blade reduction. Then, during the main reduction phase and as the core and/or its flaking surface became smaller and/or narrower, primary reduction transformed from blade to blade/bladelet –such cores are found in Unit H, levels Gd and Gc1-Gc2. The second reduction strategy produced only bladelets from rather small flint nodules/chunks. Core exploitation began with removal of crested bladelets (products a smaller variant of the *lame à crête technique*) followed by regular serial bladelet and sometimes microblades. Striking platforms and flaking surfaces were very often convex and wide (actually semicircular) and regularly shaped with additional retouch-like treatment on their intersected edges that caused two things. First, from a strictly typological point of view, the bladelet cores or some of them (the bladelet "carinated" cores) resemble carinated end-scrapers. Therefore, for the present Siuren I Aurignacian bladelet "carinated" core and carinated end-scraper classification (see p. 91-107) morphological and metric boundaries have been established: when a striking platform/"working edge" was wider than bladelet removal length on its flaking surface/"secondary treated working surface", the piece was classified as a carinated end-scraper, and the reverse as a bladelet "carinated" core. But still the bladelet cores and their most indicative variations - bladelet "carinated" single-platform and even double-platform cores, which have two opposed or adjacent flaking surfaces - fit better into the core category because of their very regular bladelet production. Retouch-like treatment of the striking platform was simply abrasion for better control and easier removal of a series of bladelets. Following all these features for the bladelet cores, it becomes more understandable why mostly "on-axis", with slight dominance of "weakly" twisted profiles on rather long and wide rectilineal bladelets *sensu lato* were the products of this reduction strategy. Continuous and multiple bladelet reduction for the strict bladelet cores is again clearly seen by the presence of re-crested bladelets and microblades, core tablets on blades and bladelet "carinated" double-platform cores. At the same time, the Units H and G carinated end-scrapers *sensu lato* are part of this strict bladelet core reduction strategy, but usually with a more limited number of bladelets removed that were also shorter and narrower, actually mostly microblades, which is why they can be technologically considered as initial bladelet cores.

Again, the Unit H Aurignacian finds are a genuine part of technological methods and traits common to the Aurignacian of both Units H and G.

The results of tool and debitage classification and attribute analysis for Units H and G allow us to present a general summary of these data with some limits.

Debitage, by its morphological features, is very consistent with basic core reduction strategies and their technological traits. <u>Flakes</u> from Units H and G do not appear to have been produced as intentional blanks, suggested by their overall small size (most items with length no more than 3 cm – 86% in Unit H and 75.9-79.5% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G), cortex data with the highest ratios of wholly cortical items (11.3% in Unit H, 10.7-14.3% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) and partially cortical items (25% in Unit H, 25-27.9% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) in comparison to all blady debitage classes and especially bladelets and microblades, and great diversity of other attributes showing a complete lack of standardization, as shown by the dominance of expanding and irregular shaped pieces taken together (74.7% in Unit H, 72.6-80.0% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) in association with mainly "off-axis" removal directions (52.7% in Unit H, 50.7% for level Gd and 79.6-81.8% for levels Gc1-Gc2 and Gb1-Gb2 in Unit G) and often with hinged and/or overpassed ("not regular") distal ends (34% in Unit H, 26.3-32% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G).

<u>Blades</u> occupy an intermediate position between flakes and bladetets *sensu lato* and this is understandable because of their initial removal from blade/bladelet cores; nearly a third are partially cortical (34.7% in Unit H, 25.4-30.8% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G). At the same time, the complete absence of wholly cortical items (2% in Unit H and 1.1% for level Gc1-Gc2 in Unit G) is because the decortification of cores was done by flakes, and many items with irregular and expanding shapes (58.1% in Unit H, 28.6-41.1% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) and mainly "off-axis" removal directions (78.1% in Unit H, 65.4-73.5% for levels Gd and Gb1-Gb2, although "on-axis" items completely dominate with 92.8% in level Gc1-Gc2 in Unit G). Hinged and/or overpassed ("not regular") distal ends occur variably, but to a lesser extent than for flakes (27.5% in Unit H, 21.3% for level Gd, 9.1% for level Gc1-Gc2 and 39.3% for level Gb1-Gb2 in Unit G). One more indicative feature of the blades is the significant (34.9% in Unit H, 33.3% for level Gd and 44.2% for level Gb1-Gb2 in Unit G) or dominant (56.8% for level Gc1-Gc2 in Unit G) presence of twisted profiles. Even so, with all the "irregular" blade morphological features, it is necessary to remember one important and common technological blade trait for Aurignacian industries. In contrast to the later Gravettian industries in Europe, for Aurignacian traditions, straight profile and regularly parallel blades were not an objective during core reduction processes as they were not backed by lateral retouching to make composite tools for projectile hunting weapons. Aurignacian blades could be "irregular". At the same time, a great dominance of unidirectional scar pattern (87.8% in Unit H, 76-93.9% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) and mainly trapezoidal and multifaceted profiles at midpoint (65.3% in Unit H, 58-62.3% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) for blades and lateral cortex location for partially cortical items (54.5% in Unit H, 50-62.5% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) evidence their very regular and serial removal. But when we consider bladelets and microblades, we really come to the most intended products of Units H and G reduction strategies.

<u>Bladelets</u> have the following standardized features: a great dominance of pieces with unidirectional scar pattern (88% in Unit H, 79.4-94.7% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); a low number of partially cortical items (14.9% in Unit H, 10.9-12.5% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) and either the complete absence or a single representation of wholly cortical items; a dominance of parallel and converging shaped pieces with parallel ones dominant in each of the four stratigraphic subdivisions (83.9% in Unit H, 72.7-82.4% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) in association with "on-axis" removal direction (90% in Unit H, 90.3-97.8% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); an important (41.3% in Unit H) or even a dominant (54.7-67.6% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) position of twisted profiles, although this is correlated with "on-axis" removal direction; a

low number of hinged and/or overpassed ("not regular") distal ends (12.2% in Unit H, 8.8-18.2% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); prevalence of trapezoidal and multi-faceted profiles at midpoint (56.7% in Unit H, 51.1-56.2% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); a dominance of the "plain-punctiform-linear" group of butt types (73.1% in Unit H, 69.8-91.1% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) with linear butts the most significant (46.3% in Unit H, 37.4-56.9% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G), as well as a notable absence or a single occurrence of cortical and faceted butts; a dominance of butts with abrasion (79% in Unit H, 79.6-94.1% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); an average length of 2.7 cm in Unit H and of 2.6-2.8 cm for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G, an average width of 0.9 cm and an average thickness of 0.2 cm for all four stratigraphic subdivisions, while "long" bladelets (more than 3 cm long) have a proportion of a little less than a third of all complete items - 31.5% in Unit H, 25.9-29.4% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G.

Microblades are even more uniform than bladelets are and are described as follows: near exclusive presence of unidirectional scar pattern (96.3% in Unit H, 92.1-94.9% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); near absence of cortex (none in Unit H and levels Gd and Ga, with only a single occurrence of partially cortical pieces in levels Gc1-Gc2 (4.6%) and Gb1-Gb2 (6.6%); a dominance of converging and parallel shaped pieces with converging ones dominant in three stratigraphic subdivisions, except for level Gb1-Gb2, where bladelet parallel shape dominates (88.8% in Unit H, 86.3-100% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) in association with "on-axis" removal direction for Unit G microblades (83.3-93.6% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) and "off-axis" removal direction for Unit H microblades (88.8%), although this difference with Unit H can be explained by very small sample of microblades with this attribute (n=9) in comparison to Unit G (35-109 pieces); a prevalence of twisted general profiles for Unit G microblades (72.7% in level Gd, 52.8-58.7% in levels Gc1-Gc2 and Gb1-Gb2), while twisted microblades account for only 24% in Unit H; an absence (Unit H) or a rather low number of pieces with hinged and/or overpassed ("not regular") distal ends for Unit G microblades (25% in level Gd, 6.5% in level Gc1-Gc2 and 18.5% in level Gb1-Gb2); prevalence of items with triangular profile at midpoint (74.1% in Unit H, 56.4-64.6% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G) that indicates removal of microblades from intersection ridges of bladelet removal scars on bladelet cores and carinated end-scrapers *sensu lato* flaking surfaces/"secondary treated working surfaces"; excluding crushed butts, there is an absolute dominance of the "plain-punctiform-linear" group of butt types for microblades in the four stratigraphic subdivisions with some internal prevalence of either punctiform butts (Unit H and level Gb1-Gb2) or linear butts (levels Gd and Gc1-Gc2); a very common presence of butts with abrasion (87.5% in Unit H, 92-94.5% for levels Gd, Gc1-Gc2 and Gb1-Gb2 in Unit G); an average length of 1.7 cm in Unit H, 1.6 cm for levels Gc1-Gc2 and Gb1-Gb2 in Unit G, while the only two complete microblades in level Gd are 1.1 and 1.2 cm long, an average width of 0.6 cm in Unit H and of 0.5 cm in the three levels of Unit G with the very notable absence of any piece with width less than 0.4 cm indicating that microblades are rather similar to bladelets in width, an average thickness of 0.1 cm for Unit H, levels Gd and Gc1-Gc2 and 0.2 cm for level Gb1-Gb2 microblades.

It is also important to emphasize that Unit H and G bladelets and microblades, based on morphological and metric parameters, represent two very similar products of a single reduction system for their production.

Concluding the debitage characteristics and comparisons, it is seen again all basic similarities for Unit H and Unit G its classes. Some variability on "more twisted"/"less twisted" and "on-axis"/"off-axis" bladelets and microblades in between Unit H and Unit G bladelets and microblades will be once again discussed below during analyzes of "non-geometric microliths".

Also, moving beyond the debitage analysis and starting the tool analysis, it is interesting to look at the different blank selection patterns of flakes, blades, bladelets and microblades for tool production in Units H and G. These are as follows. Flakes: 1.5% in Unit H, 3.0% in level Gd, 6.2% in level Gc1-Gc2, 6.1% in level Gb1-Gb2, 6.7% in level Ga and 4.8% in total for Units H and G together. Blades: 18.7% in Unit H, 13.0% in level Gd, 17.8% in level Gc1-Gc2, 11.9% in level Gb1-Gb2, 30.0% in level Ga and 16.5% in total for Units H and G together. Bladelets: 20.7% in Unit H, 15.1% in level Gd, 14.5% in level Gc1-Gc2, 11.2% in level Gb1-Gb2, 21.1% in level Ga and 14.9% in total for Units H and G together. Microblades: 48.1% in Unit H, 44.6% in level Gd, 38.2% in level Gc1-Gc2, 30.3% in level Gb1-Gb2, 29.4% in level Ga and 38.1% in total for Units H and G together. These tool-blank selection rates clearly show and confirm the observations discussed above that flakes are not the intended products of primary reduction processes for tools and that rather microblades are the most sought products from both core and carinated end-scraper reduction processes at the site. At the same time, blade and bladelet blank selection rates are moderate but similar, again reflecting their different, by tool class production, but similar in numerical importance as was also explained above.

The tool-kits in Unit H and Unit's G 4 levels cannot be considered typologically identical, as they vary in frequencies. Excluding the Middle Paleolithic tools, unidentifiable tool fragments and even non-flint tools, the final total of tools in Units H and G is 392. Among these tools, 62.7% (183 items) come from a single level (Gc1-Gc2), while tool counts for the other levels are as follows: 60 for Unit H, 67 for level Gd, 65 for level Gb1-Gb2 and 17 for level Ga. Using these "restricted" tool accounts, it is also important to recall that "non-geometric microliths" for each of the five tool-kits comprise more than 50%: 43 items/71.7% in Unit H, 49 items/73.1% in level Gd, 117 items/63.9% in level Gc1-Gc2, 46 items/70.8% in level Gb1-Gb2 and 9 items/52.9% in level Ga. The Indicative Upper Paleolithic tool types are thus not very common in each level and show some inter-level differences. Nevertheless, the five tool-kits show several typological similarities that unite them into the same Aurignacian find complex. Regarding the representation of Indicative Upper Paleolithic tool types, the following occurrence of tool classes and types unite the five tool-kits. First, there is representation of simple flat end-scrapers on blades, unretouched blades and on blades with marginal and/or irregular retouch in Unit H and levels Gc1-Gc2 and Ga. The absence of these end-scrapers in levels Gd and Gb1-Gb2 has been "compensated" by a single, for all five tool-kits, end-scraper on retouched flake, while the other two levels contain carinated end-scrapers *sensu lato*, and these are also present in Unit H and level Gc1-Gc2. Excluding a single atypical end-scraper on blade from level Ga, the other end-scrapers from Units H and G include only a double end-scraper on retouched flake in level Gc1-Gc2 and a unilateral/flake end-scraper in level Ga. Thus, it is possible to propose, despite the occurrence of some other end-scraper types, that the most of the end-scrapers are simple flat items on blades, noting here specially the complete absence of end-scrapers on any well-retouched blades, and carinated *sensu lato* items. Second, burins are common, with dominance of truncation/lateral retouch and angle/transverse on natural surface burins over dihedral burins, with a notable absence of any carinated specimens. Variability in burin types throughout the sequence of Units H and G levels is quite interesting. Dihedral burins are completely absent in the three lower stratigraphic subdivisions (Unit H, levels Gd and Gc1-Gc2), while they are present in the two upper stratigraphic subdivisions (levels Gb1-Gb2 and Ga). Moreover, there is just a single dihedral burin among the four burins in level Gb1-Gb2, which also include a double angle, a transverse on lateral preparation and a transverse on natural surface, reflecting the typical occurrence of burin types for the three lower stratigraphic subdivisions, while both burins in level Ga are dihedral. It was not clear whether this pattern indicates a sort of "transitional burin development" into the later Siuren I, Unit F Late/Evolved Aurignacian, with or without numerous dihedral and carinated burins. All other techno-typological features of levels Gb1-Gb2 and Ga are in good accordance with basic Archaic Aurignacian/Aurignacian 0 traits for Upper Paleolithic finds from Units H and G. Other Indicative Upper Paleolithic tool classes are represented sporadically throughout the sequence, but can still be considered good representatives of the tool-kits. Third, truncations (4 items) are known from Unit H, levels Gd and Gc1-Gc2. Aside from one of two truncations on flakes in level Gc1-Gc2, the other three pieces are regular truncated blades, and all four truncations have rather simple scalar steep retouch. Retouched blades (8 items) are known in all levels but level Ga, and they usually have one or two lateral edges with scalar semi-steep retouch. During classification of retouched blades, the only exception is a retouched blade with Aurignacian-like retouch in level Gc1-Gc2 (see fig. 4:11, p. 192). This proximal fragmented piece has bilateral invasive scalar semi-steep retouch, suggesting its Aurignacian affinity. At the same time, the piece does not have true stepped Aurignacian retouch and our definition is therefore a rather conventional one, although the presence of the most heavily retouched blade in level Gc1-Gc2 is also readily understandable given the highest human occupation intensity characteristics for this level within Units H and G. The latter fact also explains why scaled tools (2 items) were only recognized in level Gc1-Gc2 during the 1990s excavations, but there is an additional indication of this tool class in Unit G in level Gb1-Gb2, where a rare composite tool on a flake – scaled tool/burin on concave truncation was recovered. Thus, taking all the Indicative Upper Paleolithic tool types together, we see a homogeneous tool class and type representation throughout the sequence of Units H and G with the only reservation being that dihedral burins are limited to the uppermost levels Gb1-Gb2 and Ga.

"Non-geometric microliths" deserve some special attention as they are much more common in each of the five stratigraphic subdivisions in comparison to the Indicative Upper Paleolithic tool types and they have very characteristic morphological features. Also, the observed morphological variability for unretouched bladelets and microblades throughout Unit H and G requires that the "non-geometric microlith" discussion begins with blank morphology. As a whole, the Units H and G "non-geometric microliths" assemblage is composed of 264 items and the following are the count and frequency data for each of the five stratigraphic subdivisions: 43 specimens/71.7% in Unit H, 49 specimens/73.1% in level Gd, 117 specimens/63.9% in level Gc1-Gc2, 46 specimens/70.8% in level Gb1-Gb2 and 9 specimens/52.9% in level Ga. By the internal composition of blanks used, "non-geometric microliths" are characterized by varying percentages of bladelets and microblades, although some wide microblades may have been bladelets prior to retouch of their lateral edge(s). Bladelets are always well less than half of all microlith blanks, sometimes less than one third of all tools – 18 pieces/41.9% in Unit H, 16 pieces/32.7% in level Gd, 46 pieces/39.3% in level Gc1-Gc2, 13 pieces/28.3% in level Gb1-Gb2 and 4 pieces/44.4%. Microblades, on the contrary, are dominant: 25 pieces/58.1% in Unit H, 33 pieces/67.3% in level Gd, 71 pieces/60.7% in level Gc1-Gc2, 33 pieces/71.7% in level Gb1-Gb2 and 5 pieces/55.6%. The clear prevalence of microblades over bladelets among microlith blanks is also very indicative, particularly for levels Gd and Gb1-Gb2. This microlith blank pattern with a dominance of microblades should be stressed because the opposite is observed for the internal structure of bladelets *sensu lato* with a prevalence of bladelets over microblades in all five stratigraphic subdivisions: Unit H – 67 bladelets (71.3%) and 27 microblades (28.7%), level Gd – 88 bladelets (69.3%) and 39 microblades (30.7%), level Gc1-Gc2 – 266 bladelets (70.9%) and 109 microblades (29.1%), level Gb1-Gb2 – 101 bladelets (57.1%) and 76 microblades (42.9%) and level Ga – 14 bladelets (58.3%) and 10 microblades (41.7%). Thus, comparison of the two retouched and unretouched samples of bladelets *sensu lato* through percentages of bladelets and microblades allows us to postulate a general pattern of selection of microblades and much fewer bladelets for "non-geometric microlith" production. Then, the blank type data is complemented by comparative data on the occurrence of complete and broken pieces for unretouched and retouched bladelets and microblades in each of the five stratigraphic subdivisions. The Unit H unretouched sample has 19 complete bladelets (28.4%) and 48 fragmented bladelets (71.6%), and 3 complete microblades (11.1%) and 24 fragmented microblades (88.9%). The Unit H retouched sample has 3 complete bladelets (16.7%) and 15 fragmented bladelets (83.3%), and 5 complete microblades (20%) and 20 fragmented microblades (80%). The level Gd unretouched sample has 14 complete bladelets (15.9%) and 74 fragmented bladelets (84.1%), and 2 complete microblades (5.1%) and 37 fragmented microblades (94.9%). The level Gd retouched sample has 2 complete bladelets (12.5%) and 14 fragmented bladelets (87.5%), and one complete microblade (3%) and 32 fragmented microblades (97%). The level Gc1-Gc2 unretouched sample has 31 complete bladelets (11.7%) and 235 fragmented bladelets (88.3%), and 8 complete microblades (7.3%) and 101 fragmented microblades (92.7%). The level Gc1-Gc2 retouched sample has no complete bladelets and 46 fragmented bladelets (100%), and 2 complete microblades (2.8%) and 69 fragmented microblades (97.2%). The level Gb1-Gb2 unretouched sample has 17 complete bladelets (16.8%) and 84 fragmented bladelets (83.2%), and 7 complete microblades (9.2%) and 69 fragmented microblades (90.8%). The level Gb1-Gb2 retouched sample has one complete bladelet (7.7%) and 12 fragmented bladelets (92.3%), and no complete microblades and 33 fragmented microblades (100%). The level Ga unretouched sample has no complete bladelets and 14 fragmented bladelets (100%), and one complete microblade (10%) and 9 fragmented microblades (90%). The level Ga retouched sample has one complete bladelet (25%) and 3 fragmented bladelets (75%), and no complete microblades and 5 fragmented microblades (100%). In sum, the comparison of bladelet *sensu lato* condition characteristics for unretouched and retouched bladelets and microblades indicates one very special feature of its selection for tool production: it is clear that there was no special selection of complete bladelets and microblades for microlith production by Aurignacian groups in Units H and G, which is why many deliberately broken specimens were used in production. This clear trend has also an interesting metric and technological meaning. All complete unretouched and retouched bladelets and microblades were measured together and then separately to obtain the following average metric indices. The Unit H samples are as follows: all 29 complete bladelets *sensu lato* are 2.61 cm long, 0.77 cm wide and 0.2 cm thick; 22 only unretouched complete bladelets *sensu lato* are 2.55 cm long, 0.82 cm wide and 0.2 cm thick; 7 only retouched complete bladelets *sensu lato* are 2.81 cm long, 0.66 cm wide and 0.18 cm thick. The Unit G samples taken together for all four levels are as follows: all 87 complete bladelets *sensu lato* are 2.44 cm long, 0.76 cm wide and 0.2 cm thick; 80 only unretouched complete bladelets *sensu lato* are 2.41 cm long, 0.80 cm wide and 0.2 cm thick; 7 only retouched complete bladelets *sensu lato* are 2.84 cm long, 0.65 cm wide and 0.2 cm thick. These mean lengths indicate some selection of the longest complete pieces among bladelets and microblades as blanks for microliths, but differences in width can be explained by the reduction in width by often bilateral and also lateral retouching, while thickness indices are stable for all three bladelets *sensu lato* in Units H and G. Nevertheless, the length differences are not large and do not reach even 0.5 cm, being at any rate under 3 cm. Accordingly, Aurignacian makers and users of Units H and G "non-geometric microliths" did not require longer (more than 3 cm) bladelets *sensu lato* because they knew in advance the length, width and thickness of the blanks needed "non-geometric microlith" production. Accordingly, special reduction methods were used for bladelet and microblade production, most clearly seen in the presence of bladelet "carinated" cores and carinated end-scrapers *sensu lato* as these pieces are characterized by both rather wide striking platforms/"working edges" and non-elongated flaking surfaces/"secondary treated working surfaces". Moreover, the shape and axis removal morphological features of bladelets and microblades further indicate implication of these reduction objects. By shape, there is not just a great dominance of pieces with parallel and converging shapes for both unretouched and retouched bladelets and microblades, but there is especially the prevalence of parallel over converging shape in all levels except level Gb1-Gb2 in Units H and G. In axis removal, the great dominance of "on-axis" bladelets within the debitage samples of Units H and G has been observed. The microblade debitage samples, however, showed this dominance only for Unit G levels, while Unit H microblades were "off-axis". Therefore, it was necessary to look at the morphological features of retouched bladelets and microblades separately. Microliths on bladelets and microblades from all four levels of Unit G again show the great dominance of "on-axis" items (80-100% for each blank type). Unit H also, quite different to the unretouched samples, shows that all retouched bladelets and microblades had an "on-axis" removal direction. Accordingly, it is possible to argue that there was a special selection of parallel and to a lesser degree converging bladelets *sensu lato* with the necessary "on-axis" removal direction. Such selection was again planned in advance for primary core reduction and this explains the presence of serial bladelet "carinated" cores and carinated end-scrapers *sensu lato* in the assemblages. At the same time, the general profiles show the dominance of twisted bladelets (54.7 – 67.6%) and microblades (52.8 – 72.7%) within the debitage samples of three levels in Unit G. Unretouched bladelets *sensu lato* in Unit H show a different pattern: 41.3% twisted bladelets and 24% twisted microblades. Looking at the twisted/non-twisted characteristics retouched bladelets *sensu lato* in Units H and G, the following are obtained. Unit H shows 60% twisted bladelet blanks and 40% twisted microblade blanks. The microlith blanks in the four levels of Unit G demonstrate the occurrence of twisted items of less than 50%: level Gd – 30.8% bladelets and 63.6% microblades, level Gc1-Gc2 – 62.5% bladelets and 42% microblades, level Gb1-Gb2 – 45.5% bladelets and 48.4% microblades, level Ga – 25% bladelets and 50% microblades, that is lower in comparison with just the debitage samples. Thus, it is possible to speak about equal representations and intentions of twisted and non-twisted bladelets *sensu lato* in primary production and microlith manufacture. And here it is important to stress once again the complete dominance of the "on-axis" aspect of all unretouched bladelets and microblades in Unit G and only the representation of "on-axis" retouched bladelets and microblades in Unit H. At first sight, there is a contradiction when we interconnect the two morphological features as twisted bladelets *sensu lato* are usually considered to be "off-axis", which is, for example, exactly the case for the Siuren I, Unit F Dufour and pseudo-Dufour microliths of Roc de Combe sub-type (see below). The Unit H and G bladelets *sensu lato* find, however, an explanation not in a technological sense, but in the way the pieces have been classified. When the present author, with V.P. Chabai, undertook the attribute analyses for the Siuren I artifacts, we applied very strict definitions and approaches, so that even a slightly proximally twisted piece was attributed as such. But data on the absolute dominance of "on-axis" bladelets *sensu lato* easily explains the situation showing actual more non-twisted feature for these specimens. Indeed, the usual occurrence of less than half of twisted microliths in Units H and G evidences this. Again, placing the accent on a not specifically twisted bladelet *sensu lato* intention for "non-geometric microlith" production, we further understand why there are only cores and end-scrapers, from a typological point of view, among the Units H and G carinated pieces and no carinated burins, because the latter were the basic "reduction source" of real twisted and "off-axis" microblades.

Concluding with the metric and morphological features for "non-geometric microliths", keeping in mind the same data for unretouched bladelets and microblades, it is already possible to propose some hypotheses regarding the use of microliths. It is a common belief (e.g. Rigaud 1993) that Archaic Aurignacian/Aurignacian 0 Dufour microliths of Dufour sub-type with mainly alternate retouch served as lateral component inserts for projectile points and no use-wear studies contradict this idea. Here it is again worth noting the basic features of microliths – "on-axis" removal direction, non-twisted or "weakly" twisted, mainly flat and incurvate medial general profiles, parallel shape and small size, the majority being between 1.5 and 3 cm. Therefore, mounting of Dufour microliths probably involved inserting them into wooden spearheads with a specific adhesive material, as no Archaic Aurignacian/Aurignacian 0 bone/antler points are slotted for microlith insertion. Moreover, the presence of a few Krems points with bilateral alternate or dorsal retouch and some Dufour microliths with converging shape may indicate their location on spearheads' tips or close to it, although it might be also possible that the latter two groups were used as arrowheads, if we are able to prove the existence of bow usage by Archaic Aurignacian/Aurignacian 0 humans. At any rate, a few microliths from Units H and G do in fact show traces of some projectile damage. Two Dufour microliths (a bladelet and a microblade) with alternate retouch from Unit H (see fig. 3:4, p. 127) and level Gb1-Gb2 (see fig. 7:11, p. 201) have clear projectile damage scars at their distal ends. In Level Gc1-Gc2, some Dufour bladelets and microblades with alternate retouch have separate lateral ventral facet damage (see fig. 5:8-9, 11-12, 14, 17, 22, 29, p. 195), originating after a spearhead/an arrowhead came into contact with a hard material (e.g., a hunted animal's thick bone) and its inserts clashed one into another.

Finally, the Units H and G microlith retouch types, angles and extent characteristics should be considered for determination of their basic features and variability.

For retouch types, there is an absolute dominance of microscalar and micro-stepped retouch types taken together – 83.1-93.4%, and marginal retouch occurs only in low percentages – 6.6-16.9%. Along with this, Unit H microliths show a slight prevalence of micro-stepped retouch (45%), while Units G microliths are characterized by some prevalence of micro-scalar retouch (71.3% in level Gd, 48% in level Gc1-Gc2, 51.9% in level Gb1-Gb2, 66.7% in level Ga). Principally, there is not much difference in between micro-scalar and micro-stepped retouch as both can be considered "heavy retouch types" for microlith treatment and, moreover, they are again joined by their clear dominant position on the right edge on the ventral face for Dufour microliths with alternate retouch.

For angle types, while abrupt retouch is absent or represented by single artifacts (1.2% in Unit H and 2.0% in level Gc1-Gc2), semi-abrupt retouch angle is quite common – 66.3% in Unit H, 78.3% in level Gd, 67.6% in level Gc1-Gc2, 81.8% in level Gb1-Gb2 and 86.7% in level Ga. Accordingly, a flat retouch angle played a subordinate role in microlith production – 13.3-32.5%.

For retouch extent, microliths have continuous retouch that is always well over half of all secondary treated edges – 70% in Unit H, 64.4% in level Gd, 69.6% in level Gc1-Gc2, 73% in level Gb1-Gb2 and 80% in level Ga. A subordinate position is occupied by partial retouch – 22.5% in Unit H, 24.1% in level Gd, 23.5% in level Gc1-Gc2, 23% in level Gb1-Gb2 and 20% in level Ga. Finally, discontinuous retouch is either absent for a small microlith sample of level Ga or occurs in rather rare cases – 7.5% in Unit H, 11.5% in level Gd, 6.9% in level Gc1-Gc2 and 4% in level Gb1-Gb2.

Summing up the three retouch types for microliths, there is a dominance of microliths with continuous semi-abrupt micro-scalar and/or micro-stepped retouch. It is probable that microliths were mounted into wooden spearheads and/or arrowheads (?) with an adhesive material, where such "heavily" retouched lateral edges served for better attachment.

Also, the observed variability for microliths from each stratigraphic subdivision in Units H and G falls within a normal deviation range for basically a single microlith set. This means that the Unit H and G Upper Paleolithic sequence has no significant internal differences for such an important tool class as "non-geometric microliths", which is true for microliths from the sequence's lowermost (Unit H) and uppermost (level Ga) subdivisions.

The Siuren I, Units H and G Upper Paleolithic tool-kits are finally completed by "Neutral" tool types (here actually only notched pieces) and Retouched Pieces with marginal and/or irregular retouch. Most of these specimens are produced on blades and even when on flakes, they usually do not exhibit any specific Middle Paleolithic morphological features, from techno-typological points of view, except for a single retouched flake from Unit H assumed to be a probable unfinished Middle Paleolithic unifacial scraper. Regarding the occurrence of these two tool groups throughout the Units H and G sequence, their proportion to overall tool numbers in each of four stratigraphic subdivisions can be seen, except for level Ga which lacks notched pieces, probably due to the poor tool representation there (only 17 specimens).

Thus, the morphological, metric, technological and typological data for Units H and G Upper Paleolithic flint artifacts reflect a single industrially homogeneous find complex, termed by the present author in a series of publications as Early Aurignacian of Krems-Dufour type, stressing the common very similar industrial nature of such assemblages in Western Europe, as well as some assemblages in Central Europe and, finally, even in Eastern Europe, postulating their Pan-European character. Of course, any previously used names for such assemblages can be used as synonyms (e.g. Aurignacian 0/Archaic Aurignacian/Protoaurignacian with Dufour bladelets of Dufour sub-type) and these have actually been used in different chapters of the present book.

Finally, non-flint artifacts from the Unit G level sequence with Upper Paleolithic artifacts are discussed: 6 bone tools (points and an awl) and 5 shell beads of fresh water river mollusk – *Theodoxus transversalis* (2 pieces), terrestrial snails – *Helix lucorum* *taurica* and *Helicella dejecta* and fossil marine mollusk – *Apporhais pes pelicani* (see p. 73-78 and p. 79-90). Touching on the subject of bone tool presence in the different levels of Unit G, it is again readily understandable why 5 of 6 are from level Gc1-Gc2; this is the most representative level in Unit G for all find classes, again reflecting the most intensive human occupation. Also, the Unit G bone tools (various flat points and a shouldered awl) represent a homogeneous set of pieces from both typological and technological points of view. Among the shell beads, the most important piece is the *Apporhais pes pelicani* marine mollusk. First, it corresponds well with the same *Apporhais pes pelicani* shell beads found during the 1920s Lower layer and, second, because it is from level Ga, the poorest in finds and the uppermost level for the entire sequence of Units H and G. Thus, with this *Apporhais pes pelicani* shell bead finally ends a story on the possibility of some variability for level Ga compared to the other levels, discussed several times before in this chapter. The only visible and significant difference of level Ga in comparison to the other Unit G levels is the presence of two dihedral burins, but nothing else. Moreover, the presence of another dihedral burin in level Gb1-Gb2, with the same traits as the Units H and G Early Aurignacian of Krems-Dufour type/ Archaic Aurignacian industry, reduces the significance of the presence of dihedral burins in level Ga to zero.

The final subject uniting the Units H and G Upper Paleolithic Aurignacian assemblages is the raw materials used. Using statistical data on gray and colored flints in all five stratigraphic subdivisions (see tabl. 16, p. 131 and tabl. 50, p. 207), it is seen that gray flints play a dominant role, while colored flint are also significant (25-33%). Recalling that very few examples of colored flint were found in Aurignacian assemblages from overlying Unit F, the Units H and G assemblages indeed form a homogeneous and distinct Aurignacian industry at the site.

Units H and G Middle Paleolithic Micoquian component comparisons

The Siuren I Middle Paleolithic industrial component will be discussed in detail in a separate chapter (see MP component meaning…") and therefore we will only consider here some basic inter-Unit and inter-level comparisons, which prove that the same Micoquian industry is present in all four stratigraphic subdivisions with Middle Paleolithic finds.

At first view, considering only flint tools, which total 20 specimens from Unit H (3 pieces), level Gd (1 piece), level Gc1-Gc2 (13 pieces) and level Gb1-Gb2 (3 pieces), it is difficult to imagine the same tool type representations in each of the four stratigraphic subdivisions. On the other hand, this has been observed for unifacial tools. Each stratigraphic subdivision has quite indicative Crimean Micoquian Tradition unifacial tool types – various convergent and *déjeté* forms with some additional thinning elements, and the latter elements also occur for a transversal denticulate in level Gb1-Gb2, a transversal scraper in Unit H and 2 double scrapers in levels Gb1-Gb2 and Gc1-Gc2. Moreover, a heightened presence of all convergently shaped unifacial tools (scrapers and points) in both level Gc1-Gc2 which has the most tools (7 pieces among all 11 identifiable tools – 63.6%) and the entire Unit H and G tool-kit (10 pieces of the 18 identifiable tools – 55.6%), along with specific forms including a small point with basal ventral thinning from level Gd and a low value of identifiable bifacial tools (2 pieces of the 18 identifiable tools – 11.1%), also point to an attribution to the Kiik-Koba industry type for the Siuren I Micoquian finds (Demidenko 2000). Also, a series of waste from production and rejuvenation of Middle Paleolithic tools (totaling 23 items) is represented in each of the four stratigraphic subdivisions as well: 7 in Unit H, 4 in level Gd, 8 in level Gc1-Gc2 and 4 in level Gb1-Gb2. These are again very typical Crimean Micoquian Tradition pieces: bifacial shaping and thinning flakes, resharpening flakes of bifacial and unifacial convergent tools' tips, a "Janus/Kombewa" chip on basal ventral thinning of a unifacial tool and some simple retouch flakes. Their high frequency in relation to tool frequency also corresponds well with the Kiik-Koba industry type assemblage data from Buran-Kaya III Grotto, layer B and Kiik-Koba Grotto, Upper layer. Some specific data on Middle Paleolithic tool treatment waste pieces allow us to postulate the existence of bifacial tool treatment and rejuvenation processes for Unit H although no bifacial tool, even broken, were found there. Accordingly, adding three bifacial tools and a bifacial thinning flake from level Gc1-Gc2, there are objective arguments for two of the four stratigraphic subdivisions of bifacial tool treatment and retreatment processes performed by Micoquian groups at Siuren I. Finally, the occurrence of two bone retouchers in level Gc1-Gc2 (see p. 79-90) corresponds well to the assumed most intensive Micoquian flint treatment exploitation processes on unifacial and bifacial tool multiple reductions for this level.

All in all, it is now clear that the Units H and G Upper Paleolithic and Middle Paleolithic industrial components, coming from respectively five and four stratigraphic subdivisions, are homogeneous and represent the Early Aurignacian of Krems-Dufour industry type and the Kiik-Koba industry type of Crimean Micoquian Tradition.

Unit F artifact data in comparison to Aurignacian artifacts from Units H and G

The Unit F inter-level comparisons of lithic artifact data have been already presented in another chapter (see p. 213-279) and will not be specifically presented again here. This is also because the Unit F assemblage is archeologically homogeneous representing a single Upper Paleolithic industry of Late/Evolved Aurignacian of Krems-Dufour industry type. This chapter thus presents basic morphological, metric, technological and typological data for Unit F and compares them directly with the Early Aurignacian of Krems-Dufour industry type in Units H and G. It should be noted that the four Unit F archeological levels (stratigraphically, from bottom to top – Fc, Fb1-Fb2, Fa3 and Fa1-Fa2) are very different from the Unit G levels, since 91.1% the lithics come from only one level: Fb1-Fb2. Therefore, given the similar techno-typological characteristics for all four levels, some special emphasis will be mostly done for level Fb1-Fb2.

Technologically, primary reduction in Unit F is based on almost exclusive exploitation of bladelet cores with no strict blade cores and just a single blade/bladelet core, considering a series of 4 flake/bladelet multiplatform exhausted cores as the final product of multiply reshaped and reduced bladelet cores. Among the bladelet cores (11 items), "regular" (3 items) and "carinated" (8 items) types have been defined. All of the bladelet "regular" cores are double-platform pieces of non-volumetric character with rectangular shape. The cores differ by reduction system, being bidirectional, bidirectional-adjacent or bidirectional-alternate. Taking these into consideration and adding the non-volumetric nature of their final reduction stages, as well as the known typical volumetric reduction for such cores, it is possible to argue that these three particular cores do in fact represent the very last stages of primary use, when any possibility for bladelet removals has been realized, explaining why they have such rather unusual morphological characteristics. Bladelet "carinated" cores were subdivided into three groups: "carinated" items (4 pieces), "advanced carinated" and, finally, new for all Siuren I Aurignacian materials, bladelet narrow flaked single-platform cores/"carinated burins" (3 items). Five bladelet "carinated" cores include four single-platform and one double-platform of volumetric character. Despite the fact that they can be considered as typical "carinated" cores, four of them also have a specific feature that differentiates them from the Units H and G bladelet "carinated" cores – offset platform morphology in plane and twisted removal scars on flaking surfaces. The latter "carinated" cores and a bladelet pre-core, similar to carinated burins, are pieces with wider than usually typologically defined for the flaking surfaces of carinated cores; this is why they have been defined through the twofold core/tool definition. Along with this, they are also characterized by offset platform morphology in plane and twisted removal scars on flaking surfaces. Thus, the Unit F bladelet "carinated" cores in very general terms are similar to those from Units H and G as both served for intensive bladelet reduction. At the same time, they differ in platform morphology in plane, and removal scars on flaking surfaces being either semicircular or even once offset with no, however, twisted scars. Therefore, they technologically served for the production of morphologically different bladelets specific to the two Siuren I Aurignacian assemblages.

The distinctiveness of the Unit F bladelet core reduction processes are confirmed by structures and types of core maintenance products (CMP). First, there is a significant dominance of crested bladelets and microblades over crested blades in the most informative level Fb1-Fb2 – 75 versus 28 pieces, while Units H and G crested pieces, aside from the incomplete sample from level Ga, have always demonstrated the reverse – prevalence of crested blades over crested bladelets *sensu lato* pointing out the more intensive bladelet *sensu lato* reduction at the site during Unit F Aurignacian occupations. The Units H and G crested pieces have been reasonably interpreted above as indicating two basic reduction strategies: blade/bladelet and strictly bladelet. Here, for Unit F, we also can suggest the presence of some blade/bladelet reduction with an initial removal of a crested blade for subsequent serial blade and then bladelet processes. But looking at the level Fb1-Fb2 internal structure of crested blades (4 primary, 7 re-crested, 11 secondary and 6 unidentifiable) with a rather minor role of primary elements among them, it is only possible to argue a subordinate role of crested blades and some blades removed within blade/bladelet reduction processes that themselves were not very common in the entire "primary reduction activity package" of this assemblage. Accordingly, the basic role in core reduction processes was occupied by a strict bladelet reduction strategy with some variations. The data from level Fb1-Fb2 on crested bladelets (12 primary, 3 re-crested, 14 secondary and 10 unidentifiable items) and crested microblades (20 primary, 6 re-crested, 5 secondary and 5 unidentifiable items) firmly confirm the major role of the true "crested blade technique" in its bladelet variant for bladelet core reduction processes from the very beginning of primary flaking with removal of primary crested bladelets *sensu lato*. It is also worth noting the dominance of twisted general profiles for the primary crested bladelets *sensu lato*. Moreover, the occurrence of some re-crested bladelets and microblades also supports continuous bladelet *sensu lato* reduction throughout core exploitations. Examining another CMP – core tablets –, there is another striking example of technological differences between Unit F and Units H and G. For core tablets from the latter units, single core tablets on blades were found for three stratigraphic subdivisions, while core tablets on flakes were extremely dominant. Not the opposite but still a significantly different situation with core tablets is observed in Unit F, where in 3 of 4 levels (Fb1-Fb2, Fa3 and Fa1-Fa2), these CMP pieces have been identified. Level Fb1-Fb2 CMPs contain 12 core tablets on flakes, 11 core tablets on blades and even a single core tablet on bladelet. Level Fa3 CMPs are characterized by 9 core tablets on flakes and 2 core tablets on blades. The only 2 core tablets in level Fa1-Fa2 are on blades. And what do core tablets on flakes and blades mean in a technological sense? As was already stressed during the Unit F core morphological descriptions, typical bladelet "carinated" cores show by their wide and narrow striking platform characteristics that they were rejuvenated by core tablets on flakes, but for bladelet narrow flaked single-platform cores/"carinated cores", we see that the thickness of striking platforms is always more than twice as width, indicating for plain platforms their rejuvenation through the removal of core tablets on blades. The same characteristics are also known for typologically strictly defined carinated cores and we have to admit removal of some of the core tablets on blades and, probably, a single core tablet on bladelet from carinated burins as well. This is especially true for level Fb1-Fb2, where for 11 core tablets on blades there are only 3 bladelet narrow flaked single-platform cores/"carinated cores". Indeed, technologically, the reduction process occurred as follows: first a narrow and long striking platform was created and from it a few bladelets and mostly microblades were subsequently serially removed; then, after a core tablet on blade was removed for platform rejuvenation, it was possible to continue reduction. Thus, considering the Unit F debitage data, it should be kept in mind that the great dominance of bladelets *sensu lato* and particularly of microblades is correctly explained by the significant degree of carinated tool reduction processes.

Coordinating the Unit F core and CMP data, good technological correlations are observed between them. At the same time, the observed Unit F basic core reduction technologies are strikingly different from the Aurignacian ones of Units H and G.

Debitage data further confirm these specific features of bladelet cores and CMPs in Unit F. All of the detailed debitage data will be based on the sample from level Fb1-Fb2, which has the most intensive indications for on-site flint exploitation.

At the same time, it is important to note very briefly the debitage data for the other three levels in Unit F. The lowermost level Fc has the smallest sample of debitage among the four levels – 36 items for debitage *sensu stricto* with no CMPs and tool blanks and 44 items for debitage *sensu lato* including such pieces. Therefore, it is reasonable to simply exclude this level's debitage sample, although one important comment should be made. By its internal structure, the level Fc blady debitage is similar to level Fb1-Fb2 debitage with the following pieces in decreasing frequency: microblades – bladelets – blades. Such a pattern in the former level may also be due to the small sample size. The two other debitage samples from levels Fa3 and Fa1-Fa2 are statistically more significant with two pairs of debitage samples for them in the following order. Level Fa3 debitage *sensu stricto* sample of 192 items is as follows: 32.8% flakes, 15.6% blades, 28.7% bladelets and 22.9% microblades, while the debitage *sensu lato* sample in 233 items contains 33.5% flakes, 19.3% blades, 26.2% bladelets and 21% microblades. Level Fa1-Fa1 debitage pairs are similar to level Fa3: flakes – 39.6% and 38.7%, blades – 12.3% and 15.3%, bladelets – 30.2% and 29.9%, microblades – 17.9% and 16.1% for debitage *sensu stricto* with 106 items and for debitage sensu lato with 124 items, respectively. In spite of some index differences, there is a clear inner structure for debitage classes, where flakes occupy the main position with about one third of all pieces, while blady debitage demonstrates the following decreasing frequency: bladelets – microblades – blades. Accordingly, we see that by blady debitage data, assemblages from Unit F levels are also different from the respective Aurignacian debitage data for Units H and G. Level Fb1-Fb2 is characterized by microblade – bladelet – blade inner structures, whereas levels Fa3 and Fa1-Fa2 show bladelet – microblade – blade in decreasing frequencies. At the same time, the bladelet – blade – microblade inner blady debitage structures for Units H and G 4 stratigraphic subdivisions should be recalled. What can these twofold structures mean? Considering the technological and typological data, the answers are clear. Blady debitage from levels Fa3 and Fa1-Fa2 levels with bladelet – microblade – blade decreasing in order of representation shows more microblades because of the presence in the former level of a bladelet pre-core, a bladelet "carinated" core and a carinated burin, and in the latter level a flake/bladelet multi-platform core, a thick shouldered end-scraper (a carinated end-scraper *sensu lato*) and a carinated burin. Also, we know that the flint exploitation processes were not very intensive in the area excavated in the 1990s for these two levels and, accordingly, little bladelet *sensu stricto* reduction took place, while it is highly likely that carinated tools contributed more microblades. At the same time, the low percentages of blades are perhaps connected to non-intensive initial core reduction events, during which mainly blades were struck off, while the significant percentages of flakes is related to core preparation and/or re-preparation processes. The importance of the debitage inner structures for levels Fc, Fa3 and Fa1-Fa2 lies in its comparison to the debitage data for the subdivisions of Units H and G. It is obvious that they are not similar to one another and, therefore, represent technologically different Aurignacian find complexes.

Now let us consider the debitage data from the basic Unit F level – level Fb1-Fb2, again starting with their inner structures. Debitage *sensu stricto* with total quantity of 1883 items is composed of 22.5% flakes, 5.9% blades, 19.0% bladelets and 52.6% microblades (see tabl. 3B, p. 225).

Debitage *sensu lato*, having 2174 items, has the following inner structure: 22.5% flakes, 8.6% blades, 18.6% bladelets and 50.3% microblades.

Comparing the two pairs of debitage class indices, we see no differences for flakes and bladelets, while the blade index became almost 1.5 times higher for debitage *sensu lato*, however still below 10%. The microblade index became slightly lower for debitage *sensu lato*. The blade index change occurred because of equally significant addition of blade-tools and blade-CMP to "simple blades" (68.5%), such that the actual number of 111 blades within debitage *sensu stricto* became 187 blades for debitage *sensu lato*. At the same time, the number of microblade-tools was almost twice as high in comparison to microblade-CMPs, but the addition to 991 microblades in debitage *sensu stricto* was in total only 102 items (10.3%), so that the respective microblade index for debitage *sensu lato* was only somewhat lowered.

The observed index variability is important as it shows the definite significance of blades for this assemblage. Indeed, at first sight, with 5.9% and 8.6% indices (ILam) within both the debitage *sensu stricto* and *sensu lato* samples for level Fb1-Fb2, blades might be seen as rare pieces. Such a suggestion may be further supported by another strong argument when we compare these indices with the blade indices in debitage samples for levels Fa3 (ILam = 15.6% and 19.3%) and Fa1-Fa2 (ILam = 12.3% and 15.3%) that are more than two times higher. Therefore, our accent on blade-tools and blade-CMPs is correct for showing both the importance of tools on blades and CMPs on blades with their indices within the debitage *sensu lato* sample – ILam (for tool-blanks) being 19.8% and 20.9%, respectively. A similar tendency is also observed for blade debitage from levels Fa3 and Fa1-Fa2. Thus, despite the high dominance of bladelets (more than twice as blades – 404 *versus* 187 items) and especially microblades (more than five times as blades – 1093 *versus* 187 items) within the debitage *sensu lato* sample in level Fb1-Fb2, it is not reasonable to claim any significant blade absence. These Siuren I, Unit F blade role considerations are of real importance for some arguments for flake-oriented true classical Aurignacian assemblages in the Levant (e.g. Bergman 1987; Williams 2006), such as Ksar Akil rock-shelter, levels VIII and VII (Lebanon) and Hayonim Cave, layer D (Israel). But it should be taken into consideration that not all debitage pieces, especially small ones (bladelets and especially microblades) were systematically recovered during the 1930s and 1940s Ksar Akil rock-shelter excavations and also, similar to Siuren I, Unit F, for Hayonim tool-kits where several tools were made on blades (see Bar-Yosef & Belfer-Cohen 1996). It is also worth separately counting the Unit F blady debitage classes for increased understanding of the complete role of blades, bladelets and microblades, as has been done for Units H and G. The following data are in this way obtained:

The joint blade/bladelet *sensu lato* indications for all four Unit F levels are as follows – 60.4 – 77.5% for debitage *sensu stricto*

(Fc – 66.7%, Fb1-Fb2 – 77.5%, Fa3 – 67.2%, Fa1-Fa2 – 60.4%) and 61.3 – 77.5% for debitage *sensu lato* (Fc – 63.6%, Fb1-Fb2 – 77.5%, Fa3 – 66.5%, Fa1-Fa2 – 61.3%). Thus, as is the case with blade/bladelet *sensu lato* indices for Units H and G, the Unit F levels' assemblages are blade *sensu lato* dominated with two decreasing frequency patterns of the three debitage classes for three levels: bladelets – microblades – blades in levels Fa3 and Fa1-Fa2 and microblades – bladelets – blades in level Fb1-Fb2.

Then, it is possible to evaluate the technological roles of different debitage classes for the Unit F assemblages, placing special emphasis on the level Fb1-Fb2 materials as the most indicative and with the most intensive bladelet *sensu lato* reduction, and excluding from the analyses the small and controversial sample from level Fc.

<u>Flakes</u>, as for Aurignacian materials from Units H and G, were not technologically desired products in any of the four Unit F levels, taking into consideration their overall small size (a significant dominance of specimens with length no more than 3 cm – 90.1% in level Fb1-Fb2, 81.1% in level Fa3 and 69.6% in level Fa1-Fa2), cortex data with a few wholly cortical specimens (5.4% in level Fb1-Fb2, 4.8% in level Fa3 and none in level Fa1-Fa2) and, at the same time, with the highest ratios of partially cortical specimens (25.5% in level Fb1-Fb2, 39.6% in level Fa3 and 38.1% in level Fa1-Fa2) in comparison to all the blady debitage classes and especially to bladelets and microblades. The great diversity of their other attribute characteristics shows the complete lack of standardization, mentioning here only the great dominance of expanding and irregular shaped pieces taken together (67.8% in level Fb1-Fb2, 75.9% in level Fa3 and 83.4% in level Fa1-Fa2) in association with mainly "off-axis" removal direction (82.8% in level Fb1-Fb2, 76.4% in level Fa3 and 74.3% in level Fa1-Fa2). At the same time, the good numerical representation of flakes in the three assemblages (22.5-39.6% in debitage *sensu stricto* and 22.5-38.7% in debitage *sensu lato* samples) explains their metric and morphological "instabilities". As is seen in the Aurignacian assemblages of Units H and G, flakes played a major role in preparation and especially re-preparation of cores and carinated pieces during multiple bladelet *sensu lato* reduction phases. Moreover, their technological re-preparation role was even more significant in the Unit F assemblages than for the Aurignacian materials from Units H and G, as bladelet narrow flaked single-platform cores/"carinated burins" and carinated burins themselves required smaller and wider detached re-preparation pieces (flakes) rather than more elongated and narrow pieces (blades), except for CMPs, and these reduction objects are missing in Units H and G.

<u>Blades</u> can be only characterized for level Fb1-Fb2, recalling the rather poor blade samples from the rest of the Unit F levels. Wholly cortical blades are absent not only in level Fb1-Fb2, but also all other levels in Unit F, while partially cortical blades compose 23.4% of the blades in level Fb1-Fb2 and laterally cortex items are dominant – 81.8%. These cortex data are similar for blades and flakes in the Unit F assemblages. Expanding and irregular shapes for blades in level Fb1-Fb2 are represented by a moderate number only (20.2% together), while blades with parallel (59.6%) and converging (20.2%) shapes dominate, with "on-axis" removal direction (80%). Also, blades are mainly with unidirectional (70%) and fairly common unidirectional-crossed (20%) scar patterns, and with twisted general profiles (64.8%), but with trapezoidal and multifaceted profiles at midpoint (49.5%) and, at the same time, rare hinged and overpassed profiles at distal end (7%). Thus, the basic blade features are quite interesting. On one hand, their removal is regular and systematic, according to the majority of features. On the other hand, rather important roles of partially cortical pieces, unidirectional-crossed scar pattern and a less dominant position of trapezoidal and multifaceted profiles at midpoint definitely point out both preparation (cortex data) and re-preparation (the other features discussed) for blades during core reduction processes. Also, a majority of "on-axis" blades does not always indicate continuous reduction of blades and then microblades, as the latter are characterized by non-dominant but common "off-axis" items. Thus, core reduction processes for these two debitage classes were well separated one from another and the role of carinated tools again becomes evident for microblades. Finally, some patterns in blades are also explained by the certain intention of Siuren I, Unit F Aurignacian people to produce blades as blanks for tools. All in all, the blades are in an intermediate position for the Aurignacian flintknappers – they were intended blanks for some future tools and, at the same time, played a significant supplementary role in core reduction processes. The Unit F blades have some similarities to blades from Units H and G.

<u>Bladelets</u> are even more interesting to analyze from typological and technological points of view and keeping in mind the obvious importance of bladelets in the Units H and G assemblages. Yes, bladelets are more than twice as common as blades in level Fb1-Fb2 but they again, like blades, seem to be at first sight not the most desired end products of core reduction processes because of the 77 "non-geometric microliths" from Unit F, only 7 are on bladelets (9.1%). If we additionally exclude a bladelet with dorsal retouch at distal end (level Fa1-Fa2) and 3 truncated bladelets (level Fb1-Fb2), the laterally retouched microlith sample (71 specimens) also with a microblade with lateral dorsal micro-notch and a truncated microblade (level Fb1-Fb2) will have only 3 pseudo-Dufour bladelets with lateral dorsal retouch in level Fb1-Fb2 (4.2%). Contrary to these data, "non-geometric microliths" on bladelets in four stratigraphic subdivisions of Units H and G range from 28.3 to 41.9%. Accordingly, bladelets do not appear to be blanks intended for microlith production in Unit F, or for any other tool class or type. But why are there so many of them and why are their metric and morphological features so standardized? Let us, first, look at the features. So, bladelets of level Fb1-Fb2 can be characterized as follows: a dominance of unidirectional (76.6%) and a moderate number of unidirectional-crossed (15.6%) scar patterns; a low number of partially cortical items (8.1%) and the complete absence of wholly cortical items; a dominance of parallel and converging shaped pieces with near-equal representation – 41.3% parallel and 37.5% converging; a minor prevalence of "on-axis" pieces (53%) over "off-axis" (47%); an abundance of items with twisted general profiles (73.2%); a medium number of items with hinged and/or overpassed ("not regular") distal ends (18.2%); prevalence of items with trapezoidal (43.3%), triangular (31.6%), and rare multifaceted (16.7%) profiles at midpoint; a dominance, but not absolute,

of "plain-punctiform-linear" group of butt types (65.4%) with the most significant role among them of linear type (49.4%), as well as with a notable presence of many crushed butts (31.6%); an absolute dominance of butts with abrasion (95.2%); an average length of 2.3 cm, an average width of 0.9 cm and an average thickness of 0.2 cm, whereas so indicative "long" bladelets (more than 3 cm long) compose only 8.4% with no one of them reaching length of 4.5 cm. By most of these features, the level Fb1-Fb2 bladelets are similar to bladelets from Units H and G, noting only their somewhat shorter length (2.3 cm versus 2.6-2.8 cm), more "off-axis" and twisted characteristics. But being similar to Units H and G, the Unit F bladelets were still almost never used for tool production. Therefore, the bladelet problem decision might be found through both examination of level Fb1-Fb2 microblade data and some specific technological and/or typological considerations. First, there is the very indicative numerical correlation between microblades and bladelets in the level Fb1-Fb2 debitage *sensu lato* sample: 1093 items versus 404 items, or 2.7:1. Second, very few microblades were retouched – only 70 items of all 1163 pieces, or just 6.0%. Thus, we need to take a closer look at microblade features.

Microblades from level Fb1-Fb2 are characterized by the following features: near-total occurrence of items with unidirectional scar pattern (95.7%); only a single partially cortical piece (3.1%); dominance of parallel (55.2%) and many converging (36%) shaped pieces in association of "on-axis" (59.6%) and "off-axis" (40.4%) removal directions; significant dominance of twisted general profiles (76.9%); low number of hinged (8.7%) and only a few overpassed (0.7%) ("not regular") distal ends; prevalence of specimens with trapezoidal (45.1%) and triangular (43.9%) profiles at midpoint, although multifaceted type is rare (7.5%), where the former is an objective indication of systematic microblade removal; a dominance of "plain-punctiform-linear" butt types (59.7%) with most linear (47.4%) not taking into account many crushed butts (37.4%); most of the pieces with butt abrasion (96.3%); an average length of 1.4 cm with the longest complete item 3.4 cm long, an average width of 0.5 cm with the important presence of many pieces with width of 0.2-0.4 cm (41.5%), an average thickness of 0.1 cm. As a result, making direct comparisons between observed bladelet and microblade features, we come to the following quite surprising observations. They are similar to one another in all morphological features (*sic!*) except, of course, metric parameters. So, it is first needed to take a look at some technological aspects that might relate to bladelet and microblade production. Both have been flaked from bladelet cores, including "carinated" ones, and also typologically defined carinated tools, especially carinated burins. Along with this, level Fb1-Fb2 microblades are also a little different from Units H and G microblades in their profile at midpoint: the former ones have ca. 45% trapezoidal profiles and 7.5% multifaceted profiles (the direct evidence on the microblade systematical and continuous reduction) while the latter are mostly triangular profiles – 56.4-74% with, respectively, significantly less representation of trapezoidal and multifaceted profiles. Such difference is again understandable due to the absence of carinated burins and a smaller number of carinated end-scrapers *sensu lato* (including thick shouldered/nosed ones) in Units H and G tool-kits. Accordingly, level Fb1-Fb2 bladelet *sensu lato* primary reduction was much more directed toward production of microblades, while bladelets played much more significant role for the Aurignacian of Units H and G. Thus, by all technological means, the true desired position of microblades in flint exploitation processes for level Fb1-Fb2 Aurignacian groups is evident.

Therefore, 66 retouched microblades deserve some special morphological comparisons with the already analyzed 991 unretouched ones for level Fb1-Fb2. Morphologically identifiable retouched microblades are as follows: 100% pieces with unidirectional scar pattern; 71.4% parallel, 26.6% converging and 2% (a single piece) expanding shapes; 33.9% "on-axis" and 66.1% "off-axis" removal directions; 92.2% twisted general profiles; 100% feathering distal ends; 40% triangular, 52.3% trapezoidal and 7.7% multifaceted profiles at midpoint; a great dominance of linear butts – 86.1%; 100% butts with abrasion. Among these morphological features, only three attributes differ in comparison with unretouched microblades: retouched microblades have only feathering distal ends, and are considerably more "off-axis" and twisted. Moreover, as noted during the level Fb1-Fb2 "non-geometric microlith" analysis, all "off-axis" microblades have only twisted general profiles. At the same time, by metrics, the 66 retouched microblades are not much different from the unretouched ones. On average, 10 complete pieces are 1.7 cm long, 0.5 cm wide and 0.15 cm thick, and thus slightly longer when compared with unretouched microblades (1.4 cm long on average). The length data might be used to argue that longer microblades were selected for tool production, but this is not true. First, there is no retouched microblade longer 2.7 cm while such longer complete items are known among the unretouched microblades. Second, the retouched microblades vary greatly in length from 0.8 and 1.0 cm long to 2.7 cm long with most pieces in between these extremes. Thus, the size is not a factor for selection of microblades for tool retouching. As a consequence, selection of microblades for microlith production is made mainly choosing "off-axis" and, at the same time, necessarily twisted pieces, as well as feathered distal ends. When we again examine the selection rate for microblades involved in retouching processes, we should probably not take into account too seriously "on-axis" microblades. There are indeed 57.4% "on-axis" microblades (594 pieces) among all 1093 microblades in level Fb1-Fb2 assemblage. But only 21 of them have been retouched (3.5%), while of 441 "off-axis" microblades (42.6% all identifiable by these feature microblades) 41 have been retouched (9.3%). Therefore, the latter index seems to be the more pertinent for microblade selection for microlith production. All in all, the observed microblade features are quite different from those from Units H and G ("weakly" twisted and "on-axis") that may be related to their use as projectile point components, but attached in a different way there.

Concluding consideration of the debitage data, clearly understanding the great role of microblades in level Fb1-Fb2 primary reduction processes, there is one stricter objective data set to evaluate the importance of each of four debitage classes in the assemblages of Unit F –tool selection rates. Flakes: 6.3% in level Fc, 5.1% in level Fb1-Fb2, 6.4% in level Fa3, 6.3% in level Fa1-Fa2 and 5.4% in total for Unit F flakes. Blades: 10% in level Fc, 19.8% in level Fb1-Fb2, 8.9% in level Fa3, 10.5% in level Fa1-Fa2 and 16.9% in total for Unit F blades. Bladelets: 0% in level Fc, 1.5% in level Fb1-Fb2, 0% in level Fa3, 2.7% in level Fa1-Fa2 and 1.4% in total for Unit F bladelets. Microblades: 10% in level Fc, 6% in level Fb1-Fb2, 4.1% in level Fa3, 5% in level Fa1-Fa2 and 6% in total for Unit F microblades. Taking into consideration these statistical data, we come up with the rather surprising conclusion that blades were the most common debitage class for tool production, although it should not be forgotten that of all 37 tools on blades, 21 pieces (56.7%) are blades with marginal and/or irregular retouch. Then, flakes and microblades are similarly weakly represented among tools and again for the flake tool-blank sample of 25 items, 15 flakes (60%) are just pieces with marginal and/or irregular retouch. Finally, bladelets randomly occur only in levels Fb1-Fb1 and Fa1-Fa2 where there are just a few examples.

Thus, it is possible to interpret the tool-blank selection debitage data as indicating a complex picture for the level Fb1-Fb2 assemblage where each debitage class was needed to some extent for tool production such that all of the four classes are rather well represented among the debitage.

At the same time, coming back to levels Fa3 and Fa1-Fa2 debitage data and especially for the inner structure of blady debitage with the following decreasing frequency order of the three classes (bladelets – microblades – blades), while the level Fb1-Fb2 data are different (microblades – bladelets – blades), it is possible to discuss variability in the intensity of flint exploitation at the site for two pairs of Unit F levels, where the most intensive exploitation is recorded for level Fb1-Fb2. Moreover, such a suggestion finds strong support when recalling the complex multi-occupational structure of level Fb1-Fb2. Indeed, sub-level Fb1 contains 1810 flint artifacts (only 26.2% the whole flint assemblage of 6900 items for the level). Such the low frequency of flints in sublevel Fb1 is in good correspondence with the sub-level Fb2 stratigraphic data where sub-level Fb2 is much more grayish in color in comparison to sub-level Fb1 due to a significantly higher quantity of ash, charcoal and burnt bones and, more importantly, all the special features of the level occur in sub-level Fb2: 3 ashy clusters, 3 fireplaces, 3 hearths and 2 pits all pointing to a significantly higher intensity and longer duration of human occupations. Taking these human intensity occupation indices along with overall flint artifact numbers and dominance of either bladelets or microblades within the three blady debitage classes, we come to the conclusion that the same Late/Evolved Aurignacian assemblages in Unit F vary to some extent technologically depending upon intensity of human occupation. This conclusion may have far-reaching implications. When a Late/Evolved Aurignacian archeological level occurs at a site with no evidence for high intensity of human occupation (e.g., a low number of artifacts and near-absence of any special features within the level), it might have a bladelet – microblade – blade debitage inner structure for blady pieces with respectively a few retouched microliths as observed for levels Fa3, Fa1-Fa2 and sub-level Fb1. On the other hand, such a level with evidence of much higher intensity of occupation, such as sub-level Fb2 or the entire level Fb1-Fb2 taken together, might have a microblade – bladelet – blade debitage inner structure for blady specimens and also a significantly higher amount of retouched microliths. The former case, by the way, can be already proposed for the Late/Evolved Aurignacian levels at Mitoc-Malu Galben (Eastern Rumania) with mainly workshop characteristics for serial short-term human occupations (see Otte *et al.* 2007), explaining why bladelets dominate and retouched microliths are completely absent.

Regarding the Unit F levels' tool-kits compositions and basic typological features, it is easy again to emphasize their similarities, since their common characteristics have been already noted during their detailed descriptions (see p. 213-279).

Taking the Indicative Upper Paleolithic tools from levels Fb1-Fb2, Fa3 and Fa1-Fa2 (absent in level Fc), a rather consistent tool type representation can be seen. Simple flat end-scrapers (on 3 blades and an elongated flake) are represented in levels Fa3 and Fb1-Fb2. Absence of such end-scrapers in level Fa1-Fa2 is "compensated" by 2 characteristic Aurignacian items there (a thick shouldered and a flat shouldered end-scraper) that are the only end-scrapers in the level. At the same time, a thick shouldered end-scraper and a flat shouldered end-scraper also occur in level Fb1-Fb2 whereas a simple flat end-scraper in level Fa3 is the only one present there. Having such an end-scraper type representation in the three Unit F levels, it is seen that they actually complement one another. The other end-scrapers in level Fb1-Fb2 are a circular, an ogival, and 2 carinated items where the two latter pieces have Aurignacian characteristics for the end-scrapers in Unit F. At the same time, the Unit F end-scraper types, being similar to Units H and G end-scrapers by representation of carinated *sensu lato* pieces, contain one new important type – flat shouldered endscrapers in levels Fa1-Fa2 and Fb1-Fb2. Burin types present in Unit F are even more different from those in Units H and G by the dominant position of dihedral and carinated items. Both of these burin types are well represented in levels Fa3 and Fb1-Fb2, while one of only two burins in level Fa1-Fa2 is carinated. The only two composite tools in Unit F (a simple end-scraper/dihedral burin and a simple end-scraper/carinated (busked) burin), found in level Fb1-Fb2, once again confirm the typical occurrence of simple end-scrapers, dihedral and carinated burins in these tool-kits. Other Unit F Indicative Upper Paleolithic tool types are only represented by single finds of truncations on blades in levels Fa1-Fa2 and Fb1-Fb2, and they also occur in Unit H and levels Gc1-Gc2 and Gd of Unit G. There are also, however, other Indicative Upper Paleolithic tool class representations between Units F, G and H. There were no scaled tools or well retouched blades, including those with Aurignacian-like retouch, in Unit F, but they are known in Units H and G. Thus, by both tool class and type representation, the Unit F Indicative Upper Paleolithic tools are quite different from those in Units H and G, so that these tools can be used to conclude that two different Aurignacian industries are present at Siuren I.

Unit F "non-geometric" microliths further strengthen the differences between the two Aurignacian industries. Excluding truncated pieces, a bladelet with dorsal retouch at distal end, a microblade with lateral dorsal micro-notch and microblades with fine abrupt retouch from the Unit F non-geometric microliths, the majority is composed of Dufour (26 specimens) and pseudo-Dufour (27 specimens) items of Roc de Combe subtype with either ventral or dorsal marginal lateral retouch and mostly "off-axis" and twisted. Other microliths are mostly marginally retouched Dufour microblades with alternate retouch (9 specimens) and pseudo-Dufour microblades with bilateral dorsal retouch (6 specimens) again with dominant "off-axis" and twisted morphological features. It is also worth noting a few representations of bladelet blanks among the 68 retouched microliths – only 3 pseudo-Dufour bladelets with dorsal retouch (4.4%), while the remaining 65 items are microblades. Seventy-eight retouched edges of the 68 microliths are also characterized by the following retouch types, angles and extent data. By retouch types, the predominant position of marginal retouch is clear (61.6%), a moderate number with micro-scalar retouch (33.3%) and only a few edges with stepped retouch (5.1%). By retouch angles, semi-abrupt retouched edges are quite dominant (80.8%), with the minor presence of some flat retouched edges (17.9%) and a single abruptly retouched edge (1.3%). By retouch extent characteristics, continuous retouch dominates (57.7%) followed by partial retouch (38.5%), while discontinuous retouch is poorly represented (3.8%). Taking the three retouched edge characteristics together, we come up with the dominance of retouched edges with continuous semi-abrupt marginal retouch (32.1%), partial semi-abrupt marginal retouch (16.7%) and continuous semi-abrupt micro-scalar retouch (14.1%). Now comparing the Unit F Roc de Combe sub-type microliths with the Dufour sub-type microliths from Units H and G, their morphological and typological differences are quite obvious, noting only here the dominance of items with continuous semi-abrupt but micro-scalar and micro-stepped retouch for the Dufour sub-type microliths from Units H and G.

But these different features for the Unit F microliths also reflect their different use than that of the Units H and G microliths, as suggested during their specific descriptions above. There is general agreement that Roc de Combe sub-type microliths were also used as component inserts for projectile points with, however, no single universally recognized way for their mounting onto projectile points. Lateral mounting, like that put forward for the Siuren I, Units H and G Dufour sub-type microliths, seems to be very unlikely for the following two reasons. First, given their "off-axis" and twisted morphological features, it is difficult to visualize how the Unit F Dufour and pseudo-Dufour microliths of Roc de Combe sub-type could be laterally mounted onto projectile points. Second, these Unit F microliths do not have any specific lateral facet damage traces like that observed on Unit H and level Gc1-Gc2 microliths. Accordingly, another means of attachment must have existed. A new hypothesis for this question is proposed here. A colleague of the present author, Paleolithic archeologist and geologist Reid Ferring (USA), has suggested that I examine Southern African historical San Bushmen arrows with stone and/or glass inserts published by J. Desmond Clark (1975-1977) that reminded Ferring of the Siuren I, Unit F microliths. Based on Clark's article, as well as the original publication of A.J.H. Goodwin (1945), used by Clark in the 1970s for analyses of the Bushmen bows and arrows, it is indeed possible to suggest the Bushmen's technique of arrow production for the Siuren I Roc de Combe microliths. So, the Bushmen were making so-called first type of composite arrows recognized by Goodwin as follows:

"Arrows with stone (later glass) segments or microliths mounted with mastic on a foreshaft of wood or bone. The tapered, torpedo-shaped foreshaft is ca. 230 mm long and ca. 10 mm in maximum diameter and is mounted directly into the reed shaft (fig. 1:4 and plate 1)" (Clark 1975-1977:130). Descriptions of the particular "segments or microliths" are the most important for our analysis. Goodwin, describing the pieces produced by "a member of the Cape Bushman tribes at the home of Miss Lloyd and Dr. Bleek at Mowbray, Cape Town" in 1878 to show other people the very traditional Bushmen way of their fabrication from a bottle glass, although previously a quartz crystal was used, and their attachment to arrowheads, underlined their characteristics: "the glass tips, mounted at the forward end of the foreshaft, consists of a pair of flaked slivers of bottle glass. These roughly resemble single crescents" and "X-ray photographs have been taken of several specimens" of arrowheads and they "show that the tip of a wooden foreshaft comes to within 0.6 cms. of the extreme tip of the wax bedding in each instance" and "this end is covered with wax, pressed out to a rough ivy-leaf shape, and the glass slivers (the microliths – Yu. D.) are set into the shoulders of the leaf to a depth not exceeding 0.15 cms." which is why the microliths were "somewhat precarious, and in use would certainly have fallen away from the wax, and have lodged themselves in the skin of the animal" (Goodwin 1945:429, 433-434). It is also interesting to see how "segments or microliths" were produced and inserted into an arrowhead. "The fragments of glass have been flaked, not merely shattered, and each shows a bulb of percussion at the hinder end, and one or two cleavages on the opposite face. This is unlike the true microlithic technique, in which the bulb of percussion is generally discarded. The edge lying embedded in the wax is worked with tiny facets" (Goodwin 1945:434). Finally, the dimensions and morphology of "segments or microliths" is important to examine. Goodwin's dimension data of the pair of microliths he described are as follows: length – 1.31 and 1.30 cm, width – 0.38 and 0.5 cm, thickness – 0.17 and 0.19 cm (Goodwin 1945:434, fig. 2A on p. 443). Clark (1975-1977) has added to Goodwin's data several more similar 19th century Bushmen arrows with wooden foreshafts with a pair of stone/glass "segments or microliths" either still intact or which had left their impressions there. Clark's data confirms all of Goodwin's observations for these arrowheads. What is important is that Clark contributed additional information on the microliths' retouch characteristics, their mounting into a mastic and also their dimensions. The retouch is characterized to be only on lateral edges of a microlith, which is never pointed – "fine, normal, unidirectional backing while the cutting edge also shows evidence of fine nibbling and retouch or more probably of utilization or damage on both faces" and "the exposed upper tip of the blunted back" was "pressed into the mastic" (Clark 1975-1977:135). Accordingly, the retouch was a lateral marginal one and the microlith was positioned into mastic by its retouched edge. Also, microliths were always mounted into mastic at an "oblique angle" making "an effective triangular cutting edge" for an arrowhead (Clark 1975-1977:135). The microliths themselves or their impressions have the following dimension ranges: length – 8.5-17.4 mm, width – 3-5 mm, thickness – 0.8-2 mm, according to the Clark's measurements (Clark 1975-1977:135-136). It is also possible to add here, analyzing Goodwin's and Clark's descriptions, that retouch was mainly located on one lateral edge of each microliths (see fig. 1; Goodwin 1945: fig. 2A on p. 443; Clark 1975-1977:fig. 1:4 on p. 131 and Plates I – V on pp. 129, 133, 137-139). Having such rather detailed descriptions, illustrations and photos of the Bushmen arrows, it is now possible to say that their stone/glass microliths are not really backed segments and, on the contrary, are very similar to the Siuren I, Unit F Roc de Combe sub-type microliths. Indeed, both of them are usually "off-axis", twisted and small (no more than 1.7 cm long for the Bushmen ones and average 1.7 cm long for the Siuren I ones, with no retouched piece longer 2.7 cm; and narrow – 0.3-0.5 cm for the Bushmen items and 0.5 cm on average for the Siuren I retouched microliths), with mainly fine marginal retouch on one lateral edge either on dorsal or ventral surface – the Siuren I pseudo-Dufour and Dufour microliths (see fig. 4B, p. 270). It is also very important to note their right-sided usual "off-axis" orientation for the following reasons. First, the pseudo-Dufour items with dorsal retouch are positioned on the left sides of Bushmen arrowheads and Dufour items with ventral retouch on the right. Second, the right-sided very dominant "off-axis" orientation for the microliths might also indicate microlith primary reduction by right-handed humans, both Siuren I Aurignacian *Homo sapiens* ca. 30,000 years BP and South African Bushmen in 19th century. Of course, these proposals require additional analyses, but it is important to note them now. Finally, the Siuren I retouched microliths, if they are broken (62 incomplete pieces in level Fb1-Fb2), are mostly proximal parts (38 pieces/61.3%) which may indirectly indicate total breakage of the distal tip due to projectile damage, keeping in mind the very thin distal tips of the microliths, which is why any partial spall scars from spin-off projectile damage is hard to imagine instead of them being just completely broken instead in such projectile damage cases. There is also one more very important general observation by Clark regarding the Bushmen arrows and their inserts. He suggested the appearance of a bow and such arrows with pairs of microlithic inserts much earlier than the 19th century Bushmen examples, tracing back similar microlith existence for even Stone Age assemblages as old as 17,000 years BP (Clark 1975-1977:142-145). He also provided some precise information about Bushmen bows with which the arrows were used. The 18th century oldest known proper Bushmen bows were "all short segment" ones and with no composite elements (Clark 1975-1977:142). Clark also mentioned "traditional preferences of San or Pygmies for short (c. 60 cm) bows with a weight (pull) of c. 20 lbs, and arrows also about 60 cm long" (Clark 1975-1977:146). The bow data mean that there were no particular difficulties in making such simple bows which, however, enabled the Bushmen to "hit a mark, some with unerring certainty, from 50 to 100 paces" (Clark 1975-1977:142). Finally, it is also needed to cite below a final observation by Clark about the effectiveness of bow and arrow use. "The description of the San arrow indicates that it is a very ingenious but not a particularly strong but impressive-looking piece of equipment for use against large game over any but a very short distance. It is, however, the use of poison that turns these arrows into very formidable weapons" (Clark 1975-1977:141). All in all, the considering South African San Bushmen "a non-reversible arrow with reed shaft, presumably fletched, and with bone or wooden foreshaft tipped with "microliths" set in mastic and set directly into the distal end of the reed" (Clark 1975-1977:142) is also possible to imagine in use with a simple bow by Siuren I Late/Evolved Aurignacian humans, given identical morphological and metric characteristics for the microlith inserts.

Finally, to finish with the rest of the Unit F flint tools, it is needed to mention very briefly the presence of 2 notched tools and a denticulated tool on flakes (so-called "Neutral" tool types) only in level Fb1-Fb2 and 45 retouched pieces for all of Unit F (2 in level Fc, 36 in level Fb1-Fb2, 6 in level Fa3 and 1 in level Fa1-Fa2) with similar representation of blade (23 items) and flake (22 items) blanks, although blades (21 items) dominate over flakes (15 items) in level Fb1-Fb2.

The non-flint artifacts from Unit F are represented by 2 bone ovoid in section points, 2 debitage pieces from bone tool production and a pendant on polar fox canine which are, except for one debitage piece from level Fa1-Fa2, from level Fb1-Fb2 (see p. 79-90); and 4 recognized shell beads are the following: one of marine mollusk species (*Gibbula maga albida*) and three of fresh water river mollusk species (*Theodoxus fluviatilis*, *Theodoxus transversalis* and *Lithoglyphus naticoides*) (see p. 73-79). And again, as is the case with nearly all of the other basic artifact classes and/or types, even these Unit F few pieces are very different from the respective items in Unit G where bone tools are usually flat in section and among the shell beads only *Theodoxus transversalis* occurs, while the other shell beads were produced using different mollusk species.

Thus, comparing the Unit F Aurignacian artifacts with the Aurignacian artifacts from Units H and G, we see a different industry that while still Aurignacian, like that from Units H and G, shows at the same time the appearance of definite even more "developed" Aurignacian typological features (e.g., carinated burins and their technological variant as bladelet narrow flaked cores/"carinated burins" that actually together with bladelet "carinated" cores and carinated end-scrapers *sensu lato* represent the entire set of Aurignacian carinated pieces) than is the case for the Units H and G Aurignacian industry. Also, the detailed data on both unretouched bladelets and microblades, and non-geometric microliths from the two Siuren I Aurignacian industries allowed us not only to differentiate the industries, determine the reasons for a number of differences between the two Aurignacian industries. These are briefly summarized below to conclude this chapter.

Concluding remarks

Taking all of the microlith data into consideration, the complete techno-typological view of the Unit F Aurignacian assemblages becomes increasingly understandable. Knowing in advance how Roc de Combe sub-type Dufour and pseudo-Dufour microliths with either ventral or dorsal lateral retouch would be used, the Siuren I, Unit F Aurignacian humans also knew exactly what morphological and metric features the microliths should have. Accordingly, special technological methods for their purposeful serial production have been applied, mainly based on reduction of carinated end-scrapers *sensu lato* (including thick shouldered/nosed ones), bladelet narrow flaked cores/"carinated burins" and strictly speaking carinated burins, causing the detachment of many "off-axis", twisted and narrow microblades from these technologically, primary flaking objects (cores)/typologically, formal carinated tools. This is why the technological and typological features of the Unit F assemblages, and especially the one from level Fb1-Fb2 with the largest assemblage and flint exploitation indications and with the most dominant microblade sample among all Unit F levels, represent such a distinct Aurignacian industry. On the other hand, the Aurignacian assemblages from Units H and G with completely different and dominant Dufour sub-type microliths with alternate lateral retouch ("on-axis", "weakly" twisted and non-twisted wider microblades and a significant portion of bladelets) have been technologically needed in reduction from typologically definable cores and especially their bladelet "carinated" type with rather wide striking platforms and flaking surfaces and, at the same time, relatively short length parameters leading to serial production of bladelets and microblades with these features and no more than 3 cm long. Accordingly, the typologically definable carinated end-scrapers *sensu lato* (including thick shouldered/ nosed ones) are present in a lesser number for some purely microblade reduction, while carinated burins do not occur there at all. It is worth repeating: all of the features of the Units H and G Aurignacian assemblages are connected to a certain need for specific microliths for projectile hunting weapons, possibly including bow and arrow, but in a very different way than assumed for Unit F Aurignacian humans.

Thus, the two different Aurignacian industries at Siuren I, varying in their techno-typological features, were indeed very much connected to the different uses of microliths as components (with either lateral or distal tip positions) of projectile points and production. Such the flint primary and secondary reduction features, dependent on different hunting weapon applications for different Aurignacian humans, led to the composition of two different Aurignacian industries, from our archeological points of view. By these hunting weapon aspects, the Siuren I Aurignacian industries are very different from any Middle Paleolithic industries where there is no such hunting weapon need reflected in their flint assemblages. On the other hand, these Siuren I, like other Old World Aurignacian industries, are very much like other Upper Paleolithic industries (e.g., Gravettian, Epigravettian, Solutrean) where most of the techno-typological features are again connected to use and, accordingly, production of flint hunting equipment. Therefore, the clear observed techno-typological patterns of flint exploitation strategies in the Siuren I Aurignacian industries, depending on flint hunting weapons, "open the door" to further studies aimed at understanding industrial variability in the Aurignacian *sensu lato* as will be certainly the case for some Central European Aurignacian assemblages (e.g., Breitenbach, Senftenberg and Alberndorf I in Germany and Austria) and some Eastern European Epi-Aurignacian assemblages (e.g., Sagaidak I, Anetovka I, Muralovka and Zolotovka I in the southern regions of Ukraine and Russia) which have mostly or only dorsally and marginally non-twisted and "on-axis" retouched microliths and no carinated burins.

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15 - COMPARISONS BETWEEN THE SIUREN I ASSEMBLAGES FROM THE 1920S LOWER AND MIDDLE LAYERS AND THE 1990S UNITS G AND F

Yuri E. DEMIDENKO

Introduction

The data on the assemblages from the 1990s excavations Units H-G-F and inter-unit comparisons (in separate chapters in this volume) are not complete enough to understand the site's entire archaeological record relating to these cultural deposits. This becomes clear when we take into consideration the rather limited area (12 sq. meters) excavated during the 1990s in comparison to the entire area of the rock-shelter (about 350 sq. meters) and parts previously excavated in 1879-1880 (about 60 sq. meters) and 1926-1929 (about 120 sq. meters). The significant difference in these areas warns us against directly applying all of the data on 1990s Units onto archaeological finds recovered during the previous excavations from stratigraphically corresponding cultural deposits, or to consider them as characteristic of the site's entire archaeological context, before detailed comparisons of these new data to existing data have been completed. Such comparisons are crucial if we recall the doubts expressed about the correspondence of data from new limited excavations to old collections for some Paleolithic sites, for example, La Ferrassie (Périgord, France) (Rigaud 1988:395). In the present case, we should, first, only view the new 12 sq. meter area excavated as a "standard-setting sample" for the site, excavated using modern field methods and the archaeological material analyzed using the latest techno-typological approaches and definitions. Only then can we evaluate the data provided from previous investigations and try to compare them with the new.

In doing so, however, some problems are encountered. The area excavated by K.S. Merejkowski in 1879-1880, about 60 sq. meters in the inner area of the rock-shelter was only once and very briefly discussed scientifically in the archaeological literature by Vekilova (1957:283-288), compared to the finds recovered from the 1920s excavation areas. As shown in Chapter 1 "History...", the Lower and Upper layers of the 19th century excavations are broadly comparable to the Lower and Middle layers of the 1920s excavations. But these comparisons were based only on the presence of some very indicative tool types in the 19th century artifact assemblages, while Vekilova's descriptions of most cores, tools and debitage categories were often limited to comments on their similarity to artifacts from the 1920s excavations with no illustrations provided. Such limited data from the 19th century excavations limit correlation of the 1920s Lower and Middle layers to layers in the rock-shelter's inner part investigated in 1879-1880 to a questionable degree of probability. Our current analysis of the site's old excavated areas and their finds is thus limited to data from the 1920s investigations published by Bonch-Osmolowski (1934) and Vekilova (1957). It is worth noting, however, that despite very important general descriptions of the Siuren I finds made by Bonch-Osmolowski, his data do not contain any concrete statistics. So, only data on the Siuren I Lower and Middle layers in Vekilova's publication could be used for detailed comparative analyses with the 1990s excavation results, while Bonch-Osmolowski's observations, as well as the present author's personal conclusions and remarks on part of the 1920s collection at Kunstkamera Museum (St.-Petersburg, Russia) made in November 1999, can be used to add to responses to specific questions.

The 1920s Lower and Middle layers correspond stratigraphically to the 1990s Units G and F, respectively, excluding Unit H from the comparative analyses despite its strong techno-typological similarity to Unit G. Comparative analyses should be done separately for each corresponding Layer and Unit through descriptions and understanding of stratigraphic position, the spatial distribution of artifacts and the techno-typological industrial characteristics of the lithics due to the existence of certain differences between the Layers/Units under discussion.

Comparisons of 1920s Lower Layer and 1990s Unit G

Stratigraphy

According to Bonch-Osmolowski's stratigraphic profiles published and described by Vekilova (1957:242, fig. 4 on p. 240, fig. 6 on p. 243, fig. 7 on p. 244 and fig. 8 on p. 245) (see fig. 2, p. 13 and fig. 2 and 3, p. 21-22), the 1920s Lower layer was "sandwiched" between two lower rock-fall levels of huge limestone blocks (3rd and 4th rock-fall levels in the site's new 1990s stratigraphy) with sediment thickness varying from 0.8 to 2.0 meters depending on excavated area. These profiles are also marked by Bonch-Osmolowski's artificial horizons in accordance with their number and deposition in the sediments, varying from 7 to 8. This number of horizons in the Lower layer is explained by Bonch-Osmolowski's method for excavating the thick Siuren I layers-"usually defining three horizons (about 10-30 cm thick each): above a hearth level, a hearth level itself and below a hearth level" (Vekilova 1957:248), that is, in correspondence with three hearth/ashy lenses clearly visible in the stratigraphic profiles. The 1990s excavations are strongly in accordance with the 1920s excavations in this respect as three hearth/ashy lenses were identified in Unit G: Gb1-Gb2, Gc1-Gc2 and Gd.

Spatial distribution of artifacts

Data related to the spatial distribution of artifacts are obtained from Bonch-Osmolowski's and Vekilova's plans of the Lower layer and the spatial distribution of artifacts shown (Vekilova 1957: fig. 11 on p. 247, fig. 13 on p. 258) (see fig. 1, p. 20) and the number of lithic artifacts for selected squares mentioned by Vekilova (1957:258). It is clear that the Lower layer is represented throughout the entire western and central areas excavated, breaking off in between squares on the И/К-12 line, but was completely absent in small excavated areas in the eastern part of the site. The Lower layer was thus found in about 85 sq. meters during the 1920s excavations. The uneven distribution of the Lower layer is marked by variation in lithic frequency. The western part, with three 2x2 meter squares (10-В, Г and 11-Г; totaling 12 sq. meters), shows the richest concentration for the Lower layer with 4518 flints (n=1892, 1358, 1268 lithic artifacts per square respectively). To this area we can also connect two neighboring squares 12-В, Г (about 6 sq. meters) with the number of lithics ranging from 600 to 900 per square. Only sq. 12-Ж in the site's central area, also with finds numbering between 600 and 900, is comparable to squares 12-В, Г, while all other squares contained less than 600 flints each. It is important to note that the areas poorest in finds (less than 100 lithics per square) are located near the rock-shelter's western, right side wall (squares 6-Е, 7-Е, Д, 8-Г, 9-В, Г, Д with a total area of about 22 sq. meters) and at the Lower layer's southernmost edge (sq. 12-И). Such variability in quantity of lithics across the Lower layer seems to be dependent on both the varying occurrence of artifacts in the assumed three hearth/ashy lenses (occupational floors) and on the nature of these hearth/ashy lenses with much higher finds concentrations assumed around each distinct hearth area.

The new area excavated in the 1990s (squares 10, 11-Ж, З-12 sq. meters) is located between the richest 1920s squares 10-В, Г, 11-Г, 12-В, Г and 12-Ж. The total number of artifacts for all four levels defined (Ga, Gb1-Gb2, Gc1-Gc2 and Gd) is 4709, averaging 1569 artifacts per single 2 x 2 m square from these three squares, using Bonch-Osmolowski's grid system. These artifact counts bring together the site's new area and the three richest squares 10-В, Г, 11-Г (from 1268 to 1892 finds) from Bonch-Osmolowski's investigations. Although hearth/ashy lenses are characteristic for both the new 1990s area and the 1920s neighboring squares 12-Ж, З (see the stratigraphic profile on line 12-А-Н (Vekilova 1957: fig. 4 on p. 240) (see fig. 2, p. 13), it nonetheless seems unlikely that the new area is really similar to the 1920s squares with the most numerous finds. Taking into consideration that systematic screening of all deposits was not conducted during Bonch-Osmolowski's investigations, and even when it was done, the screened pieces were not separated by particular square, but were grouped as simply "screened items", we can easily assume that most of the small chips and microblades were ignored and lost, with just knives and picks used on sorting processes of occupational floors. Playing with this suggestion, it is not hard to imagine the presence of only about 25% of the chips and microblades actually found in the 1990s excavations Unit G if Bonch-Osmolowski's field methods had been applied. Accordingly, the actual artifact count of 4709 would decrease to 2924. Dividing this new number over three squares gives an average 974 lithic artifacts per one 2x2 square. Such an average flint density is intermediate between the richest (1200-1900 items) and the less representative (600-900 items) squares, and certainly closer to the latter. There is also planigraphic evidence pointing to the site's western part as the richest area of the Siuren I Lower layer and Unit G. Most of the Unit G finds were found in the northern part of the new 1990s excavations area, leading towards this western center.

Thus, the spatial distribution analysis of the Siuren I Lower layer and Unit G definitely demonstrates interconnections between and similarity of the areas excavated during the 1920s and the 1990s field campaigns, allowing us to consider them as together representing a single complex of occupational floors with hearth/ashy lenses and comparable numbers of finds.

Assemblages

Bonch-Osmolowski's Lower layer lithic collection in Vekilova's accounts (1957: tabl. 6 on p. 260) numbers about 15500 pieces. As an aside, this is the largest lithic assemblage for the Siuren I 1920s excavations because it is even more than the quantity from both Middle and Upper layers taken together. The approximate nature of the Lower layer's lithics is explained by inexact counting of debitage and debris categories, as well as of some tool types. The following flint artifact categories were precisely counted: 85 core-like pieces (43 cores and 42 core fragments), 622 tools (610 pieces with secondary treatment and 12 hammerstones) and 45 burin spalls. Approximately counted artifact categories are the following: about 200 blades with mostly irregular and/or marginal retouch, about 1000 blades and bladelets *sensu lato*, more than 500 flakes, about 50 core tablets, about 30 crested pieces and about 13000 "chunks and flint fragments". On the basis of Vekilova's flint descriptions and our personal observations of part of the Lower layer artifacts in St.-Petersburg (November 1999), it is clear that this category is composed of many broken flakes, blades, chunks and complete bladelets, microblades and different chips as well. The represented "too rough" debitage and debris counts do not allow us, unfortunately, to structure them in accordance with their actual roles in primary flaking processes or their particular morphology - even, for instance, in distinction between bladelets and microblades. Therefore, information comparable to that from the 1990s Unit G assemblage could be only obtained from cores and tools from Bonch-Osmolowski's investigations. The only additional good exception is composed of Vekilova's raw material characteristics. In this respect, she noted (1957:258-259) the prevalence of gray flints, the rare representation of local black flints and a medium but very characteristic role, particularly for the Lower layer, of meso-local colored flints on which about 20% of all tools and about 10% of all cores were made. Vekilova's core and tool characteristics can be understood in modern Paleolithic terminology as follows.

All 43 cores were subdivided into Upper Paleolithic "prismatic" (38 pieces) and "discoidal" cores (5 pieces). The "prismatic" cores appear to be predominantly bladelet single-platform ones with usually acute angles and abrasion for striking platforms and of generally small and medium size (length-5-6 cm and width-3-4 cm) (1957:259) (fig. 1:1-4). The "discoidal" cores are described only through the example of one seemingly truly discoidal core on gray flint with overall small size (length-4.8 cm and width-4.0 cm) (1957: p. 260 and fig. 14, 5 on p. 261) (fig. 1:5). The presence of core tablets and crested pieces are technologically in good agreement with Upper Paleolithic bladelet and some blade core reduction.

Upper Paleolithic "Indicative Tool Types" (n=205) are composed of 85 end-scrapers, 76 burins, 4 composite tools, 29 scaled tools, 9 perforators and 2 "Chatelperron points". End-scrapers were subdivided by Vekilova (1957:264-266) into specimens on blades (45 items), flakes (12 items) and "thick" pieces (28 items) where the latter ones terminologically would generally correspond to "carinated end-scrapers". According to Vekilova's descriptions, it is possible to distinguish the following end-scraper types among "45 end-scrapers on blades": 32 simple, 1 double simple, 10 simple on differently retouched blades with usually light scalar and/or irregular/marginal retouch (1957: fig. 16, 1, 3 on p. 264) (fig. 2:1-2), 1 shouldered flat (1957: fig. 16, 6 on p. 264) (fig. 2:3) and 1 nosed flat (1957: fig. 16, 7 on p. 264) (fig. 2:4). The "10 end-scrapers on flakes" (1957: fig. 16, 2, 10 on p. 264) (fig. 2:5-6) do seem to be truly of this type. The "28 thick/carinated end-scrapers" in terms of our classification system would be mainly defined as "bladelet carinated cores". All written descriptions, the three illustrated pieces (1957: fig. 14, 4, 6 on p. 261 and fig. 16, 4 on p. 264) (fig. 1:3-4; 2:7) and our own personal observations of pieces in November 1999 allow us to describe these "thick/carinated end-scrapers" as having elongated but narrow fronts with regular bladelet removals that is typical of cores rather than end-scrapers. Vekilova additionally specially pointed out that the piece on fig. 16, 4 (fig. 2:7) is "... the best example of this tool type from the Lower layer" (1957:266) which corresponds exactly to the "bladelet carinated single-platform cores" of our definitions. So, in this situation, we should admit that if carinated end-scrapers are present in the Lower layer, they seem, at best, to be fairly rare, no more than a few examples, that were not recognized in Vekilova's descriptions. At the same time, such "recalculation" reduces the number of common end-scrapers, which become less than for burins in the Lower layer; the number of bladelet cores in their "carinated variation" also increases. Burins are represented by the following types: angle (32), dihedral (17), on truncation (15) and "multifaceted" (12) ones (1957:262). The latter "multifaceted" type is neither well-described nor illustrated, leaving us with no clear understanding of their morphology. Other burin types are typically Upper Paleolithic with predominant manufacture on blades. In Vekilova's opinion, the main morphological feature of burins is the characteristic presence of a single facet on the verge of each burin, even for double burins. Because of this, we can assume the absence of carinated forms among dihedral burins. My own observations of burins at Kunstkamera Museum in November 1999 revealed the presence of only two piece which could be considered carinated burins. The predominance of angle (1957: fig. 15, 7 on p. 263) (fig. 2:13) and on truncation (1957: fig. 15, 1-2, 4, 6 on p. 263) (fig. 2:10-12) types over dihedral burins (1957: fig. 15, 3 on p. 263) (fig. 2:14) is indicative of the Lower layer. Composite tools (1957:266) are only represented by end-scraper/burins (1957: fig. 15, 5 on p. 263, fig. 16, 8 on p. 264) (fig. 2:8) with no clear specifications for their specific morphology. Scaled tools (1957:266-268) were not identified as such by Bonch-Osmolowski in the Siuren I Lower layer assemblage. Checking his inventory books for lithic descriptions at Kunstkamera Museumin in November 1999 allowed the present author to recognize that most scaled tools were identified by him as either "Mousterian tools"-side-scrapers or simply retouched pieces – an understandable choice in the 1920s when scaled tools were not a commonly acceptable tool type for Upper Paleolithic industries in the 1920s. So, it is certainly to Vekilova's merit that scaled tools were recognized (**1957**: fig. 17, 1-8 on p. 265) (fig. 1:6-13). Perforators are described by Vekilova (1957:269) as having only irregular secondary treatment and, accordingly, not formally defined types. Illustrations of some perforators (1957: fig. 18, 1, 7-8 on p. 267) (fig. 2:15-17) confirm her morphological observations and even allow us to exclude several dubious examples. The "2 Chatelperron points" (1957:269-270) are blades with, however, not abrupt but semi-steep scalar lateral retouch (Bonch-Osmolowski 1934: fig. V, 4; Vekilova 1957: fig. 18, 3 on p. 267) (fig. 2:18) that instead places them strictly typologically into the retouched blades tool category.

Retouched pieces, as noted by Vekilova (1957:270-272), are composed of about 200 pieces with blady metric proportions of the following size ranges: length from 2.5 to 12 cm and width from 1.0 to 3.3 cm with most about 6 cm long and 2 cm wide. From these metric data, there is a clear presence of bladelets *sensu stricto* and an odd absence of flakes among retouched pieces. There is, unfortunately, only a single illustrated piece (1957: fig. 16, 5 on p. 264) (fig. 2:9): a large blade (length-9.9 cm and width-2.8 cm) with irregular bilateral dorsal retouch. Supposing this item is a typical example of Vekilova's defined retouched pieces, we could argue that blades with irregular and/or marginal retouch are the most characteristic for the Lower layer's retouched pieces. Although we should not exclude the presence of blades with regular scalar retouch among Vekilova's retouched pieces, signs of indicative tool types such as blades with "Aurignacian-like heavy retouch" do not appear to occur in the Lower layer.

"Non-geometric microliths" (365 pieces) are the most numerous and typical Upper Paleolithic tool category for the Lower layer assemblage. Their typological classification was made by Vekilova before common recognition of Aurignacian bladelet types in Paleolithic Archaeology and she thus did not identify any of the Siuren I "non-geometric microliths" as Aurignacian (1957:268-269). Rather, she defined the following four retouched bladelet types based on retouch: "with alternate retouch" (213), "with backed edge" (97), "with light retouch"

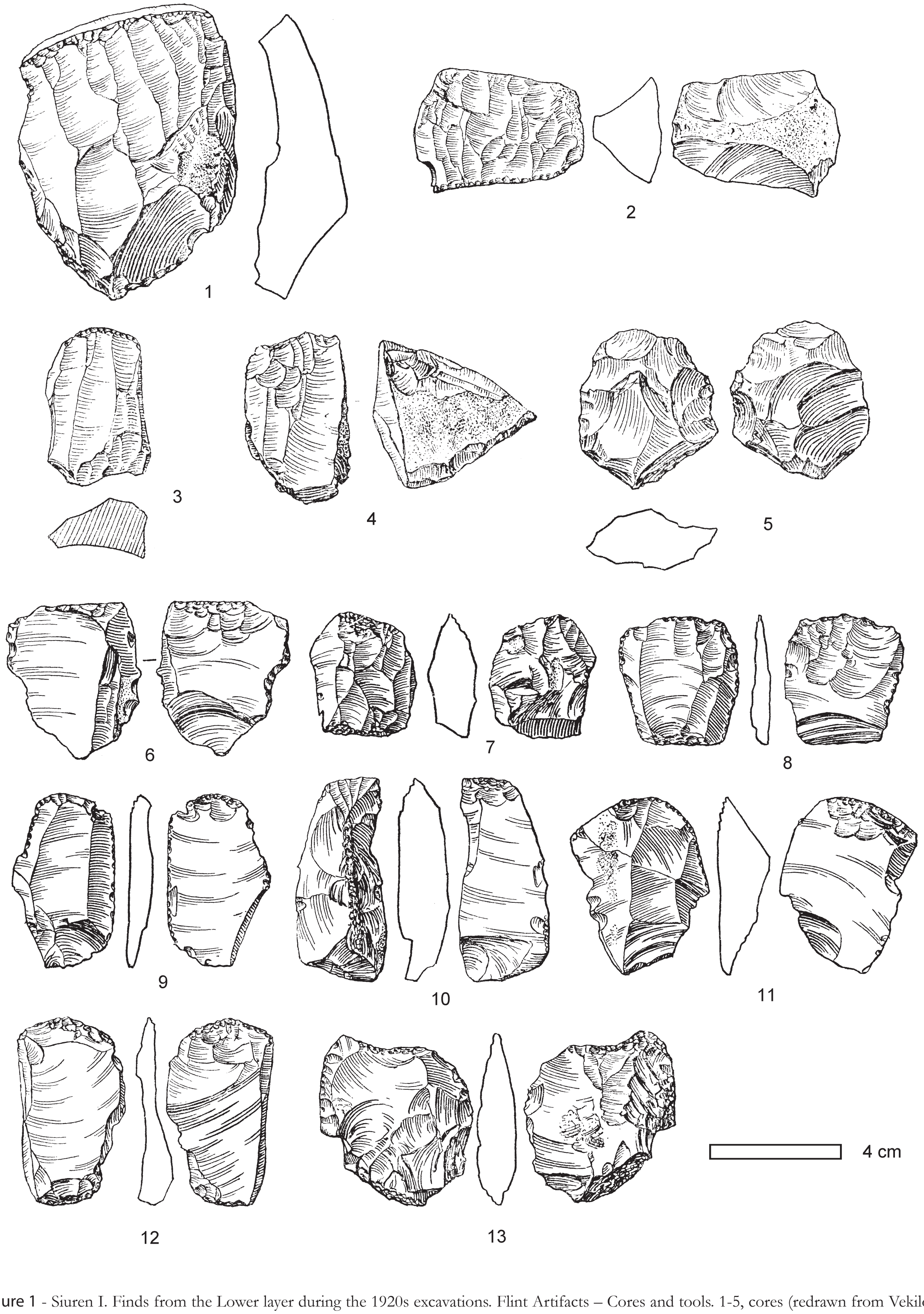

Figure 1 - Siuren I. Finds from the Lower layer during the 1920s excavations. Flint Artifacts – Cores and tools. 1-5, cores (redrawn from Vekilova 1957: fig. 14, 1, 3-6, p. 261); 6-13, scaled tools (redrawn from Vekilova 1957: fig. 17, 1-8, p. 265).

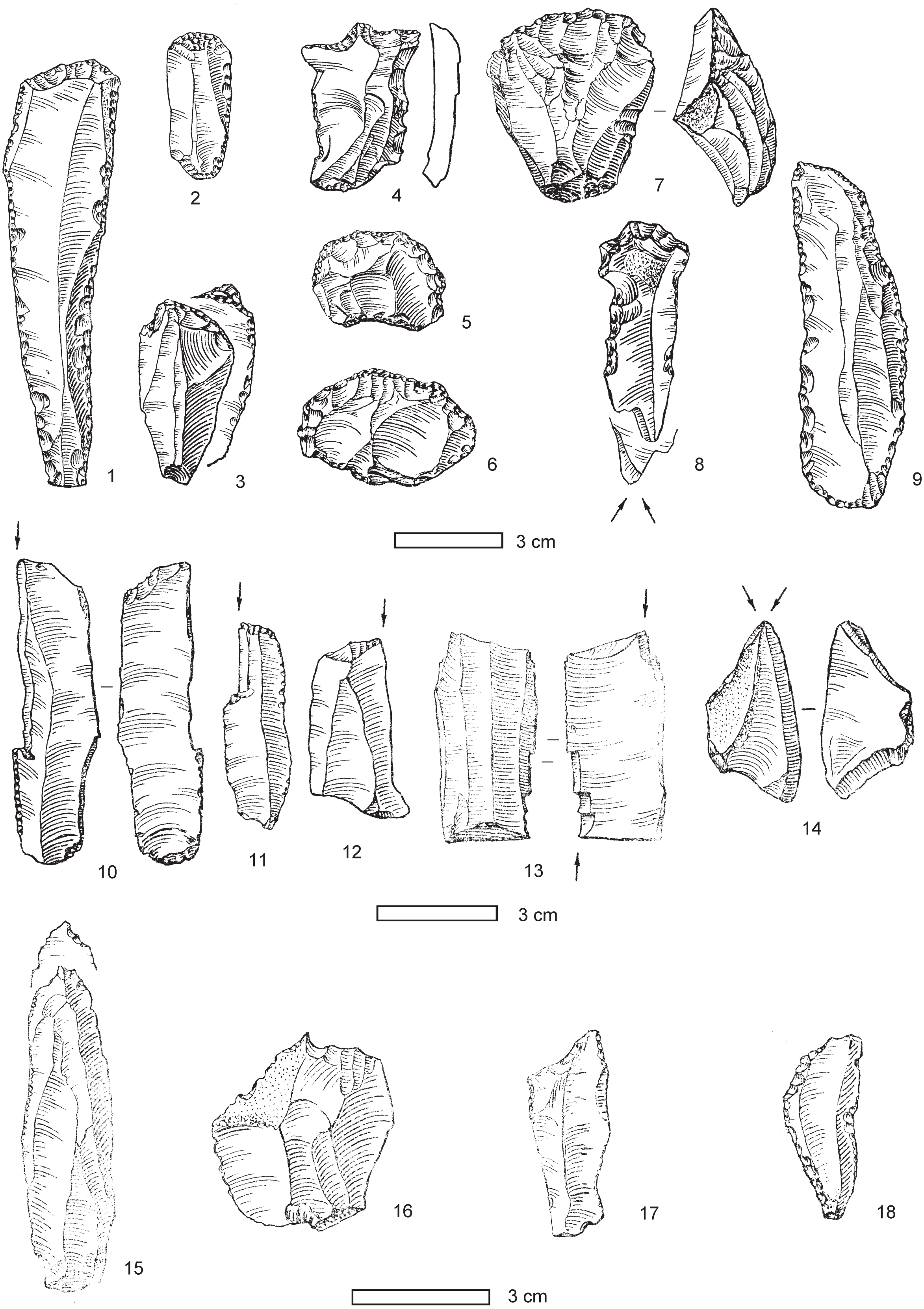

Figure 2 - Siuren I. Finds from the Lower layer during the 1920s excavations. Flint Artifacts – Cores and tools. 1-6, end-scrapers (redrawn from Vekilova 1957: fig. 16, 1-3, 6-7, 10, p. 264); 7, bladelet "carinated" core (redrawn from Vekilova 1957: fig. 16, 4, p. 264); 8, simple flat end-scraper/ dihedral burin (redrawn from Vekilova 1957: fig. 16, 8, p. 264); 9, blade with a bilateral dorsal irregular retouch (redrawn from Vekilova 1957: fig. 16, 5, p. 264); 10-12, burins on truncation (redrawn from Vekilova 1957: fig. 15, 1, 4, 6, p. 263); 13, double angle burin (redrawn from Vekilova 1957: fig. 15, 7, p. 263); 14, dihedral burin (redrawn from Vekilova 1957: fig. 15, 3, p. 263); 15-17, "perforators" (redrawn from Vekilova 1957: fig. 18, 1, 7-8, p. 267); 18, "Chatelperron point"/blade with semi-steep scalar retouch lateral edge treatment (redrawn from Vekilova 1957: fig. 18, 3, p. 267).

(50) and "with denticulated edge" (5). In Vekilova's view, common features of retouched bladelets consist in their representation by mostly broken pieces, the near-absence of twisted general profiles, length from 1.8 to 4.2 cm and width from 0.4 to 1.2 cm. The width range points to the presence of at least some retouched microblades (0.4-0.6 cm wide). Here it is also worth noting Bonch-Osmolowski's remark that "almost all bladelets were used for retouching processes" (1934:152). Use of Vekilova's descriptions and illustrations of retouched bladelets allows us to make some specifications on her defined types within the retouched bladelets tool category. "Bladelets with alternate retouch" are the most typical (1957: fig. 18, 4, 9, 11-12 on p. 267) (fig. 3A:1-4). There are 25 complete items (12.4%) out of 202 pieces with alternate retouch. Taking into account the illustrated pieces, we suggest the existence of the following variations among them: microblades (1957: fig. 18, 12 on p.267) (fig. 3A:3) and bladelets (1957: fig. 18, 4 on p. 267) (fig. 3A:1) with bilateral alternate retouch ("Dufour bladelet" type), and even including some very wide (1.1 cm) bladelets (1957: fig. 18, 11 on p. 267) (fig. 3A:2), and "Krems points" with bilateral alternate retouch on microblades (1957: fig. 18, 9 on p. 267) (fig. 3A:4). Eleven more fragmented bladelets sensu lato among "pieces with alternate retouch" have only ventral retouch. The reason why Vekilova included bladelets with lateral ventral retouch in this type was that almost all of these items have retouch always along the bladelets' left lateral side on the ventral surface, which was interpreted by her as representating the first stage of production of bladelets with alternate retouch. "Bladelets with backed edge" include 10 complete items (10.3%) out of 97 pieces. This type actually appears to be represented by "Krems points" with bilateral dorsal retouch on bladelets (1957: fig. 18, 5-6 on p. 267) (fig. 3A:5-6), pieces on microblades (1957: fig. 18, 10 on p. 267) (fig. 3A:7) and bladelets with dorsal bilateral or lateral retouch ("pseudo-Dufour bladelet" type) and just a few true backed microblades and bladelets. The exact number of each of these variations is not clear from Vekilova's data, but my own observations of actual pieces in St.-Petersburg in November 1999 suggests strongly that broken "Krems points" are dominant among them. "Bladelets with light retouch" include 5 complete items (10%) out of 50 examples of this type. Although none of these pieces were illustrated, Vekilova's observation that "fine pointing retouch forms usually one and rarely two bladelets' lateral edges" (1957:269) clearly supports their attribution according to our classification system as microblades/bladelets with dorsal bilateral and lateral retouch ("pseudo-Dufour bladelet" type). "Bladelets with denticulated edge" were only counted and not described by Vekilova. The absence of abrupt retouch for these pieces does, however, allow us to consider them as microblades/bladelets with dorsal microdenticulated lateral edge formed by fine and/or semi-steep retouch, also confirmed by personal observations of these rare bladelets in St.-Petersburg in November 1999.

In addition to these Upper Paleolithic tool types in the Lower layer, this assemblage contains a significant series of "pieces of Mousterian forms" using Vekilova's definition. According to her data (1957:270), there are 40 such tools represented by 36 unifacial and 4 bifacial tools. Unifacial tools were further subdivided into 27 points and 9 side-scrapers. Transforming Vekilova's descriptions into our own classification system, points are mainly represented by small-sized pieces (usually no more than 4 cm long and/or wide) with semi- and sub-trapezoidal, triangular and leaf shapes sometimes with additional basal ventral thinning (**1957**: fig. 19, 1-3, 5 on p. 271) (fig. 3B:1-4), as well as rarer examples of larger items - e. g., a sub-triangular piece 6 cm long and 3.2 cm wide (1957: fig. 19, 7 on p. 271) (fig. 3B:5) and another similar sub-triangular item 5.4 cm long and 2.8 cm wide (Bonch-Osmolowski 1934: fig. IV, 8). At the same time, three times less common scrapers are only said to be represented by examples that are "quite massive, not regularly shaped by secondary treatment" (1957:270) and illustrated by a single piece - a simple convex dorsal scraper 5.1 cm long and 4.5 cm wide (1957: fig. 19, 6 on p. 271) (fig. 3B:6). Our own observations of about 20 unifacial Middle Paleolithic tool types at Kunstkamera Museum allows the present author to say that scrapers are actually more common than points and the reverse statement by Vekilova is explained by her consideration of all convergent and asymmetric tools as points. Vekilova classified four bifacial tools as "*miniature hand-axes"* - the tool type definition widely used for many bifacial tools descriptions of the Crimean Middle Paleolithic industries during the 1930s-1960s. The only illustrated bifacial item (1957: fig. 19, 4 on p. 271) (fig. 3B:7) is a basally fragmented sub-triangular/leaf-shaped "plano-convex" scraper 5.1 cm long and 4.0 cm wide. Among the materials of the Lower layer at Kunstkamera Museum, in addition to this bifacial piece, there is only one more bifacial tool - a distal fragment of a bifacial symmetric piece with "plano-convex" shaping.

There are also some non-flint artifacts in the Lower layer assemblage. Unfortunately, aside from hammerstones, Vekilova only noted among them a complete limestone pebble with a number of long shallow striations (1957: fig. 25 on p. 292 with no scale) - quite possibly a grinding tool in accordance with our classification system.

Now let us summarize these data on the Siuren I Lower layer assemblage based mainly on Vekilova's descriptions. Regarding the primary flaking processes, bladelet production from both "regular" and especially "carinated" single-platform cores with acute striking platforms is dominant. The following three tool type groups are connected to the Upper Paleolithic typological component: "Indicative Upper Paleolithic tool types" - 205 items/26.6%, "retouched pieces" - about 200 items/26% and "non-geometric microliths" - 365 items/47.4%. The Aurignacian typological indicators among them are most prominently expressed by "Dufour bladelets" and "Krems points" with bilateral alternate retouch and "Dufour bladelets" with lateral ventral retouch - respectively, 202 pieces/55.34% and 11 pieces/3.01% among all 365 "non-geometric microliths" taken as 100%, although quite a few fragmented "Krems points" with bilateral dorsal retouch should also be added here, although the eaxct number is not known, as well as less common carinated end-scrapers, for which the exact quantity is also not known. Transferring Vekilova's many "thick end-scrapers" into bladelet "carinated" cores leads to a slight overall predominance of burins over end-scrapers. The near-absence of carinated burins and a subordinate position of dihedral type in comparison to dominant angle and on truncation types are characteristic for burins. Other Upper Paleolithic tool types (composite tools, perforators, retouched blades) are neither numerically nor morphologically well-defined. The only exception in this regard is a series of typical scaled tools. On the other hand, the "Middle Paleolithic techno-typological components" also comprise the morphologically expressive series of finds.

Before presenting final conclusions on the 1920s Lower layer assemblage and the 1990s Unit G assemblage, it seems very useful to additionally summarize the results of classification analysis using modern typological criteria of part of the Lower layer flints by J. Hahn in Leningrad (Hahn 1977). The following are the representation of the general tool types in Hahn's calculations for 249 tools (1977: tab. 3 on p. 338): simple end-scrapers - 14 items/5.6%, end-scrapers on retouched pieces - 2 items/0.8%, carinated end-scrapers - 5 items/2.0%, nosed end-scrapers - 2 items/0.8%, angle burins - 11 items/4.4%, burins on truncation - 16 items/6.4%, dihedral burins - 9 items/3.6%, truncations - 19 items/7.6%, scaled tools- 5 items/2.0%, retouched blades- 41 items/16.5%, bladelets with fine retouch - 101 items/40.6%, Middle Paleolithic unifacial tool types: points- 12 items/4.8% and scrapers - 5 items/2.0%, notched pieces - 6 items/2.4% and other tools - 1 item/0.4%. The structure of these tool types confirms the following typological characteristics already noted using Vekilova's data: the predominance of burins (36/14.4%) over end-scrapers (23/9.2%), the absence of carinated burins and the very minor occurrence of dihedral

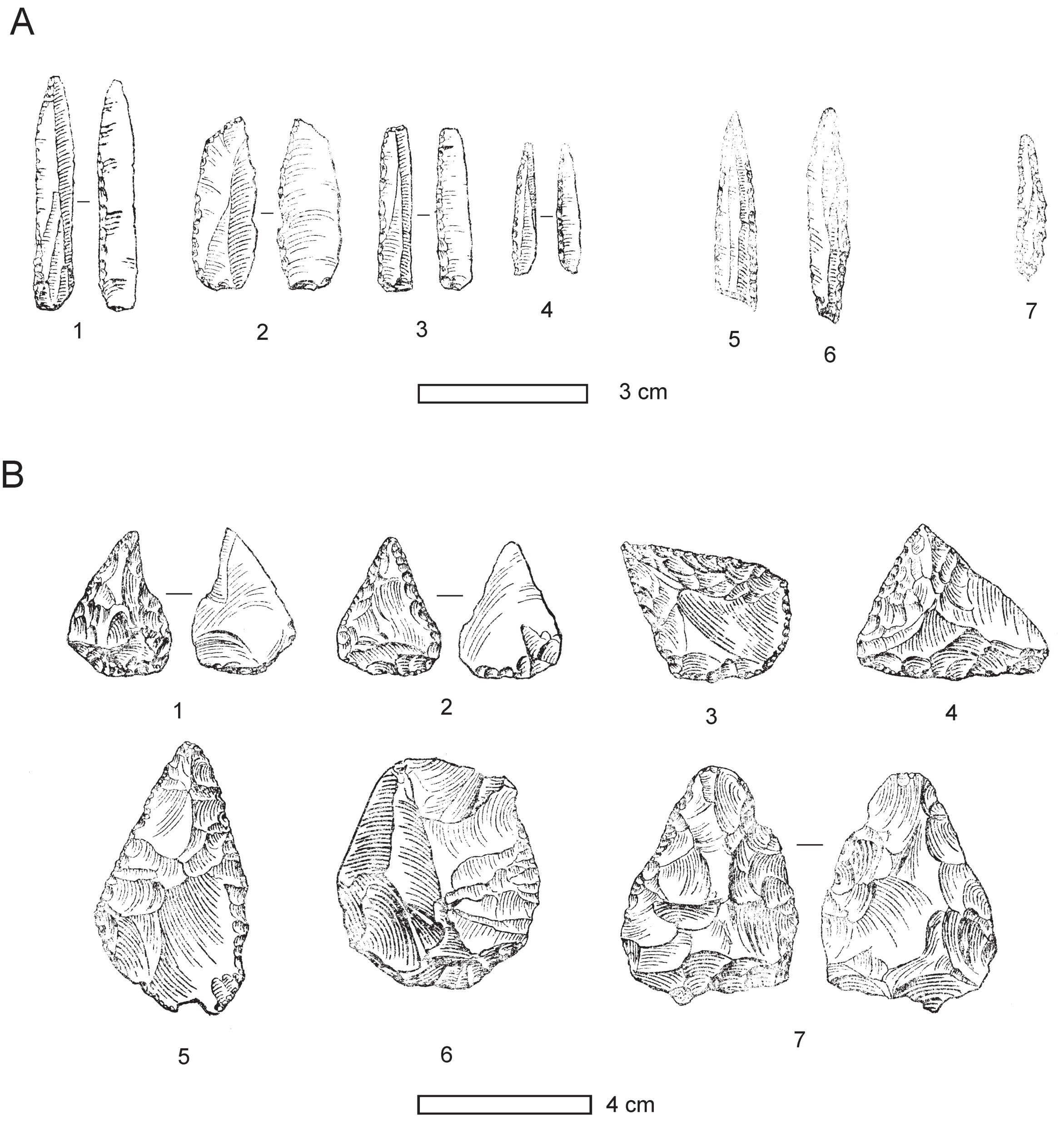

Figure 3 - Siuren I. Finds from the Lower layer during the 1920s excavations. Flint Artifacts – tools. A. "Non-geometric microliths" (redrawn from Vekilova 1957: fig. 18, 4-6, 9-12, p. 282). 1-2, Dufour type bladelet, on bladelets with alternate retouch; 3, Dufour type bladelet, on microblade with alternate retouch; 4, Krems point, on microblade with alternate retouch; 5-6, Krems points, on bladelets with bilateral dorsal retouch; 7, pseudo-Dufour type bladelet, on microblade with bilateral dorsal retouch. B. Middle Paleolithic tool types (redrawn from Vekilova 1957: fig. 19, 1-7, p. 282). 1-6, various unifacial tools; 7, "miniature hand-axe"/bifacial "plano-convex" scraper.

type among burins, a number of differently retouched blades, the presence of scaled tools, the notable proportion of Middle Paleolithic types (6.8%) and, finally, the most abundant representation of retouched bladelets *sensu lato*. On the other hand, discrepancies with Vekilova's data could also be noted: the absence in Hahn's counts of perforators and Middle Paleolithic bifacial tools that can certainly be explained by his examining only a sample and not all finds, and the appearance of truncations and notched pieces not defined by Vekilova at all. The newly recognized type was nosed end-scrapers, although Hahn did not describe their particular morphology: shouldered or nosed and thick or flat features. At the same time, Hahn's structure of retouched bladelets *sensu lato* is worth noting because it is very different from Vekilova's data and is as follows using our classification system: "Dufour bladelets" with bilateral alternate retouch- 80 items/79.2%, including two with additional distal retouch; "Dufour bladelets" with lateral ventral retouch - 4 items/3.96%; "pseudo-Dufour bladelets" with bilateral dorsal retouch - 9 items/8.91%; "pseudo-Dufour bladelets" with lateral dorsal retouch - 5 items/4.95%; "Krems points" with bilateral alternate retouch - 1 item/1.0% and "Krems points" with bilateral dorsal retouch - 2 items/1.98% (Hahn 1977: p.141, Tab. 15 on p. 350, Tafel 182, 1-18).

So, combined together with some corrections, Vekilova's and Hahn's data on the Siuren I 1920s Lower layer assemblage certainly appear to be quite similar and comparable as well to the 1990s Unit G assemblage. This latter complex of finds has already been described and thoroughly analyzed in previous chapters and will not be discussed in the same way here. It is instead more useful to agree that these two assemblages actually represent the same find complex, recovered during two different excavation campaigns with some differences explained by differences in field methods and techno-typological approaches to lithic analyses. Accepting this conclusion, it is thus better to create a general techno-typological definition of the Siuren I Lower layer/Unit G assemblage for common industrial understanding of the site's entire archaeological record relating to the respective cultural bearing sediments. On the other hand, for further detailed and comparative analyses of these Siuren I materials with other Crimean and not only Crimean Paleolithic industries, it would be better to use only the industrial characteristics and statistics for the Unit G assemblage.

Thus, the Siuren I Lower layer/Unit G lithic finds are composed of two industrial components: the most dominant and numerous Upper Paleolithic, namely, the Aurignacian component and although not abundant quantitatively but quite clear morphologically, Middle Paleolithic component with strict techno-typological analogies with assemblages of the Crimean Micoquian Tradition.

The Upper Paleolithic/Aurignacian find complex is with no doubt attributable to the Aurignacian 0/Archaic Aurignacian of Krems-Dufour type. It is technologically characterized by a clear dominance of bladelet production with the almost exclusive exploitation of bladelet single-platform cores with acute angles and edge abrasion for plain striking platforms, among which the "carinated" sub-pyramidal and sub-cylindrical types should be particularly noted as most indicative of the Aurignacian. Associated with these cores are bladelet "carinated" double-platform cores with orthogonal-adjacent and bidirectional-perpendicular disposition of plain striking platforms, while blade/bladelet and bladelet "regular" double-platform bidirectional cores with opposite striking platforms and the same flaking surface are quite rare, suggesting that they did not play a major role in primary flaking processes. This technological direction toward bladelet production is clearly connected to the abundance of "non-geometric microliths" in the typological structure of this find complex (from about 40% in the Lower layer collection to about 60% in the Unit G collection of all tools), among which the most morphologically characteristic and numerous are Archaic Aurignacian types with semi-steep micro-scalar and/or micro-stepped retouch - "Dufour bladelets" with bilateral alternate retouch, as well as some "Krems points" with bilateral alternate and bilateral dorsal retouch. Other Upper Paleolithic tools are represented by the following categories in order of decreasing frequency: burins, for which angle and on truncation/lateral retouch types are dominant, including notable but rare dihedral and the near-complete absence of the Aurignacian carinated type; end-scrapers with rare but typical Aurignacian carinated and thick/flat shouldered/nosed types and dominance of the simple type mainly on unretouched blades; scaled tools; truncations; perforators; retouched blades with only a single exceptional piece with "Aurignacian-like heavy retouch".

The Middle Paleolithic/Micoquian find complex has clear technological and typological features which can be summarized on the basis of 5 cores and 40 tools (36 unifacial and 4 bifacial items) from the 1920s Lower layer and 17 tools (14 unifacial and 3 bifacial pieces) from the 1990s Unit G. All of the Middle Paleolithic pieces from Unit G were found in three hearth/ashy levels - Gd, Gc1-Gc2 and Gb1-Gb2. At the same time, the Middle Paleolithic artifacts of the Lower layer were also recognized in different artificial horizons of this cultural sediment unit. We attribute this find complex to the Kiik-Koba type industry of the Crimean Micoquian; detailed discussion is presented in a separate chapter of the present volume.

Comparisons of the 1920s Middle Layer and the 1990s Unit F

Stratigraphy

The 1920s Middle layer was claimed to be associated with sediments above the rock-fall level of huge limestone blocks (3rd Pleistocene rock-fall level in the site's new 1990s stratigraphy) covering the top of the Lower layer and overlain by the next Pleistocene rock-fall level of huge limestone blocks (2nd in the site's new 1990s stratigraphy) (Vekilova 1957: p. 242, fig. 4 on p. 240, fig. 6 on p. 243, fig. 7 on p. 244, fig. 8 on p. 245 and fig. 9 on p. 246) (see fig. 2, p. 13 and fig. 2 and 3, p. 21-22). The thickness of the Middle layer's sediments varied from 0.6 to 1.2 m in the rock-shelter depending on area excavated. On the basis of Bonch-Osmolowski's stratigraphic profiles published by Vekilova and some of her specific comments on the Middle layer's features (1957:306), it is possible to argue that this layer contained several separate hearths which in some squares created two hearth/ashy compact lenses at different depths. Strangely enough, the number of Bonch-Osmolowski's artificial horizons does not exceed three on the site's profiles, although we know that he usually practiced multi-horizon excavations of cultural deposits with such features in them. The 1990s excavations in general confirmed the 1920s excavations stratigraphic data with, however, the following clarifications. First, the new investigations revealed the twofold stratigraphic structure of this unit, with some dispersed finds of Unit E lacking any particular features of the weakly, if at all, expressed occupation floor at its top and below this, four stratigraphically defined levels of Unit F (Fa1-Fa2, Fa3, Fb1-Fb2 and Fc) separated from this Unit E by almost of 0.5 m of sterile deposits (see fig. 4 and 5, p. 23 and see fig. 1, p. 29). Unit E is most likely in stratigraphic correspondence with the lower limits of the 1920s Upper layer and will be discussed in the chapter on the Upper layer/Units E-A stratigraphy and archaeological finds. Second, three of the four levels of Unit F (Fa3, Fb1-Fb2 and Fc) contain some compact or separate hearth/ashy lenses or clusters, among which the most impressive is level Fb1-Fb2 because such features were even characteristized here by a common grayish color.

Spatial distribution of artifacts

Objective information for spatial analysis was available in Bonch-Osmolowski's and Vekilova's quite detailed plans for the Middle layer finds distribution (Vekilova 1957: fig. 11 on p. 247, fig. 13 on p. 258) (see fig. 1, p. 20), as well as the approximate quantity of lithics and data on hearths for some specific squares of the 1920s excavations (Vekilova 1957:306). These sources of information show that the Middle layer in the excavated areas (totalling about 95 sq. meters) was represented by a clearly lower artifact density than the Lower layer, and, in addition, was not distributed throughout the entire western and central areas excavated by Bonch-Osmolowski in the 1920s, as was also noted for the Lower layer. The Middle layer was absent at the site's western edge near the rock-shelter's right side wall (squares 6-Е, 7-Е, Д, 8-Г), in the western area near the rock-shelter's back-wall (squares 10-Г, В and 12-В, Б) and at the southern edge of the central area (squares 12-Н, М, Л). Moreover, in these three areas, the neighboring squares have less than 100 pieces for each of the following 2 x 2 m squares: 9-Д, Г, 10-Д, 11-Г, 12-К. Among the remaining 17 squares (about 70 sq. meters), only six squares (24 sq. meters) in the site's central part (12-Ж, З, 16-Е, Ж, 16-И, 15-Ж) contain the highest frequencies of lithics (between 600 and 900 items) but never, however, reaching 1000 items for any particular square as is the case for the three squares of the Lower layer. Two other squares (15-Е and 16-З) with flint frequencies between 300 and 600 pieces are closely associated spatially with the six densest in find squares, comprising the main occupational area for the Siuren I Middle layer in its central part with a total of eight squares (32 sq. meters) containing no less than 4000 lithic artifacts. Taking only into account the lowest limits for these squares, with 600 items for six squares and 300 items for two more squares, the complete assemblage of the Middle layer totals about 5632 flints as calculated by Vekilova (**1957**: Tabl. 7 on p. 274). These lithic quantitative data are also supported by Vekilova's comments about the site's central area, the most intensively occupied: "almost in each square was recognized a hearth", "in some squares (15 -Е, 12-Ж) were found two hearth/ashy lenses», «the most numerous quantity of animal bones was noted in sq. 16-Е» (1957:306). On the other hand, only one other square for the Middle layer (13-Г) also contains 300-600 lithics, while in the remaining eight squares were found only 100-300 flint artifacts.

The new 1990s excavations area (squares 10, 11-Ж, З-12 sq. meters) is spatially associated with the main central occupational area of the 1920s excavations. But, by its lithic frequencies, 1990s Unit F is clearly different from the Middle layer. The total number of flint artifacts for all four defined levels (Fa1-Fa2, Fa3, Fb1-Fb2 and Fc) is composed of 7575 items, where 91.08% (6900 pieces) was recovered from only level Fb1-Fb2. So, these numerical data point to more finds during the 1990s excavations in an area of 12 sq. meters than the finds obtained from an area of about 95 sq. meters in the 1920s. Does this represent very different densities in different areas of the site or do they simply reflect different field methods applied during the campaigns in the 1920s and in the 1990s? Both possibilities should be discussed, although the latter clearly played a more significant role. The stratigraphic sequence of the 1990s Unit F shows quite varying features of occupation floors, artifact density and their spatial distribution for each of the four defined archaeological levels even within the limited area of 12 sq. meters. For instance, lowermost level Fc (63 flints) was only observed on the basis of two small and disconnected clusters of finds with one hearth and one ashy lens showing other finds distributed toward the unexcavated southern area in squares И, К-10, 11, while the stratigraphically overlying level Fb1-Fb2 (6900 flints) was represented over the entire excavated area with five hearth and four ashy clusters. Thus, differing representation of each of the Middle layer/Unit F archaeological levels in particular areas of the site could certainly influence find quantities. At the same time, this cannot be the only reason that the richest area for the Middle layer is located in the central area with eight squares or 32 sq. meters located near the new 1990s excavation area. As proposed for discussion of differences in find density for the Lower layer/Unit G archaeological contexts, we should also take into account the fact that Bonch-Osmolowski did not systematically sieve all of the sediments, resulting in the loss of finds during his 1920s excavations at Siuren I. Let us again, as for the Unit G assemblage, imagine the presence of only 25% of all microblades and chips in the Unit F assemblage, where the remaining 75% of these tiny flints would not have been collected by Bonch-Osmolowski due to lack of sieving, and then compare such results with the numerical data for the 1920s Middle layer. This estimation results in a change in total from 7575 pieces to 3669 for Unit F. Dividing this new number over three full 2 x 2 m squares of the new 1990s excavation area gives an average of 1223 pieces per square. Yet none of the 1920s excavated squares of the Middle layer contained more than 900 flints.

Thus, we are driven to the conclusion that the new 1990s excavation area does represent the richest area at Siuren I area for this archaeological set of occupation levels, which certainly had varying spatial distribution and density across the entire area excavated (more than 100 sq. m), with quite possibly a varying number of archaeological levels in the different areas of rock-shelter and, accordingly, different artifact frequencies. In sum, the higher 1990s artifact density is not simply due to improved field methods, but also reflects the real richness of the Middle layer in this area.

Keeping in mind that most of the tiny flint artifacts were lost from the 1920s Middle layer, we now compare the Middle layer and the Unit F assemblages to attempt to see how they fit one another and whether they represent a single complex of archaeological finds for Siuren I or not.

Assemblages

According to Vekilova's type-list (1957: tabl. 7 on p. 274), the Siuren I Middle layer is composed of about 5632 lithic artifacts, which is nearly three times less than the total for the Lower layer. Vekilova again did not precisely count "chunks and flint fragments" (about 5000 pieces). The remaining 632 flints are represented by the following artifact categories: 51 core-like pieces (29 cores and 22 core fragments), 189 tools (185 pieces with secondary treatment and 4 hammerstones), 26 burin spalls, 15 "rejuvenation flakes of thick end-scrapers' fronts", 265 blades and bladelets, 40 flakes, 26 core tablets and 20 crested pieces. About 5000 "chunks and flint fragments" are actually composed of broken flakes, blades chunks and complete bladelets, microblades and chips as well, as became clear after review by the present author of some of the Middle layer flints at Kunstkamera Museum in November 1999. From Vekilova's data, it is also clear that an objective description of the Middle layer debitage is, unfortunately, impossible, because even the counted blades/bladelets and flakes are too briefly and generally described (1957:272-274) to be informative. Therefore, we concentrate only on the cores and tools for techno-typological analyses of this assemblage and compare the results with the Unit F assemblage. Some separate typological comments about the Middle layer flints by Bonch-Osmolowski (1934), Anikovich (1992) and myself (November 1999, in St.-Petersburg) will be used here as well.

Regarding the raw materials used in the Siuren I Middle layer for primary and secondary flint treatment processes, Vekilova specially noted the great dominance of gray flints and the rarity (but with no specific counts) of colored flints (1957:272), also observed for Unit F.

All 29 cores were subdivided by Vekilova (1957:272) into 26 Upper Paleolithic "prismatic" items and 3 "discoidal" pieces. The "prismatic" cores are said to be mostly single-platform examples with acute angles of plain striking platforms. Their illustrations are, unfortunately, limited to just one piece (1957: fig. 20, 1 on p. 273) (fig. 4:1) that by its morphology is not very clear. It can be only supposed that it is a bladelet narrow flaked core with a heavily overpassed crested blade refitted to it. The "discoidal" flake cores are also illustrated by a single item (1957: fig. 20, 2 on p. 273), a quite typical radial example with one non-Levallois centripetal flaking surface (fig. 4:2). At the same time, it could be a pre-core of a bladelet core like the previous core, if our interpretation is correct. The presence of 26 core tablets and 20 crested pieces are technologically in good correspondence with the "prismatic" cores.

The Upper Paleolithic "Indicative Tool types" (n=123) are composed of 64 end-scrapers, 52 burins, 3 composite tools and 4 perforators. End-scrapers were typologically subdivided by Vekilova (1957:276) into specimens on blades (26), on flakes (13) and thick pieces (25) where the latter obviously consists of "carinated pieces". Vekilova's "26 end-scrapers on blades" correspond to the modern definition of simple end-scrapers on blades (1957: fig. 20, 8-11 on p. 273) (fig. 4:3-6), although one piece is more likely to be a simple end-scraper on flake (1957: fig. 20, 3 on p. 273) (fig. 4:7) and the presence of a double simple end-scraper was also noted. These simple end-scrapers are mainly made on complete blades (17 items) of small size (length-3-4 cm, width-1.1-3.2 cm) with a notable absence of lateral retouch. The "13 end-scrapers on flakes" are difficult to understand because the sole illustrated item instead better fits into the modern category of flat nosed end-scrapers (1957: fig. 20, 7 on p. 273) (fig. 4:8). The only other information on "end-scrapers on flakes" concerns the common size for six complete pieces: length - 2.5-4.0 cm and width - 2.5-3.8 cm. The "25 thick end-scrapers" have lengths of 1.5-3.5 cm, width of 0.8-2.5 cm and thickness of 3.0-5.5 cm; blank types are "worked out prismatic cores and core-like chunks" (1957:276). Based on the illustrated items, it is clear that some of these end-scrapers are bladelet "carinated" cores - double-platform bidirectional-perpendicular ones with sub-cylindrical shape (1957: fig. 20, 5-6 on p. 273) (fig. 4:9-10), although most of the other "thick end-scrapers" are said to be like another illustrated piece (1957: fig. 20, 4 on p. 273) (fig. 4:11) that appears to be a very typical carinated end-scraper. So, the actual number of carinated end-scrapers in the Middle layer will be probably a little less than indicated by Vekilova, although such a decrease does not seem to be as drastic as it was for the Lower layer's "thick/carinated end-scrapers" where most were considered to be bladelet "carinated" cores. Here it is worth noting the "15 rejuvenation flakes of thick end-scraper's fronts" (1957:276). Vekilova compared them morphologically with core tablets, but insisted on a different definition for these items because of their small size and overall thinness. Unfortunately, none of these artifacts was illustrated, leaving classification in question.

Summing up the data for the Middle layer end-scrapers, we note the prevalence of simple end-scrapers on unretouched blades and the carinated type, as well as the presence of some flat nosed and double simple types, and flake end-scrapers (?). Burins are represented by the following types: multifaceted (25), dihedral (16), angle (9) and on truncation (2) (1957:274-276). They are made on "well-made blades" with dimensions as follows: length - 2.8-7.8 cm and width - 0.9-4.3 cm. The most abundant "multifaceted" type according to four illustrated pieces actually seems to occur only for dihedral (1957: fig. 21, 5-6 on p. 275) (fig. 4:12-13) and carinated types (1957: fig. 21, 2, 4 on p. 275) (fig. 4:14-15). Morphologically, Vekilova's "16 dihedral burins" are similar to the "multifaceted" burins, although they were illustrated by a single double dihedral symmetric example (1957: fig. 21, 1 on p. 275) (fig. 4:16). Taking this into consideration, the dihedral and the carinated burins together certainly form the most dominant burin group - 41 items/78.84% of all the Middle layer's 52 burins. Real "busked burins" with a characteristic lateral notch appear to be absent, although Bonch-Osmolowski (1934:152) noted five typical examples of this burin type but with no convincing illustrations, suggesting only the presence of carinated burins in the Middle layer assemblage. The "9 angle burins" are not illustrated and Vekilova states only their number with a single comment on a

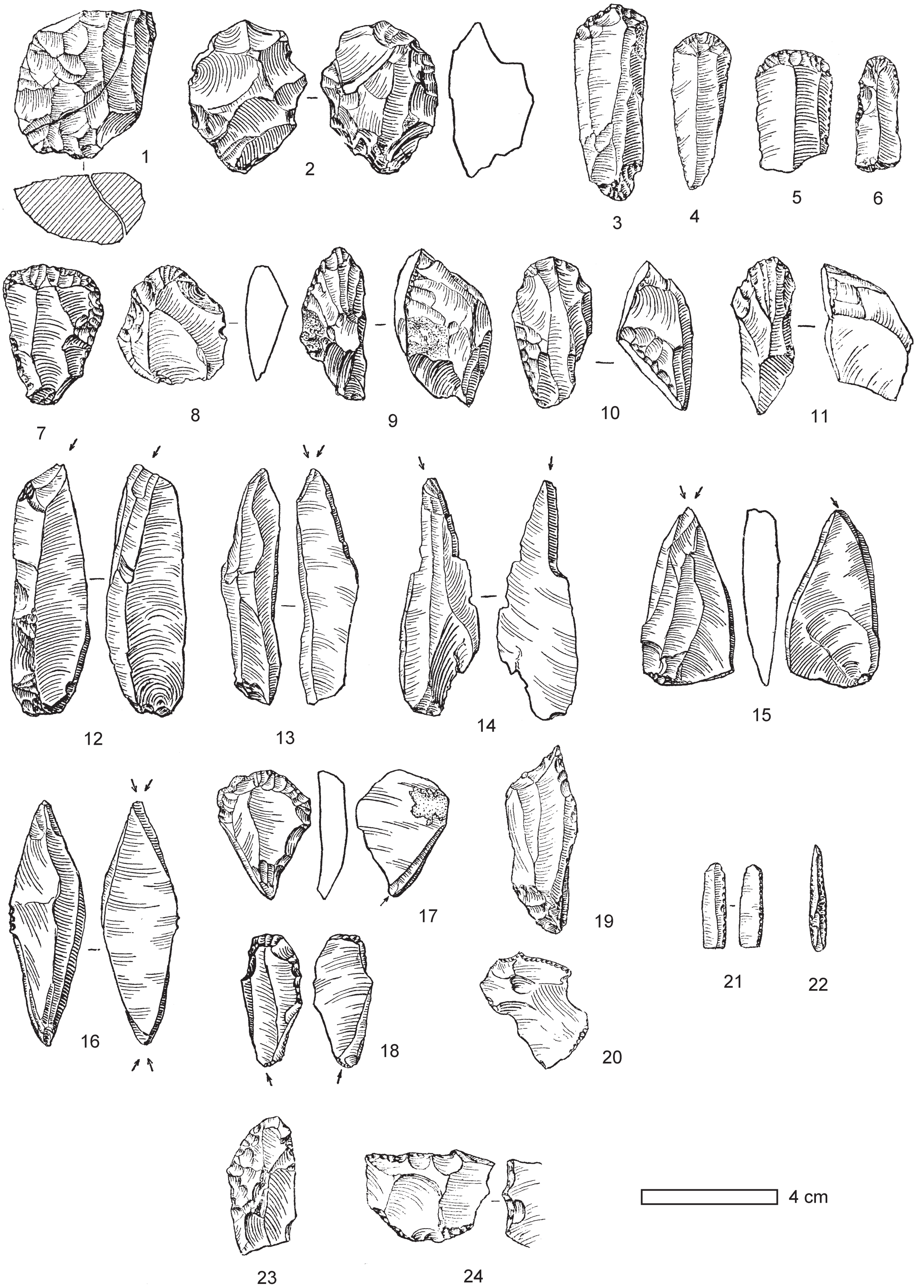

Figure 4 - Siuren I. Finds from Middle layer during the 1920s excavations. Flint Artifacts – Cores and Tools. 1-2, cores (redrawn from Vekilova 1957: fig. 20, 1-2, p. 273); 3-8, end-scrapers (redrawn from Vekilova 1957: fig. 20, 3, 7-11, p. 273); 9-10, "carinated" double-platform bidirectional-perpendicular sub-cylindrical "thick end-scrapers"/bladelet cores (redrawn from Vekilova 1957: fig. 20, 5-6, p. 273); 11, carinated end-scraper (redrawn from Vekilova 1957: fig. 20, 4, p. 273); 12-13, dihedral burins (redrawn from Vekilova 1957: fig. 21, 5-6, p. 275); 14-15, carinated burins (redrawn from Vekilova 1957: fig. 21, 2, 4, p. 275); 16, double dihedral symmetrical burin (redrawn from Vekilova 1957: fig. 21, 1, p. 275); 17-18, simple flat end-scrapers/dihedral burins (redrawn from Vekilova 1957: fig. 21, 7, 9, p. 275); 19-20, perforators (redrawn from Vekilova 1957: fig. 20, 13-14, p. 273); 21, Dufour type bladelet, on bladelet with alternate retouch (redrawn from Vekilova 1957: fig. 20, 16, p. 273); 22, pseudo-Dufour type bladelet, on microblade with bilateral dorsal retouch (redrawn from Vekilova 1957: fig. 20, 17, p. 273); 23, "Mousterian point"/pointed blade (redrawn from Vekilova 1957: fig. 20, 13, p. 273); 24, "Mousterian side-scraper"/flake with irregular retouch (redrawn from Vekilova 1957: fig. 20, 12, p. 273).

double angle burin. The "2 burins on truncation" are both illustrated (1957: fig. 21, 3, 8 on p. 275), showing typical examples made on an almost complete blade and a distal blade fragment. Taking into account some reduction of Vekilova's number of "thick end-scrapers", we assume a near-equal representation of end-scrapers and burins in the Middle layer tool-kit. Three composite tools (1957:276) are represented only by end-scraper/burin variations where end-scrapers' fronts are always simple flat and burins are always dihedral (1957: fig. 21, 7, 9 on p. 275) (fig. 4:17-18). Four perforators (1957:276) are composed of apparently typical pieces on both flakes and blades (1957: fig. 20, 14-15 on p. 273) (fig. 4:19-20).

Retouched pieces are composed of 18 blades and 12 flakes with some retouch (1957:276). Their retouch characteristics and placement are not discussed by Vekilova; in conjunction with the lack of illustrations for these pieces, suggests probable only marginal and/or irregular retouch since "well retouched pieces" would certainly have been drawn.

"Non-geometric microliths" (26 pieces) only constitute 14.05% of all tools with secondary treatment, strikingly different in terms of quantity to the Lower layer tool-kit where "non-geometric microliths" form about 40% of all tools. Their typological classification was done by Vekilova in the same manner as for the Lower layer's "non-geometric microliths". Vekilova (1957:276) distinguished the following three retouched bladelet types: "with alternate retouch" (14), "with backed edge" (2) and "with light retouch" (10). No real description of the retouched bladelets was, however, done. She only noted that their quantity reduced by almost 15 times in comparison to the Lower layer's retouched bladelets *sensu lato*, as well as a remark on their general decrease in size that corresponds to Bonch-Osmolowski's (1934:152) observations. The only two illustrated pieces (1957: fig. 20, 16-17 on p. 273) are a distal part of bladelet *sensu stricto* with bilateral alternate retouch (length - 2.2 cm and width - 0.7 cm) (fig. 4:21) and a complete microblade with fine marginal bilateral dorsal retouch (length - 3.0 cm and width - 0.5 cm) (fig. 4:22) according to our classification system. Such data on the prevalence of bladelets *sensu lato* with bilateral alternate retouch (53.85% of all "non-geometric microliths") in the Middle layer, as well as their smaller overall size and numerical decrease in comparison with the Lower layer's retouched bladelets and microblades have led many archaeologists to agree with her conclusions on both the high morphological similarity of the retouched bladelets in these two Siuren I layers and on some patterns in their development through time (e.g., Anikovich 1992:224).

The remaining six tools with secondary treatment in the Middle layer assemblage were defined by Vekilova (1957:276) as representing "Mousterian forms": 5 points and 1 side-scraper. Taking into consideration the certain importance of this tool group, it is significant to cite directly Vekilova's descriptions of these tools: "Of three complete points, two pieces represent an example of use of Mousterian point as a burin. The third point is made on a broken in its lower part massive blade 3.5 cm long, 2.0 cm wide with secondary treatment only at the pointed end. The other examples are far less expressive" (1957:276). Although Vekilova did not precisely correlate the two illustrated "Mousterian forms" with the described items, it is possible to do so. Her "third Mousterian point", morphologically much better, actually fits into the typical Upper Paleolithic tool category of "pointed blades" (1957: fig. 20, 13 on p. 273) (fig. 4:23). The second illustrated piece (1957: fig. 20, 12 on p. 273) is said to be a side-scraper. Given the obvious irregular retouch on this piece, we disagree with this attribution, considering it instead to be a retouched flake (fig. 4:24). Regarding these new proposed definitions, the two illustrated "Mousterian forms" thus do not appear to be Middle Paleolithic tool types. Moreover, the two "Mousterian points used as burins" (not illustrated) are quite likely simply burins on truncation/lateral retouch. Remembering the "far less expressive" morphology noted for the other two "Mousterian points", we suggest that they are also not truly Middle Paleolithic. So, analysis of the "Mousterian forms" defined by Vekilova in the Middle layer assemblage rather points out the absence of any Middle Paleolithic tool types. This conclusion is in agreement with Bonch-Osmolowski's and Anikovich's observations for the so-called Middle Paleolithic tool types there as well. Bonch-Osmolowski (1934:150, 152) noted "the sharp decreasing of a number of Mousterian forms" in the Middle layer in comparison to the Lower layer with a comment noting "only two massive rough side-scrapers having casual character" without respective illustrations. Anikovich (1992:224), on the other hand, completely rejected their presence in the Middle layer-"there are no obvious archaic forms (sidescrapers, Mousterian points, small hand axes)". Thus, the Middle Paleolithic tool types claimed for the Siuren I Middle layer are rather burins and retouched flakes and blades, in some cases similar to "archaic forms" but not properly attributable to the Middle Paleolithic.

The data on the Siuren I Middle layer assemblage can be summarized as follows. In contrast to the Lower layer, this find complex is composed of exclusively Upper Paleolithic pieces lacking Middle Paleolithic tools, where three "discoidal" cores defined by Vekilova could be either very exhausted cores or precores for future Upper Paleolithic blade/bladelet narrow edged flaking with forming of a crested ridge. Technologically, bladelet "regular" and "carinated" single-platform cores with plain acute striking platforms are the most dominant, associated with which are bladelet "carinated" double-platform bidirectional-perpendicular with sub-cylindrical shape cores defined by us among Vekilova's "thick end-scrapers". Carinated end-scrapers and burins (the latter tool type is nearly absent in the Lower layer) are the most characteristic Aurignacian tool types among the Upper Paleolithic "Indicative tool types". Some flat nosed end-scrapers and bladelets with bilateral alternate retouch are also included in the Aurignacian tool types group. Aside from the carinated burins, dihedral burins are considerably more common than angle and on truncation/lateral retouch burins, making this dominance along with the carinated type as one of the most characteristic typological features for this tool-kit. Other Upper Paleolithic "Indicative tool types" are represented by rare perforators, while scaled tools and some "well-retouched" blades common in the Lower layer are entirely absent. "Non-geometric microliths" constitute only about 14% of the tools; in numerical comparison to burins and end-scrapers, they are only about half as common as each of these distinctive Upper Paleolithic tools, while in the Lower layer's tool-kit "non-geometric microliths" were the most significant tool group (about 40%) and were about 4.5 times more common than either end-scrapers or burins. All in all, these techno-typological features point out the Aurignacian affinity of the Siuren I Middle layer assemblage, that has often been interpreted as reflecting further development through time of the Lower layer's flint treatment traditions by all specialists, without taking into consideration their Aurignacian or non-Aurignacian attribution.

The 1990s Unit F's assemblages leave a twofold impression based on general techno-typological comparisons to the features of the Middle layer assemblage. The prevalence of bladelet "regular" and "carinated" single-platform cores, near-equal representation of end-scrapers and burins, the presence of typical carinated end-scrapers and burins, the dominant position of dihedral and carinated burins among burin types, the occurrence of a flat shouldered end-scraper and composite tools only in the end-scraper/burin variation, as well as the absence of scaled tools, "well retouched" blades and Middle Paleolithic tool types in Unit F certainly reflect the main industrial characteristics of the Middle layer. On the other hand, the Unit F "non-geometric microliths" are numerically and morphologically very different from the Middle layer's retouched bladelets; in addition, abundant unretouched microblades and bladelets are the main products of the primary flaking processes in Unit F. Such discrepancies in the retouched and unretouched microblades and bladelets between Unit F and the Middle layer assemblages should be considered more thoroughly, through typological and numerical analyses that could lead to understanding of the reasons causing them. Unfortunately, Bonch-Osmolowski's and Vekilova's data on microblades and bladelets in the Middle layer's debitage structure are completely unclear. Therefore, we cannot state anything definite on this matter, especially in comparison to Unit F's unretouched microblades and bladelets. In this situation, we are left only with the possibility of comparing the retouched "non-geometric microliths" of these two complexes.

The 26 "non-geometric microliths" of the Middle layer can be briefly described and summarized as follows. Bladelets *sensu lato* with bilateral alternate retouch number 14 pieces (53.85%.) Bladelets *sensu lato* with lateral ventral retouch are not noted, while the other bladelets *sensu lato* most likely have bilateral and lateral dorsal retouch (12 pieces/46.15%). The two pieces "with backed edge" noted by Vekilova could either be actual "pieces with abrupt retouch" or "pieces with fine marginal or semi-steep retouch". The retouched "non-geometric microliths" illustrated by Vekilova include one bladelet with bilateral alternate retouch and one microblade with bilateral dorsal retouch, which does not help in determining the proportions of bladelets and microblades among the Middle layer's "non-geometric microliths", although their length (3.0 cm for the complete piece and 2.2 cm for the broken piece) may show the existence of some rather long examples. At the same time, "non-geometric microliths" constitute only 14.05% of all tools with secondary treatment in the Middle layer assemblage. Now let us turn to the Unit F "non-geometric microliths". All 77 pieces are subdivided by retouch into "pieces with fine and/or semi-steep retouch" - 74 items/96.1% and "pieces with abrupt retouch" - only 3 items/3.9%. The former group is composed of such items, with a clear dominance of fine marginal retouch. Pieces with bilateral alternate retouch account for 9 items/11.7% and notably all are microblades based on their dimensions. Microblades are again only characteristic for pieces with lateral ventral retouch - 26 items/33.8%. So, all "Dufour bladelets" (35 items/45.5%) were made exclusively on microblades with none made on bladelets. "Pseudo-Dufour bladelets" (33 items/42.8%) are characteristized by the following sub-types: microblades with lateral dorsal retouch - 24 items/31.1%, microblades with bilateral dorsal retouch - 6 items/7.8% and bladelets with lateral dorsal retouch - only 3 items/3.9%. The remaining 6 "pieces with fine and/or semi-steep retouch" (7.8%) include 4 bladelets and 1 microblade with dorsal retouch at the distal end (actually, truncated pieces), and another microblade with a dorsal lateral micronotch. These latter pieces were not noted, however, among the Middle layer's "non-geometric microliths", making them irrelevant for our typological comparisons. "Pieces with abrupt retouch" (1 bilaterally and 2 unilaterally backed pieces-3.9%) again occur only on microblades. Thus, among the 77 "non-geometric microliths" in Unit F, only 7 bladelets (9.1%) are present while only 3 bladelets (4.2%) are characteristic for all pieces with lateral and bilateral continuous retouch - the only known items for the Middle layer. At the same time, it should be recalled that Unit F's "non-geometric microliths" also constitute 42.8% of all tools with secondary treatment.

Thus, the Middle layer's "non-geometric microliths" (26 items), according to Vekilova's data, show a slight prevalence of pieces with bilateral alternate retouch (53.85%) over pieces with bilateral and lateral dorsal retouch (46.15%), and a complete absence of pieces with lateral ventral retouch, while Unit F's "non-geometric microliths" are again characteristized by the near-absence of "pieces with abrupt retouch" (3.9%), some presence of pieces with distal retouch and a lateral micronotch (together 7.8%) and, very different from the Middle layer composition, "pieces with fine and/or semi-steep" continuous lateral retouch: pieces with bilateral alternate retouch - 11.7%, pieces with lateral ventral retouch - 33.8% and pieces with bilateral and lateral dorsal retouch - 42.8%. The only similarity is the proportion of bladelets *sensu lato* with bilateral and lateral dorsal retouch: 42.8% and 46.15%. On the other hand, the proportions of "Dufour bladelet" sub-types with bilateral alternate and lateral ventral retouch are, however, completely different in these two complexes. Such differences could even lead to the hypotheses that either different Aurignacian industries were excavated in the 1920s and in the 1990s, or a single Aurignacian industry with significantly varying activity in the different areas excavated for the Middle layer and Unit F was present, reflected in the composition of "non-geometric microliths". Moreover, these hypotheses could be further supported by the very different quantity of "non-geometric microliths" in these two assemblages: 14.05% in the Middle layer and 42.8% in Unit F for all tools with secondary treatment. Nevertheless, we insist that the Middle layer and Unit F assemblages represent the same Aurignacian industry in which all major tool categories and types correspond to one another. There are two ways to resolve the "non-geometric microliths" question.

The first consists in using only published data and their different interpretations. It seems useful here to turn back again to the different excavations methods applied during the 1920s and the 1990s campaigns at Siuren I. As already discussed, the find density of Unit F's four distinct stratigraphically defined archaeological levels taken together is higher in comparison with the data for the Middle layer even taking into account a hypothetical loss estimation of 75% of all microblades and chips for the Unit F assemblage given the non-systematic sieving of sediments during the Siuren I 1920s excavations. In this case, a hypothetically larger quantity of lost tiny flint artifacts for the Middle layer than was artificially estimated for the Unit F assemblage seems to be quite possible. Bonch-Osmolowski's brief remarks on the retouched bladelets *sensu lato* of the Middle layer in comparison to the Lower layer seem to be quite indicative on this matter. "Bladelets become considerably much less numerous quantitatively and smaller in size. Such decreasing is so remarkable that the results of the first field season gave me the reason to suggest their absolute disappearance. However, with the later excavations the presence of small series of these tools in the Middle layer was established as well" (Bonch-Osmolowski 1934:152). These comments by the director of the Siuren I 1920s excavations definitely show the "hard fate" of the Middle layer's "non-geometric microliths". Taking into account that more than 90% of the Unit F "non-geometric microliths" were microblades based on metric parameters, it is not surprising to see retouched microblades in the 1920s Middle layer deposits only during excavations of the site's central area. If we agree to connect most of the Middle layer's "non-geometric microliths" with the site's central area, which contains the six richest squares (24 sq. meters) with lithics numbering between 600 and 900 items per square, we could conclude that less than 1 retouched bladelet *sensu lato* per 1 sq. meter was found during Bonch-Osmolowski's excavations. At the same time, dividing Unit F's 77 "non-geometric microliths" across the excavated area of 12 sq. meters gives an average of more than 6 retouched bladelets *sensu lato* per 1 sq. meter for the 1990s excavations. Keeping in mind such numbers of "non-geometric microliths" in the two find complexes per 1 sq. meter, and hypothetically excluding part of the sieving for Unit F, we may assume recovery of only 10-15 retouched bladelets and microblades in Unit F where most would be rather long as is the case of two such retouched items illustrated by Vekilova. Thus, given these reasons underlying the difference in frequency of "non-geometric microliths" in the two assemblages, such quantitative discrepancies may not be significant. Yet different typological structures of the Middle layer and Unit F "non-geometric microliths" still constitute a definite problem. At present, based only on the published data, it is impossible to explain unambiguously the strong prevalence of pieces with lateral ventral retouch over pieces with bilateral alternate retouch (correlation 2.88:1) for Unit F's "Dufour bladelets" and, at the same time, only the presence of pieces with bilateral alternate retouch for "Dufour bladelets" in the Middle layer. Before examination of some of the 1920s materials at Kunstkamera Museum in November 1999, we had two possible explanations for this. The first was that the representation of different sub-types (with alternate or ventral retouch) is not very important within the broadl "Dufour bladelets" type, keeping in mind the stability (about 45%) of "pseudo-Dufour bladelets". The second was that different activities carried out by human groups at the site involving the laterally retouched bladelets *sensu lato* recovered in the Middle layer and Unit F could also have influenced retouch placement for this tool type, although this explanation does not contradict the first.

The second approach is to address the "non-geometric microliths" problem with examination of some of the 1920s materials in St.-Petersburg. This has led to another, quite unexpected and more likely, suggestion. During observation of the Middle layer's finds from Bonch-Osmolowski's final field season (1929), a series of 12 retouched bladelets and microblades from squares 15, 16-E was studied. Surprisingly, 9 of these "non-geometric microliths" were quite typical for the 1920s excavations Lower (!) layer. These include 5 bladelets and 4 microblades with bilateral alternate semi-steep micro-scalar and micro-stepped retouch with flat or incurvate general profiles and, moreover, 6 of these pieces were made on the colored flints so typical of the Lower layer. The remaining 3 of the 12 "non-geometric microliths" from this area are the following: 1 twisted microblade with lateral ventral retouch, 1 twisted microblade with lateral dorsal retouch and 1 incurvate microblade with bilateral dorsal retouch. All of these items have semi-steep micro-scalar retouch. Based on all of these features, the 12 "non-geometric microliths" clearly fall within the morphological range of such pieces in the Lower layer. The additional observation of other tool categories from these two squares revealed that none of the carinated burins, so typical for the Middle layer, were present. It was also recognized that during that final field season, part of the Lower layer flints was labeled as "layer 3", not as "layer 4" as had been done during previous seasons. Taking all these data together into consideration, we can assume that Vekilova included some actual materials of Bonch-Osmolowski's Lower layer in her descriptions of the Middle layer, which would have led to the prevalence of alternately retouched bladelets in this layer. This hypothesis finds additional support in the results of our observations of the 1927 Middle layer's four «non-geometric microliths» from squares 12-Ж, З, Г. These items only have fine marginal retouch and can be generally described as follows: 1 twisted microblade with lateral ventral retouch, 1 incurvate microblade with lateral ventral retouch, 1 flat microblade with bilateral alternate retouch and 1 twisted microblade with bilateral dorsal retouch. The presence of only microblades, fine marginal retouch with, finally, two instances of lateral ventral placement, twisted general profiles certainly point to the great similarity of these Middle layer's "non-geometric microliths" to those in Unit F. Thus, after understanding the quantitative differences, which were more dramatic than represented by Vekilova - since of the 14 bladelets with bilateral alternate retouch no more than 5 items actually remain, reducing the overall quantity of 26 «non-geometric microliths» to 15 or even 12 pieces -, we have a quite solid basis for explanation of the typological differences between Vekilova's data on the 1920s Middle layer «non-geometric microliths» and the 1990s Unit F "non-geometric microliths". We can finally conclude that "non-geometric microliths" from the 1920s Middle layer and the 1990s Unit F have the same basic characteristics. Both objective (Bonch-Osmolowski's excavations methods) and subjective (some mistakes by Vekilova during analysis of some of the 1920s materials) reasons prevent us from using data on the 1920s Middle layer "non-geometric microliths" for further comparative analysis with other Aurignacian industries and, therefore, for such comparisons only data for the 1990s Unit F "non-geometric microliths" will be used.

Thus, these considerations of the "non-geometric microliths" enable us to argue that the industry in the Middle layer and Unit F is the same one: Late/Evolved Aurignacian of Krems-Dufour type. Of the analyzed data relating to the Middle layer and Unit F, the 1990s excavations area of 12 sq. meters appears to be the area with the highest density of lithic artifacts among the entire area (about 110 sq.) excavated during both campaigns. This can be seen not only by the average number of lithics per each 2 x 2 meter square and the high amount of unretouched and retouched microblades and bladelets in the Unit F assemblage in comparison with the Middle layer assemblage, but also in the correlation of the most Indicative Upper Paleolithic tool categories such as end-scrapers and burins. For these, 18 end-scrapers and 19 burins, including broken items for the two categories, were identified in the Unit F tool-kit, while, from Vekilova's counts, 54 end-scrapers and 52 burins (although we assume a near-equal number of burins and end-scrapers given that their overall number is reduced through transfer of bladelet «carinated» cores among them into the cores category) in the Middle layer tool-kit. Thus, there are about three times more end-scrapers and burins in the Middle layer than in Unit F. At the same time, the 1990s excavations area (12 sq. meters) is about 8 times smaller than the overall 1920s excavations areas (about 95 sq. meters) or about 6 times smaller than the 1920s excavation areas (about 70 sq. meters) which contained 2x2 m squares with artifact density more than 100 items. With such comparisons, it is clear that artifact density and possibly intensity of occupations were, for the 1990s excavations area, at least twice as high on average than the 1920s excavations, whether 95 or 70 sq. meters. Other tool classes and types cannot be used for these comparisons as, on one hand, truncations, denticulated and notched pieces, unidentifiable tool fragments were not distinguished in the Middle layer assemblage by Bonch-Osmolowski and Vekilova, while, on the other hand, perforators and "Mousterian forms" do not appear occur at all in the Unit F assemblage. In addition, direct comparisons between retouched pieces of the two complexes would not be correct because of Vekilova's unclear typological criteria for their recognition in the Middle layer.

Thus, despite a quite comparable general tool count (about 180 pieces for each assemblage), the Middle layer and Unit F tool-kits cannot be used for various all-around comparative analyses. However, it is still possible to create a general techno-typological description of these Siuren I complexes that reflects all distinct features according to the system, adding unique characteristics of each assemblage to the whole.

The Siuren I Middle layer/Unit F Late/Evolved Aurignacian of Krems-Dufour type industry's techno-typological characteristics can thus be summarized as follows. Technologically, primary flaking processes were most intensively directed towards production of many small microblades and bladelets with mostly typical twisted general profiles and "off-axis", almost "déjeté" axis removal from bladelet single-platform "regular" and Aurignacian types "carinated" cores with plain acute angle striking platforms with edge abrasion, as well as from Aurignacian carinated end-scrapers and burins that often approach our definition for bladelet narrow flaked cores based on dimensions. Typologically, Aurignacian tool types are most prominently expressed by carinated end-scrapers and burins, flat/thick shouldered/nosed end-scrapers and, finally, such impressive Aurignacian indications as the quite numerous (about 40% in the Unit F tool-kit) mostly twisted microblades and a few bladelets with fine marginal retouch, about half of which are "Dufour bladelets" (mainly pieces with lateral ventral retouch and some pieces with bilateral alternate retouch) and half "pseudo-Dufour bladelets" with lateral dorsal and bilateral dorsal retouch, with, at the same time, a near-absence of «pieces with abrupt retouch» and no indicative Aurignacian «non-geometric microlith» types such as "Krems points". Regarding the common Upper Paleolithic "Indicative Tool types", we note the near-equal presence of end-scrapers and burins, the definite prevalence of dihedral and carinated burin types over angle and on truncation/lateral retouch burin types and, at least, some presence of perforators and truncations with the notable complete absence of "well-retouched" blades and scaled tools. Despite the presence of "Mousterian forms" in the Middle layer claimed by Vekilova, no truly Middle Paleolithic core and tool types are present in this 1920s and 1990s Aurignacian find complex. This "*summa summarum*" of the common techno-typological data for the Siuren I Middle layer and Unit F assemblages can be used as a description of the general characteristics of this find complex within the Siuren I archaeological sequence and also for comparisons between it and other European Aurignacian industries with small "Dufour and pseudo-Dufour bladelets *sensu lato*", which also have similar morphological features including twisted general profiles, "off-axis" removal directions and fine marginal retouch, while the probable precise position of the Siuren I Aurignacian industry would be more likely determined with some additional techno-typological characteristics of the Unit F assemblage alone, identified by application of the detailed classification system and attribute analysis.

Concluding remarks

In sum, then, detailed comparisons between the Siuren I find complexes of the 1920s Lower and Middle layers and the 1990s Units G and F allow us, first, to reach clear conclusions regarding the comparability of the assemblages resulting from these two campaigns and, second, to create on the basis of such comparability a common general techno-typological description for both the Siuren I Lower layer/Unit G assemblages and the Siuren I Middle layer/Unit F assemblages as two Aurignacian assemblages combining the most indicative flint characteristics of the two collections for each complex. The Middle Paleolithic industrial component of the 1920s Lower layer/1990s Unit G is not considered here, but will be discussed separately in this volume. The detailed descriptions of the 1990s Units G and F assemblages, comparative inter-level and inter-unit analyses corroborate the 1920s data of the site excavator (Bonch-Osmolowski) and the main publisher of the recovered finds (Vekilova). Further and final discussions of the Siuren I Aurignacian Lower layer/Unit G and Middle layer/Unit F find complexes with the addition of data on the Unit H assemblage, will be presented in the concluding chapters of the present volume during analysis of the Siuren I archaeological sequence as a whole and the place and role of the Siuren I Aurignacian in the context of the European Aurignacian.

16 - INTERPRETATION OF THE MIDDLE PALEOLITHIC COMPONENT IN THE EARLY AURIGNACIAN UNITS H AND G AND THE 1920S LOWER LAYER

Yuri E. DEMIDENKO

Introduction

Both the 1920s and the 1990s excavations at Siuren I led to the remarkable discovery of distinctive Middle Paleolithic cores and tools in the lower part of the sequence (1990s Units H and G and 1920s Lower layer) which also contain much more abundant Upper Paleolithic material attributed to the Aurignacian 0/Archaic Aurignacian of Krems-Dufour type. Since the 1920s excavations, such co-occurrence of Middle and Upper Paleolithic artifacts has been one of the most intriguing topics of debate regarding the Siuren I archaeological context. Discovery of the same "association" of Middle and Upper Paleolithic artifacts during the 1990s excavations requires further discussion, presented here with an attempt to propose a possible resolution of the issue.

Before presenting our own analysis, it is necessary to once again specifically recall that the Middle Paleolithic cores and tools found in the 1920s *Lower* layer were always considered to be an integral part of the Upper Paleolithic industry. Three specialists who personally studied these artifacts at very different times (1920s - 1930s, early 1950s, late 1980s) entirely independently came to this same conclusion, which is without exception shared by all other archaeologists who have ever discussed the Siuren I *Lower* layer finds. Their opinions are summarized here.

G.A. Bonch-Osmolowski discussed the Siuren I *Lower* layer Middle Paleolithic type pieces in the general context of Middle-Upper Paleolithic transition. "*Presence of some Mousterian tool types in Aurignacian, especially in the Lower Aurignacian sites, is not a rare case at all but indeed composes one of the characteristic features of this stage. ... we see in them (Yu. D. - Mousterian tool types) a quite natural survival of old forms in the new stage of cultural development. This survival, from our point of view, once again proves the straight succession of both stages (Yu. D. - Mousterian and Aurignacian)*" (1934:150).

E.A. Vekilova completely supported the Bonch-Osmolowski's "unilinear evolutionary Paleolithic development" view, so common for that time in the history of Paleolithic archaeology, while additionally specifying the Shaitan-Koba Mousterian industry as the direct predecessor for the Siuren I Upper Paleolithic with "Mousterian forms" (1957:313-314).

More recently, the opinion of M.V. Anikovich: "*We cannot interpret the "Mousterian complex" in the lower layer of Siuren I as a result of mechanical admixture, since there is about the same ratio of Middle and Upper Paleolithic forms throughout the sequence. Moreover, the deposits of the lower layer yielded none of the fauna characteristics of Middle Paleolithic sites in the Crimea (such as mammoth, woolly rhinoceros, wild donkey, cave bear). Thus, the collection from the lower layer of Siuren I must reflect ties between local "Mousterians" and, probably, intruders, who brought with them developed Upper Paleolithic cultural traditions. The material in the middle layer shows the rapid obsolescence of Middle Paleolithic traditions and a complete dominance of Upper Paleolithic techniques. The likely geological age of the lower and middle layers* (Yu. D. - ca. 20000-18000 BP as proposed by Anikovich.) suggests that the Middle-Upper Paleolithic transition occurred in the Crimea much later than in most of Europe"(1992:224-225). Accordingly, Anikovich's conclusions also confirm the genuine inclusion of Middle Paleolithic tool types within the Siuren I Lower layer Upper Paleolithic complex, but his cultural interpretation differs from Bonch-Osmolowski and Vekilova. Non-local roots for the Upper Paleolithic complex were assumed for which human group(s), after contact with local Crimean "Mousterians", incorporated some Middle Paleolithic techno-typological traits into their own flint traditions. This interpretation of the cultural exchange process, proposed by M.V. Anikovich, can only be seen as a miraculous example of "reverse acculturation" because none of the Crimean Middle Paleolithic industries contain any Upper Paleolithic/Aurignacian cores and tools.

All in all, despite some differences in cultural interpretations of the Middle Paleolithic techno-typological component in the Siuren I Lower layer, there has never been any objection to the industrial integrity of this find complex as a whole.

New methodological approach

For new discussion of the "Siuren I Middle Paleolithic problem", it is proposed to begin once again, excluding these previous interpretations in order to keep open the possibility of other interpretations. Indeed, we are quite sure that all possible different explanations should be evaluated here, out of which one of the suggestions may finally be the most probable. Such an approach to discussion of the problem is much more fruitful than a simple attempt to prove just one possibility; this methodological approach avoids the obvious subjectivity of having only one preferred hypothesis and, at the same time, any colleague may evaluate the various explanations and accept one of them, if it seems probable to him/her. Such an *"alternative hypotheses"* approach has not often been used in Paleolithic archaeology, although it was sometimes applied with certain convincing conclusions (e.g., Gladilin & Sitlivy 1987; d'Errico *et al.* 1998).

For proposal and analysis of several alternative hypotheses, we should also avoid the main assumption that served as the basis for previous explanations, - namely the consideration that finding Middle and Upper Paleolithic artifacts together in the same sediment unit represents occupations of a single human group with a single flint treatment tradition. Without this assumption, it becomes much more productive to propose alternative hypotheses related to both *natural* and *human/cultural factors* which could have influenced the presence of Middle Paleolithic artifacts in the Upper Paleolithic/Aurignacian archaeological levels.

We begin with *natural factors* that may have affected the site's stratigraphy.

Hypothesis 1

The 1920s Lower layer/1990s Units H and G Middle Paleolithic cores and tools come from a distinct cultural layer or rather thin level within the sedimentary units under discussion, whether interstratified between other Upper Paleolithic/Aurignacian levels or the stratigraphicly lowest one within the sequence of these levels.

Here we should first note that this hypothesis was the main one for our team prior to the Siuren I 1990s excavations. At first sight, the stratigraphic profiles of the 1920s excavations, published by both Bonch-Osmolowski (1934) and Vekilova (1957) certainly allow us to consider such a possibility. Taking into consideration the presence of both the stratigraphically separated three continuous hearth/ashy levels within the *Lower* layer sedimentary unit and the very abundant Upper Paleolithic/Aurignacian finds with only 5 cores and 40 tools of Middle Paleolithic types among a total of 15500 lithic artifacts (which includes 43 cores and about 810 tools in Vekilova's accounts from all investigated areas totaling ca. 85 sq. meters for this *Lower* layer), the suggestion of the existence of a "very ephemeral" Middle Paleolithic level with a limited number of artifacts accompanied or, more likely, unaccompanied by hearths is not at all unexpected. Moreover, the probability of such a "Middle Paleolithic ephemeral level" could explain why it was not identified by Bonch-Osmolowski during his excavations.

This hypothesis, unfortunately, found no support during the 1990s excavation. Both the lowest archaeological level Gd of Unit G (the stratigraphic analog of the 1920s *Lower* layer) and the newly found lowermost Unit H are not of Middle Paleolithic character only, but rather repeat the pattern of the *Lower* layer with a few Middle Paleolithic artifacts among much more dominant Upper Paleolithic/Aurignacian finds. Thus, half of this hypothesis, in supposing the existence of a "Middle Paleolithic level" at the base of the Siuren I archaeological sequence, is not confirmed. At the same time, the other two archaeological levels (Gc1-Gc2 and Gb1-Gb2) of Unit G with hearth/ashy features also have the same proportional occurrence of Middle and Upper Paleolithic tool types in their tool-kits as is known for level Gd and Unit H. Precise frequencies of Middle Paleolithic tool types for these four tool-kits are as follows: Unit H - 3 pieces among all 69 tools - 4.3% and without two "non-flint tools" - 4.5%; level Gd - 1 piece among all 77 tools - 1.3% and without two "non-flint tools" - again 1.3%; level Gc1-Gc2 - 13 pieces among all 210 tools - 6.2% and without 2 "non-flint tools" - 6.3%; level Gb1-Gb2 - 3 pieces among all 71 tools - 4.2% with no "non-flint tools" present. The Middle Paleolithic tools could be supplemented by some very characteristic "retouch flakes and chips" resulting from secondary treatment processes Middle Paleolithic tools - 7 items in Unit H, 3 in level Gd, 8 in level Gc1-Gc2 and 4 in level Gb1-Gb2, although including them in percentage calculations would be not methodologically appropriate. Despite the small statistical range between 1.3% and 6.3% for Middle Paleolithic tools in these four tool-kits, the lowest ratio for the lower level of Unit G (Gd) is remarkable given that this level is the most probable analog for the 1920s excavations *Lower* layer's lowest hearth/ashy lens that was initially considered by us as Middle Paleolithic. Recalling Anikovich's observation (**1992**: 224) of "*about the same ratio of Middle and Upper Paleolithic forms throughout the sequence*" of the *Lower* layer, we should completely reject the idea of the existence of any kind of independent Middle Paleolithic level in the sediments of the 1920s *Lower* layer/1990s Units H and G.

Hypothesis 2

Both a Middle Paleolithic and several Upper Paleolithic/Aurignacian archaeological levels were present in the Siuren I 1920s Lower layer/1990s Units H and G deposits, but they differed in spatial distribution across the site: two distinct find spots (a Middle Paleolithic and an Upper Paleolithic one) in the large rock-shelter's excavated areas totaling about 160 sq. meters for all excavations in 1879-1880 (about 60 sq. meters), 1926-1929 (about 85 sq. meters) and 1995-1997 (12 sq. meters).

Data examined for discussion of hypothesis 1 are again relevant as arguments refuting hypothesis 2. For the 12 sq. meters excavated in the 1990s, the presence of both Middle and Upper Paleolithic artifacts in the expected ratios is characteristic for three levels of Unit G and the single level of Unit H. Thus, hypothesis 2 is not supported by the latest Siuren I data. Now let us discuss the spatial distribution data for distinct Middle and Upper Paleolithic cores and tools from the 1920s excavations. Bonch-Osmolowski (1934) did not specifically comment on this matter, simply stating that Middle and Upper Paleolithic artifacts were found together, although Middle Paleolithic cores were not recognized by him at that time. About sixty years after Bonch-Osmolowski, M.V. Anikovich (1992) just "echoed" the site's excavation "data" on this subject. E.A. Vekilova also simply noted the presence of both Middle and Upper Paleolithic cores and tools in the Siuren I Lower layer during her analysis of the "Mousterian forms" (1957: 270), but in her description of Bonch-Osmolowski's excavations, we find an important comment on the discovery in the rock-shelter's western area (squares 10-Б, 11-В, 12-А, Б) in the *Lower* layer of "perforated shells of *Aporrhais pes-pelicani*, bone points and typical for this layer flint tool complex composed of burins, end-scrapers, bladelets with alternate retouch and backed retouch, a tool of Mousterian form. In the same layer in square 11-В was recognized the very important find - a human molar (Yu. D.- *Homo sapiens*)" (1957:239). So, there is at least one documented fact concerning the actual occurrence of Middle and Upper Paleolithic artifacts together in the Siuren I *Lower* layer in Vekilova's data. Some special observations on the precise location of the Middle Paleolithic pieces and of the most typologically indicative Upper Paleolithic/Aurignacian pieces in the 1920s *Lower* layer's different squares and artificial horizons were made for some of these materials on the basis of labels on the flints and Bonch-Osmolowski's inventory lists by the present author in November 1999 at the Department of Archaeology in St.-Petersburg Kunstkamera Museum. Of 27 Middle Paleolithic tools in that collection, 23 items can be situated in the following squares and horizons: squares - 9-В; 10-Б; 11-Б/В, В, Г, Д; 12-А, Б/В, Б, В, Г, Д, Е and horizons (from top to bottom) - 1-5 and 7-8. In these same squares and horizons, Upper Paleolithic/Aurignacian types including *"*Dufour bladelets*"* with alternate retouch, scaled tools, carinated end-scrapers, bladelet "carinated" cores, simple end-scrapers and burins on lateral retouch were also found. Combining all these data with the common (although not specifically stated) belief of all specialists on the association of Middle and Upper Paleolithic types in all areas excavated in the 1920s (about 85 sq. meters), we should again, as for the 1990s much smaller excavation block, reject hypothesis 2 for these larger investigated areas. But there is still Merejkowski's *Lower* layer excavated area about 60 sq. meters. Surprisingly enough, this quite large inner area near the back-wall yielded not a single Middle Paleolithic artifact, while tools comparable to the *Lower* layer Upper Paleolithic/Aurignacian tool types, including 5 carinated end-scrapers and/or bladelet "carinated" cores, 18 bladelets *sensu lato* with alternate bilateral retouch and 1 scaled tool are present (Vekilova 1957:285-286). Any suggestion of a possible unrecognized presence of Middle Paleolithic types in Merejkowski's *Lower* layer assemblage (1137 items including 111 tools) cannot be accepted because Vekilova classified these finds of the late 19th century excavations through constant comparisons with Bonch-Osmolowski's *Lower* layer flints and, if there were some or even a single "Mousterian form" there, she would surely have recognized it. There is thus no other conclusion than that the site's *Lower* layer significant interior portion studied in 1879-1880 contains only Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry finds. Accordingly, this leaves some room for speculations on hypothesis 2.

Summing up all the data for discussion of hypothesis 2, we are left with a twofold impression. On one hand, the rock-shelter's inner western and central areas, and central areas around the drip-line zone (about 100 sq. meters in total) of the 1920s *Lower* layer/the 1990s Units H and G sedimentary units are distinguished by the "co-existence" of both Middle and Upper Paleolithic cores and tools. On the other hand, the rock-shelter's inner central area (about 60 sq. meters) of the 1879-1880 *Lower* layer deposits contains only Upper Paleolithic/Aurignacian artifacts. Thus, hypothesis 2 finds partial support in one discrete Upper Paleolithic/ Aurignacian area, while another, larger Middle and Upper Paleolithic/Aurignacian areas does not conform to "the differential spatial distribution" proposal of hypothesis 2. The impossibility of full acceptance for hypothesis 2 does not mean, however, that we should not keep in mind some spatial differences revealed during discussions of the other hypotheses.

Hypothesis 3

An independent Middle Paleolithic archaeological level existed within 1920s Lower layer/1990s Units H and G, but it was destroyed because of natural causes either by cryoturbation or by erosion and/or water processes and, therefore, the Middle Paleolithic artifacts were found in all archaeological levels with Upper Paleolithic/Aurignacian pieces in the sedimentary units.

For hypothesis 3, these sediments we should be divided into two distinct parts – the 1920s *Lower* layer/the 1990s Unit G, and the 1990s Unit H. This subdivision is explained by a clear-cut stratigraphic separation of these two sedimentary units given the presence of a huge limestone block horizon. The natural causes for sediment disturbance may have been different or had a varying influence for each. Of course, such analysis can be only done for the 1990s excavations.

The single archaeological level of Unit H was sandwiched between huge limestone blocks of the fourth and the fifth rock-fall horizons with little or no archaeologically sterile sediments above and below the culture bearing deposits. Three hearth/ashy levels of Unit G (Gd, Gc1-Gc2, Gb1-Gb2), recalling that level Ga is highly likely the top of level Gb1-Gb2, are also enclosed by horizons of huge limestone blocks (the third and fourth rock-fall horizons) where culturally sterile sediments, separating the archaeological levels, were almost exclusively composed of thin horizons of pure limestone éboulis. Despite some possible differences in condition and preservation of these two sedimentary units, neither visible natural disturbances caused by cryoturbation nor rolled gravel as evidence of water streams were identified. The presence of discrete hearth/fireplaces and/or ashy clusters in each of the four archaeological levels (H, Gd, Gc1-Gc2, Gb1-Gb2) also points to the absence of serious disturbance for these levels. At the same time, as sometimes happens, possible natural disturbance processes and their evidence could not be easily identified during excavation (e.g., see papers in Goldberg *et al.* 1993), but in such cases some influence of these processes on the condition and preservation of both archaeological/paleontological finds and limestone éboulis should be represented. Variability in traces commonly left by such natural disturbance processes are discussed separately below.

Water stream action, sometimes attaining a degree of disturbance causing erosion is usually evidenced by the presence of heavily or slightly but still recognizably rolled and/or worn surfaces for at least some flint artifacts (which are additionally always considerably patinated), animal bones and limestone éboulis. Such disturbances are known for "true caves" with karstic rejuvenation and both caves and rock-shelters with raised water levels of adjacent rivers or significant water sources as seas and lakes. These kinds of natural processes may also affect cave and rock-shelter sediments around the drip-line zone because of water flowing from a higher plateau or directly from the overhang of a cave or rock-shelter. Karstic rejuvenation is unrelated to Siuren I since it is a true rock-shelter. The other two natural disturbance processes are theoretically possible for the Siuren I deposits and finds and should be evaluated. The condition of all limestone éboulis is "fresh and angular " in the 1920s *Lower* layer/1990s Units H and G sedimentary units, commonly accepted since the work of V.I. Gromov (1948:249-250) on the site stratigraphy. Animal bones also show good preservation with no signs of abrasion. Flint artifacts of both Middle and Upper Paleolithic types have the same surface characteristics – little or no patina and no rolled/worn features. So, erosion and/or water stream disturbance processes do not appear to be a factor affecting the archaeological layers and artifacts. This conclusion finds additional support in comparison of the 1920s *Lower* layer/1990s Units H and G *in situ* sediments with the underlying deposits. The latter, basal for the rock-shelter and archaeologically sterile, are formed of dark yellowish-brown clay with many rolled river pebbles in vertical position and heavily worn limestone éboulis identified during both the 1920s and 1990s excavations (Vekilova 1957:242). This basal sedimentary unit, about 3 meters in overall thickness, according to data from Bonch-Osmolowski's sondages, was subject to water action during flooding of the Belbek River and are highly likely connected to alluvial deposits. Therefore, during that time, this large rock-shelter was not convenient for long-term occupations or even short-term visit by Paleolithic groups.

Cryoturbation processes usually cause more mechanical damage for archaeological material, especially lithic artifacts with serious breakage of edges. It is, for instance, well-known for many Hungarian Paleolithic cave sites, among which the most famous is Szeleta Cave thoroughly discussed by Ph. Allsworth-Jones (1986:83-89, 108-111 and see also appendix "site stratigraphies"). Stratigraphic layer 4 of Szeleta Cave with the Lower archaeological find complex ("Lower Szeletian") was significantly affected by cryoturbation processes. In addition to numerous heavily worn limestone éboulis and animal bones, many lithic artifacts have significant mechanical damage from cryoturbation, evidenced by the presence of "pseudo-truncated and abrupt alternate retouch" and "pseudo-heavily denticulated" edges so typical of bifacial leafpoints. The present author was able to personally see such damaged lithic pieces from Szeleta Cave during the international conference "Les industries à pointes foliacées d'Europe centrale" at Miskolc Herman Ottó Muzeum (Hungary) in 1991 through the courtesy of Árpád Ringer to whom I am greatly indebted. By the way, lack of acceptance of cryoturbationally damaged "pseudo-heavily denticulated" bifacial leafpoints in the cave's "Lower Szeletian" caused definite misunderstanding in some interpretations of this Paleolithic complex, either in proposial of its generic links with the Shubalyuk Middle Paleolithic (e.g., Vértes 1960) or, as expressed by M.V. Anikovich (Grigorieva & Anikovich 1991), its great industrial similarity to the technologically and typologically transitional industry of Korolevo II, complex II, in the Ukrainian Transcarpathian region (Gladilin & Demidenko 1989) where, on the other hand, the presence of some bifacial leafpoints with denticulated-like edges is surely explained by their unfinished/spoiled morphology (Demidenko & Usik 1993a; 1995). Regarding the Siuren I 1920s *Lower* layer/1990s Units H and G surface preservation for limestone éboulis, animal bones and flint artifacts, not even minor cryoturbation damage is present that would evidence the action of such natural damage processes.

Thus, for hypothesis 3, which proposes the existence of a Middle Paleolithic level possibly destroyed by natural processes in the Siuren I sedimentary units to explain the presence of some Middle Paleolithic types pieces in all archaeological hearth/ashy levels with an Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry, there is no support either in the stratigraphic context or in the condition and preservation of finds, and it should thus be rejected.

Hypothesis 4

Middle Paleolithic artifacts are known to occur at numerous localities throughout the Crimean Mountains region, both in in situ *position in different rock-shelters and caves and also as surface finds from destroyed open-air and rock-shelter sites or occasionally isolated artifacts found on mountain plateaus and slopes. Taking this into consideration, we cannot exclude a situation in which Middle Paleolithic flints may be present in the Siuren I Upper Paleolithic/Aurignacian lower cultural bearing sediments due to their washing in by water action from the plateau situated directly above the site. They would, therefore,, first penetrate sediments below the rock-shelter's drip-line and then be partially distributed in other inner areas of the rock-shelter.*

Acceptance or rejection of hypothesis 4 can be made with the following comments in mind.

First, such "falling" of Middle Paleolithic flints would have had to be strictly limited to the time span of the 1920s Lower layer/1990s Units H and G deposition events because no typologically convincing Middle Paleolithic artifact types have been found above these sediments. Such a restricted period for Middle Paleolithic flints "falling" into the rock-shelter seems highly unlikely.

Second, surface characteristics for Middle Paleolithic flints show that they were, at least for some time, exposed to open sunlight on the plateau; the quite possible influence of deflation processes, as well as "driving" them some distance on the plateau slope should have produced definite and easily visible features - patina, lustre, abrasion and/or abrupt breakage of edges. As we already know, however, none of these are observed on the Siuren I Middle Paleolithic artifacts.

Finally, the discovery of definite retouch flakes and a tiny chip from secondary treatment processes for Middle Paleolithic bifacial and unifacial tool types in each of the four archaeological hearth/ashy levels of 1990s Unit G (Gd, Gc1-Gc2, Gb1-Gb2) and Unit H with identical fresh condition and preservation, as the Middle Paleolithic tools themselves have, clearly refutes hypothesis 4.

Now, after discussion of the several natural processes which could have been responsible for the Middle Paleolithic cores and tools in the 1920s Lower layer/1990s Units H and G with rejection of all of these hypotheses, we consider *human/cultural factors* which may have influenced the "mixing" of Middle and Upper Paleolithic artifacts in these deposits.

Hypothesis 5

Here we return to the old "evolutionary idea" of Bonch-Osmolowski (1934) and Vekilova (1957) in considering the Siuren I "Mousterian forms" as "survivals" of the Crimean Middle Paleolithic industries, possibly having direct links with the Siuren I Lower layer Upper Paleolithic complex. In other words, we should discuss the possibility of a local Middle-Upper Paleolithic transition in the Crimea reflected in the materials from the 1920s Lower layer/1990s Units H and G Upper Paleolithic assemblages and regional Middle Paleolithic industries where the Siuren I Middle Paleolithic component would represent evidence of such a transition.

For analysis of hypothesis 5, we summarize the main techno-typological features of both the Upper and Middle Paleolithic components in the archaeological deposits. This is necessary because for any real considerations of a "transition", we need to know the kinds of Middle and Upper Paleolithic industries that would possibly have been involved. These "industrial summaries" are rather easy to construct on the basis of the detailed techno-typological analyses of the assemblages from Units H and G and their comparison with the 1920s Lower layer assemblage.

The 1920s Lower layer/1990s Units H and G Upper Paleolithic industrial component is technologically characterized by the dominant production of bladelets and microblades from "regular" and "carinated" bladelet cores, as well as by the following typological data:- rare but typical carinated end-scrapers, a series of well-made simple flat end-scrapers mainly on unretouched blades, an absence of carinated burins and a dominance of angle and on truncation burins, among "non-geometric microliths" (more than 60% of all tools) the most represented being non-twisted rather large Dufour bladelets with alternate bilateral micro-scalar and/or micro-stepped retouch, the presence of some Krems type points including its alternately retouched variant on bladelets *sensu lato,* scaled tools, perforators and retouched blades, with only a single piece with "Aurignacian-like heavy retouch" among the latter tools. This Upper Paleolithic complex is industrially well-placed within the framework of the European Early Aurignacian of Krems-Dufour type according to our terminology, and its European analogies (Aurignacian 0/ Archaic Aurignacian/Proto-Aurignacian). At the same time, this Early Aurignacian of Krems-Dufour type complex at Siuren I is unique in Crimea.

The 1920s Lower layer/1990s Units H and G Middle Paleolithic industrial component, on the other hand, is technologically characterized by only flake production evidenced by rare (n=5) non-Levallois radial cores and tool blanks with only flake proportions and the following typological trends: a dominance among unifacial tools of different convergent points and scrapers with more than one retouched edge (semi- and sub- trapezoidal, triangular and leaf shapes) often with various dorsal and ventral additional thinning, along with the presence of simple, double and transversal scrapers and a series (7 items from all 60 tools - 11.66%) of bifacial tools with basic "plano-convex" secondary treatment ,sometimes becoming "bi-convex" only after heavy multiple rejuvenation, as is the case of a semi-leaf/triangular point with concave base from level Gc1-Gc2. The bifacial tools have the same shape types characteristic of unifacial convergent tools. The prevalence of small size dimensions (no more than 4 cm long and/or wide) for a majority of unifacial and bifacial tools is also notable. Moreover, several (n=23) distinct retouch flakes and chips from secondary treatment processes of Middle Paleolithic bifacial and unifacial tools in the Units H and G assemblages were identified. The morphology of these retouch flakes and chips are clearly evidence of "on-site" production and rejuvenation of Middle Paleolithic bifacial and unifacial tools with a strong emphasis on thinning and rejuvenation, while "on-site production" is only seen on 3 (of 23) pieces - one bifacial shaping flake (Unit H) and two partially-cortical retouch flakes (levels Gc1-Gc2 and Gb1-Gb2) and another bifacial shaping flake used as a blank for a semi-trapezoidal dorsal scraper from level Gc1-Gc2. These techno-typological data on the Siuren I Middle Paleolithic component have direct analogies in the Middle Paleolithic/Crimean Micoquian Tradition industries: the Ak-Kaya, Kiik-Koba and Starosele types (e.g., see Kolosov *et al.* 1993; Marks & Chabai 1998). Thus, the Siuren I Middle Paleolithic "transitional survival" component, based on its basic techno-typological features and unique retouch pieces from tool production and rejuvenation clearly point to "predecessors" in the Middle Paleolithic/Crimean Micoquian Tradition for a "hypothetical transition".

It is worth noting here Bonch-Osmolowski's and Vekilova's opinions on "Crimean Mousterian predecessors" for the Siuren I Lower layer Upper Paleolithic industry. Bonch-Osmolowski (1934) did not specify a particular kind of Crimean Mousterian, but described it simply as local Mousterian. Vekilova (1957:313-314) identified the Shaitan-Koba site as a possible "Mousterian predecessor" for a "transition". This choice is explained by the assumed youngest chronological and industrial position for the Shaitan-Koba Middle Paleolithic complexes in Bonch-Osmolowski's scheme of "Crimean Early Paleolithic and Mousterian unilinear evolutionary development" (1934:143-148), characterized by some primary blade reduction and more or less elongated proportions for points and scrapers. Since that time, the Shaitan-Koba assemblages have been attributed to an early stage of the Western Crimean Mousterian industry (Chabai 1998), techno-typologically characterized by non-Levallois radial and parallel, and Levallois radial reduction strategies, a moderate blade index (9-16%-20%), a complete absence of bifacial tool production traditions and a dominance among large-sized unifacial tools of scrapers (about 80% of which are of simple type) and points with elongated proportions. Obviously, neither the Siuren I Middle Paleolithic component nor the Crimean Micoquian Tradition complexes have industrial connections with the Shaitan-Koba Early Western Crimean Mousterian. At the same time, a suggestion of the possibility of the Shaitan-Koba complexes being "predecessors" for the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type industrial component only would not be supported by the respective techno-typological data for the former complexes. The Shaitan-Koba assemblages lack primary bladelet flaking, its blade production was accompanied by more significant roles of non-Levallois and Levallois radial knapping methods, as well as only single and very atypical Upper Paleolithic tool types (end-scrapers and burins) present (Kolosov 1972). Moreover, in the context of Western Crimean Mousterian development through time (Chabai 1996; Chabai & Marks 1998), its Late Stage (Kabazi II site, levels II/1A-II/6) dated after the Hengelo Interstadial of the Würm Interpleniglacial and, accordingly, chronologically penecontemporaneous with the Siuren I Upper Paleolithic/Aurignacian industry, is marked by only "very final" Middle Paleolithic characteristics: exclusive blade production (with no bladelet reduction) and secondary blade modification into simple and double scrapers and elongated points, including some with abrupt retouch (obliquely truncated blades), and the remarkable absence of simple typical end-scrapers or "non-geometric microliths". Taking all these data into consideration, the Shaitan-Koba Middle Paleolithic complexes must be excluded from our "transition analysis".

Thus, on the basis of direct analogies between the Siuren I Middle Paleolithic techno-typological component and the Crimean Micoquian Tradition industries, the latter complexes are the only candidates for a hypothetical transition towards the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry with "Middle Paleolithic elements", taking it as a single integral find complex. It is now necessary to define Upper Paleolithic techno-typological elements, and especially specific elements in the Siuren I 1920s Lower layer/1990s Units H and G assemblages, Early Aurignacian of Krems-Dufour type or, at least, some definite trends toward their possible "future appearance" in the Middle Paleolithic/Crimean Micoquian Tradition industries.

None of these Middle Paleolithic industries (Ak-Kaya, Kiik-Koba and Starosele types) contain any such Upper Paleolithic/Aurignacian elements. Technologically, they are neither characterized by bladelet primary flaking (including the absence of Aurignacian bladelet "carinated" cores) nor even blade production that usually has a minor representation among debitage pieces and tool blanks (basically less than 10%) with strong flake production using non-Levallois radial and parallel reduction methods. Typologically, Upper Paleolithic tool types (end-scrapers, burins, perforators) may occur in these industries, but are atypical both quantitatively (always less than 5% of all tools) and morphologically (no specifically Aurignacian types and only simple, mainly atypical, forms which may not necessarily be classifiable as Upper Paleolithic). All in all, the Middle Paleolithic/Crimean Micoquian Tradition industries appear to be "quite conservatively" Middle Paleolithic and even if we imagined a sort of "industrial explosion" toward Upper Paleolithic development, the starting elements for the "origin" of true Upper Paleolithic/Aurignacian techno-typological features are completely absent.

So, on the basis of flint treatment methods, the 1920s Lower layer/1990s Units H and G Upper Paleolithic/Early Aurignacian of Krems-Dufour type industrial component has no hypothetical or even highly imaginable links with the Middle Paleolithic/Crimean Micoquian Tradition industries which, therefore, cannot no longer be considered as "predecessors" in the "transitional problem" under discussion.

Moreover, such a transition from the Middle Paleolithic/Crimean Micoquian Tradition industries to the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry complex would be additionally complicated by the very different human remains associated with these complexes. Found by Bonch-Osmolowski in 1926 in the Siuren I Lower layer, a human molar with modern morphological features, along with a common attribution to modern *Homo sapiens* as the only population associated with the European Aurignacian, supports modern *Homo sapiens* as the makers of the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry complex. On the other hand, findings by Bonch-Osmolowski and Kolosov of definite Neanderthal remains at sites with the Ak-Kaya industry: Zaskalnaya-V and VI, Prolom-II and the type-site of the Kiik-Koba industry - Kiik-Koba Cave, upper layer (Bonch-Osmolowski 1940; Gladilin 1979; Yakimov & Kharitonov 1979; Danilova 1979a, 1979b; 1983; Kolosov *et al.* 1993; Smirnov 1991) surely allow us to consider Neanderthals as responsible for the Middle Paleolithic/Crimean Micoquian Tradition industries. Keeping in mind such paleoanthropological differences, we would be additionally forced to accept the highly unlikely hypothesis that the transition also included local transformation from Neanderthals to modern humans over a very short time period around ca. 30,000 years BP.

We consider that the physical anthropology data figuratively serve as a "final nail in the coffin" for the question of a local Middle-Upper Paleolithic transition.

Hypothesis 6

The occurrence of Middle Paleolithic artifacts in the Siuren I archaeological sequence may be explained by either collecting by Upper Paleolithic/Aurignacian Homo Sapiens groups of such unusual lithic pieces on open surfaces of Crimean Middle Paleolithic sites and/or were directly received through exchanges with Crimean Middle Paleolithic Neanderthals. These suggestions principally repeat the arguments of M. Oliva (1981:12-13, 1984:210) on the "intrusive presence" of "Szeletian typological elements" (scrapers and bifacial leafpoints) in Moravian Bohunician sites (but contra see, for example, Svoboda 1988:171, 1990:202; Allsworth-Jones 1986:143-144, 1990:185-187). These possible explanations are also partially in accordance with the proposal by Anikovich (1992:225) for Siuren I: "... ties between local "Mousterians" and, probably, intruders, who brought with them developed Upper Paleolithic cultural traditions" that we already called in the beginning of this Chapter as a "reverse acculturation model".

First, during analysis of hypothesis 6, we have to keep in mind that such cultural explanations are only possible if we fully accept the basic contemporaneity of Middle Paleolithic/Crimean Micoquian Tradition Neanderthals and Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type *Homo sapiens* in the Crimea around 30000 years BP. Two AMS dates recently obtained for the Kiik-Koba industry at Buran-Kaya, layer B (28,840 ± 460 BP, OxA-6673; 28,520 ± 460 BP., OxA-6674) (Pettitt 1998:331) seem to support this assumption with quite firm arguments. Without such contemporanety, there is no sense in discussing hypothesis 6.

The collection of "strange-looking" lithic artifacts which were absolutely unknown or, at least, not typical of the reduction strategies of the modern human "collectors" is, of course, possible to imagine. But all such cases known by the author for Paleolithic archaeology (unfortunately very rarely published) do not show subsequent use and rejuvenation of these unusual items exactly in the same manner as did the original makers of these artifacts. Having retouch flakes from Middle Paleolithic tools (as well as from thinning and rejuvenation) in the 1990s Units H and G, we are driven to the definite conclusion that some interactions existed between Middle and Upper Paleolithic human groups, whether we accept "a collecting possibility" or not. This is especially evident because of identical morphology and reduction techniques observed for tools from the Siuren I Middle Paleolithic and the Middle Paleolithic/Crimean Micoquian Traditions.

Thus, positive resolution of hypothesis 6 is possible only with the general acceptance of the contemporaneity of Upper Paleolithic modern *Homo sapiens* and Middle Paleolithic Neanderthals in the Crimea and, moreover, actual interactions between them. This would place the problem under discussion within theoretical questions regarding the Middle-Upper Paleolithic transition that are basically beyond the framework of concrete considerations. In other words, we must put forward the following question: Is it possible to consider interactions between Crimean Neanderthals and modern humans in which modern humans borrowed reduction and tool production techniques from Neanderthals, incorporating them into their own technological tradition? At the same time, this question must be addressed with scientific data that supports or refutes such interaction.

We start with facts that could point out towards acceptance of hypothesis 6. The present author was initially inclined to believe that the homogeneity of the 1920s Lower layer/1990s Units H and G assemblages during the 1990s excavations was the result of some kind of interaction between human groups (supposedly so different) of local Middle Paleolithic and "foreign" Upper Paleolithic complexes, elaborating Anikovich's interpretation but for a much earlier time span (ca. 30,000 years BP) than he had assumed. Therefore, all "positive arguments" were thoroughly gathered.

The presence of not only typologically clear Middle Paleolithic tool types indistinguishable from the Crimean Micoquian Tradition in each of the four archaeological hearth/ashy levels of Unit G (Gd, Gc1-Gc2, Gb1-Gb2) and Unit H, with the additional discovery of retouch flakes and chips from secondary treatment processes ("on-site" production and especially rejuvenation of Middle Paleolithic bifacial and unifacial tools) again in each of these four archaeological levels, are compelling arguments. This is further strengthened by the same fresh condition and preservation characteristics of both Middle and Upper Paleolithic cores and tools in these levels. Also, in terms of spatial distribution of Middle and Upper Paleolithic pieces throughout the 12 sq. meter zone in the 1990s, there are no differences and no separation of these groups.

One more "positive argument" concerns the flint types used in the Siuren I complexes. Vekilova recognized a certain importance of colored flint in the Siuren I Lower layer industry - about 20% of all tools, remarkably noting its application for only Upper Paleolithic tool production and surprisingly no mention of its use for Middle Paleolithic tool production (1957:258-270). Therefore, one could assume use of this colored flint (the source still unknown, but likely distant from the site) only for Upper Paleolithic/Aurignacian reduction along with gray flints at Siuren I, while the Middle Paleolithic industrial component would be characterized by the use of gray flints alone. It is also important to remember that none of the Crimean Middle Paleolithic industries (not only sites and industries of the Crimean Micoquian Tradition) is known for the use of such colored flints, but this suggestion is not supported by the data from the 1990s excavations. The following definite Middle Paleolithic artifacts are identified on colored flint: a transversal wavy dorsal scraper with additional ventral basal thinning and bipolar dorsal thinning of both lateral edges in Unit H (fig.4:5 on p. 130), a semi-trapezoidal ("déjeté") ventral scraper (fig.6:8 on p. 199), a retouch flake in level Gc1-Gc2 and a retouch flake in level Gb1-Gb2. Special study of the use of different flint types on 27 Middle Paleolithic tool types from the 1920s excavations conserved at the Department of Archaeology at the St.-Petersburg Kunstkamera Museum was undertaken by the present author in November 1999. Despite the clear prevalence of gray flints (25 tools), two unifacial scrapers were identified on colored flints - sq. 12-B/horizon 4 and sq. 11-Г/horizon 3. So, exploitation of both colored flints imported from a long distance and less distant gray flints (from outcrops of no more than 7-10 km in straight distance) is characteristic for both Middle and Upper Paleolithic industrial components of the 1920s Lower layer and the 1990s Units H and G assemblages, once more strengthening support for hypothesis 6.

Now, however, let us turn to possible facts and thoughts which would contradict hypothesis 6.

These first concern technology. Indeed, there are strong technological differences. The Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry is based on the production of blades and especially bladelet *sensu lato* and tools made on blades and bladelets *sensu lato* obtained from cores, as well as blanks produced from mainly carinated end-scrapers which served as cores. The Middle Paleolithic/Crimean Micoquian Tradition is directed towards the primary production of flakes from non-Levallois radial and parallel cores, with Middle Paleolithic points and scrapers made on such flake blanks, as well as the use of flat flint nodules and plaquettes for bifacial tool production in "plano-convex manner".

These distinct differences, as well as the absence of any Upper Paleolithic/Aurignacian techno-typological features in the Middle Paleolithic/Crimean Micoquian Tradition industries have been already discussed with respect to hypothesis 5 and point towards the following interpretation. For *Homo sapiens* groups of the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry, incorporation of the Neanderthal Middle Paleolithic/Crimean Micoquian Tradition rduction techniques, particular thinning, rejuvenation and use traditions into their own system would mean either some obvious reorganization of the system or just a simple repeating and "echoing" of the Middle Paleolithic tool types. The first possibility of a "reorganization of the Upper Paleolithic/Aurignacian system" is not at all reflected in the Siuren I assemblages. As will be shown later in the present volume, the Siuren I Aurignacian component perfectly fits into the European Early Aurignacian of Krems-Dufour type industry which is not characterized at all by Middle Paleolithic techno-typological elements, if we exclude typological misiterpretations of "retouched flakes", and, at the same time, having the same general and particular techno-typological Upper Paleolithic core, debitage and tool categories, sub-categories and types and morphological characteristics. Thus, the existence in these Siuren I assemblages of two separate but integral Upper and Middle Paleolithic components with, at least, 90% dominance of the former should be called into question. Then, if we continued to accept the integral part of the Middle Paleolithic pieces within the Siuren I Upper Paleolithic, we are forced to consider the often claimed "imitation explanation " as part of an "acculturation model". For Siuren I, this would be a very unusual suggestion because traditionally such an explanation is used to interpret the appearance of some distinct Upper Paleolithic features (e.g., blade technology, bone/antler tools and especially personal ornaments) in the European Chatelperronian, Szeletian and Uluzzian industries associated with Neanderthals (whether actually discovered in association or simply assumed) under the influence ("acculturation") of Aurignacian *Homo sapiens* newcomers (e.g., Mellars 1989). Although this and other aspects of the "acculturation model" is remain at the level of claims and speculations for understanding the processes of the Middle-Upper Paleolithic transition in Europe (see, for instance, D'Errico *et al.* 1998 with comments and reply; Zilhao & d'Errico 1999), we repeat that one-way cultural influence is generally assumed for European Neanderthals from Aurignacian *Homo sapiens* for development of their technology and "lifestyle" towards Upper Paleolithic "modern" forms. On the other hand, with the Crimean Siuren I problem, there would again be one-way cultural influence, but in the opposite direction - Aurignacian *Homo sapiens* would have undergone a process of introducing Middle Paleolithic techniques into their own system as an integral and unmodified part from Crimean Micoquian Tradition Neanderthals. If we were to further continue to play with the "imitation explanation of acculturation model", we must accept "reverse acculturation" for the Siuren I Aurignacian *Homo sapiens* (why not?), who, from their side, left no archaeologically visible evidence of their interactions with local Neanderthals in the Crimean Micoquian Tradition industries.

Such a situation at Siuren I, with the necessity of accepting the "imitation explanation" and even a "reverse acculturation model" is surely unknown for the European Early Upper Paleolithic and, therefore, should be viewed, if at all, very cautiously and, from our point of view, seems not very likely to have occurred in the Crimea.

So, hypotheses 5 and 6 regarding *human/cultural factors* do not provide us with convincing data and interpretations to explain the presence of a Middle Paleolithic component in the 1920s Lower layer/1990s Units H and G, either, although hypothesis 6 will be probably supported by some of our "more daring colleagues" for further speculation on the question. From our point of view and based on the available data, there is only hypothesis left for consideration, consisting of a combination of both *human/cultural* and *natural factors.*

Hypothesis 7

*Instead of viewing of the Siuren I cultural remains as left by human (*Homo sapiens*) groups with the same technological traditions - Early Aurignacian of Krems-Dufour type industry with some Middle Paleolithic elements, we assume several alternative visits to the Siuren I rock-shelter by both the Upper Paleolithic/Early Aurignacian of Krems-Dufour type* Homo sapiens *and the Middle Paleolithic/Crimean Micoquian Tradition Neanderthals, where visits by modern humans were much more intensive and prolonged than those of the Neanderthals. Accordingly, during a short time span of a couple of thousand years around 30000 BP for these visits, sedimentation processes and their rates were not rapid enough for the composition of distinct Middle and Upper Paleolithic levels intercalated within the stratigraphic sequence, creating instead a sequence of Upper Paleolithic levels with some Middle Paleolithic artifacts present in each.*

We now analyze possible data that would support hypothesis 7.

First, some data on intensity, duration and nature of both the Middle and the Upper Paleolithic occupations will be summarized.

Occupations

The 1920s Lower layer/1990s Units H and G Middle Paleolithic/ Crimean Micoquian Tradition component is composed of only definitively identified 5 cores, 60 tools and 22 retouch flakes and chips, while all possible Middle Paleolithic debitage pieces based on morphological features are impossible to separate exactly from the abundant unretouched flints in these units. Of course, taking into account the correlation of Middle Paleolithic tool types (20 pieces) to retouch products (23 pieces) from the 1990s excavations, we may assume the presence of about 40 more retouch flakes and chips from Middle Paleolithic tool production processes in the Lower layer assemblage, which were not identified by any of the specialists who either excavated the site (G.A. Bonch-Osmolowski) or studied the flint assemblages (e.g., E.A. Vekilova, J. Hahn, M.V. Anikovich). Actually, retouch products from rejuvenation processes of Middle Paleolithic tools are indeed present in the 1920s Lower layer assemblage. This was determined by the present author in November 1999 during observation of some of the debitage and waste product artifacts recovered in 1927 and conserved at the Department of Archaeology in the St.-Petersburg Kunstkamera Museum. During these brief studies, two bifacial thinning flakes (sq. 12-Г/horizon 4 (fireplace) and sq. 12-Ж/horizon 2) and three small resharpening chips of unifacial convergent (asymmetrical) tool tips (2 items from sq. 12-E with no indication of a particular horizon and one item from sq. 11-Г/horizon 4) were identified. Thus, the Middle Paleolithic industrial component would be composed of 5 cores, 60 tools and perhaps about 60 retouch flakes and chips that totals, at best, no more than 130 artifacts. Although unidentified/unidentifiable debitage pieces would certainly increase the sample, we do not think it would do so significantly because of the rarity of cores, the absence of easily morphologically recognizable unretouched flakes and the abundance of tool retouch by-products. Taking all of this into consideration, we consider that the total possible number of Middle Paleolithic artifacts would be no more than 200 pieces. For the areas excavated during the 1920s and the 1990s, about 100 sq. m total, this yields on average 2 artifacts per square meter; the 1990s sample taken alone contains 43 pieces (but no supposed debitage included) for 12 sq. m, or 3.6 artifacts per square meter. Keeping in mind the latter ratio, even the unlikely doubling of the average for both excavation campaigns give us only about 4 artifacts per square meter. It should also be recalled that this estimated artifact density is not the result of a single human occupation event, but actually corresponds to several (at least four) occupations based on the number of archaeological hearth/ashy levels of the 1920s Lower layer/1990s Units H and G where the Middle Paleolithic flints were found: the Siuren I occupations by the Middle Paleolithic/Crimean Micoquian Tradition Neanderthals. Thus, the assumed number of Middle Paleolithic pieces for each occupational episode was very limited, from nearly single examples to no more than 100 pieces in all artifact categories, excluding debris. This obvious rarity of Middle Paleolithic artifacts, where tools account for about 30% and about 30% more by retouch flakes and chips from secondary treatment processes of tools (these percentages are given with only the supposed (!) debitage unretouched items), allows us to suggest very special characteristics for Middle Paleolithic occupations by Neanderthals at Siuren I in the 1920s Lower layer/1990s Units H and G. Considering as well both core rarity (5 cores versus 60 tools - correlation 1 to 12) and the presence of retouch flakes and chips from mainly on-site tool thinning and rejuvenation processes and very few signs of on-site tool production, we can express some definite thoughts on these occupation events.

The Middle Paleolithic tools were mainly brought into the rock-shelter as finished products and their subsequent use was accompanied by quite intensive thinning and rejuvenation. The limitation of technological activity to these specific aspects was due to the long distance to flint sources and by the poor raw material base limiting primary core reduction and tool production at the site. The presence of only a few cores and retouch flakes from initial shaping of tools, as well as the location of the nearest outcrops with good quality flints about 7-10 km in straight direction from the rock-shelter certainly support this. Thus, flint treatment processes were very limited and restricted even for the assumed most representative Middle Paleolithic occupations at the rock-shelter, without mentioning the entire Siuren I Middle Paleolithic component. These subjective factors (Demidenko 1996) explain the common industrial features of the Siuren I Middle Paleolithic component as corresponding to formal techno-typological criteria of Kiik-Koba type in the Crimean Micoquian Tradition industries. Moreover, these activities are not related to the rock-shelter's all excavated areas being completely absent for its central inner part (the 1879-1888 excavations of K.S. Merejkowski) that makes the Neanderthals occupations once more restricted in terms of the rock-shelter's space use, too. All in all, the Siuren I Middle Paleolithic/Crimean Micoquian Tradition Neanderthals occupation episodes were of very short duration with the only aspect of intensive activity focused on multiple thinning and rejuvenation of tool leading to the appearance of numerous and different bifacial and unifacial convergent tool forms with more than one edge retouched that at the same time points to the special character of frequent ephemeral visits here.

The 1920s Lower layer/1990s Units H and G Upper Paleolithic/Early Aurignacian of Krems-Dufour type industrial component is very different in all aspects of occupation characteristics from the site's Middle Paleolithic component. These differences are discussed below.

The Upper Paleolithic component contains a much more abundant lithic assemblage with about 15500 flints in the 1920s Lower layer and almost 5000 flints in the 1990s Units H and G from about 100 excavated square meters, on average about 200 items per sq. m. This is about 50 times more than the estimated (and without identified retouch flakes and chips and debitage pieces from the 1920s Lower layer) artifact density of 4 items per 1 sq. m on average for the Middle Paleolithic component. On the other hand, for both industrial components, we have fairly precise data on only three artifact categories (core-like pieces, tools and waste from tool production and rejuvenation) and another, possibly more objective, estimation of artifact density can be done for only these artifacts. In this case, the Middle Paleolithic component is composed of only 87 items for about 100 sq. meters - less than 1 piece per sq. m, while the Upper Paleolithic component is composed of no less than 1300 items for the same area - more than 13 pieces per sq. m. So, artifact density, as well as other possible comparative estimations definitely show that average artifact density is more than 10 times higher for the Upper Paleolithic occupations in comparison to that for the Middle Paleolithic occupations.

At the same time, the presence of all artifact categories in the Upper Paleolithic collections from Units H and G clearly evidences strong "on-site" activities that included primary and secondary flint treatment processes at Siuren I, where possibly only some but not many finished tools were brought to the rock-shelter.

Next, the majority of hearths, fireplaces and/or ashy clusters in four archaeological levels of the 1920s Lower layer/1990s Units H and G are more likely connected with *Homo sapiens* Upper Paleolithic occupations. This inference of association with the Upper Paleolithic find complexes is explained through the presence of such features in more or less long-term and intensive short-term occupations with rather abundant artifacts, and rarely in ephemeral Middle and Upper Paleolithic sites with small assemblages, which is in complete correspondance with all data on the find complexes of Early Aurignacian of Krems-Dufour industry at Siuren I.

Finally, let us also recall the distribution of these Upper Paleolithic archaeological levels in the central inner part rock-shelter more than 60 sq. meters in total area and 1137 flint artifacts where 131 items are composed of core-like pieces, tools and burin spalls excavated by Merejkowski in 1879-1888. With the previously described data, this "spatial fact" additionally points out that *Homo sapiens* groups at the time of these occupations probably used the entire space of the rock-shelter for living and activity needs.

The totality of these data allows us to make the following basic conclusions on the Upper Paleolithic *Homo sapiens* occupations at Siuren I in the 1920s Lower layer/1990s Units H and G, as well as probably the lower layer of the late 19th century excavations. The presence of about 200 flints per sq. m for the combined sample of the 1920s and 1990s excavations and more than 400 flints for the separate sample of the 1990s excavations, the occurrence of all artifact categories numerically well-represented in this component, the discovery of distinct hearths, fireplaces and/or ashy clusters and the distribution of the material across the entire investigated areas of about 160 sq. m testify to the clear dominance of "on-site" flint treatment processes carried out during frequent visits by *Homo sapiens* to the rock-shelter and to characteristic "intensive short-term camp" features, especially with intensive bladelet *sensu lato* production, retouching and probable use.

Thus, the differences between the Middle and the Upper Paleolithic components, interpreted as evidence of alternating frequent occupations at Siuren I by anthropologically different human groups, point out that the much more intensive and, highly likely, longer duration occupation by modern *Homo sapiens* of the entire area of the rock-shelter, with more than 20000 lithic artifacts in four stratigraphically distinct archaeological levels, could actually "envelop" no more than 200 lithic pieces of very ephemeral Neanderthal occupations noted in only some areas of the rock-shelter.

Sedimentation rates

These supposed processes of "absorption" of Middle Paleolithic artifacts by Upper Paleolithic levels also need to be confirmed by consideration of sedimentation rates in the Siuren I stratigraphy. From a general geological point of view (e.g., Gromov 1948; Ivanova 1969, 1983), very rapid sedimentation processes at the rock-shelter had always been proposed. The main agencies for the site's depositional components were angular limestone éboulis and products of their dissolution of cryoclastic origin - from intensive weathering and exfoliation of the limestone bedrock that, nevertheless, do not alone enable estimation of sedimentation rates. It is only possible to express some thoughts on this matter with comparisons to other Crimean sites. In light of this, we should not forget about Kabazi II, a Middle Paleolithic open-air site, the only Crimean Paleolithic site for which a geological attempt was undertaken to estimate sedimentation rates (Ferring 1998). There were three main depositional processes at the site: weathering and exfoliation of huge limestone slabs and boulders, colluvial and pedogenesis processes. So, for Kabazi II Unit II with 14 occupational surfaces (Chabai 1998:181-182), "*a sedimentation rate for the 3.3 m of deposits of 0.08 cm/year*" (Ferring 1998:177) is assumed, very rapid deposition indeed. For Siuren I, it is worth recalling that colluvial and pedogenesis processes, so active at Kabazi II, play little or no role. The sedimentation rate at Siuren I could thus not be as rapid as at Kabazi II. Even acceptance of the Kabazi II sedimentation rate for the Siuren I deposits, about 1 m thick (excluding the thickness of the huge limestone block between Units H and G) does not contradict the proposed ideas of hypothesis 7. Simple calculations show that 1920s Lower layer/1990s Units H and G sequence "was constructed" over a period of about 1000-2000 years ca. 30000 years BP, based on AMS dates for the site. In this case, on one hand, the sedimentation rate was not rapid enough to create stratigraphically separate intercalated Middle and Upper Paleolithic archaeological levels, but, on the other hand, was quick enough for the composition of at least four distinct archaeological Upper Paleolithic levels that "enveloped" rare Middle Paleolithic finds. At the same time, if the sedimentation rate was really slow, we would most likely see only a single rather thick Upper Paleolithic layer with some Middle Paleolithic artifacts in it, which is not the case at Siuren I.

Combining the data on the specific characteristics of Middle and Upper Paleolithic human occupations at Siuren I and the probable sedimentation rate for the deposition sequence, hypothesis 7 seems to offer the best explanation. Indeed, at present, of the seven hypotheses discussed, only the last one, suggesting several alternating visits of Siuren I by both Upper Paleolithic *Homo sapiens* and Middle Paleolithic Neanderthals around ca. 30000 years BP to explain the discovery of Middle Paleolithic artifacts within the Upper Paleolithic archaeological levels seems to be the most probable on the basis of data from the site and modern theoretical points of view on the Middle-Upper Paleolithic transition.

Here we admit that alternative visits by two human groups with different technological traditions leading to the appearance of one or even several archaeological levels with different techno-typological components due to unique aspects of sedimentation processes at Paleolithic sites is rather unusual and/or very rarely used in analyses of Paleolithic sites to explain assemblage variability. Nevertheless, such cases are noted as being theoretically possible in site formation processes and probable "industrial mixing" at Paleolithic sites. For instance, Rigaud and Simek in their thought-provoking article noted that "... *at the present time we cannot be sure that the assemblages available for analysis correspond to individual occupation events. In fact, we can probably assume the opposite. ... In sites where deposition is slow, it is very probable that many brief occupations, perhaps seasonal or annual, would appear as a single unit*" (1987:54). Moreover, there are also several very convincing analyses of some Paleolithic sites showing near simultaneous occupations of a site by human groups with different technological traditions.

One such case for the Ukrainian Paleolithic is worth discussing here. The single-layer open-air Late Mesolithic site (Boreal period, about 6000 years BC) of Mirnoe in the northwestern Black Sea region was investigated in 1969-1976 by V.N. Stanko (1982). Eight concentrations with flint and bone artifacts and faunal remains were identified in a 700 sq. m zone among the site's other areas where altogether 1807 sq. meters were excavated. Techno-typological analysis of the materials undertaken separately for each concentration by Stanko revealed a unique view of the industry. Concentration "N 1" (29 sq. meters) was characterized by the exclusive presence of "Kukrek culture" type pieces: "pencil-shaped" cores, an abundance of bladelets and microblades among the debitage, "Kukrek armatures", backed bladelets and microblades with some points, bone slotted points. Three other concentrations - "N 2" (25 sq. m), "N 12" (21 sq. m) and "N 13" (28 sq. m) - contained only "Grebeniki culture" type pieces: prismatic and non-volumetric flat cores, a dominance of flakes in debitage, geometric trapezes. The remaining four concentrations - "N 3-8" (294 sq. m), "N 9-11" (140 sq. m), "N 14-16" (93 sq. me) and "N 17-18" (66 sq. m) were considered to be a "mixed" occurrence of artifacts from both "Kukrek and Grebeniki cultures", although for each of the latter four concentrations some distinct "pure microconcentrations" with either "Kukrek" or "Grebeniki" finds were also noted (Stanko 1982:60-81) . The various spatial distributions of the two Late Mesolithic "cultures" in the same archaeological layer of the Mirnoe site was interpreted by Stanko as a kind of co-existence and interaction of two different human groups at the settlement (1982:79-81, 116). On the other hand, we could instead propose alternating visits of "Kukrek and Grebeniki cultures" human groups to the Mirnoe site where the four "pure concentrations" with areas of 21-29 sq. meters could represent *"*culturally*"* distinct individual occupation events, while the four "mixed concentrations" with sizes of 66-294 sq. meters are probably traces of several individual occupation events by each of these "cultures", but in the same areas with a very short time period between occupations making spatial separation of the "Kukrek and Grebeniki cultural complexes" occupations impossible, although the presence of "pure microconcentrations" within each of these four "mixed concentrations" is notable. Here it would not be hard to imagine either a situation in which artifacts were of much greater density at the Mirnoe site if the separate "culturally" distinct concentrations were considered a single concentration, or if Stanko had analyzed the entire site as a single assemblage, the Mirnoe Late Mesolithic industry would definitely have "heterogeneous features" and interpretation of the technological tradition would remain very speculative, even to the point of suggesting "synchretic" industrial amalgamations. Nevertheless, our proposal to explain the Mirnoe Late Mesolithic Kukrek and Grebeniki cultures by "alternating visits" to the large open-air site area (about 700 sq. meters) of the Early Holocene deposits can also be applied to the co-existence of Middle and Upper Paleolithic materials at Siuren I in a much more limited area of the rock-shelter (about 100 sq. meters) of the Upper Pleistocene sediments. This strengthens our "alternating visits" hypothesis for Siuren I, which also has a "pure concentration" (about 60 sq. meters) with only Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry from Merejkowski's 19th century excavations.

Moreover, further application of the "alternating visits" hypothesis to other Crimean Paleolithic rock-shelter sites (namely, Final Paleolithic ones) would allow us to avoid creating several new discrete cultures of synchretic character for the Crimean Final Paleolithic, as was absolutely unconvincingly proposed by V.Yu. Cohen (Bibikov *et al.* 1994; Cohen 1996; Cohen & Gorelik 1998). For example, the co-occurrence of "Swiderian" and "Shan-Koba" industrial components leads Cohen to propose a "Siuren II Final Paleolithic culture", as well as the discovery of "Epi-Tardigravettian" ("Shan-Koba Mesolithic culture", according to Yanevich [1993]) and "Shan-Koba" industrial components in mixed position are interpreted by Cohen as "Shan-Koba, layer 4 Final Paleolithic culture". As it seems now, application and development of the "alternating visits" hypothesis to these questions may lead to a much more realistic and clearer picture of the distribution and development of Crimean Final Paleolithic industries through time.

Concluding remarks

Discussions of the problem of the co-occurrence of Middle and Upper Paleolithic artifacts at Siuren I and the analysis of several alternative hypotheses have led us to the following conclusions.

There is no separate archaeological horizon with exclusively Middle Paleolithic finds at Siuren I (*hypothesis 1*).

All possible natural, post-disturbance processes and other means for the integration of Middle Paleolithic artifacts in Upper Paleolithic archaeological levels (*hypotheses 3-4*) should be unambiguously rejected.

The evolutionary idea of development of the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry with some "Middle Paleolithic survival elements" from the local Middle Paleolithic/Crimean Micoquian Tradition industries (*hypothesis 5*) is also not appropriate, because the techno-typological industrial features and physical anthropology data (Neanderthals vs. *Homo sapiens*) are too different for any possible transitional processes at ca. 30000 years BP to have taken place in these archaeological complexes.

Possible contacts and interactions between the Upper Paleolithic *Homo sapiens* and the local Middle Paleolithic Neanderthals (*hypothesis 6*) do not seem to be very likely because in this case we would have to accept a "reverse acculturation model" where only "archaic" human groups introduced techno-typological elements into the technological tradition of "modern" human groups, which were accepted and used with no changes by *Homo sapiens*, while Neanderthals, at the same time, did not incorporate any Upper Paleolithic/Aurignacian elements in their tradition.

At present, the only possible explanation, in our opinion, involves "alternating visits" of Siuren I at ca. 30000 years BP by both Middle Paleolithic Neanderthals (frequent very ephemeral occupations) and Upper Paleolithic *Homo sapiens* (frequent occupations with "intensive short-term camps"). Given the sedimentation processes and rates, Upper Paleolithic levels "absorbed" the rare Middle Paleolithic artifacts (*hypothesis 7*), creating an archaeological sequence with only Upper Paleolithic levels containing some Middle Paleolithic pieces, instead of actual interstratification of Middle and Upper Paleolithic levels.

Finally, in light of the "Siuren I Middle Paleolithic problem" and the proposed explanation, further elaboration of the "alternating visits" hypothesis for analyses of Paleolithic sites and their assemblages would be quite fruitful and useful. It is especially worth consideration for assemblages with "heterogeneous industrial features", as already pointed for the Crimean Final Paleolithic industries, which should not be regarded as "discrete cultures with synchretic characteristics" without thorough discussion of potential explanations, among which the "alternating visits" hypothesis would certainly play a crucial role.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 333-342.

17 - THE PROBLEM OF INDUSTRIAL ATTRIBUTION OF ARTIFACTS FROM THE UPPER CULTURAL BEARING DEPOSITS AT SIUREN I: 1920S EXCAVATIONS UPPER LAYER AND 1990S EXCAVATIONS UNITS E-A

Yuri E. DEMIDENKO

Introduction

Although the main aim of the new 1990s archaeological research at Siuren I focused on the excavation and explanation of the Pleistocene deposits which include the Lower and Middle layers (excavated in the 1920s) relevant to studies of the Middle-Upper Paleolithic transition in the Crimea, the recovery of artifacts in sediments corresponding to the Upper layer (1920s excavations) also necessitates discussion of the archaeological context of the site's upper cultural deposits. The term "problem" in the title is deliberate. As will be shown below, there were several questions regarding industrial attribution prior to the new excavations and this issue continued to pose a problem afterwards. At first sight, it is because of artifact scarcity (less than a hundred pieces) obtained for Units E-A in 1994-1995 that makes comparison with the Upper layer (about 6000 items) from 1926-1929 difficult. This is especially obvious when we take into consideration the comparisons made between Units G and F (1990s) and the Lower and Middle layers (1920s) where collections from both campaigns are abundant, complement one another and, most importantly, are quite uniform in their industrial techno-typological characteristics. On the other hand, as is clear from the artifact descriptions, the Units E-A finds are of heterogeneous industrial nature and were found in different and mainly disturbed depoists. The heterogeneous character of both stratigraphy and artifact structure also appear to be true for the Upper layer (1920s). Therefore, before final analysis of the industrial attribution for Units E-A/Upper layer, their stratigraphy and archaeological context should be discussed in the light of new data and the points of view expressed by scientists involved in excavations and/or subsequent studies of these finds.

Bonch-Osmolowski's published data on the Upper layer excavations and summary of finds

Here we emphasize the following main his data. Regarding the stratigraphic context of the Siuren I Upper layer, Bonch-Osmolowski, on one hand, has marked the lower boundary for this cultural layer both partially below huge limestone blocks and partially in between such blocks, while the upper boundary was delimited by modern dark humus sediments in stratigraphic profiles (1934: fig. 9 on p. 127). On the other hand, as is clear from his general description of the site's stratigraphy (1934:124), the Upper layer was only sandwiched between huge limestone blocks and modern deposits. In this case, sediments between these blocks and below them do not conform to this statement, especially taking into account the accepted subdivision of the site's three cultural layers based on their separation by rock-fall levels formed of such limestone blocks. Thus, the "lowermost portion" of the Upper layer as defined by Bonch-Osmolowski should be considered as different from the other sediments of this layer above the limestone blocks, pointing out the heterogeneous stratigraphy of the Upper layer deposits. Moreover, these "lowermost portions" already seem to be related to the upper part of the Middle layer and, therefore, we cannot exclude the presence of some artifacts from the Middle layer in the Upper layer assemblage.

Bonch-Osmolowski's general description of the Upper layer assemblage shows a uniform Upper Paleolithic industry. This was defined by by him as an "*Upper Aurignacian with Gravette points and backed bladelets*" given the standards of the early 1930s, that would now be considered a Gravettian industry *sensu lato*. Aside from flint artifacts, Bonch-Osmolowski also noted the presence of an engraved broken red deer antler (1934: fig. VI, 1) and 2 broken red deer tooth pendants (1934: fig. VI, 2) and a beaver's tooth, as well as a bone awl in this layer.

Vekilova's data on the Upper layer's stratigraphy and artifacts

E.A. Vekilova (1957) clarified Bonch-Osmolowski's brief stratigraphic data on the basis of unpublished field reports, notes and profiles. Gray limey sand and numerous limestone slabs were mentioned as the main deposition components for the Upper layer. She noted that the Upper layer was subdivided into three artificial horizons across the rock-shelter's investigated areas during the 1920s, and again confirmed the underbedding of this layer by huge limestone blocks (1957:239-243, figs. 4 and 9 on pp. 240 and 246). On the other hand, we again see on the site's profiles made by Bonch-Osmolowski and published by E.A. Vekilova (1957: fig. 4 on p. 240) that the lower boundary for the Upper layer goes between huge limestone blocks and even partially below them. Thus, as was already noted by Bonch-Osmolowski (1934), Vekilova's information on Bonch-Osmolowski's unpublished sources again points to the possible heterogeneous character of the Upper layer's stratigraphy where the three artificially defined horizons in the site's excavated areas may have indeed been in different stratigraphic contexts and, accordingly, could contain different industrial complexes.

This suggestion that the Siuren I Upper layer did not have homogeneous stratigraphy, repeated by us, seems to find support in Vekilova's detailed description of the Upper layer artifacts. According to her list of artifact categories, there are about 6000 flint pieces in the Upper layer's assemblage. The following artifact categories were precisely counted: 113 core-like pieces (79 cores and 34 core fragments), 295 tools (288 items with secondary treatment and 7 hammerstones), 480 blades, 30 flakes, 19 core tablets, 37 crested pieces and 19 burin spalls. "*Chunks and flint fragments*", according to Vekilova's definition, compose "about 5000 pieces" that we understand could be classified as broken items: blades, bladelets, microblades, flakes, chunks and chips (1957:277-283). In light of modern Paleolithic terminology, the cores and tools definitions of Vekilova can be summarized as follows: 34 single-platform and 25 double-platform blade/bladelet and bladelet cores. Other cores either show nonsystematic reduction or with unrecognizable features in Vekilova's data. Thus, blade/bladelet and bladelet double-platform cores certainly compose a very significant proportion of all cores (31.6% of 79 cores) which, of course, is much higher when taking into account only easily definable cores – 42.4% of 59 cores.

Tools show the prevalence of Gravettian typological elements *sensu lato*. First of all, this is expressed by the presence of many backed bladelets – 145 pieces/50.3%, the great majority of which are simple backed items with thick abrupt retouch (1957: fig. 24, 14-15, 17 on p. 282). A few additional backed pieces are pointed and include a Gravette point with truncated base (1957: fig. 24, 13 on p. 282/ and 2 "micro-Gravettes" (1957: fig. 24, 16, 20 on p. 282). Other backed items are represented by a unilaterally backed bladelet with denticulated retouch on another lateral edge ("microsaw") (1957: fig. 24, 9 on p. 282), 2 bladelets and a blade with truncated proximal end among which one example's retouch makes it a rectangle (1957: fig. 24, 4-6 on p. 282) and 3 shouldered pieces ("Rgani type knives", according to S.N. Zamyatnin's typological definiton later widely accepted in ex-Soviet Paleolithic archaeology) (1957: fig. 24, 10-12 on p. 282). It is worth noting the presence of only 9 bladelets with fine lateral dorsal retouch (3.1%). "Indicative Upper Paleolithic tool types" are composed only of end-scrapers (31 specimens/10.8%) and burins (35 specimens/12.2%). End-scrapers were subdivided by Vekilova into two groups: simple (28 pieces) and thick (3 pieces). The former is said to consist of flat end-scrapers on complete and broken blades (1957:280-281, fig. 23, 3-4 on p. 280). Basically, Vekilova came to the following conclusion on common features for end-scrapers. "End-scrapers of the Upper layer in comparison to end-scrapers of the Lower layer are markedly smaller. They are much similar to end-scrapers of Azilian layers of Crimean Paleolithic sites Shan-Koba, Fatma-Koba and others" (1957:280). Three "thick end-scrapers" are illustrated by two pieces which according to our classification system would be defined as a thick shouldered end-scraper (1957: fig. 23, 7 on p. 280) and a bladelet narrow flaked core/"carinated burin" (1957: fig. 23, 8 on p. 280). Burins were subdivided by Vekilova (1957:278) into 28 multifaceted, 5 dihedral and 2 items on truncation. The appeared abundance of multifaceted burins seems to be connected to Vekilova's inclusion into this burin type of all pieces with 2-3 burin facets. This suggestion can also be confirmed by a fact that 6 of such multifaceted burins are on truncation. Thus, the real representation of different burin types in the Upper layer's assemblage remains unclear, although true carinated burins are certainly not present among the burins identified by Vekilova. The remaining tools are represented by a single "Mousterian point" on the distal part of a blade (1957: fig. 23, 5 on p. 280), 54 blades and bladelets with mainly irregular retouch and such surprisingly for such an Upper Paleolithic industry, six segments (1957: fig. 24, 1-3, 7-8 on p. 282). The presence of thick end-scrapers, simple end-scrapers similar to Azilian ones and segments in the assemblage was decisive for Vekilova to propose generic links for the Upper layer with the site's Middle layer and Crimean Azilian sites (Shan-Koba, Fatma-Koba, Buran-Kaya-I). Moreover, she also noted some similarities in the stratigraphy (thick cultural layers with abundance of limestone slabs) for the Siuren I Upper layer and the Crimean Azilian sites, as well as the presence of warm-loving fish species (roach – *Rutilus frisii* and chub – *Leuciscus cephalus*) for the Upper layer that, in her opinion, further strengthened this hypothesis (1957:317-319; 1971:142-143). So, as we see, Vekilova took a completely different position on industrial attribution for the Siuren I Upper layer in the context of Crimean Paleolithic than Bonch-Osmolowski.

It is worth noting here that the main data for such a different opinion (thick end-scrapers, segments, warm-loving fish species) were not at all noted by Bonch-Osmolowski (1934) for the site's Upper layer. Although subdivision of all fauna for each of three layers was only done in the 1950s, he would have clearly been able to distinguish such unique tools as segments in the early 1930s, but he did not. The reason for this is unclear in Bonch-Osmolowski's and Vekilova's publications and this problem will be once again brought up in the discussion of the Siuren I Upper layer finds.

Subsequent interpretations of the Siuren I Upper layer

After Vekilova's publication, the quite recent position in the Crimean Upper Paleolithic of the Upper layer and its industrial proximity and generic links to local Azilian was fully accepted by Soviet archaeologists and still persists (e.g. Rogachev & Anikovich 1984:221-222; Anikovich 1992:223; Cohen *et al.* 1996:337-339). Yet this widely accepted opinion was seriously questioned by S.N. Bibikov as early as the 1960s (Bibikov 1966). Bibikov himself participated in Bonch-Osmolowski's excavations at Siuren I from 1927 to 1929, discovered in 1927 with S.A. Trusova such key Crimean Final Paleolithic and Mesolithic sites as Shan-Koba and Fatma-Koba rock-shelters, participated in their excavations (directed by Bonch-Osmolowski) in the late 1920s and then directed their subsequent excavations in the 1930s and 1950s. So, he was well acquainted with the archaeological materials relevant to the problem of attribution and, therefore, his opinion is quite valuable. He completely rejected any links between the Siuren I Upper layer and the early Crimean Azilian (e.g. lower layer of Shan-Koba rock-shelter). His arguments are as follows:

"Basic forms of Siuren I Upper layer flint assemblage remain types which are not characteristic for the Crimean Azilian sites. We mean multifaceted burins, pieces of rabot type (Yu. D. – Vekilova's "thick end-scrapers"), backed bladelets, etc. Technologically, the flint complex from the Upper layer of Siuren I is considerably different from Early Mesolithic complexes. The only exception is composed of six microlithic segments. However, all of them are found in a peripheral area of Siuren I, in the uppermost part of deposits. Bonch-Osmolowski connected them to a Mesolithic hearth found at Siuren I. The exceptional attentiveness of Bonch-Osmolowski to the stratigraphic position of finds ... serves as the best guarantee for correctness of his observations. ... Accordingly, denying Upper Aurignacian age of Siuren I Upper layer, the date proposed by Bonch-Osmolowski, it is impossible, at the same time, to consider this layer as a predecessor of Early Azilian complexes of the Crimea. Thus, Crimean Mesolithic loses its early generic link" (Bibikov 1966:142).

Bibikov's opinion points out the several facts: (1) the segments in the Siuren I Upper layer represent an "outsider" element in this find complex and (2) the main techno-typological features of the site's Upper layer assemblage are true Upper Paleolithic with no similarities to the Crimean Azilian. As an aside, in the same article Bibikov proposed a North Caucasian origin for the Crimean Azilian, not seeing possibilities for its local development (1966:142).

Surprisingly enough, these important arguments by Bibikov on the heterogeneous nature of the Upper layer finds and the absence of generic links of this Upper Paleolithic complex with the later Crimean Azilian based on techno-typological data were only supported in the archaeological literature by D.Ya. Telegin (1982:64-65). Adherents of Vekilova's interpretation of the Upper layer did not at all respond to Bibikov's interpretation and, accordingly, did not take into consideration his data. The only exception was Vekilova herself (1971:141-143). Rightly pointing out the scarcity of thick end-scrapers within the Upper layer assemblage, she continued to support a local origin of the Crimean Azilian with sources in the Siuren I Upper layer, but strangely did not discuss the "intrusive" nature of the six segments which continued to be the main typological link between the Upper layer and the Crimean Azilian. It is possible that her position was a reason for her adherents to not take into consideration Bibikov's observations.

Closing the discussion on interpretations of the Siuren I Upper layer finds prior to the excavations in the 1990s, we make the following new comments. As was indicated by Bibikov, Bonch-Osmolowski considered the six segments of Siuren I as originating not from the Upper layer with Upper Paleolithic finds ("Upper Aurignacian" in his terminology and "Gravettian *sensu lato*" in modern terms), but from a peripheral area around "*a Mesolithic hearth*", making it clear why these segments were not mentioned in the 1934 article as part of the Upper layer assemblage. At the same time, it also in all probability points to Vekilova's inclusion in the Upper layer assemblage all 1920s finds discovered above the Middle layer. Moreover, additional possibilities for the Upper layer complex stratigraphy with respect to likely differences between sediments above, between and below the limestone blocks claimed as the lower stratigraphic limit for the Upper layer, visible on Bonch-Osmolowski's and Vekilova's stratigraphic profiles for the 1920s excavations should be recalled. Taking all of these aspects into consideration, we may surely assume not only a "Mesolithic spot" in the site's upper cultural deposits, but also some "lower admixture" as well. Thus, despite the interpretation by Vekilova of the Siuren I Upper layer as a homogeneous very late Upper Paleolithic industry with the tendency towards further "Azilianization", it is more likely that in fact the upper cultural deposits excavated in the 1920s were stratigraphically different and contained heterogeneous Upper Paleolithic and Mesolithic (Yu. D. - Final Paleolithic in modern terminology) occupations.

First attempt to explain the Siuren I Upper deposits in the framework of new investigations during the 1990s

In the beginning of new excavations at Siuren I, S.V. Tatartsev visited St.-Petersburg in 1995 to study the unpublished information in field reports, notes, stratigraphic profiles and their descriptions made by Bonch-Osmolowski, which are conserved in the Scientific Archives of the Institute of History of Material Culture of the Russian Academy of Sciences. First, Tatartsev's task was to identify as precisely as possible the 1920s excavation grid system, the datum point and different elevation markers, stratigraphy and artifact spatial distribution, relying not on data published in Vekilova's article alone (1957). These data allowed us to adopt Bonch-Osmolowski's grid and datum point and, in doing so, to mesh our vertical and horizontal controls with his. But aside from these data, Tatartsev also managed to obtain additional information regarding the 1920s Upper layer stratigraphy and spatial distribution of some artifacts in this layer. This was intentional on his part, as he was already aware of Bibikov's idea of "a Mesolithic hearth with segments in the site's uppermost sediments" and the possibility of checking this important remark in the original field documents would be clearly of significance. The analysis of both Bonch-Osmolowski's field data and initial results from the 1995 investigations allowed Tatartsev to make some valuable observations regarding the Siuren I upper cultural deposits and some archaeological finds (Tatartsev 1996). His main observations are summarized below.

Stratigraphically, the Siuren I Upper layer was described by Bonch-Osmolowski as "a gray limey sand with numerous limestone slabs of different size" primarily in the internal part of the rock-shelter and "a yellow and a light-yellow clayey sediment or a loose sand with limestone slabs" in the central part of the rock-shelter close to the drip-line. The presence of the "yellow clayey sediment" was confirmed in the central area (sq. 13-3) during the 1990s excavations (Stratum 4 with Unit A artifacts) where rounded limestone éboulis in mostly vertical position were also found, indicating some degree of stratigraphic disturbance. Such disturbance was highly likely caused by periodical water streams within the rock-shelter's drip-line zone, an assumption also made by Bonch-Osmolowski for this part of the site's upper cultural deposits. Thus, the stratigraphy of the Siuren I upper cultural deposits according to these descriptions differs in depositional components and was partially disturbed, something not indicated by Vekilova (1957:242) for the description of this layer, which was limited to "a gray limey sand with limestone slabs". Additionally, sediments of the Upper layer in the different areas of the rock- shelter during the 1920s excavations varied significantly in their thickness – from 1.0 to 2.5 m. Therefore, Bonch-Osmolowski excavated this layer in three artificial horizons. The artificial character of these horizons is clear as, for example, Bonch-Osmolowski "recognized 3 hearth/ashy lenses with no connection between them" at different depths of the second horizon in the rock-shelter's central part. Moreover, in his 1926 field report and noted by Bibikov, "a Mesolithic hearth" was identified. This hearth was represented by an ashy concentration 1.4 x 0.6 m in size and 0.1 cm thick near the western or right wall of the rock-shelter (squares 8, 9 – В, Г) 1.18 m below datum. The recovered finds were designated as the second horizon of the Upper layer. Bonch-Osmolowski also specifically noted that this hearth "was not connected to other hearth/ashy lenses of the Upper layer and it occupies a higher stratigraphic position, being later" (Bonch-Osmolowski 1926:40, quoted in Tatartsev 1996:195). Taking all these data into consideration, Tatartsev came to the conclusion that "finds of the Upper layer are impossible to discuss as a homogeneous complex, as they originated from cultural horizons different both by their spatial distribution and stratigraphic position" (1996:196). Regarding the Upper layer's artifacts, Tatartsev analyzed the spatial distribution of the six segments in the areas excavated by Bonch-Osmolowski. As was already known from Vekilova's article (1957:281), only three segments had known provenience, while the other three items were found during screening of sediments from undefined squares. So, two segments (Vekilova 1957: fig. 24, 1, 3 on p. 282) were found in the first and second horizons of the Upper layer in squares 10, 11 – Г and another segment (Vekilova 1957: fig. 24, 8 on p. 282) in the second horizon of the Upper layer in sq. 24-Ж. Tatartsev inclined to associate the two segments from squares 10, 11 – Г, with an edge of the "late" (according to Bonch-Osmolowski) or "Mesolithic" (according to S.N. Bibikov) hearth in the site's western area (1996:196). The segment from sq. 24-Ж (area of 4 x 2 m – squares 24-Ж, Е at eastern edge of the rock-shelter about 4 meters from the western edge of Siuren II Final Paleolithic rock-shelter) was interpreted by Tatartsev as representing at Siuren I some finds from the Siuren II Upper "Azilian" layer (1996:196). This conclusion was based on Bonch-Osmolowski's field notes that "during excavations of the 24-E area in Upper levels were found tools of the Siuren II Azilian culture" (Bonch-Osmolowski & Trusova 1930:13, quoted in Tatartsev 1996:196). Tatartsev's final conclusions regarding the Siuren I segments are as follows. "Evidently, geometric microliths of Siuren I Upper layer do not compose an integral complex, as they are represented by single pieces found in different stratigraphic conditions varying by site area. According to techno-typological characteristics, all segments are quite in the frames of Crimean Early Azilian complexes. Probably, they are a more late admixture in this collection (that is highly likely in these heterogeneous upper sediments of the site) and, in my opinion, cannot be used as a direct proof for generic links between the Siuren I Upper layer and the Early Mesolithic of the Crimean peninsula" (Tatartsev 1996:196). At the same time, Tatartsev accepts Bibikov's interpretation in considering numerous backed bladelets as the main typological component of the Siuren I Upper layer; he thus proposed to look for industrial analogies for this find complex in the "Eastern Gravettian", as well as suggesting its possible similarity to the Upper Paleolithic industries of Adji-Koba and Buran-Kaya-III in the Crimea (Tatartsev 1996:196-198).

Final analyses of Siuren I Upper cultural deposits and their finds in the framework of the 1990s project

Now let us summarize all the data on the Siuren I upper cultural deposits of 1920s excavations and of the 1990s excavations.

First, the composition of the deposits should be considered in order to establish their succession from Upper to Lower levels. The first horizon of the Upper layer was composed of "large limestone slabs" in the 1920s excavations (Tatartsev 1996:195), correlating to Stratum 4a of the 1995 excavations (first Pleistocene rock-fall level with large limestone blocks according to the site's new stratigraphy). The artifact component in such deposits was very poor with only rare or isolated pieces recovered between limestone blocks during the 1920s excavations. These finds could be either of late origin (Final Paleolithic/"Crimean Azilian") or representing of naturally uplifted and/or artifacts reworked from lower levels of these deposits. No hearth/ashy lenses were distinguished in the first horizon. The second horizon of Bonch-Osmolowski's excavations was composed of different sediments depending on area of the site. Its most clearly described stratigraphic context relates to the site's central part around the rock-shelter's drip-line zone. For this area, the second horizon occupied the many times claimed position above the huge limestone blocks (second Pleistocene rock-fall level – Stratum 8 of the 1990s excavations). Accordingly, this second horizon is characterized by three definite hearth/ashy lenses in squares 13-E, Д and 15, 16E, Ж at different depths with abundant artifacts (Vekilova 1957:306; Tatartsev 1996:195-196). In the 1990s excavations, archaeological Unit A correspond stratigraphically to the Upper layer's second horizon of the 1920s, although the former is in disturbed context, not perfectly *in situ* yellowish-brown silty clay with rounded limestone éboulis. We do not take into consideration the 1990s excavations Unit C here because it is represented by only a single non-*in situ* artifact (Aurignacian carinated (buskoid) double burin). The third horizon of the 1920s Upper layer was the lowest for the site's upper cultural deposits. Its main distinctive feature was a hearth/ashy lens at the site's central part discussed by us for the second horizon. According to Bonch-Osmolowski's field report, Tatartsev (1996:196) describes this hearth/ashy lens as found at depth -2.00 m below the datum in sq. 13 – E. Taking into account such elevation marker and this area's basic stratigraphy (Vekilova 1957: fig. 4 on p. 240), the third horizon here clearly falls into sediments between (not above !) the limestone blocks of the second Pleistocene rock-fall level. If it is true, the stratigraphic position of the 1920s excavations third horizon appears to be analogous to Strata 8a with finds of archaeological Unit D of 1990s excavations. Thus, there were seems to be at least four occupational floors in 1920s excavations Upper layer seen in a view of four definite hearth/ashy lenses in the site's central area around the rock-shelter's drip-line zone. The described second and third horizons of 1920s excavations Upper layer were also distinguished by Bonch-Osmolowski in the site's other areas. But only in the western part was a single particular feature noted ("a Late/Mesolithic hearth"), while other artifact bearing sediments were not definitely structured and subdivided by any features and therefore divided artificially into two horizons. Coming back to the site's central part, we should also not forget the sediments below the limestone blocks of the second Pleistocene rock-fall level which were partially excavated there in the 1920s as also being part of the Upper layer. Stratigraphically, these sediments relate to the 1920s Middle layer and finds its correspondence in the upper part of Stratum 9 with artifacts of archaeological Unit E in the 1990s excavations.

So, the results of our attempt to subdivide the 1920s Upper layer sediments indeed show the complex stratigraphy of the deposits, which vary according to the different areas of the site and which contain a number of occupational episodes. The archaeological characteristics of these human occupations can only be understood through inter-level comparisons of the techno-typological features presented below. Realization of these comparisons is very important because inter-level analyses of the Siuren I Unit F/Middle layer and Unit G/Lower layer assemblages indeed confirm their general integral industrial features (two distinct sub-types of Aurignacian of Krems-Dufour type industries with a Middle Paleolithic component in the latter as well), while industrial homogeneity seems not to be the case for the site's Units A-E/Upper layer artifacts.

As we know, the Upper layer finds were published by both Bonch-Osmolowski (1934) and Vekilova (1957) as a uniform Upper Paleolithic industry with no separate descriptions for lithic and bone pieces from particular horizons – neither artificial nor actual (hearth/ashy lenses). Only two exceptions can be mentioned in this regard. Two segments near the "Late/Mesolithic hearth" in the site's western part and a segment and several other, not precisely mentioned "Azilian" pieces for the site's eastern area very close to Siuren II rock-shelter (Bibikov 1966; Tatartsev 1996). There are, however, additional data which can clarify the Upper layer find distribution in specific horizons. First, of course, is comparable data from the 1990s excavations. Then, some comments about the Upper layer artifacts spatial distribution are found in Vekilova's article (1957), as well as more than 20 Upper layer flint artifacts' illustrations with exactly known provenience (Bonch-Osmolowski's squares and artificial horizons) made during a visit to Leningrad in the early 1980s and proposed for the present study by A.A. Yanevich.

The artifact analyses will be presented according to the already proposed Upper layer stratigraphic subdivision, from the bottom to the top of the deposits.

The presence of Unit E with homogeneous and indicative Aurignacian carinated types within *in situ* sediments just below the second Pleistocene rock-fall level allows us to argue that the three carinated pieces in Bonch-Osmolowski's Upper layer assemblage originated from the stratigraphic analog of Unit E in the 1920s sediments. Unit E is very poor in finds, is stratigraphically well separated from the upper levels of Unit F and was also highly likely not well represented during the 1920s excavations. Such a situation could lead Bonch-Osmolowski to the inclusion of these very rare finds in the Upper layer assemblage instead of identifying them as from a separate distinct horizon. Of course, only very indicative Aurignacian tool types can be identified in the 1920s Upper layer assemblage today, while debitage and debris items of this find level in Bonch-Osmolowski's collection are impossible to separate. In this case, rare Aurignacian tool types in the Upper layer, indicating according to Vekilova generic links between the Upper Paleolithic industries of the Siuren I Middle and Upper layers are actually an "intrusive" typological component from the site's uppermost Aurignacian Unit E with techno-typological features very similar to the Aurignacian from Unit F.

Overlying Unit E, the finds of Unit D form an occupational episode in sediments between the limestone blocks of the second Pleistocene rock-fall level. Only 8 flint artifacts were recovered in these sediments during the 1995 excavations. Despite such scarcity, there are two quite indicative cores – blade and bladelet double-platform bidirectional cores with rather elongated metric proportions (length - 6.6 and 6.5 cm, width - 5.2 and 2.9 cm, respectively). These cores do not find analogies within the Siuren I Aurignacian complexes of Units H-G/F assemblages and, in our opinion, argue for the presence of a non-Aurignacian industry in this stratigraphic horizon for the site. Taking into consideration that these cores are typical for Gravettian industries, as well as the definite absence of any Aurignacian types, we can attribute the lithics of Unit D as Gravettian. What finds in the Upper layer could correspond to 1990s Unit D? Unfortunately, neither Bonch-Osmolowski (1934 and field reports) nor Vekilova (1957) did not present any direct data on this matter, although stratigraphically we should correlate the third horizon of the Upper layer containing a single hearth/ashy lens in the site's central area to Unit D. Industrially, we can only assume general Gravettian characteristics for the third horizon because the Upper layer's rare Aurignacian types from the 1920s excavations have been associated by us to 1990s Unit E. From the available data, only Yanevich's artifact illustrations contain some information on the flints of this third horizon. These include two cores and an end-scraper. The cores are strikingly similar to the two cores of Unit D. Both (fig. 1:1-2) are blade/bladelet double-platform bidirectional cores with again quite elongated metrics: length - 7.3 and 6.8 cm, width - 3.6 and 2.8 cm, respectively. The end-scraper (fig. 2:3) correspond to the cores by its size (length - 5.4 cm and width - 2.4 cm), although with a unidirectional scar pattern, and, by typology, it is a simple flat one on blade. Planigraphically, all three pieces were found in the site's central area – squares 15, 16-Ж for the two cores and sq. 15-Ж for the end-scraper. It is quite likely that these artifacts come from the single hearth/ashy lens of the central part of the site and, at the same time, actually both stratigraphically and techno-typologically correspond to 1990s Unit D. None of the numerous backed bladelets from the Upper layer were marked according to their spatial distribution in Vekilova's article (1957), while Yanevich's artifact illustrations also do not

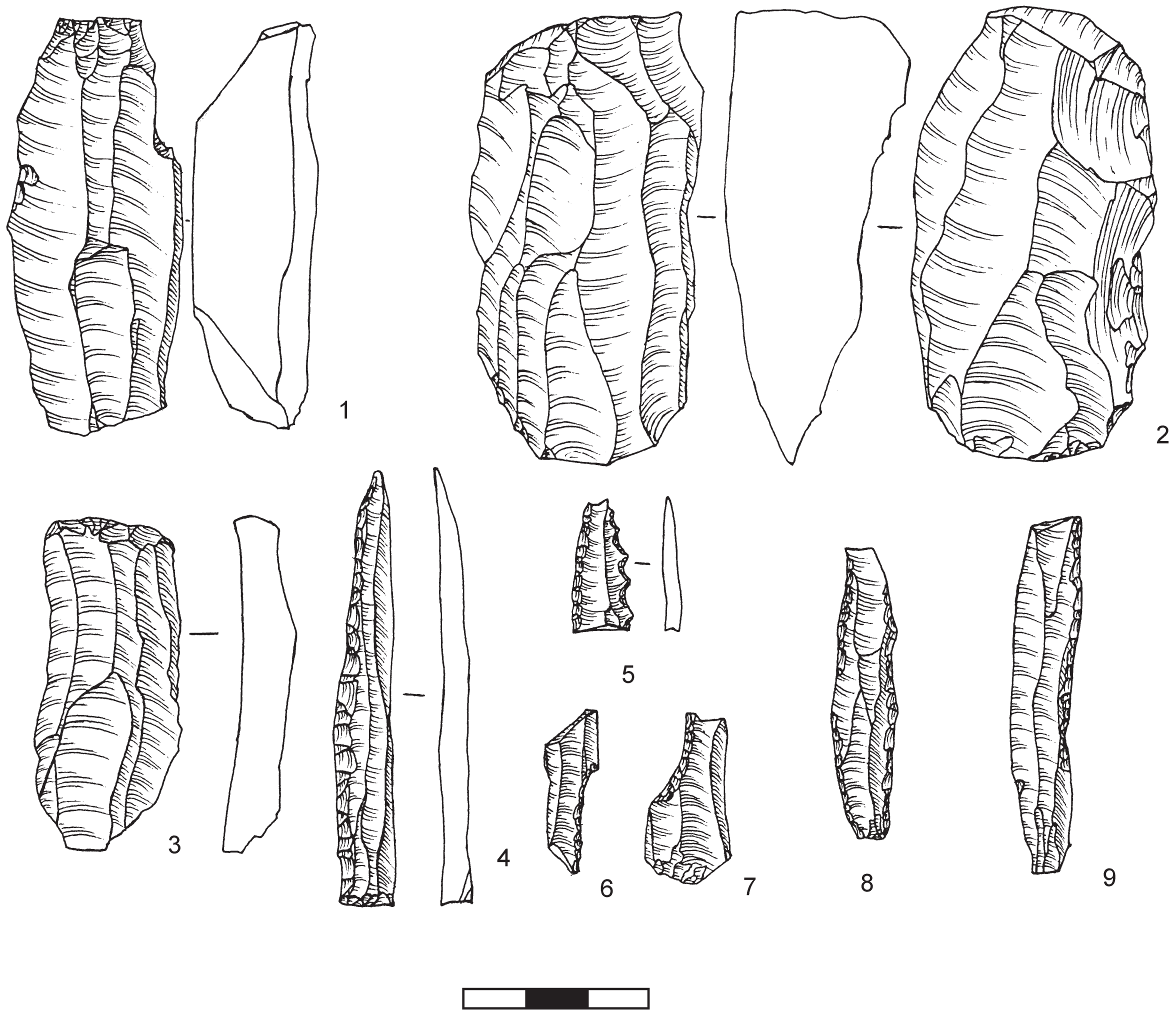

Figure 1 - Siuren I. Supposed Gravettian finds from the 3rd horizon of Upper layer in the rock-shelter's central area during the 1920s excavations. Flint Artifacts – Cores and Tools. 1-2, double-platform bidirectional blade/bladelet cores; 3, simple flat end-scraper; 4, Gravette point with truncated base; 5, backed bladelet microsaw; 6-7, shouldered/pieces à cran bladelet and blade; 8-9, backed bladelets with elongated metric proportions and bidirectional scar pattern.

show any of the backed items for the central part of the site. In this case, the direct data on specifications of the Gravettian attribution for the Unit D/third horizon of the Upper layer artifacts can only be done on the basis of the rather large sizes of the known pieces that may suggest a "Gravettian *sensu stricto*", but not Epigravettian, industrial affinity. At the same time, we cannot exclude some backed tools of the Upper layer belonging to Unit D/third horizon of the Upper layer on purely typological grounds. A large Gravette point with truncated base (length - 7.1 cm, width - 0.9 cm on a bidirectional bladelet) (fig. 1:4), 2 truncated blade and bladelet, a backed bladelet microsaw (fig. 1:5), 2 shouldered bladelet and blade (fig. 1:6-7) where the latter has a bidirectional scar pattern, all illustrated in Vekilova's article (1957: fig. 24 on p. 282), as well as two more broken long and bidirectional backed bladelets with lengths of 5.8 and 4.8 cm (fig. 1:8-9) in Yanevich's artifact illustrations comprise the distinct typological component among the remaining Epigravettian simple backed items, which include only three unique forms – 2 microgravettes and 1 rectangle. Of course, some of the simple backed items could also belong to the former tool group with large and/or unique (truncated and shouldered) types. If we accept such a typological subdivision for the backed tools, we may readily assume that the simple backed tools group would belong to an Epigravettian industry, while the "large" backed tools group would be considered as part of a proper Gravettian industry. Namely, these latter backed tools can be connected to the Gravettian industry of the 1990s Unit D/third horizon of the 1920s Upper layer. The observed scarcity of artifacts of this Siuren I occupational floor is probably explained by its short duration which is seen both in just the single hearth/ashy lens of the 1920s third horizon and the artifact-poor sediments lacking any features in the 1990s Unit D.

Other Siuren I Upper layer finds from the 1920s are indeed connected to sediments above the second Pleistocene rock-fall level. As is clear from Bonch-Osmolowski's unpublished field reports, as well as articles by Bibikov (1966) and Tatartsev (1996), these sediments did not contain industrially homogeneous artifacts representing both Upper Paleolithic Epigravettian and Final Paleolithic Azilian flint artifacts. There is enough information on the Azilian finds spatial distribution throughout the site's excavated areas for their separation from the Upper Paleolithic artifacts.

The Azilian artifacts and, namely, their the most indicative types (i.e., segments) were found only in the western and eastern areas of the site separated from one another by about 22 meters that for the large Siuren I rock-shelter (about 40 meters wide overall) is more than enough to consider these areas as two very possible separate Azilian find spots. Accordingly, these find spots should thus be discussed individually.

The eastern area is represented by a 4 x 2 m area – squares 24-E, Ж. From Vekilova's article (1957: p. 281 and fig. 24, 8 on p. 282) a segment from sq. 24-Ж was found in the second horizon (fig. 2A:1). Tatartsev (1996:196) also found Bonch-Osmolowskiəs field comment that "... during excavations of the 24-E area in the Upper levels were found tools of Siuren II Azilian culture", although, unfortunately, precise data on what tool types were meant by Bonch-Osmolowski remain unclear. Moreover, Yanevich was able to recognize on one of the Upper layer's three segments found, according to Vekilova, via sediment screening without known provenience (Vekilova 1957:281 and fig. 24, 2 on p. 282), a label with the indication "sq. 24-E screening" (fig. 2A:2). Aside from these segments, there are also in Yanevich's illustrations 8 of the 9 end-scrapers from squares 24-E, Ж. All these end-scrapers are simple flat and shortened (sic!) ones on flake and blade fragments (fig. 2A:3-10) so typical of the Crimean Azilian-Shan-Koba type industry (Telegin 1982:60). It is worth noting here as well that no genuinely Upper Paleolithic tool types were noted for this eastern area of the site by any of the archaeologists who examined this portion of Siuren I, including on Bonch-Osmolowski's map of the spatial distribution of the three Upper Paleolithic layers where there is an empty place for the squares 24-E, Ж area published by Vekilova (1957: fig. 11 on p. 247). The number of finds also seems to be very limited for this area – less than 100 pieces (Vekilova 1957: fig. 13 on p. 258). Taking all these data into consideration, we can argue that the most eastern part of the upper cultural deposits at Siuren I is characterized by exceptionally Crimean Azilian (Shan-Koba type industry) finds which may represent part of the Final Paleolithic settlement at Siuren II rock-shelter, as originally considered by Bonch-Osmolowski (Bonch-Osmolowski & Trusova 1930:13, quoted in Tatartsev, 1996:196).

The western "Azilian find spot" is marked by both the "Late/Mesolithic hearth" in squares 8, 9-B, Г and two segments in squares 10, 11-Г where the two latter artifacts were assumed to be located at the edge of the hearth (Bibikov 1966; Tatartsev 1996) (fig. 2B:1-2). The hearth and one segment are connected to the Upper layer's second horizon (fig. 2B:1), while another segment was found in the first horizon (fig. 2B:2). Another Azilian piece can also be recognized in Yanevich's illustrations – an unfinished segment/obliquely retouched Azilian point from the first horizon in sq. 9-B (fig. 2B:3). As noted above, artifacts from the first artificial horizon were very probably uplifted items from the second horizon, allowing us to connect them to the hearth, given their location in the same squares. Other Azilian finds cannot be precisely identified today, although some end-scrapers from the numbered squares may also belong to the Azilian finds spot considering Vekilova's comment on the close typological similarity of the Siuren I Upper layer end-scrapers to "... end-scrapers of Azilian layers of Crimean Paleolithic sites Shan-Koba, Fatma-Koba and others" (1957:280). The "Azilian find spot" with its finds, as was noted by Bonch-Osmolowski (1926:40, quoted in Tatartsev 1996:195), represents the uppermost portion of the 1920s excavations Upper layer, but putting it into the second horizon has led to mixing together these Final Paleolithic Azilian finds with the much more abundant Upper Paleolithic Epigravettian artifacts also found there, although the latter probably occupied a deeper stratigraphic position. On a very general level for tool identification, however, it is still possible to separate the Final Paleolithic Azilian and the Upper Paleolithic Epigravettian lithics there because Upper Paleolithic simple backed bladelets so numerous in the sediments above the second Pleistocene rock-fall level are either totally absent or account no more than 1-2% of all tools within Crimean "true Azilian" Shan-Koba type industry find complexes (Bibikov 1966; Telegin 1982; Bibikov *et al.* 1994). This last typological background together with Bonch-Osmolowski's stratigraphic data do not allow us to speculate on the "transitional" industrial characteristics from Upper Paleolithic to Final Paleolithic for the second horizon find complex, and instead forces us to insist on the presence of both Upper Paleolithic Epigravettian and Final Paleolithic Azilian complexes there. Concerning the industrial attribution of Azilian finds, we may suggest an Early Shan-Koba type industry affinity (e.g. Shan-Koba rock-shelter, layer 6) because of the high percentage of segments made on "rough" blanks. This suggestion is additionally strengthened by new examination of the Siuren I Upper layer "bone pieces" found during the 1920s excavations (Bonch-Osmolowski 1934:153-154; Vekilova 1957:301-303) and described in this chapter as part of the Upper layer finds in Bonch-Osmolowski's published data. These "bone pieces" were among the finds, in Vekilova's opinion (1957:316-319), that showed the close similarity of the Siuren I Upper layer to the Crimean Azilian. Some data, however, support rather the very likely association of these "bone pieces" to the Siuren I "western Azilian find spot". First, all "bone pieces" (a bone awl, an engraved broken antler of red deer, two broken tooth pendants [red deer and beaver, the latter lost prior to Vekilova's analyses]) (fig. 2B:4-5) were all found "in the area of squares 8, 9-Г near a small hearth" (Vekilova 1957:301). As recalled, the only hearth in the Upper layer deposits is found here, "the Late/Mesolithic hearth" of the "Azilian find spot". Moreover, the use of red deer and beaver teeth, bones and/or antler for non-lithic tools and "artistic objects" is only typical of the Early Shan-Koba type industry (e.g. Shan-Koba, layer 6 – Bonch-Osmolowski 1934:162 and fig. VII, 13; Bibikov *et al.* 1994:66-68) within the Crimean Paleolithic, while such pieces are entirely unknown in the Siuren I Aurignacian and any other Crimean Paleolithic industry. Accordingly, we should with no doubt attribute the Siuren I Upper layer "bone pieces" to the site's "western Azilian find spot", as well as associating some of the burins from the second horizon in squares 8, 9 – Г (certainly needed for "bone piece" production) with these Azilian finds.

Thus, the Siuren I Upper layer cultural deposits, aside from the Upper Paleolithic finds, are also characterized by two "Azilian find spots". The "western spot" is a very short-term camp concentrated around a single hearth with an Early Shan-Koba type industry. The "eastern spot" is quite likely related to the Siuren II Lower layer occupation, with a Shan-Koba type industry. Here we should emphasize that based on Bonch-Osmolowski's

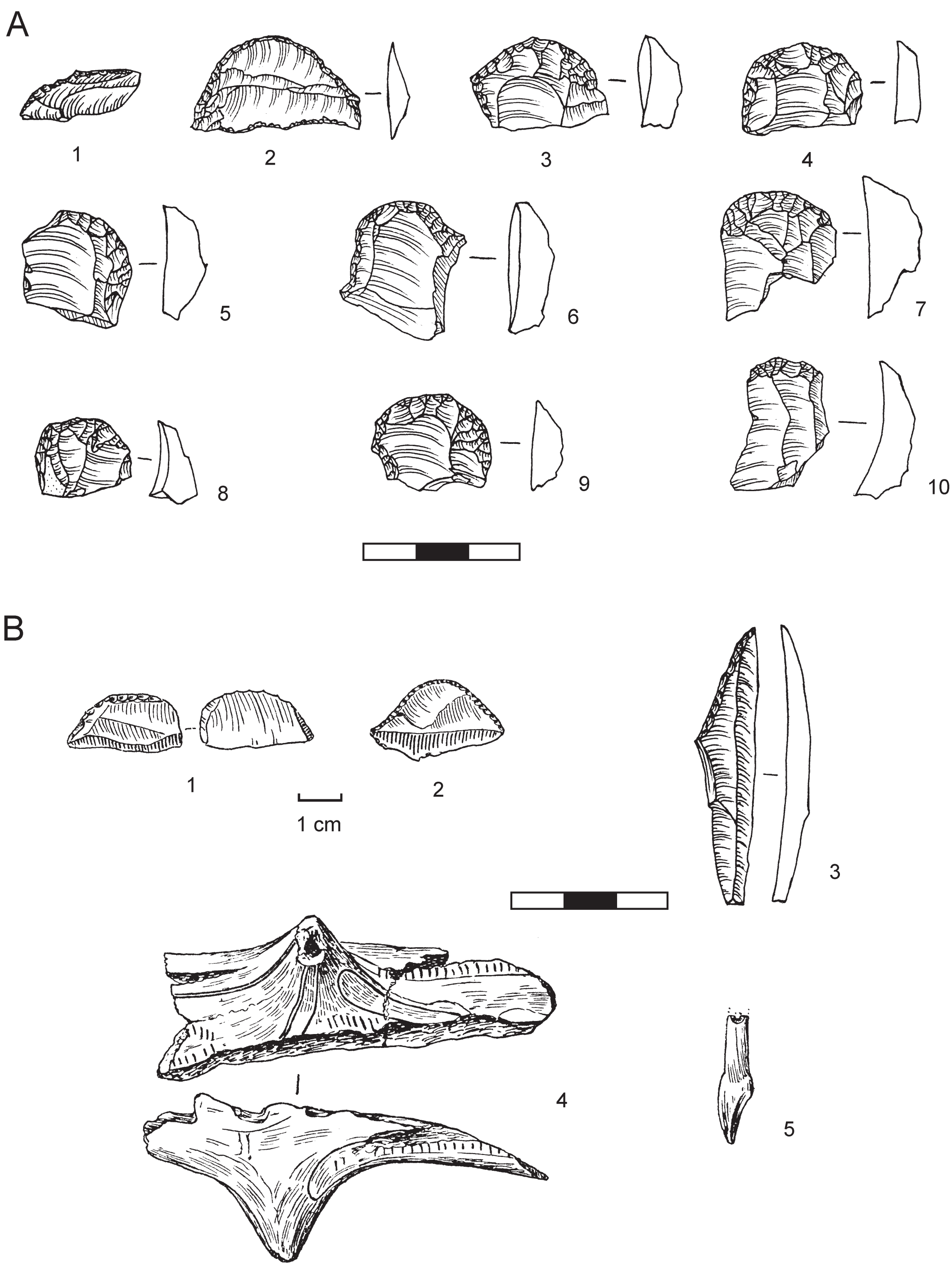

Figure 2 - Siuren I. Final Paleolithic/"Crimean Azilian" finds from the Upper layer during the 1920s excavations. Flint Artifacts and Bone Pieces. A. Eastern Azilian find spot (squares 24-E, Ж). 1-2, segments; 3-10, simple flat shortened end-scrapers. B. Western Azilian find spot (squares 8-9 – B, Г and 10, 11–Г). 1-2, segments; 3, unfinished segment/obliquely retouched Azilian point; 4, engraved broken red deer antler; 5, broken red deer tooth pendant. (B. # 1-2 – redrawn from Vekilova 1957: fig. 24, 1, 8, p. 282; # 4-5 – redrawn from Vekilova 1957: fig. 31, 5, 6, p. 302).

field observations, Tatartsev's proposal of a probable attribution of these finds to the Siuren II "Upper Azilian" layer seems to be incorrect. It is now known that Bonch-Osmolowski excavated only the lower cultural deposits with mixed finds of both Azilian/Shan-Koba and Swiderian types at Siuren II in the 1920s. Only in 1954-1955 did Vekilova find the Siuren II Upper layer in a different area of the site with finds of a specific late phase of Shan-Koba type industry (1961; 1966). Thus, in the 1920s, Bonch-Osmolowski would have been able to connect Siuren I finds from the area of squares 24-E, Ж only to the Siuren II lower cultural deposits with Azilian finds. On the other hand, the Siuren I central areas of the Upper layer show no evidence of "Azilian find spots", as both the 1879-1880 excavations by K.S. Merejkowski and the 1926-1929 excavations by Bonch-Osmolowski did not recover any indicative Azilian artifacts (Vekilova 1957:286-288).

Concluding the discussion of the Siuren I "Azilian find spots", we would also like to mention a final indication of the close proximity to "Crimean Azilian" of the Siuren I Upper layer's Upper Paleolithic as proposed by Vekilova: the presence of warm-loving fish species (roach – *Rutilus frisii* and chub – *Leuciscus cephalus*). The fishing of these species is entirely unknown in the Crimean Upper Paleolithic, including the Siuren I Aurignacian, but quite typical of the Crimean Final Paleolithic ("Crimean Azilian"/Shan-Koba type) and Mesolithic ("Crimean Tardenuazian"/Murzak-Koba type) with even sporadic use of *Rutilus frisii* teeth for pendant manufacture as seen in layer 6 of the Shan-Koba rock-shelter (Bibikov *et al.* 1994:67). Therefore, we should not exclude associating these warm-loving fish species to one or another of the two "Azilian/Shan-Koba type industry find spots" in the Siuren I Upper deposits. In doing so, any similarities of Siuren I Upper layer to Crimean Azilian defined by Vekilova disappear, the finds all considered as truly belonging to the Final Paleolithic Azilian/Shan-Koba type industry.

Returning again to the Siuren I Upper Paleolithic finds above the second Pleistocene rock-fall level, stratigraphically and in plan, the Upper Paleolithic artifacts are primarily concentrated in the central and western areas of the site.

The central area contained more than two thirds of the nearly 6000 flint artifacts from the Upper layer, by Vekilova's calculation (which include all of the industrially heterogeneous lithics discussed in this chapter). These are distributed by square as follows: 15-E (n=1945), 15-Ж (n=1007), 13-Ж (n=451), 16-E (n=379) and 16-Ж (n=307) (Vekilova 1957:277) and total 4089 artifacts. Exactly for this central area we have the already proposed origination of the following finds stratigraphically related to sediments between the limestone blocks of the second Pleistocene rock-fall level: 1990s Unit D/ 1920s third horizon of the Upper layer; to sediments below the limestone blocks of the second Pleistocene rock-fall level: 1990s Unit E/1920s rare Aurignacian tool types in the Upper layer. Recalling the highly likely suggestion regarding the poor representation of these two occupational floors at the site, we should consider the Upper Paleolithic complex for sediments above the second Pleistocene rock-fall level in the central area as numbering at least 3000 artifacts, if not more. This find complex is stratigraphically related to the second horizon of the Upper layer with no less than three occupational floors marked by three hearth/ashy lenses in squares 13-E, Д and 15, 16-E, Ж. As already described above during the separation of the 1920s third horizon of the Upper layer, the second horizon of the Upper layer is typologically characterized by many simple backed bladelets, some microgravettes and a rectangle. The most indicative technological data come from Yanevich's illustrations of six bladelet double-platform bidirectional cores from squares 13, 15, 16-E, Ж (fig. 3:1-4). All of these cores are small, with maximum length for five of them ranging from 2.9 to 3.9 cm, while only one is somewhat larger at 5.3 cm. The 1990s excavations flints of Unit A corresponding stratigraphically and in plan to these Upper Paleolithic finds are not as indicative, but include a large blade single-platform narrow flaked core, a blade/bladelet double-platform bidirectional-adjacent core, a bladelet and a microblade with light abrupt retouch. On the other hand, there are five lithics from the same area found during the 1990s excavation of humus sediments, associated with medieval and Tatar ceramics from the 18th-19th centuries (the latter determinations by I.B. Teslenko and A.V. Lysenko – scientific associates of the Crimean Branch of the Institute of Archaeology NAN Ukraine, Simferopol) and isolated Upper Paleolithic lithic debris. These are five backed bladelets and microblades with pronounced abrupt retouch and, moreover, at least three additionally show some clear evidence of "projectile damage" (fig. 3:7-11). This functional determination of these pieces was also confirmed by D.Yu. Nuzhny – the well-known specialist in projectile point macro-analysis on materials at Ukrainian Upper Paleolithic and Mesolithic sites (e.g. Nuzhny 1992). These backed "projectile" pieces fit well into the 1920s tool group of backed bladelets and microgravettes.

The western area containing Upper Paleolithic artifacts above the second Pleistocene rock-fall level (second horizon of the 1920s Upper layer) includes the part of the rock-shelter west of the "13" line of squares excavated in the 1920s and lacks any features such as hearth/ashy lenses. The number of artifacts recovered does not exceed 1000. Typological indications of these finds include backed bladelets and microgravettes from squares 6-E, 9-Г, 11-Д illustrated by Yanevich, some of which show projectile damage (fig. 3:5-6). These tool types clearly have analogies with both Vekilova's illustrations (1957: fig. 24, 16-17, 20 on p. 282) and with the above-mentioned backed pieces from humus sediments found during the 1990s excavations.

So, both central and western areas of Siuren I 1920s excavations Upper layer's second horizon and 1990s excavations separate finds above limestone blocks of the second Pleistocene rock-fall level do contain an Upper Paleolithic Epigravettian industry, aside from, of course, some "intrusive" Final Paleolithic "Crimean Azilian"/Shan-Koba finds in the western area.

Thus, for the Siuren I Upper cultural bearing deposits and their archaeological context, we conclude finally that they should no longer be considered a uniform sedimentary unit dating to the transition to the Crimean Azilian Late Upper Paleolithic industry. Instead, this part of the site's depositional and archaeological sequence should be viewed as complex and heterogeneous, containing ***four*** occupational episodes from bottom to top:

- sediments below the limestone blocks of the second Pleistocene rock-fall level with 1920s rare Aurignacian tool types/1990s Unit E – the site's uppermost Aurignacian level;
- sediments between the limestone blocks of the second Pleistocene rock-fall level with the 1920s third horizon of the Upper layer with one hearth/ashy lens/1990s Unit D – Gravettian;
- sediments above the limestone blocks of the second Pleistocene rock-fall level with the 1920s second horizon of the Upper layer with three hearth/ashy lenses/1990s Unit A and some non-*in situ* finds in humus –Epi-Gravettian;
- uppermost sediments above the limestone blocks of the second Pleistocene rock-fall level with the 1920s second horizon of the Upper layer with two spatially separated and different Final Paleolithic "Crimean Azilian"/Shan-Koba type industry find spots in the western and eastern areas.

It would be possible to additionally clarify the proposed sequence for the Siuren I Upper cultural deposits through two paths of further research. On one hand, new excavations of the

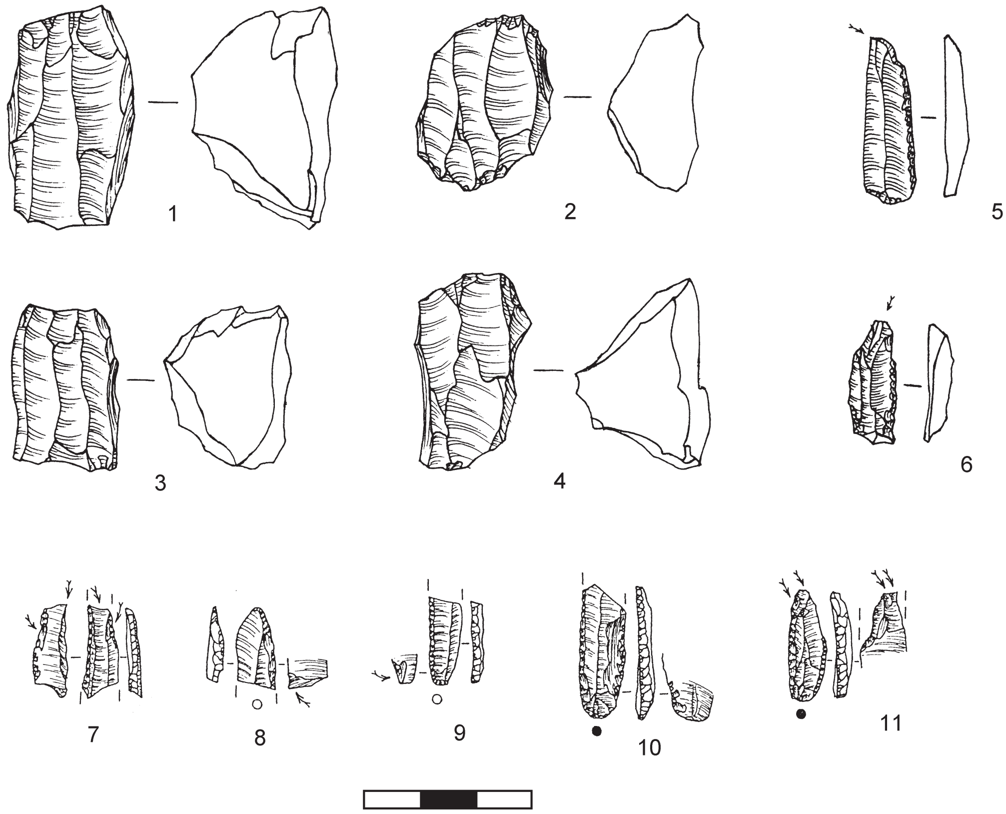

Figure 3 - Siuren I. Epigravettian finds. Flint Artifacts – Cores and Tools. 1-4, double-platform bidirectional bladelet cores; 5-6, backed bladelets with "projectile damage" (Epigravettian finds from the Upper layer 2nd horizon during the 1920s excavations); 7-11, backed bladelets with "projectile damage" (non-in situ Epigravettian finds during the 1990s excavations of the Holocene humus sediments).

site's upper cultural deposits in an appropriate area or areas may provide further information regarding the stratigraphic and archaeological contexts under discussion. However, such possible places for new excavations are very limited in areal extent – no more than 6 sq. m each at different points in the rock-shelter and it is thus fairly unlikely that a new place would include with finds in stratigraphic context for all four of the the identified occupationsl events. On the other hand, a thorough re-analysis of both Bonch-Osmolowski's unpublished field data and the 1920s Upper layer finds in St.-Petersburg (Russia) through their spatial and stratigraphic distribution for "filling" each of the four occupational episodes would provide much more detailed data than is possible with the present information. This was, very generally, undertaken by the present author in 2001 and 2003 through rapid observation of the flint artifacts. The main conclusion was that all of the above-represented data for the Suiren I materials are in good correspondance with my personal general observations of the artifacts and I hope that a colleague will some day confirm the proposed "reconstructed archaeological sequence", filling in the details. This was, however, beyond the aims of our 1990s project and, at the same time, our work can serve as the background for a new project focusing on the Siuren I non-Aurignacian Upper Paleolithic and the Final Paleolithic.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 343-357.

18 - THE SIUREN-I AURIGNACIAN OF KREMS-DUFOUR TYPE INDUSTRIES IN THE CONTEXT OF THE EUROPEAN AURIGNACIAN

Yuri E. DEMIDENKO & Pierre NOIRET

Introduction

After defining here the Siuren I Aurignacian industries as Early and Late/Evolved Aurignacian of Krems-Dufour types, we now present the arguments supporting such industrial attributions. Moreover, as will be seen in the archaeological industrial sequence summarized in the next chapter, of the seven occupational events and associated assemblages, the Siuren I Aurignacian industries are the most understandable; their positions within the European Upper Paleolithic and particularly the European Aurignacian technocomplex can be established quite rigorously that unfortunately cannot be said for the other Upper Paleolithic and Final Paleolithic industries at Siuren I. So, given the presence of two different kinds of Aurignacian of Krems-Dufour at Siuren I, they will be discussed separately, starting with the Early Aurignacian.

The Siuren I Early Aurignacian of Krems-Dufour type in 1990s Units H and G/1920s Lower layer in the context of the European Aurignacian

The absence of assemblages in the Crimea comparable to the Early Aurignacian at Siuren I does not necessarily indicate its uniqueness within the European Aurignacian as a whole. On the contrary, there are quite a few Aurignacian complexes outside the Crimean peninsula in Europe which share very similar or even identical techno-typological features, including the bone tools and non-utilitarian objects characteristic of the Siuren I Early Aurignacian. In this chapter, artifact analyses are aimed at determining the geochronological positions of European Aurignacian related complexes and their spatial distribution throughout Europe and, finally, the place that the Siuren I Early Aurignacian may occupy among them.

The Siuren I assemblages from the 1990s Units H and G 1920s Lower layer have the following basic features which should be stressed again here. Technologically, they are characterized by the predominant production of bladelets/microblades from bladelet "regular" and "carinated" cores. Typologically, they include less common but typical carinated and thick/flat shouldered/nosed end-scrapers, show the prevalence of angle and on truncation/lateral retouch burins over dihedral burins with a near-absence of carinated burins, and include some scaled tools, truncations, perforators, retouched blades with only a single piece with "Aurignacian-like heavy retouch", while "non-geometric microliths" comprise from about 40% (in the 1920s Lower layer) to about 60% (in the 1990s Units H and G) of all tools. The composition and morphology of "non-geometric microliths" show that the most typical is the Aurignacian "Dufour bladelet" sub-type with bilateral alternate micro-scalar and/or micro-stepped semi-abrupt retouch made on bladelets and microblades with basically "on-axis" removal direction and flat/incurvate/"weakly twisted" general profiles; the occurrence of Aurignacian "Font-Yves/Krems points" with similar bilateral dorsal and bilateral alternate retouch and blank morphology should be noted as well.

Thus, intensive bladelet/microblade production from bladelet "regular" and "carinated" cores in flint primary flaking processes in conjunction with the rather rare representation of Aurignacian tool types (only some specific end-scrapers, very few retouched blades and no carinated burins) among the "Indicative Upper Paleolithic Tool types", many Aurignacian "Dufour bladelets" sub-type and some "Font-Yves/Krems points", may serve as "industrial keys" for comparative lithic analysis, especially given the very different ways in which such information is published for European sites. Such "industrial keys" can also be supplemented by a rather "simple set" of bone tools (flat points and some shouldered awls) and non-utilitarian objects (shell beads).

The most obvious way to identify industries similar to the Siuren I Early Aurignacian is to focus first on the European Aurignacian assemblages with many and/or characteristic "Dufour bladelets". This simple and definite approach narrows the range of Aurignacian complexes for comparative analysis. Taking this as a "starting point" or initial filter, further checking of the other "industrial keys" of the Siuren I Early Aurignacian leads us to definite identification of comparable European Aurignacian complexes. Taking into consideration the occurrence of such complexes in Western, Central and Eastern Europe, it is better to discuss three huge European regions separately, especially given that quite different industrial attributions of these Aurignacian complexes have been given by local archaeologists.

Western European Aurignacian complexes

We successively discuss the main regions in selected countries with certain concentrations of Paleolithic sites containing relevant Aurignacian complexes, although these often have different "industrial names".

France and Spain

Périgord, Languedoc and Provence, Franco-Cantabria and Catalonia are the main regions for these studies at this western edge of Europe.

In Périgord such Upper Paleolithic complexes were first called "*Périgordien II (Bos-del-Ser type)*" by Peyrony (1933, 1936). Later, de Sonneville-Bordes (1955a, 1955b, 1960) showed that "*Périgordien II*" lithic assemblages with "Dufour bladelets" (usually less than 5% of all tools, probably because of old excavation techniques - Sonneville-Bordes 1960:149) are actually Aurignacian in basic typological composition, often mixed with some Chatelperronian and/or Gravettian artifacts (La Ferrassie, layer E', Bos-del-Ser, Dufour, Chanlat-I and -II). Geochronologically, de Sonneville-Bordes placed the "*Aurignacien à lamelles*" (1955a, 1955b) between the Chatelperronian/Perigordian I and typical Aurignacian - Aurignacian I-II (e.g., at the monumental Paleolithic site La Ferrassie in Périgord) and, therefore, termed it "*Aurignacian 0*" (1960). This latter attribution became quite widely accepted in Paleolithic archaeology. Some of these complexes (e.g., Dufour and Bos-del-Ser) were also called "*Corrézien*" by Pradel (1968, 1972) to distinguish them from the Aurignacian and Perigordian (Chatelperronian and Gravettian) and some combinations of these technocomplexes' typological elements. Then in the 1980s, it became generally accepted that the "Aurignacian 0" was contemporary with the "Aurignacian I" (e.g., Sonneville-Bordes 1982; Rigaud 1982:440-443; Leroyer & Leroi-Gourhan 1983; Harrold 1988). This served as the basis for combining these two Aurignacian phases into the "Early Aurignacian". On the other hand, we should also admit that before such geochronological studies and conclusions in the 1980s, the first step toward this "unification process" was made by Delporte (1968) on a strictly typological basis. He underlined "a polymorphous character" for lithic assemblages of the "Aurignacian 0" phase complexes (La Ferrassie, layer E'; Caminade-Est, layer G; La Rochette, layer 5d) identifying, aside from the presence of Dufour bladelets, the following industrial features. *"Les caractères sont les suivants: grattoirs aurignaciens assez nombreux, plus nombreux que dans les séries de l'Aurignacien I; burins souvent plus abondants que dans l'Aurignacien I, mais sans burins busqués; lames aurignaciennes absentes ou très peu abondantes; souvent, présence de lamelles Dufour. Cette phase initiale, répétons-le, présente plus de caractères communs avec l'Aurignacien II qu'avec l'Aurignacien I»* (Delporte 1968:60).

These initial industrial considerations were much further developed in the 1990s when Dufour bladelets were no longer considered a *"fossile directeur"* at all for the Aurignacian of Périgord subdivision since they were often found in many Aurignacian complexes throughout the Aurignacian 0/I-IV sequence and their presence explained by functional reasons (e.g., Demars 1992; Rigaud 1993; Djindjian 1993).

Without neglecting such functional reasons, we are not inclined to completely ignore Dufour bladelets which are actually different morphologically in the Aurignacian of the Périgord, reflecting techno-typological variability for several complexes. As already noted in the "Classification..." chapter, Demars specifically subdivided "Dufour bladelets" from Aurignacian complexes of the Périgord into two sub-types: "Dufour" or *"sur lamelle à profil courbe"* usually 3.0 - 4.5 cm long and "Roc-de-Combe" or *"sur lamelle à profil torse"* usually 1.5-2.0 cm long (Demars & Laurent 1989:102). Adding to Demars' "Dufour" sub-type of Périgord the other main morphological features of the Siuren I Dufour bladelets (typical occurrence of "on-axis" removal direction, slightly twisted general profile and bilateral alternate micro-scalar and/or micro-stepped semi-abrupt retouch), as well as their manufacture on both bladelets and microblades, we have nearly the same Aurignacian type of Dufour bladelets as for the Crimean site. One more notable thing is that the Dufour bladelet sub-type seems to only occur in "Early Aurignacian" complexes in the Périgord – mostly in "Aurignacian 0" and in much lesser number in "Aurignacian I". In particular, the important Early Aurignacian industry with Dufour bladelets from Le Piage, layer K in the Périgord corresponds strongly to the Siuren I Early Aurignacian. This can be seen especially by the prevalence of "non-carinated"/"thin" end-scrapers over all types of "carinated"/"thick" end-scrapers, the dominance of on truncation and angle burins in comparison to dihedral burins with only a few examples of carinated burins (5.4% of all burin types) and no busked burins at all, as well as quite a few Dufour bladelets (16.4%) and Font-Yves points (6.6%) (Demars 1992; Champagne & Espitalié 1981). It should also be recalled that on sedimentological and stratigraphic grounds Le Piage, layer K is geochronologically related to the period between the Les Cottés and Arcy Interstadials of the Last (Würm) Glacial (ca. about 34000-33000 BP) (Leroyer & Leroi-Gourhan 1983:42), placing this Aurignacian complex among the earliest Aurignacian industries of Western Europe (but contra see d'Errico *et al*. 1998:17; Zilhao & d'Errico 1999:7). New excavations at the site (Bordes *et al*. 2008) will certainly add much information about the site and its Aurignacian 0 finds. Industrial characteristics of other "Aurignacian complexes with Dufour bladelets" are either very similar to La Piage, layer K - for example, the site of Dufour (Sonneville-Bordes 1955a, 1960) or, like the Font-Yves site, show some possible developmental trends reflected by a more important role of dihedral burins (39.5% of all burins) and a definite increase in carinated burins (23.4% of all burins), although with only a sole busked item among them, and retaining Dufour bladelets and Font-Yves points as well (Demars 1992; Pradel 1968).

Thus, Early Aurignacian 0 with Dufour bladelets and Font-Yves points of the Périgord can be viewed as a type of "Early Aurignacian" with some definite techno-typological differences from both "Early Aurignacian I with absent or rare Dufour bladelets and Font-Yves points" and "Late Aurignacian II-IV with Roc-de-Combe bladelets and no Font-Yves points", also highly likely reflecting changes in the Aurignacian through time in the Périgord.

Before discussing other French and Spanish regions with important Aurignacian complexes having Dufour bladelets, we have to raise some methodological questions. Around the same time that de Sonneville-Bordes began to study and publish intensively on the Périgord Aurignacian, since the late 1950s Laplace also initiated large-scale investigations of Western and Central European Early Upper Paleolithic industries where the role of "Aurignacian with Dufour bladelets" had a crucial importance in his hypothesis of the "*Aurignaco-gravettian synthetotype*" (e.g. Laplace 1958, 1970). He had a broad knowledge of the subject as he had personally excavated new sites in Italy, France and Spain, and studied lithic collections of already known sites in these countries as well as Austria, Hungary and Czechoslovakia. His theoretical ideas and system for lithic artifact descriptions are still applied today (e.g. Levêque *et al.* 1993). His "*Aurignaco-gravettian synthetotype*" will not be discussed here since it has already been criticized in the past (e.g. Bordes 1963; Kozlowski 1965:50-51) that is correct from the points of view of modern Paleolithic archeology. Here instead we would like to underline his studies of European "*Protoaurignacien à pieces à dos marginal*" and the influence of his studies on archeologists from many countries. Namely, under the influence of these initial studies of the Aurignacian by de Sonneville- Bordes and especially Laplace, many archeologists involved in research on "Early Aurignacain complexes with Dufour bladelets" in the Mediterranean zones of Spain (plus Cantabrian Spain), France and Italy accepted the "polymorphous and undeveloped" industrial characteristics for these complexes that led them to use the following industrial definitions as synonyms in the 1980s and 1990s, still in use today: "*Aurignacien primitif*" (Bazile 1983, 1984), "*Protoaurignacien à lamelles retouchées*" (Onoratini 1986), "*Aurignacien à lamelles Dufour*" (Broglio 1993), "*Protoaurignacien à lamelles Dufour*" (Gambassini 1993), "*Aurignaziano a dorsi marginali*" (Palma di Cesnola 1993), "*Aurignacian 0*"/"*Archaic Aurignacian*" (González Echegaray & Freeman 1971; Freeman 1982; Bernaldo de Quiros 1982; Bernaldo de Quiros & Cabrera Valdes 1993; Soler-Masferrer & Maroto-Genover 1993). Accordingly, these archeologists separate such Aurignacian complexes special types or facies of the Early Aurignacian (see also Le Brun-Ricalens 2005). Moreover, their geochronological determinations within either separate site sequences or Aurignacian successions of local regions indeed often indicate very early positions for these complexes predating the "Aurignacian I with no Dufour bladelets", although both of these Aurignacian types/facies are still basically contemporaneous in more general correlations, keeping in mind very early Aurignacian dates for Geißenklösterle and Willendorf II in Germany and Austria.

The main sites with "Protoaurignacian with Dufour bladelets" complexes in Asturias, Franco-Cantabria and Catalonia (Spain), Languedoc and Provence (France), and in Italy are briefly presented below, followed by a discussion of industrial techno-typological differences between them, as well as their common chronological ranges with some exceptions.

Asturia, Franco-Cantabria and Catalonia

La Vina, level XIII inferior (Asturia) (Zilhao 2006), Gatzarria, levels Cjn1 and Cjn2 (Laplace 1966a) and Isturitz, level C4d (Normand & Turq 2005) (Basses-Pyrénées), Labeko Koba, level VII (Cantabria) (Arrizabalaga *et al.* 2003; Arrizabalaga & Maillo Fernandez 2008), Les Abeilles, lower and middle levels (Haute-Garonne) (Laplace 1966b), Cueva Morin, levels 9, 8b and 8a (Cantabria) (González Echegaray & Freeman 1971; Maillo Fernandez 2005, 2006; Arrizabalaga & Maillo Fernandez 2008), Abric Romani, level 2/A (Catalonia) (Laplace 1962; Vaquero 1992), L'Arbreda, level H/BE 111 (Catalonia) (Soler & Maroto 1987; Ortega *et al.* 2005), Reclau Viver, lower layer (Catalonia) (Laplace 1966b, 1970).

Southern France – Languedoc and Provence

La Laouza, level 2B1 and l'Esquicho-Grapaou, levels SLC1B-SLC1A (Languedoc oriental) (Bazile 1983, 1984, 2005), Tournal à Bize, level G (Languedoc occidental) (Tavoso 1987), Rainaude, level 10 (Provence orientale) (Onoratini 1986), Mandrin, upper level (Occitanie orientale) (Slimak *et al.* 2003), as well as Roclaine (dep. Saône-et-Loire) (Combier 1951; Laplace 1966b, 1970) which might also be in more or less territorial proximity to this region.

Italy

There are several local regions with some occurrences of "Protoaurignacian with Dufour bladelets" complexes in Italy.

These include the following three sites in Northern Italy (close to the Alps): Riparo Mochi, layer G in Liguria (Blanc 1953; Laplace 1977; Broglio 1993; Palma di Cesnola 1993; Kuhn & Stiner 1998), Tagliente, levels 25a-c (Bartolomei *et al.* 1982; Broglio 1993; Palma di Cesnola 1993) and Fumane, levels A3-A1, D6 and D3 (Broglio 1993; Palma di Cesnola 1993; Bartolomei *et al.* 1994; Broglio *et al.* 2005) in Verona and Venice provinces.

There are two more such Aurignacian assemblages at La Vallombrosina (Cocchi 1951; Laplace 1966b; Palma di Cesnola 1982, 1993) and La Fabbrica, levels 3-4 (Pitti *et al.* 1976; Palma di Cesnola 1982, 1993) in Tuscany province (Central Italy).

Two other important sites are located further to the south – Castelcivita, upper layer "rsa" (Campanie) (Cioni *et al.* 1979; Gambassini 1982, 1993, 1997; Palma di Cesnola 1982, 1993) and Paglicci, levels 24B2-B1 – 24A4-A2 (Puglia) (Gambassini 1982, 1993; Palma di Cesnola 1982, 1993, 2006).

Thus, the "Protoaurignacian with Dufour bladelets" is known from 20 sites in Spain, France and Italy. All of these assemblages are techno-typologically similar to the Siuren I 1990s Units H and G/1920s Lower layer assemblages. As identified by us for the Siuren I tool-kits, the "Indicative Upper Paleolithic tool types" have nearly the same characteristics: nearly equal representation of end-scrapers and burins or a dominance of burins over end-scrapers excluding "carinated/thick" end-scrapers; a general scarcity of carinated and thick/flat shouldered/nosed end-scrapers with true bladelet "carinated" cores often classified as carinated end-scrapers (e.g. González Echegaray & Freeman 1971: Fig. 85, 6, 10, for level 9; Fig. 91, 13-15, 22 for levels 8b and 8a of Cueva Morin (Cantabria); prevalence of angle and on truncation/lateral retouch burins over dihedral burins except for Roclaine which has a dominance of dihedral burins although not significant; the absence or single examples of carinated burins with true busked burins usually absent; the presence of some scaled tools, truncations, perforators and retouched blades with only a few if any items with "Aurignacian-like heavy stepped retouch". Bone tools (awls and points) and non-utilitarian objects (mainly shell beads) were also, if present, characteristic by a "rather simple set" of items. The basic difference is related to some characteristics and internal composition of "non-geometric microliths" which divide most of these "Protoaurignacian with Dufour bladelets" assemblages into two basic groups: 1) Dufour bladelets with mainly bilateral alternate retouch and Font-Yves/Krems points (Cueva Morin, Gatzarria, Labeko Koba, Les Abeilles, L'Arbreda, Reclau Viver, Mandrin, Fumane, Tagliente), and 2) Dufour bladelets with mainly lateral ventral retouch and no or very rare Font-Yves/Krems points (Abric Romani, La Laouza, l'Esquicho-Grapaou, Tournal à Bize, Rainaude, Roclaine, Riparo Mochi, La Vallombrosina, La Fabricca, Castelcivita, Paglicci). With this subdivision, however, all other morphological features of the Protoaurignacian's Dufour bladelets remain almost exactly the same for both groups – generally "on-axis" removal direction, no real twisted general profile, micro-scalar and/or micro-stepped retouch, especially on ventral side for alternatively retouched pieces, both bladelet and microblade blanks often close to 3.0 cm in length (Demars' "Dufour sub-type"). The differences within the Protoaurignacian complexes related to "non-geometric microliths" may evidence their varying and specific destination and use as composites of projectile points, a common function usually assumed for Dufour bladelets (e.g. Rigaud 1993:183).

In light of this twofold subdivision of the "Protoaurignacian with Dufour bladelets" assemblages from the Mediterranean zone/southern part of Western Europe, it is clear that the Siuren I Early Aurignacian easily fits into the first defined group, including here La Piage, level K (Périgord) as well, with almost identical techno-typological features.

Geochronological ranges for "Protoaurignacian with Dufour bladelets" assemblages of the Western European Mediterranean zone

The complete geochronological period for the Proto-Aurignacian covers the time span from the Hengelo/Les Cottés Interstadials (formerly Würm II/III) until the beginning of the Arcy Interstadial. In absolute and uncalibrated chronology, this falls between ca. 38,000 and 31,500 BP. Our examination of the available data leads us to propose a twofold geochronological subdivision: 1) Hengelo/Les Cottés Interstadials – ca. 38,000-34,500 BP and 2) a period between the Hengelo/Les Cottés and Arcy Interstadials – ca. 34,500-31,500 BP. At the same time, it is not easy to perfectly fit each of the complexes discussed into one or another of these two chronological phases due to either incomplete "dating data" or difficulties in correlating absolute dates (conventional C14 AMS, TL and uranium-series dates) with the available sedimentological, palynological and faunal data. Therefore, first, we try to list the sites which appear to be attributable, with high probability, to one of these geochronological phases.

The following complexes may be attributable to the first phase (Hengelo/Les Cottés Interstadials – ca. 38000-34,500 BP): Abric Romani, level 2/A – an average of 36,780 ± 870 BP from five AMS dates (NZA and AA labs) on bone samples, 35,000 ± 500 and 36,300 ± 1,300 BP conv. C14 dates (USGS lab) on carbonate samples for two travertine levels sandwiching the level at the site, an average of 43,000 ± 1000 BP Uranium-series dates on 38 carbonate samples and faunal indications of a temperate climate (Bischoff *et al.* 1994); L'Arbreda, level H – BE 111 – an average of 38,500 ± 1000 BP from four AMS dates (AA lab) on charcoal samples (Bischoff *et al.* 1989) and another AMS date (OxA lab) on a bone sample – 35,480 ± 820 BP (Hedges *et al.* 1994); La Laouza, level 2B1 – no appropriate absolute dates but some palynological indications of the end of the Würm II-III Interstadial (Bazile 1983, 1984, 2005; Leroyer & Leroi-Gourhan 1983); Tagliente, levels 25 a-c – from sedimentological studies with "*phase pédogénétique au sommet (25a)*" (Broglio 1993:201; Bartolomei *et al.* 1992).

The following complexes may be attributable to the second phase (period between the Hengelo/Les Cottés and Arcy Interstadials – ca. 34,500-31,500 BP): Gatzarria, levels Cjn1 and Cjn2 – from sedimentological data (Laville 1983); Tournal à Bize, level G – absolute Uranium-series and ESR dates indicate a period of ca. 35-34,000 BP (Bischoff *et al.* 1989), as well as palynology suggesting an "episode of climatic instability" (Leroyer & Leroi-Gourhan 1983:42); Fumane, levels A3-A1, D6 and D3 – more than twenty AMS dates between 34-32,000 BP and sedimentological and fauna data indicating a dry cold climate (Broglio 1993; Palma di Cesnola 1993; Bartolomei *et al.* 1994; Broglio *et al.* 2005); Castelcivita, upper layer "rsa" – stratigraphic position between the Uluzzian (conv. C14 date 32,930 ± 720 BP on burnt bone – F lab) and Aurignacian with "*micropointes à dos marginal*" (conv. C14 date 31,950 ± 650 BP on burnt bone – F lab) and microfaunal data (Gambassini 1993, 1997; Palma di Cesnola 1993; Riel-Salvatore 2007); Paglicci, levels 24B2-B1 – 24A4-A2 – two AMS dates for level 24B1 (34,000 +900/–800 BP) and for an Aurignacian with bladelets treated with unique fine marginal abrupt dorsal retouch considered to be related to Arcy Interstadial situated above level 24A1 (29,300 ± 600 BP) (Palma di Cesnola 1993, 2006).

For another group of Aurignacian complexes, dating data indicate possible continuity of several human occupations within thick cultural archeological layers or a series of levels at some sites during both geochronological phases: l'Esquicho-Grapaou, levels SLC1B-SLC1A – one conv. C14 date for level SLC1B – 34,540 ± 200 BP and three conv.C14 dates for stratigraphically overlying level SLC1A – 31,850 + 1280 – 1700 BP (MC lab), as well as sedimentological studies (Bazile 1983, 1984, 2005; Leroyer & Leroi-Gourhan 1983); Riparo Mochi, layer G – pollen data indicate the Hengelo-Arcy Stadial period (Leroi-Gourhan & Renault-Miskovsky 1977), while five AMS dates on charcoal samples between 35-32,000 BP (OxA lab) (Kuhn & Stiner 1998) may also evidence the end of Würm II-III Interstadial as well.

Geochronological data for the "Protoaurignacian with Dufour bladelets" complexes of sites (Les Abeilles, Reclau Viver, Rainaude, La Vallombrosina, La Vina, Isturitz and Labeko Koba) are not definite enough to place them into one of the two geochronological phases with certainty, although La Fabbrica, levels 3-4 can probably be attributed to the Arcy Interstadial (Pitti *et al*. 1976; Palma di Cesnola 1993).

The great complexity of the two geochronological phases for Aurignacian 0/Protoaurignacian in Western Europe and in simply a preliminary view can be well-illustrated by problems of geochronological determinations at Cueva Morin, levels 9, 8b and 8a. These have been long debated and different interpretations proposed. First, there is a reverse order for conv. C14 dates of the Lower Aurignacian sequence at the site. It is also worth noting that all of the 1970's C14 dates are conventional ones on charcoal from the SI lab (see Maillo Fernandez *et al*. 2001: Table 1). The underlying Chatelperronian level 10 is dated to 36,950 ± 6580 and 28,610 ± 560 BP where the first date has a much too broad standard deviation. Three dates for the "Archaic Aurignacian with Dufour bladelets" in level 8a group around 28,000 BP (28,600 ± 1285, 28,435 ± 540 and 28,155 ± 735 BP), while three dates for the "Aurignacian I" levels above are older: ca. 29,000 BP for level 7 (29,515 ± 840 and 29,055 ± 1490 BP) and 32,415 ± 865 BP for the contact between levels 7/6 (see Bernaldo de Quiros 1982b). With such rather contradictory C14 dates, the site's sedimentology, palynology and fauna are needed to attempt to place these levels into geochronological periodization of the Last Glacial, as all archeologists agreed that the absolute dates for the "Archaic Aurignacian" are too young (Freeman 1982; Bernaldo de Quiros 1982a, 1982b). It is worth summarizing further such attempts, keeping also in mind that the "Archaic Aurignacian" levels 9, 8b and 8a, based on environmental and faunal data, are characterized by a temperate climate. Arl. Leroi Gourhan attributed level 9 to the end of the Hengelo/Les Cottés Interstadial and levels 8b and 8a to the initial inter-Hengelo/Les Cottés-Arcy Stadial (Leroi-Gourhan 1971; Leroyer & Leroi-Gourhan 1983). Bernaldo de Quiros (1982a, 1982b) argued for attribution of levels 9, 8b and 8a with the Arcy Interstadial. In the 1990s, Djindjian (1993b), first taking into consideration the characteristics of the different assemblages, placed levels 9, 8b and 8a into the Würm II-III Interstadial. So, there was little agreement, although in our view, Bernaldo de Quiros' early 1980s proposal appeared to be the best supported. This is because both C14 dates and indications of a temperate climate for these Archaic Aurignacian levels at Cueva Morin were rather similar to the data for the Siuren I Lower Aurignacian, that would indeed argue for the later survival of this Early Aurignacian industry at both edges of Europe: westernmost – Cueva Morin and easternmost – Siuren I.

The geochronological problem for the Archaic Aurignacian at Cueva Morin was, however, resolved in the beginning of the 2000s. Two more C14 (AMS) dates were obtained on charcoal samples (GIFA lab) for the uppermost Mousterian level 11 (39,770 ± 730 BP) and Archaic Aurignacian level 8 (36,590 ± 770 BP) (Maillo Fernandez *et al*. 2001: Table 2). Accordingly, the temperate climate for the Cueva Morin Archaic Aurignacian can be correlated with the Hengelo/Les Cottés Interstadial, fitting it geochronologically into the earliest, or first, phase of this Early Aurignacian in Western Europe.

Thus, more work is needed to be done to date these sites and their archeological levels – both absolute dates and geochronological determinations (geology, pollen, fauna etc.) – in order to place them within a rigorously dated chronostratigraphic sequence.

Concluding remarks

All in all, the "Archaic Aurignacian/Protoaurignacian with Dufour bladelets" Western European complexes are characterized by quite uniform techno-typological features and by an early geochronological position within the Aurignacian *sensu stricto* in Europe. The Siuren I 1990s Units H and G/1920s Lower layer Aurignacian complexes would surely "feel comfortable" within this Western European Aurignacian if it had been territorially located there.

Central European Aurignacian complexes

Having already analyzed data on the Western European Archaic Aurignacian as related to the Siuren I Lower Aurignacian, it is not difficult to identify similar Aurignacian complexes in Central Europe. Surprisingly enough, there were initially only two regions in Central Europe with sites having such Aurignacian 0/Protoaurignacian complexes: the Middle Danube basin in Austria (Krems-Hundssteig); and the Banat region of southwestern Romania (Tincova, Cosava, levels I and II, Romanesti-Dumbravita I, levels II-III, and Romanesti-Dumbravita II). After recent field work, two other sites can be added to these: Beregovo I in the Upper Tisza river basin (Ukraine) and Kozarnika Cave, layer VII (Eastern Balkan area, Bulgaria). But that is all for this huge European territory. It is also important to emphasize that all of these sites except Kozarnika are open-air sites, in striking contrast with the Western European sites which are almost exclusively found in caves and rock-shelters. Thus, by site location, the Central European region is very different from the Western European one for Aurignacian 0/Protoaurignacian sites.

Middle Danube basin (Austria) – Krems-Hundssteig

This is the type-site for defining the "Aurignacian of Krems-Dufour type" in Central Europe (**K**ozlowski 1965; Sachse-Kozlowska 1978; Kozlowski & Kozlowski 1975, 1979) or "*Kremsien*" (Fridrich 1973; Bánesz 1993). Although the site was recognized as a Paleolithic site, it was investigated not by regular excavation but rather the collection of finds during loess quarrying for the Danube high dam construction at the end of the 19th century and the very beginning of the 20th century (Strobl & Obermaier 1909; Nigst 2006). Its abundant lithic assemblage was thoroughly analyzed and published in the 1960s-1970s by G. Laplace, A. Broglio and J. Hahn (Broglio & Laplace 1966; Laplace 1970; Hahn 1977) and thanks to them, all basic and unique industrial features are thus quite clearly described. The Krems-Hundssteig complex is techno-typologically within the first group for the Western European "Aurignacian 0/Protoaurignacian", with numerous alternatively retouched Dufour bladelets (Demars' Dufour sub-type) and Font-Yves/Krems points, including the Krems alternatively retouched variant of the latter. Many "non-geometric microliths" (about 60% of all tools, or about 1900 items, an astoundingly large number for a surface find collection) and a variety of both carinated cores and end-scrapers with, at the same time, the near absence of carinated burins (ca. 1.5% of all burin verges, including multiple burins), are the most prominent characteristics of the assemblage. The flint artifacts were also accompanied by 128 shell beads and two bone awls. Accepting the general industrial similarity of the Krems-Hundssteig and Siuren I 1990s Units H and G/1920s Lower layer assemblages, we would like, first of all, to stress the great similarity in "non-geometric microliths" types, as well as the occurrence of the same "grinding tools" with a series of short shallow striations on limestone pebbles (Hahn 1977: Tafel 118, 8).

Direct indications of the geochronological position of the Krems-Hundssteig Aurignacian are absent. However, the inter Hengelo-Arcy Stadial period has been proposed for it (e.g. Kozlowski 1965:40). The single conv. C14 date, with a quite large sigma, obtained in 1970 by J. Hahn on an early 20th century charcoal sample – 35,200 ± 2000 BP (KN lab), and faunal data do not appear to contradict such a proposal.

But with all these considerations of Krems-Hundssteig, it should be recalled that the finds do not all originate from a single archeological layer, based on the loess quarry profile (Strobl & Obermaier 1909: Tafel XI). J. Hahn already noted the multi-layer structure for the Aurignacian at the site and also mentioned the presence of Gravettian pieces among the Aurignacian lithics (Hahn 1977). Regarding the Aurignacian finds, some doubts on the Aurignacian 0/Protoaurignacian homogeneity of Krems-Hundssteig finds were also expressed by N. Teyssandier (2003, 2006, 2008). Particularly, he specially admitted the "presence of wide-fronted carinated scrapers and wide, robust blades, some modified into end-scrapers or blades with lateral retouch tending toward the Aurignacian or strangled blade form" and stated that "these elements are more typical of the Early Aurignacian (Aurignacian I – Yu.D.) in south-west France" (Teyssandier 2008:496). The occurrence of Gravettian artifacts for the site was confirmed by new fieldwork at the site in 2000-2002 headed by Ch. Neugebauer-Maresch (2008a), although the new excavations were conducted some distance to the south from the previously known site area (Neugebauer-Maresch 2008a: Abb. 207 – 208; 2008b: Abb.1). Two very limited areas of archeological horizon 4 (AH 4) with no lithics, but with charcoal lenses, were excavated and surprisingly the attribution to the inter Hengelo-Arcy Stadial period finds support from a new C14 date on charcoal, 32,810 +420/–450 BP (VERA lab), while "malacological analysis … indicates a loess tundra landscape rich in herbs and grasses and with scattered undemanding bushes and/or tree species" (Neugebauer-Maresch 2008a:330). At the same time, a series of Gravettian levels (AH3.1–AH3.8) stratigraphically above the Aurignacian provided several C14 dates on charcoal ranging between 27,200 and 28,750 BP, strongly supporting the presence of Gravettian lithics in the 1890s and 1900s loess quarry area. Moreover, the lowermost archeological level (AH5) for the 2000-2002 excavations, again with no artifacts and recorded only by drilling holes, yielded a single C14 date on charcoal of 41,000 +1300/–1100 BP, allowing Neugebauer-Maresch to suggest even a Middle Paleolithic occupation for the site, which may be possible given the discovery of some definite side-scrapers of Middle Paleolithic types published by Strobl and Obermaier (1909: Tafel XIII).

All of these other industrial components within the Krems-Hundssteig site artefacts of the 1890s and 1900s studies are, however, of minor importance within the predominant Aurignacian 0/Protoaurignacian component there. Moreover, some wide-fronted carinated end-scrapers and blades with Aurignacian-like stepped retouch, noted by N. Teyssandier, do in fact occur in some similar Western European Aurignacian 0/Protoaurignacian assemblages – e.g. Cueva Morin. Thus, a new detailed techno-typological re-analysis of the Krems-Hundssteig old lithics collection is once again needed to clarify its specific features, keeping in mind that this is the richest Aurignacian 0/Protoaurignacian assemblage in Europe with ca. 1900 retouched Aurignacian microliths (*sic!*). Regarding the geochronological aspect for the Aurignacian 0/Protoaurignacian assemblage at Krems-Hundssteig, it should be noted that two C14 dates around 33-32,000 and 35,000 BP may well be connected not only to the Aurignacian 0, but also to one of two other possible industrial components there –Middle Paleolithic or Aurignacian I, or even, most likely, to a local steppe fire completely independent of any human occupation there, which is why Nigst's position of being very cautious about the Krems-Hundssteig Aurignacian 0 is quite understandable (Nigst 2009).

Banat (Romania)

The four sites of this region compose a rather compact Aurignacian complex group. Three sites (Tincova, Cosava, levels I and II and Romanesti-Dumbravita I, levels II-III) are relatively homogeneous and the lithic assemblages similar to one another both structurally and techno-typologically (Mogosanu 1972, 1983; Chirica 1996; Hahn 1977). This is expressed by the dominance of bladelet single-platform cores, including "carinated" types, and the following tool indications: the importance of carinated and thick/flat shouldered/nosed end-scrapers, although some fit better into our definition of bladelet "carinated" cores; the rarity of dihedral burins, the absence of carinated burins with a dominance of angle and on truncation burins (see Hahn 1977:131-134 and Tab. 3 on p.338); the presence of some truncations and retouched blades, some with "Aurignacian-like heavy stepped retouch" and, finally, a series of Font-Yves/Krems points and Dufour bladelets sub-type with mainly bilateral dorsal retouch (fragmented Font-Yves/Krems points?) and some bilateral alternate retouch. Less common "non-geometric microliths" in these assemblages (always less than 10% of the tool-kits) is clearly understandable given the lack of systematic sieving of the sediment screening during the excavations. On the other hand, Romanesti-Dumbravita II site could be a very special locus with only eight unretouched bladelets/microblades and 12 "non-geometric microliths": 1 bladelet with bilateral dorsal retouch (a fragmented Font-Yves/Krems point?), 1 Krems point on microblade with bilateral alternate retouch, 9 Dufour bladelets on 7 microblades and 2 bladelets with bilateral alternate retouch and 1 bladelet Dufour on microblade with lateral ventral retouch (Mogosanu 1983: Fig. 4, 11-18 on p. 230; Hahn 1977: p.134 and Tafel 169, 17-28). No other flint artifacts were found at the site. Taking together both tool structures in general and the representation of "non-geometric microliths" in particular, we can clearly infer functional differences between Tincova, Cosava and Romanesti-Dumbravita I, on one hand, and Romanesti-Dumbravita II, on the other hand, where differences in retouch position on "non-geometric microliths" (although with the same dominance of "on-axis" removal direction, no real twisted general profiles and semi-abrupt microscalar and/or micro-stepped retouch) is one of the most interesting features. Often mentioned in the archeological literature (e.g. Kozlowski 1965:38), the industrial similarity between the Krems-Hundssteig and Tincova (the most known Banat Aurignacian site) Aurignacian complexes seems to be evident, while some of their differences may be explained through the proposal that "… Tincova is relatively homogeneous – the result of one or two occupations – whereas Krems-Hundssteig consists of at least ten occupation units" (Hahn 1977:309).

Thus, based on their techno-typological characteristics, the Banat Aurignacian assemblages are quite comparable to the first group of Western European Aurignacian 0/Protoaurignacian complexes with alternatively retouched Dufour bladelets and Font-Yves/Krems points, as well as to Krems-Hundssteig and the Siuren I 1990s Units H and G/1920s Lower layer Aurignacian.

The geochronological position of the Banat Aurignacian complexes is not as yet supported by absolute dates. General geological considerations and pollen data have led M. Carciumaru to attribute the Aurignacian of Tincova and Romanesti-Dumbravita I to the Second Pleniglacial of the Last Glacial and, specifically, to the period from the "Herculane I Oscillation" (the analog of Tursac Interstadial in Western Europe) to the "Herculane II Oscillation" (the analog of Laugerie Interstadial in Western Europe) (see Carciumaru 1980:190-200, 1993:225); in terms of absolute chronology, this covers the period between ca. 23,000 and 18,800 BP. It should be mentioned here that this absolutely surprising geochronological position for the Aurignacian *sensu stricto* proposed for the Banat sites has often been accepted, explaining why the Banat Aurignacian complexes were sometimes attributed to the Aurignacian V (Kozlowski 1993:285). We accept neither the geochronological position for the Banat Aurignacian nor its attribution to a mystical Aurignacian V. First, all archeologists discussing the Banat Aurignacian complexes noted their industrial similarity with the Krems-Hundssteig Aurignacian finds, including J.K. Kozlowski himself (e.g. Kozlowski 1965:38). In light of our own analytical comparisons of the European Aurignacian complexes under discussion, this similarity finds further support, making an "Aurignacian V" definition quite unrealistic. It is also worth noting here that, if it is true, we would be forced to discuss "the Aurignacian 0 Banat island" within a "Late Gravettian and Epigravettian sea" in Romania that is, by the way, very similar to Anikovich's (1992) position on the Siuren I Aurignacian. Finally, Carciumaru's (1980, 1993) geochronological periodization of the Romanian Middle and Upper Paleolithic leaves no doubt that it is generally "too recent" for many sites in addition to the Banat site; see for example the proposed "Ohaba B Oscillation" (the analog of the Maisières Interstadial in Western Europe) for many Middle Paleolithic complexes there. Taking all these considerations into account, the Aurignacian level association with a paleosoil at Tincova, Romanesti-Dumbravita I and Cosava and inferring a temperate Interstadial climate based on pollen data, we instead propose a correlation of the Banat Aurignacian either to the Hengelo or Arcy Interstadial, that would finally place these complexes within a "normal geochronology" for these industrially truly Aurignacian 0/Protoaurignacian assemblages.

A "new breath" for the Banat Aurignacian investigations is now coming. On one hand, a new published re-analysis of the Tincova lithic assemblage with is expected soon (see Teyssandier 2008:496-498). On the other hand, new fieldwork in Banat by German colleagues (J. Richter and Th. Uthmeier) may shed much more light on both industrial and chronological data for the Aurignacian sites. Thus, new possible data on the Banat Aurignacian should much enlarge our knowledge on the subject and may respond to the many open questions.

Upper Tisza river basin (Ukraine) – Beregovo site

Beregovo I is an Upper Paleolithic open-air site and among the first truly Paleolithic sites discovered in the Ukrainian Transcarpathia region (the westernmost region of Ukraine). It was found and first excavated by the famous Czech archeologist J. Skutil (1938:130-135) when the region was part of Czechoslovakia. Next, the site was excavated by S.V. Smirnov in the late 1960s and early 1970s (Smirnov 1974). The final, but limited, 20th century fieldwork was conducted by V.I. Tkachenko in the late 1980s and early 1990s (Tkachenko 1989, 2003). The different parts of the site excavated form a total area of ca. 240 sq. m, with only a little more than 1000 lithic artifacts found. The site's finds, with differences in their industrial and chronological interpretations seen in the publications of Smirnov and Tkachenko, were always considered as representing a Middle or Late Aurignacian with some carinated end-scrapers but no retouched microliths and many similarities to the Typical Aurignacian in Central Europe (first of all, in Slovakia). Geochronologically, the archeological layer was attributed to either the "Paudorf" paleosoil (Smirnov 1974) or to loam-like sediments above it (Tkachenko 1989, 2003). The site's importance was always considered from a geological point of view representing mostly the upper portion of the Würm Interpleniglacial and later periods in the Ukrainian Transcarpathian region (see Gladilin 1989:95; Tkachenko 1989:213-214). At the same time, the Beregovo I lithic analyses, especially Tkachenko's, were not entirely clear and understandable. This led to new limited excavations (ca. 8 sq. m area) at the site by V.I. Usik in 2006 and 2007 to resolve geological and archeological questions there (Usik 2008). The obtained results were quite unexpected and surprising, given the previous interpretations of the site. First, the position of the archeological layer within the site's Pleistocene sediment sequence has been finally precisely established. According to geologist N.P. Gerasimenko (Usik 2008:56-59), the Upper Paleolithic archeological layer is connected to the lower horizon of the Vytachiv (VT3+1) paleosoil; above this paleosoil there is another Vytachiv (VT3c) paleosoil definitely correlated to the Denekamp paleosoil. Taking these geological data into consideration, Usik correctly argues that the Upper Paleolithic layer should be dated to "a time span older than 27-30,000 BP" (Usik 2008:59). The main archeological surprise was the appearance of 55 retouched microliths (57.3%) out of 96 tools recovered in the new 2006-2007 lithic assemblage. Moreover, the retouched microliths (45 microblades and 10 bladelets) mostly include Dufour bladelets of Dufour sub-type with either alternate or ventral retouch.

No Font-Yves/Krems points were reported. Among other typologically indicative tool types, there are some carinated and thick nosed end-scrapers, a single carinated burin, dihedral, angle and on truncation burins. Some refits for artifacts from the 1969, 1975, 1990 and 2006-2007 excavations strongly suggests that all of the site's Upper Paleolithic artifacts originate from the same archeological layer. The appearance of retouched microliths at Beregovo I only during the 2006-2007 excavations can be explained by the practice of systematic water sieving of the sediments. Usik's attribution of the Beregovo I lithic artifacts as belonging to "Early Aurignacian of Krems-Dufour type" (2008:64), using Demidenko's terminology, should be accepted. It is also worth noting the presence of narrow flaked cores and a carinated burin among the 2006-2007 lithics, which is not a very typical feature for the European Aurignacian 0/Protoaurignacian find complexes. At any rate, it is now clear that the Upper Tisza river basin with Beregovo I should be included within this category of European Aurignacian complexes and further field investigations at the site are surely needed.

Eastern Balkan area (Bulgaria) – Kozarnika Cave

Kozarnika Cave is a new and very important Paleolithic site in the Balkans (Northwestern Bulgaria), with a stratigraphic sequence from the Lower Paleolithic to the Late Paleolithic, as well as more recent layers from the Neolithic to the Ottoman period. The cave has been excavated since 1994 by a Bulgarian-French team headed by N. Sirakov and J.-L. Guadelli (Guadelli *et al.* 2005). Relevant to the present discussion are the "*Kozarnikien ancient*" materials from archeological layer VII at the cave, dated by four AMS dates (GIF lab) to a period in between 39 and 36,000 BP (Hengelo/Les Cottes Interstadial?). T. Tsanova is correct in connecting the layer VII lithic assemblage with the European Protoaurignacian and some Early Ahmarian complexes (Tsanova 2006:310-384). The following European Aurignacian 0/Protoaurignacian industrial features are clearly seen for the "*Kozarnikien ancient*" materials: rarity of carinated forms and absence of carinated burins, with bladelet production mainly producing non-twisted bladelets and microblades through primary reduction of bladelet single-platform cores. Double-platform cores are rare, some of which are not true bidirectional cores but bidirectional-adjacent cores with two striking platforms and two flaking surfaces (see Tsanova 2006: Fig. III. 20, 5). At the same time, end-scrapers are usually simple ones on blades with very few carinated, while typical burins are rare with no dihedral and carinated types. On the other hand, 40 retouched microliths are not only similar to Aurignacian 0/Protoaurignacian microliths, but also to some Early Ahmarian ones. Using typological classification in the present volume, the Kozarnika cave, layer VII 40 retouched microliths (see Tsanova 2006: Table III.10) can be characterized as follows: Font-Yves/Krems points with bilateral dorsal retouch – 8 items/20%; fragmented pseudo-Dufour bladelets with bilateral dorsal retouch – 16 items/40%; pseudo-Dufour bladelets with lateral dorsal retouch – 8 items/20%; Dufour bladelets with bilateral alternate retouch – 8 items/20%. Taking into account fragmented pseudo-Dufour bladelets with bilateral dorsal retouch, interpreted by Tsanova as point fragments, the group of Font-Yves/Krems points reaches 60% of all "non-geometric microliths". Such a dominance of pointed microliths is quite typical for Southern Levantine Early Ahmarian assemblages (e.g. the Boker A site – Jones *et al.* 1983; Monigal 2003). On the other hand, the Kozarnika cave, layer VII alternatively retouched Dufour bladelets are very typical of European Aurignacian 0/Protoaurignacian assemblages with mainly continuous and well elaborated lateral edge retouch, while dorsal and alternate retouch on Ahmarian microliths is usually partial and bladelet production was also very different, obtained from blade/bladelet cores with elongated metric proportions.

Thus, so-called "*Kozarnikien ancien*" find complex opens a clear perspective for a wider look at geographically different Early Upper Paleolithic industries with bladelet production and serial "non-geometric microliths" (see Zwyns *et al.* 2008).

Concluding remarks

Thus, only 7 sites with Early Aurignacian complexes in Central Europe allow us to make the following observations. There are just a few Aurignacian 0/Protoauruignacian complexes with Dufour bladelets of Dufour sub-type and Font-Yves/Krems points in the region, although hundreds of Aurignacian sites (including here very numerous Aurignacian surface find spots in Moravia) have been found. The geochronological positions of these complexes are not yet well-established yet and can be placed within the rather broad interval between the Hengelo and Arcy Interstadials inclusive. It is also clear that both the Central and Western European Aurignacian 0/Protoaurignacian complexes are quite comparable by their techno-typological characteristics that do not contradict their grouping into one circle of Early Aurignacian manifestation in Europe.

Eastern European Aurignacian Complexes

The observed situation of relative scarcity of Aurignacian 0/Protoaurignacian complexes in Central Europe continues further to the east. In fact, prior to our new comparative analyses in the early 2000s (e.g. Demidenko 2003b, 2004b, 2006; Demidenko & Otte 2000-2001, 2007), no site had ever attributed to this Aurignacian type industry, not taking into consideration Siuren I. This situation is further marked by a real rarity of sites and surface find spots with any Aurignacian *sensu stricto* finds, numbering less than 20 across this vast European territory (Demidenko 2004b, 2006). Nevertheless, we point out three additional sites at the southern edge of Eastern Europe: Chulek I open-air site (Lower Don River area), Kamennomostskaya cave, lower layer and Shyrokiy Mys open-air site (North-western Caucasus) in Russia. Thus, only four sites with Aurignacian 0/Protoaurignacian assemblages with Dufour bladelets of Dufour sub-type can be identified in Eastern Europe (Demidenko 2000-2001, 2008a, 2008b; Demidenko & Otte 2000-2001, 2007), leaving aside some Kostenki site area data on possible Earliest Aurignacian occurrences there.

Of these, only one site - Siuren I (Crimea) – has a set of AMS dates and fauna, microfauna and malacofauna data enabling us to place its Lower Aurignacian finds from the 1990s Units H and G/the 1920s Lower layer into the regional geochronological scheme. The three other sites lack such natural science data to support any direct or indirect geochronological dating. The

Chulek I and Shyrokiy Mys open-air sites are in fact find spots with no preserved *in situ* archeological layer, but simply surface lithic finds. Kamennomostskaya Cave was only excavated in 1961 over a limited area and was then destroyed by local quarry activity. Therefore, only techno-typological lithic data have allowed us to attribute them industrially to the Aurignacian 0/ Protoaurignacian.

Moreover, surprisingly enough, the sites' artifacts show considerable variability within the proposed Aurignacian 0/ Protoaurignacian features. On one hand, the Siuren I and Chulek-I find complexes fit perfectly into European Aurignacian 0/Protoaurignacian group. As shown in previous chapters here, the Siuren I 1990s Units H and G/1920s Lower layer flint assemblages can be unquestionably considered as "full members" of the first group of the Western and Central European "Aurignacian 0/Protoaurignacian" with numerous alternatively retouched Dufour bladelets of Dufour sub-type and Font-Yves/ Krems points, including the Krems alternatively retouched variant. Some non-utilitarian objects from the Siuren I complexes, specifically *Apporhais pes pelicani* shell beads, are quite interesting in this regard as the same items have been identified in layer G of Riparo Moshi (Italy) with this kind of Aurignacian and not in any of the other many Upper Paleolithic archeological levels there (Stiner 1999). The Chulek I flint assemblage is set apart by the presence of often ventral basal thinning of many retouched microliths; it has even been propose that such microliths be termed the Chulek I type (Demidenko 2000-2001:151). This specific microlith feature is not unique, however, as it is known in some Western European Aurignacian 0/Proto-Aurignacian assemblages with Dufour bladelets of Dufour sub-type, although generally for single pieces. This ventral basal thinning element is the best illustrated for some Dufour bladelets from the Fumane Cave Early Aurignacian levels (Italy) (Broglio *et al.* 2005: Fig.9, 30-35, 37, 39). Accordingly, as with the respective Siuren I finds, Chulek I materials also fit well into the European Aurignacian 0/Protoaurignacian context.

On the other hand, Upper Paleolithic flints from Kamennomostskaya Cave and Shyrokiy Mys have techno-typological elements more in common with the Near East than in Europe. The Kamennomostskaya Cave, lower layer Aurignacian assemblage with a limited tool-kit (n=69) is noted for a series of "inverse truncations" that constitute 11.6% of the tool component. The importance of these tools lies in the fact that these "inverse truncations" are exactly the same as "lateral carinated pieces", widely known throughout the Near Eastern Aurignacian *sensu lato* sequence from its very beginning ca. 36-34,000 BP (e.g. Ksar Akil rock-shelter, levels XIII-X) until its very late manifestation ca. 18-17,000 BP (e.g. Ein Aqev). Although there are tendencies to revise the Aurignacian *sensu lato* internal industrial structure in the Near East (see for discussion Belfer-Cohen & Bar-Yosef 1999; Bar-Yosef 2000, 2006; Marks 2003; Goring-Morris & Belfer-Cohen 2006; Williams 2006), the lateral carinated pieces, among other techno-typological features, occupy a central role in various considerations of Aurignacian industrial determinations there. Nevertheless, keeping in mind all the questions in the Near Eastern Aurignacian debate, the Kamennomostskaya Cave UP materials fit much better into the Near Eastern Early Aurignacian context (complexes like Ksar Akil rock-shelter, levels XII-XI) than into any other possible European parallels. The proposed hypothesis has an additional typological nuance: the presence of some carinated burins in the Kamennomostskaya and Ksar Akil complexes. Shyrokiy Mys, with a very rich Upper Paleolithic assemblage, is very much industrially related to Aurignacian 0/Protoaurignacian. Yet it has unusually high portions of both Font-Yves/Krems points with bilateral dorsal retouch (8.2%), excluding dorsally retouched microliths with projectile "bending" and/or "spin-off" damage and pseudo-Dufour microliths with dorsal retouch (75.9%) present in the retouched microlith sample (ca. 700 items) that clearly calls for some special attention. Moreover, the occurrence of fine Ouchtata-like retouch on many dorsally retouched microliths and the relative scarcity of Dufour bladelets with alternate retouch (13.3%) for the Shyrokiy Mys microliths may well support Near Eastern and Middle Eastern Aurignacian comparisons. This is because, first, Ouchtata retouch is well-represented on many bladelets in Ahmarian and especially Late Ahmarian complexes in Near Eastern Upper Paleolithic context, although it is known to a much lesser extent for Aurignacian complexes as well. Second, the subordinate position of Dufour bladelets of Dufour sub-type with alternate retouch among retouched microliths, along with a noticeable serial presence of Font-Yves/Krems points or their Near Eastern and Middle Eastern typological equivalents, that is, el-Wad and Gar Arjeneh points, seems to be a distinct feature for the Early Levantine and Zagros Aurignacian. Accordingly, the Upper Paleolithic Near Eastern complexes like Ksar Akil, levels X-IX (Bergman 1987, 1988, 2003) and Zagros complexes like Yafteh Cave, lower levels 22-15 in the 1960s excavations (Otte & Kozlowski 2007) appear fairly similar to the Shyrokiy Mys assemblage. All in all, considering the compositions and features of the microliths, as well as common bladelet primary production, an absence of carinated burins and, at the same time, a good presence of carinated end-scrapers, and a minor but still a noticeable occurrence of Aurignacian-like blades with stepped retouch, the Shyrokiy Mys Aurignacian assemblage is in good agreement with some of the Earliest Aurignacian complexes in the Near and Middle East.

Concluding remarks

These data on the four sites from the southern part of Eastern Europe are set apart by the following observations. First, the only site with geochronological determinations, Siuren I rock-shelter in Crimea, is the youngest one of the great number of Aurignacian 0/Protoaurignacian sites in Europe – Arcy Interstadial (ca. 30,000 BP) according to the C14 results, probably older in our opinion (see Demidenko & Noiret this volume). At the same time, if our hypothesis of significant similarity between Upper Paleolithic finds from Kamennomostskaya Cave and Shyrokiy Mys and the Early Levantine and Zagros Aurignacian (especially assemblages from levels XII-IX at Ksar Akil) is correct, then we could hypothesize absolute uncalibrated dates for the North-western Caucasian sites as much older than 30,000 BP. Then, the possible Asian industrial connections for the two North-western Caucasian assemblages, keeping also in mind the late geochronology for the Siuren I Lower Aurignacian, allow us to make several important considerations regarding the origins of the Aurignacian 0/Protoaurignacian and initial distribution in Eastern Europe. We are of the basic opinion that based on the available data for these very early Aurignacian manifestations, Eastern Europe has nothing to do with a possible Aurignacian 0/Protoaurignacian origin. On one hand, the Siuren I and Chulek I data clearly point to a late geochronology for this Aurignacian industry within the European record. On the other hand, the proposed Near Eastern and Middle Eastern correlations for the other two Upper Paleolithic assemblages in the southern part of Eastern Europe rather indicate the possible penetration of the Aurignacian 0/Protoaurignacian tradition into this part of Europe from Western Asia and not vice-versa, understanding that there is no Early Upper Paleolithic industry in Eastern Europe that could give rise to the Aurignacian tradition earlier than we know it for other parts of Western Eurasia. Thus, the Eastern European Aurignacian 0/Protoaurignacian data can now testify that the southern part of Eastern Europe was the area where carriers of the earliest true Aurignacian industrial tradition arrived from two different directions: from more western European territories for Siuren I and Chulek I and from the south, Western Asia, for Kamennomostskaya Cave and Shyrokiy Mys.

Final considerations

These brief observations on the European Aurignacian 0/Protoaurignacian find complexes show, first of all, a great degree of similarity in basic techno-typological characteristics. Such similarity allows us to consider this Earliest Aurignacian industry type as "Pan-European". Indeed, apart from the importance of dihedral and carinated burins in a few complexes (e.g. Dufour in France and Kamennomostskaya Cave in Russia), there are not even any clear techno-typological changes through time for most of the complexes over this quite long, as for the Upper Paleolithic, time span – Hengelo/Les Cottes – Arcy Interstadials (ca. 38/36-30,000 uncalibrated BP). Moreover, even sites geographically situated at the edges of Europe and chronologically very different (Cueva Morin and Siuren I) have nearly the same lithic characteristics. This really means that a hypothetical or "miracle movement" of any site from our list of Aurignacian 0/Protoaurignacian complexes from its original location to a different part of the European continent, excluding, of course, lithic raw material differences, would not archeologically "spoil" the map of their distribution across the continent. Along with this, there is a clear tendency of significant decrease in site numbers for the Aurignacian complexes from west to east in Europe. Should we explain such patterning as the first appearance of this Aurignacian tradition in the southern part (mainly, the "Mediterranean belt") of Western Europe which then spread into Central and Eastern Europe? We would not do so for the moment. Instead, it is worth considering the apparent geographic distribution of these sites not only in Western Europe, but also Central and Eastern Europe as well. So, all but two of these European sites are found in the same southern geographical band in Europe – somewhat above 40°N latitude to around 46°N latitude. The two exceptions (Krems-Hundssteig and Chulek I) mark the northern extension of this Aurignacian industry type to around 48°N latitude, that can be still explained as being within the range of a single human adaptation system materially expressed by one basic flint and bone treatment and use tradition for survival in temperate climate of foothill forest and varying steppe landscapes (Demidenko 2002) with hunting of different ungulate species possible and access to river and/or sea aquatic resources. Also, the Aurignacian of level VII from Grotte du Renne at Arcy-sur-Cure (Northern Burgundy, France) may also connected to the two Austrian and Russian sites on the basis of its geochronological dating to the Arcy Interstadial (two conventional C14 dates – 31,800 ± 1240 BP [Ly-2162] obtained in 1981 on collagen and 30,800 ± 250 BP [GrN-1717] obtained in 1962 on burnt bone – see Schmider 2002: 9; and stratigraphic and pollen data – see Leroi-Gourhan & Leroi-Gourhan 1965; Leroyer & Leroi-Gourhan 1983; D'Errico *et al.* 1998; Schmider 2002: 27-47), location around 48°N latitude and the assemblage's techno-typological characteristics (Farizy & Schmider 1985; Schmider & Perpère 1995; Schmider 2002).

Taking all of these data and comments into consideration, we propose to naming the Aurignacian 0/Archaic Aurignacian/Protoaurignacian as the Aurignacian of Krems-Dufour industry type to emphasize its Pan-European geographic distribution, following here studies of J.K. Kozlowski on the subject in the 1970s (Kozlowski & Kozlowski 1975, 1979). Additionally accepting both its early geochronological position and the rather uniform industrial techno-typological characteristics within the European Aurignacian, it is logical to specify its basic attribution as the Early Aurignacian of Krems-Dufour industry type, the term which should replace all of the previous names.

The Siuren I Evolved/Late Aurignacian of Krems-Dufour industry type of 1990s Unit F/1920s Middle layer in the context of the European Aurignacian

As with the comparative analysis for the Siuren I 1990s Units H and G/ 1920s Lower layer Aurignacian, the first step for the present investigation on this problem is to present the basic industrial features of the Siuren I 1990s Unit F/1920s Middle layer Aurignacian. Technologically, it is characterized by intensive primary reduction of both "regular" and Aurignacian "carinated" bladelet, mainly single-platform, cores and "carinated tools" (end-scrapers and notably burins) that resulted in pronounced microblade production. Typologically, it is marked by the presence of serial carinated burins, the prevalence of dihedral and carinated types over angle and on truncation/lateral types among burins; the occurrence of carinated and flat/thick shouldered/nosed end-scrapers; the absence of scaled tools and retouched blades, including pieces with "Aurignacian-like heavy stepped retouch" and, finally, the presence of abundant "non-geometric microliths" (about 40% of all tools in the 1990s Unit F) among which the most characteristic types are Aurignacian Dufour bladelets and pseudo-Dufour bladelets with either lateral ventral or dorsal fine marginal retouch on microblades with an "off-axis" removal direction and twisted general profile (Demars' Roc-de-Combe sub-type) in the 1990s Unit F. The rather simple set of bone tools (points with round sections) and non-utilitarian objects (a single broken polar fox tooth pendant and some shell beads) complete this artifact collection.

By about all the above-listed characteristics, this Siuren I one more Aurignacian assemblage is indeed enough different from the rock-shelter's Lower Aurignacian find complex. Therefore, it represents another Aurignacian industry type.

The absence of any similar industries in the Crimea, again, as for the Siuren I Early Aurignacian of Krems-Dufour industry type, requires us to go beyond the peninsula to search for similar assemblages in Europe. It should be pointed out that industrially similar European Aurignacian complexes are not very common, unlike the Early Aurignacian of Krems-Dufour industry type, although they do exist; we will also discuss them by Western, Central and Eastern regions of the continent. It is also clear that the main "industrial techno-typological keys" for comparative analysis are: serial carinated burins and/or abundance of carinated and thick shouldered/nosed end-scrapers, regular occurrence of Dufour bladelets and pseudo-Dufour bladelets with lateral ventral and lateral dorsal fine marginal retouch mainly manufactured on microblades with "off-axis" removal direction and twisted general profile (Roc-de-Combe sub-type).

Western European Aurignacian complexes

The present knowledge on the respective Western European Aurignacian complexes is mainly restricted to French materials.

The most important relevant sites are known in the Périgord: Abri Pataud, level 8; Roc-de-Combe, levels 6-5 and Flageolet I, levels X-VIII. The main typological features of their lithic assemblages, bone tools and non-utilitarian objects data correspond well to this Siuren I Aurignacian complex with an understandably more important role for the busked variant of carinated burins for the French sites, which is so prominently expressed in the "Evolved/Late Aurignacian" there (see Movius 1977:113-120; Brooks 1995; Bordes & Labrot 1967; Demars & Laurent 1989:45, 47, 54-57, 102-103; Rigaud 1982; Lucas 1997; Djindjian 1993). In accordance with these archeological characteristics, the Périgord Aurignacian complexes are in the ranges of the well-known French Aurignacian II-IV stages – "Evolved/Late Aurignacian". The geochronological position of these Aurignacian complexes is related to the period between the Stadial before the Arcy Interstadial and the Maisières Interstadial (ca. 32,000-28,000 BP) that is based on C14 dates (e.g. conventional C14 date for Pataud, level 8 of 31,800 ± 280 BP – Movius 1977:120; C14 date for Flageolet I, levels IX of 27,000 ± 1000 BP – Lucas 1997:195) and various environmental data (e.g. Movius 1977; Laville 1982; Leroyer & Leroi-Gourhan 1993; Djindjian 1993).

It must be added that this state-of-the-art picture is changing in light of new technological studies. For example, Alexandre Michel has undertaken a new study of the Pataud, Roc-de-Combe, Le Flageolet and La Ferrassie collections (among others); according to him (Michel 2010), it is now possible to distinguish seven different phases in the Aurignacian complex *sensu lato*, including the (1) Proto-Aurignacian and (2) Early Aurignacian with split-based bone points that were discussed above. For the industries that are contemporaneous or comparable to Siuren I's Unit F in a way or another, Michel describes: (3) Middle Aurignacian with nosed end-scrapers, burins on truncation and "Pataud bladelets" (asymmetric with straight right lateral edge, curved left lateral edge, and inverse retouch on the right edge) [Pataud level 8, Ferrassie levels K4-K1], (4) Late Aurignacian with busked burins (mainly), nosed end-scrapers, Caminade end-scrapers, Caminade bladelets (small straight removals with fine direct retouch on the left) and "Roc-de-Combe layer 6 bladelets" (*i.e.* with inverse retouch on the right edge) [Roc-de-Combe layer 6], (5) Late Aurignacian with "destructured" burins and "Roc-de-Combe layer 5 bladelets" (*i.e.* with inverse retouch on the right edge and direct retouch on the left edge) [Roc-de-Combe layer 5, Le Flageolet layer F], (6) Evolved Aurignacian with *burins des Vachons*, and (6) Final Aurignacian with "Font-Yves bladelets" [Pataud layer 6]. These phases are not yet well situated from a chronological point of view, some of the latest being probably partially contemporaneous, but this work indicate at least a greater degree of complexity than usually thought, which does not, however, mean that the situation should be identical outside of the Périgord.

Two other cave sites with similar "Evolved/Late Aurignacian" assemblages are also known in Spain with conventional and AMS dates between 33,000-29,000 BP – Beneito, levels B9-B8 (Valencia) (Iturbe *et al.* 1993:48-54; Villaverde *et al.* 1998:139-148; Zilhao 2006:14-15; 38-40) and Bajondillo, levels 12-11 (Andalucia) (Cortes & Simon 2001:108-110; Zilhao 2006:14-15; 38-40).

Central European Aurignacian complexes

The only Aurignacian complex in this part of the continent, which can be considered as belonging to the Evolved/Late Aurignacian industry type, comes from the Gora Pulawska II open-air site (Eastern Poland). Its small lithic assemblage is quite unique typologically despite the presence of only 35 tools preserved today, obtained during the site's main excavations in the 1920s (Krukowski 1939-1948). Taking into account the low number of tools, it is useful to enumerate them according to Sachse-Kozlowska's data (1978:20 and Tables XLVI-XLVIII): end-scrapers – 19 pieces/54.3%, including 17 carinated and 1 thick-nosed; burins – 2 pieces/5.7% of only dihedral type; retouched blades – 1 piece/2.8%; truncations – 2 pieces/5.7% and, finally, "microblades with fine marginal retouch" – 11 pieces/31.4%. The latter mainly have bilateral dorsal and lateral dorsal retouch, with only a single occurrence of lateral ventral and bilateral alternate retouch. The great dominance of carinated *sensu lato* (including a thick-nosed piece) end-scrapers among the "indicative Upper Paleolithic tool types" is in good correspondence with the presence of two small bladelet "carinated" single-platform cores among a total of three cores in the assemblage. Thus, the presence of serial and numerous carinated end-scrapers and unique pseudo-Dufour bladelets and, at the same time, the absence of any carinated burins, are the main typological indicators of the Gora Pulawska II Aurignacian.

The geochronological position of the Gora Pulawska II Aurignacian is still rather uncertain. There are no absolute dates for the site, but it is commonly accepted that it belongs to the second temperate phase of the Würm Interpleniglacial (Kozlowski 1983:66) – Arcy + Maisières Interstadials. Generally, keeping in mind the northern geographical disposition of the site at 52°N latitude, it seems quite reasonable to suggest a temperate period for penetration of Aurignacian human groups into the European lowlands and, indeed, the Arcy + Maisières Interstadials are the best candidates here because of the Gora Pulawska II "developed/evolved" Aurignacian typological characteristics.

Eastern European Aurignacian complexes

Aside from the Siuren I 1990s Unit F/the 1920s Middle layer Evolved/Late Aurignacian with Dufour bladelets/pseudo-Dufour of Roc-de-Combe sub-type in Crimea, there are few other sites with a similar, to some extent, type of Aurignacian industry in Eastern Europe – mainly the find complexes of Kostenki I, layers 2 and 3 (Russia), Kostenki XIV, ashy layer, and Mitoc-Malu Galben (Romania), if we exclude redeposited Aurignacian finds within the Middle Paleolithic layers at Stinka I (Western Ukraine) and Monasheskaya Cave (North-western Caucasus, Russia). As a consequence, only the famous Kostenki Paleolithic area and the site of Mitoc are relevant to this discussion of Aurignacian materials.

Kostenki I, layers 2 and 3

The lithic assemblages of the two layers from Kostenki I taken together can be summarized as follows, based on the published data after 1951, the 1986 and 1989 excavation campaigns (Rogachev 1957; Sinitsyn 1993) and some of Demidenko's personal artifact observations in 1999 and 2001 in St.-Petersburg. Primary reduction artifacts are characterized by the dominance of bladelet single-platform cores some of which are likely "carinated" types, although many cores are exhausted. The two most common tool classes (each about 25% of all tools) are end-scrapers, of which one-third are carinated and thick shouldered/nosed types, and "non-geometric microliths". A sample of 57 retouched microliths was studied in some detail by Demidenko. These are mostly elongated and narrow (usually 0.5-06 cm wide) microblades with mainly bilateral dorsal (38 items/66.7%) and a few lateral dorsal (4 items/7.0%) fine marginal retouch (pseudo-Dufour bladelets) and with significantly fewer bilateral alternate Dufour bladelets (12 items/21.0%), a few Font-Yves/Krems points (3 items/5.3%) including two items with bilateral dorsal retouch and another with bilateral alternate retouch; Dufour bladelets with lateral ventral retouch are entirely absent. Looking at twisted/non-twisted general profiles, 54 microliths are mainly non-twisted (68.5%), while twisted items comprise only 31.5%. Burins (about 10% of all tools) are represented by dihedral, angle and on truncation types, with a notable presence of some carinated types as well. Scaled tools and retouched blades occur in about equal proportions of ca. 10% of all tools each. The retouched blades include a few items with "Aurignacian-like heavy stepped retouch" and some Aurignacian pointed items. Other tool classes are represented by truncations, perforators and retouched flakes. The lithic artifacts are also accompanied by a rich collection of bone tools and non-utilitarian objects (Sinitsyn 1993) which, however, have not yet been fully described and published.

The geochronological position of the Kostenki I Aurignacian has been determined by data from layer 3: thirteen C14 dates from different, pollen data the layer's stratigraphic position within the "Upper Humus Bed" (Denekamp + Kesselt + Tursac Interstadials, according to Sinitsyn 1993:243). This stratigraphic position is also important because the "Upper Humus Bed" is situated above (*sic!*) an ashy level at some Kostenki sites where the ashy level has been dated by AMS to ca. 32,000 BP or, according to its Campanian Ignimbrite eruption event affiliation, to ca. 40,000 BP. The C14 dates on various samples from different labs for Kostenki I layer 3 are in the range of ca. 38,000-20,000 BP (Sinitsyn *et al.* 1997: Table I on p. 50). Sinitsyn is inclined to accept absolute dates around 32,000 BP as, in his opinion, they are in good accordance with the stratigraphic and palynological data. Therefore, he has proposed the Arcy Interstadial time span for layer 3 (Sinitsyn *et al.* 1997:29). On the other hand, the latest obtained conventional C14 date of 25,820 ± 400 BP (GrN- 22276) on a fresh charcoal sample from recent excavations has been interpreted by Belgian and Dutch specialists as the most reliable absolute date for layer 3, which fits well with six other C14 dates also on charcoal samples between 25,900 and 24,500 BP (Damblon *et al.* 1996:201). At present, we are inclined to support the second proposition for the layer 3 Aurignacian chronology. It gets further support through our more detailed look at all 13 C14 dates for layer 3, choosing only dates with low sigma (less than 1000 years). In this case, four C14 dates (GrN and GIN labs) on charcoal samples form a good cluster between 25,820 and 25,400 BP and another C14 date on charcoal with low sigma is far beyond the noted chronological range – 32,600 ± 400 (GrN-17117). Taking the absolute dates of ca. 25-26,000 BP into account with the already noted common Interstadial(s) characteristics for the "Upper Humus Bed", it is possible to propose a correlation of Kostenki I, layer 3 to the "Pavlov II Interstadial (absolute dates ca. 25,500-25,000 BP) recently proposed for the Central and Eastern European Last Glacial chronostratigraphy (Damblon *et al.* 1996). It is also important to remember here that Kostenki I is geographically somewhat below 52°N latitude, placing it in a series of rare Aurignacian sites in the northern latitudes of the European continent.

The final question focuses on the industrial attribution of the Kostenki I, layers 2 and 3 Aurignacian complex. By the presence of carinated cores, end-scrapers and burins, Aurignacian bilaterally retouched blades and pointed blades, retouched microliths including 21% Dufour bladelets with bilateral alternate retouch, the complex, first of all, is true Aurignacian *sensu stricto*. At the same time, it appears that the complex includes different features of Aurignacian 0 (carinated cores and end-scrapers, retouched microliths), Aurignacian I (various Aurignacian blades) and Aurignacian II-IV (carinated burins). Also, the majority of bilaterally retouched items on unusually narrow microliths adds another unique feature to this Aurignacian complex. Taking all these techno-typological data into consideration, the complex is a special one within the known European Aurignacian taxonomy. Adding here its unusually late geochronological position, making it as the youngest Aurignacian *sensu lato* complex in Europe, it is possible to propose a hypothesis explaining its specific features due to its very late chronology. Moreover, the specific features and late geochronology of the Kostenki I Aurignacian have striking similarities in south-western France with the assemblage from uppermost level 6 at Abri Pataud (see Brooks 1995; Chiotti 1999). It is possible that comparisons of the Russian and French site materials would demonstrate a special sort of Late Aurignacian at two edges of Europe.

Of course, more work should be done at Kostenki I; new field investigations are underway by St.-Petersburg colleagues so more precise information will hopefully be available soon.

More information also is needed for the site of Kostenki XIV, ashy layer, even if technological analysis seem to indicate many convergences with Siuren I's Unit F (see Zwyns, this volume, and demidenko, this volume, Chapter 20).

Mitoc-Malu Galben

Mitoc-Malu Galben is located on the right bank of the river Prut, in Romania. Known since the 19th century, the main fieldwork began in 1978 by Vasile Chirica, with the help of a Belgian team (M. Otte, P. Haesaerts, Fr. Dambon and P. Noiret) in the 1990s (see Otte, Chrica & Haesaerts [dir.] 2007). It is an open-air location, on a promontory close to the river and to *formations crayeuses* in which flint is available. It was used as a knapping workshop for about 15,000 years, during both the Aurignacian and Gravettian periods. Archaeological remains correspond mainly to *débitage* waste, with few lithic tools, and few faunal remains, due to the purpose of the site, *i.e.* many short-term visits to the site for the preparation of lithic blanks. The Aurignacian sequence contains a set of three main assemblages (namely "Aurignacian I", "II" and "III", from the bottom to the top) with some characteristic lithics of the same cultural tradition slightly below the "Aurignacian I" during a cold episode between the first two climatic ameliorations of the second half of the Middle Pleniglacial. These isolated pieces are dated to around 32,700 BP. But the most important occupations correspond to the "Aurignacian I" assemblage. Many paleosoils are preserved in the stratigraphic sequence, providing one of the best preserved paleoclimatic sequence in Central and Eastern Europe for the second half of the Middle Pleniglacial. This Aurignacian I assemblage corresponds mainly to the paleosoil of the "MG11" interstadial, equivalent to Arcy in Western Europe, dated to 31,100-31,000 BP (Haesaerts *et al.* 2007). A Mladeč point made on reindeer antler confirms the attribution to a typical Aurignacian.

Lithic remains of the "Aurignacian I" assemblage are similar to Siuren I's Unit F, both in terms of technology and typology. Lamellar production in Mitoc was questionable for a long time, since bladelets were rarely recovered during excavations. But hints exist that could lead to the conclusion of a bladelet production, including, among others, the presence of short and twisted bladelets, from the front area of carinated tools (Noiret 2005a). The same bladelets were sometimes found (Otte & Chirica 1993; Otte *et al.* 2007), but in low quantity due to lack of screening. 667 lithics from a sediment sample from a hearth collected for dating, and recovered after careful screening, later proved that such production was really undertaken on the site, with a set of some 120 bladelets and micro-bladelets in less than one square meter (!) (Noiret *et al.* in press), and showing further technological similarities with Siuren I's Unit F (Zwyns this volume). This set of lithics has been directly dated to 31,160 ± 530 BP (GrN-20770).

From a technological point of view, 4 or 5 different bladelet *chaînes opératoires* are distinguishable. End-scrapers or nosed end-scrapers were used to produce small bladelets and this set of lithics contained some corresponding technical pieces (platform rejuvenation tablet, lateral preparation flakes to correct the angle of the flaking surface on the core-tool). Carinated burins also produced bladelets, probably of rectilinear or slightly curved profile and slightly longer than those from end-scrapers. A third method corresponds to small prismatic or pyramidal cores and a fourth is assumed from the presence of pieces and cores with long lamellar negatives on their narrow side. A fifth method could even be suspected due to the presence of flat lamellar scars on some burins, showing some similarity to the *burin des Vachons* (Noiret *et al.* in press). These *chaînes opératoires* were intended to produce blanks to be exported from the site, as proven by the total lack of any retouched bladelet!

Concerning the tools, the main characteristic of the "Aurignacian I" assemblage in Mitoc is the number of carinated burins (n=48, for a total of 200 tools), the most frequent tool, followed by carinated and nosed end-scrapers (n=44), and with notably three busked burins (Noiret 2004, 2006b). Chronological data for this assemblage are totally coherent with the three dates from Unit F in Siuren I, helping also to consider that Units G and H of the same site should probably be older (see Demidenko & Noiret this volume). And the presence of busked burins together with carinated burins recalls sub-units Fb1-Fb2 at Siuren I (Zwyns this volume).

Other sites?

The question is to determine whether other sites could have existed in the area, showing the same kind of Aurignacian industry. The site of Corpaci-Mâs (Borziac *et al.* 1981; Borziac & Chetraru 1996) is located on the other bank of the Prut River, in the Moldavian Republic, but very close to Mitoc. The lithic industry includes some carinated tools (end-scrapers), but also two foliate points that may indicate some problems of mixing for this assemblage. The presence, at any rate, of two Mladeč points, seems to indicate that a typical Aurignacian occupation also took place at this site, at one moment or another. In the same country, but along the Dniestr, the site of Climăuţi II may also have been the place of some Aurignacian occupations (Borziac *et al.* 2007), but chronological uncertainties still exist, and the lithic assemblage should be the focus of new and more detailed analysis.

Final considerations

So, the data on the Kostenki I and Mitoc Aurignacian, with only some techno-typological similarities to the Siuren I 1990s Unit F/1920s Middle layer Evolved/Late Aurignacian, allow us to make the following conclusions and hypotheses which may be especially interesting for comparisons to the European Early Aurignacian of Krems-Dufour industry type complexes observed above in this chapter.

First, the number of European Aurignacian sites comparable to the Siuren I Evolved/Late Aurignacian is smaller than the number of sites that can be compared to the Early Aurignacian of

Krems-Dufour type. Next, many European Early Aurignacian of Krems-Dufour industry type complexes were strikingly uniform in terms of industrial features and the characteristics of bone tools and non-utilitarian objects. The opposite is indeed true for the Evolved/Late Aurignacian complexes – they are represented by only a few important sites which are often quite different. Accordingly, a thought experiment in which dislocation of almost any Early Aurignacian of Krems-Dufour industry type find complex from one region to another one on the European continent would not "spoil the overall archeological picture", appears impossible for the Late/Evolved industry type assemblages under discussion due to the many differences between them.

Now let us discuss the shared and different traits of these Evolved/Late Aurignacian industry type complexes in Europe. It is possible to subdivide these Aurignacian complexes into two groups based on archeological characteristics and geographical position.

The first group would include the Crimean Siuren I 1990s Unit F/1920s Middle layer and the sites discussed here in south-western France and southern Spain. All of these are more or less similar in the main archeological and geochronological characteristics summarized above. The important moment is also a geographical one. Both the Crimean and French sites are located on the same "geographical band" around 45°N latitude and in similar environments – along river valleys within piedmont hill areas of medium elevation. The two Spanish sites are similarly located but further south in south-western Europe.

Mitoc is close, at about 48°N latitude. The lithic technology include a wider range of methods for the bladelet production than the above mentioned other sites, but as the retouched bladelets are completely lacking, precise comparisons with Siuren I or the French and Spanish sites are not easy (let us remember, nevertheless, presence of a few busked burins in Mitoc and Siuren, with carinated burins being the main characteristic of Mitoc's "Aurignacian I").

The second group of Aurignacian complexes can be created by considering together Polish Gora Pulawska II and Russian Kostenki I, layers 2 and 3. Because these Central and Eastern European complexes exhibit some significant differences with the Aurignacian assemblages from the first group and also between them, further discussion is needed here. Regarding the lithic artifacts, the Gora Pulawska II and the Kostenki I Aurignacian complexes in comparison to the Western European and the Siuren I complexes have a much more important role for microblades with fine dorsal marginal retouch (pseudo-Dufour bladelets). The Gora Pulawska II Aurignacian is also known by very limited tool class varieties – carinated and thick nosed end-scrapers and retouched microliths together comprise 82.9% of all tools (!) that definitely evidences a very specialized activity taking place at the site, which is also seen by the spatial distribution of flint artifacts in the archeological level – "4 small concentrations of artifacts around the hearths" (Sachse-Kozlowska 1983:177). On the other hand, the Kostenki I Aurignacian find complex contains products reflecting a great variety of activities undertaken at the site and, therefore, in our opinion, they certainly differ from Gora Pulawska II in typological features and the abundance of different bone artifacts. Moreover, while the Gora Pulawska II assemblage is highly likely the result of a single human occupational episode, in contrast, the Kostenki I, layer 3 assemblage, according to Rogachev (Rogachev 1957:30-34), is the combination of several archeological horizons and the result of multiple human occupational episodes. Thus, this variability in number of occupations can in fact explain the observed artifact differences which, in this case, can be transformed into the more understandable simple variability within the same Aurignacian artifact production and use system. Accepting this, we might go further to sites at the same geographical position – at around 52°N latitude. Finally, geochronological positions for the Gora Pulawska II and the Kostenki I Aurignacian find complexes are also notable because the latest chronology for the Kostenki I is actually beyond the "chronological upper limit" for European Aurignacian development *sensu stricto* (around 28,000 BP) and perhaps the same applies to the Gora Pulawska II Aurignacian. Taking all these considerations together, we may further suppose some special kinds of adaptations of Aurignacian human groups during their penetration into the European Lowland areas at the very end of the Würm Interpleniglacial ca. 26,000-25,000 BP, expressed, first of all, by the increasing role of carinated *sensu lato* end-scrapers, including thick shouldered/nosed ones, (small "mobile" bladelet/microblade cores?) and changing of fine marginal retouch placement from bilateral alternate and lateral ventral to bilateral dorsal and lateral dorsal, possibly reflecting a different use of these pseudo-Dufour bladelets on microblades as composites of projectile points.

Now finishing our "*summa summarum*" on the Siuren I 1990s Unit F/1920s Middle layer Aurignacian and the related European Aurignacian complexes, we think that it is possible to attribute all of these complexes to the Evolved/Late Aurignacian of Krems-Dufour industry type. This shows both changing industrial traits through time from the European Early Aurignacian of Krems-Dufour industry type and the internal development from the first group to the second of this Aurignacian type of complexes as the most likely result of adaptation to different environments and climate. Chronologically, the complexes of the first group should be dated from before the Arcy Interstadial to the Maisières Interstadial (ca. 33/32-28,000 BP), while the complexes of the second group may possibly be dated to the Pavlov II Interstadial (ca. 25,500-25,000 BP) at the very end of the Würm Interpleniglacial.

Concluding remarks

Putting the Siuren I Aurignacian complexes of 1990s Units H and G/Lower layer and of 1990s Unit F/1920s Middle layer into the context of the European Aurignacian indeed evidences their attribution to this Early Upper Paleolithic technocomplex. Moreover, the Siuren I Aurignacian complexes do, in fact, fit into the European Aurignacian of Krems-Dufour industry type complexes corresponding to this Aurignacian type, with two sub-types which we propose to name the Early and Evolved/Late. Each of these sub-types is quite distinct with respect to their archeological find characteristics, basic geochronological positions within the Würm Interpleniglacial and geographic distribution in Europe.

On the other hand, we are not inclined to consider the European Aurignacian of Krems-Dufour industry type as a "culturally" Aurignacian type completely separate of the Typical Aurignacian in Europe. This is explained by the fact that all basic "Indicative Upper Paleolithic Tool types" (carinated and thick/flat shouldered/nosed end-scrapers; carinated burins, including busked type; retouched blades with "Aurignacian-like heavy stepped retouched", particularly for some complexes in Central and Eastern Europe for the latter type), bladelet "carinated" cores, bone tools and non-utilitarian objects occur in both these types of European Aurignacian, keeping also in mind the notable occurrence of a few Dufour bladelets in Typical Aurignacian complexes as well. Thus, different proportions of the same artifact types cannot be used to support such a radical Aurignacian separation. Instead, we consider the European Aurignacian of Krems-Dufour industry type as reflecting a special adaptation system of human groups of the Early and then Late Aurignacian traditions to their environmental surroundings and to meet survival needs. In addition to a cultural interpretation, our opinion is in many aspects in accordance with J.K. Kozlowski's point of view on these Aurignacian problems, expressed by him in the late 1970s and which is cited below.

"… *the distinction between Typical Aurignacian and Krems-Dufour culture is partly a question of functional-ecological adaptation, and partly the expression of the stabilization of this distinction and of the formation of a separate cultural tradition. Subsequently, this tradition developed independently of any further adaptation processes*" (Kozlowski & Kozlowski 1979:29).

Specifically, Kozlowski's accent on "functional-ecological adaptations" and "this tradition development" correspond well to our proposals, although since the 1980s, J.K. Kozlowski has not continued to define the Aurignacian of Krems-Dufour industry type in Europe as a separate Aurignacian culture (e.g. Kozlowski 1993:287). Thus, considering these "functional-ecological adaptations" and "this tradition development" together, common changing trends through time for the European Aurignacian (e.g. the more important role of carinated burins in Evolved/Late Aurignacian), we see the development of both Typical Aurignacian and Krems-Dufour type complexes in similar ranges with, at the same time, changing of "non-geometric microlith" types for the latter type complexes, continuing their further adaptations to varying environments and climates. The "Pan-European" spatial distribution of these complexes additionally confirms a "genuine" basic Aurignacian uniformity.

Finally, the Aurignacian *sensu stricto* possibly left some successors in the European Upper Paleolithic after the end of Würm Interpleniaglacial (e.g. see Hahn 1977; Oliva 1993 on Central European Epi-Aurignacian dated ca. around 22-18,000 BP). The same is also true for the Central and Eastern European Evolved/Late Aurignacian of Krems-Dufour industry type, represented by Gora Pulawska II and Kostenki I, layers 2 and 3. During the Würm Second Pleniglacial and specifically its Cold Maximum phase (LGM) between ca. 22,000-18,000 years BP with the expansion of the polar front and extreme periglacial climatic conditions and environments much further to the south in comparison to the Würm Interpleniaglacial, the Aurignacian groups with the Central and Eastern European Evolved/Late Aurignacian of Krems-Dufour industry type complexes located at around 52°N latitude also had to move to the south to "refugia areas" as was assumed for the entire Northern European Upper Paleolithic population around that time (see Jochim 1987). We suggest (Demidenko 1999, 2008a) that the appearance of the "North Black Sea region Epi-Aurignacian of Krems-Dufour industry type" (Sagaidak I, Anetovka I, Muralovka, Zolotovka I sites) at ca. 22,000-18/17,000 years BP, in southern Ukraine and Russia below 48°N latitude was the result of such a migration of Aurignacian groups with already existing adaptations to the harsh European Lowland environments during the end of the Würm Interpleniglacial with "mobile" carinated *sensu lato* end-scrapers and pseudo-Dufour bladelets. The Epi-Aurignacian complexes in the southern part of Eastern Europe are, first of all, characterized by carinated atypical (i.e., with shortened non-lamellar removals) end-scrapers and numerous pseudo-Dufour microblades and chips of "Sagaidak-Muralovka" type with bilateral dorsal and lateral dorsal fine marginal abrasion retouch (see Praslov & Philippov 1967; Praslov 1972; Praslov *et al.* 1980; Praslov & Shchelinsky 1996; Stanko *et al.* 1989; Smolyaninova 1990). The main industrial traits of these Epi-Aurignacian complexes can be interpreted as a further step towards diachronic change of Aurignacian tool types which at ca. 22-20,000 BP became the only Aurignacian ones there. Both the time span and these Aurignacian tool types are reasons to term these complexes "Epi-Aurignacian of Krems-Dufour industry type". Such are the closest "historical traits" of the Evolved/Late Aurignacian of Krems-Dufour in this part of Europe.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 359-373.

19 - SMALL LAMINAR BLANKS AT SIUREN I ROCKSHELTER: TECHNOLOGICAL & COMPARATIVE APPROACH

Nicolas ZWYNS

During the last two decades, a great emphasis has been brought on the production of small laminar elements among Upper Paleolithic assemblages of Eurasia. Bladelet and microblade technological systems have been described within various techno-complexes, such as Aurignacian, Gravettian, Proto-Solutrean and Magdalenian in Central and Western Europe (Aubry *et al.* 1995; Lucas 1997; Bon 2002; Bordes & Tixier 2002; Langlais 2004; Bordes 2005; Flas *et al.* 2006; Klaric 2006; Michel & Pesesse 2006; Pottier 2006; Teyssandier 2006; Teyssandier *et al.* 2006), and Early Ahmarian, Aurignacian and Kebaran in the Near-East (Chazan 2001; Monigal 2003; Williams 2003; Goring-Morris & Davidzon 2006; Lengyel 2007). Based on the material from South-Western Europe, some researchers have rehabilitated the distinction between Proto-Aurignacian, the Early Aurignacian, and subsequent Evolved Aurignacian. Mainly by stressing techno-economic differences in the production of small laminar elements, they have confirmed the existence of a variant prior to the 'Aurignacian I'. The latter is similar to the Proto-Aurignacian, an entity previously identified in Southern Europe mainly on a typological basis (Laplace 1966b; Broglio *et al.* 1996; Broglio *et al.* 2005). This distinction has been sometimes interpreted as reflecting regional variability (Bon 2002), but also as illustrating a diachronic pattern (Bordes 2005; Mellars 2006b; Teyssandier 2006). Stratigraphic successions such as Proto-Aurignacian/Early Aurignacian (e.g. Esquicho Grapaou, Abri Mochi, Le Piage, Labeko Koba, Isturitz, L'Arbreda, Cueva Morin) and Early Aurignacian/Evolved Aurignacian (e.g. Caminade-Est, Abri Pataud, Cuvea Morin), have been documented in several sequences (Maroto *et al.* 1996; Kuhn, & Stiner 1998; Soler 1999; Bazile 2002; Kuhn 2002; Arrizabalaga *et al.* 2003; Chiotti 2003; Bordes 2005; Maillo Fernandez 2005; Teyssandier *et al.* 2006; Normand *et al.* 2007; Bordes *et al.* 2010).

Against the odds, small laminar elements have turned out to be influential in larger debates, leading to the re-assessment of interpretative models such as the development of the Aurignacian techno-complex, or shifting pre-existing models of Anatomically Modern Humans (AMH) dispersal to the Proto-Aurignacian. The proposed models of AMH dispersal point out two main different routes leading to Europe (Bar-Yosef 2002; Mellars 2006b). In the Northern route scenario, Eastern Europe is colonized from the western ridge of the Black Sea. However, such models are raising a number of issues regarding direct inter-regional comparisons between lithic assemblages (Tsanova *et al.* in press). The techno-economic, typological and metric attributes of the small laminar products remain difficult to compare with the Western and Central European records. This situation is partly due to the scarcity of multilayered Aurignacian sites eastward of the Carpathian mountain range, but also because of numerous theoretical and methodological differences between scholars.

In this context, the Siuren I rockshelter is of great interest as it has yielded three distinct cultural units attributed to the Aurignacian technocomplex *sensu lato*, giving us the opportunity to perform a detailed technological description of the material and to compare our results with the existing data set.

Sampling and measurement

In order to outline the major trends of the small laminar elements production, we sampled sub-levels Fb1, Fb2, Gc1-Gc2, and Unit H, trying to obtain a relevant and representative picture of the technological traits expressed in the assemblages. The material is classified here by arbitrarily defined categories (tabl. 1, fig. 6). The bladelet category groups all laminar elements with widths smaller than 12mm and larger than 6 mm, while the microblades category groups elements with a width smaller than 6 mm[1]. The sample analyzed for sub-level Fb1 is an exhaustive selection including all cores, retouched and non-retouched blanks available, with the exception of a few problematic fragments[2]. Sub-level Fb2 has yielded more than a thousand unretouched elements, just a few displaying secondary treatment. Regarding the unretouched blanks, we consider here the sample from Fb1 very similar to Fb2 and sufficient for the purpose of this analysis. The material from sub-levels Gc1-Gc2 and Unit H

[1] Although our total counting of artifacts is in overall agreement with those mentioned in other chapters (Demidenko, Chabai, this volume), small differences in number of elements within sub-categories may occur. This is partly due to the measurement method, Y. Demidenko and V. Chabai measuring the width in the middle of the piece.

[2] Were considered here only cores on which technological features, such as multiple laminar removals, could still be observed at the time of discard.

	Fb1		Fb2		Gc1-Gc2		H	
	n	%	n	%	n	%	n	%
bladelet	135	34%	0	0%	277	59%	61	44%
retouched bladelet	2	1%	8	14%	40	8%	16	12%
microblade	242	62%	0	0%	96	20%	33	24%
retouched microblade	14	4%	48	86%	58	12%	28	20%
	393	100%	56	100%	471	100%	138	100%

Table 1 - General composition of the blank sample.

	n	%
Fb1	5	21%
Fb2	8	33%
Gb1-Gb2	2	8%
Gc1-Gc2	4	17%
Gd	1	4%
H	4	17%
	24	100%

Table 2 - Cores included in the sample.

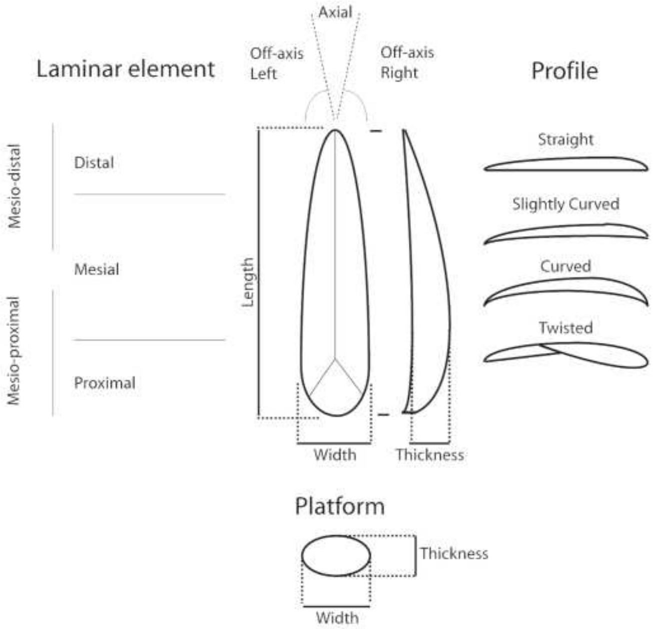

Figure 1 - Measurement methodology.

is here entirely represented, with the exception of a few problematic elements and with the typical burin spalls that might have been sources of bias. In addition, we studied cores from sub-levels Gb1-Gb2, Gb2a and Gd (tabl. 2). We will not analyze blade production here although relationships between the production systems will be discussed in the concluding paragraphs.

The sample considered is described according to technological and metric attributes to provide a realistic picture of its internal variability. The attribute list is composed of quantitative (measurement) and qualitative (e.g. type of platform, type of profile, conservation) data. The length was measured only when laminar elements were complete; width and thickness are always measured at their maximum (fig. 1). Platform surfaces are measured in length and width. Profiles are qualitatively described following a classification adapted from previous studies (Bon 2002). Only blanks which are twisted until their mid-section will be considered as such. Cores are described according to their technological features, and typologically categorized independently afterward (fig. 2)

We use box-plot and bag-plot charts to distinguish the main trends among a sample. These charts are constructed around a median value and therefore, identify outliers that could be sources of bias. We use the Mann-Whitney U-test to compare measurements as it allows comparisons between two different sample sizes. When applying Shapiro-Wilk test, most of the samples appear as non-normally distributed. They show, however, skewed unimodal distributions close to the normal fit. We use one-way Anova and Tukey's pairwise comparisons to compare means.

Sub-level Fb1

Cores

Among the five cores analyzed in unit Fb1 (fig. 3), three were produced on small sized pebbles/nodules and two on flake

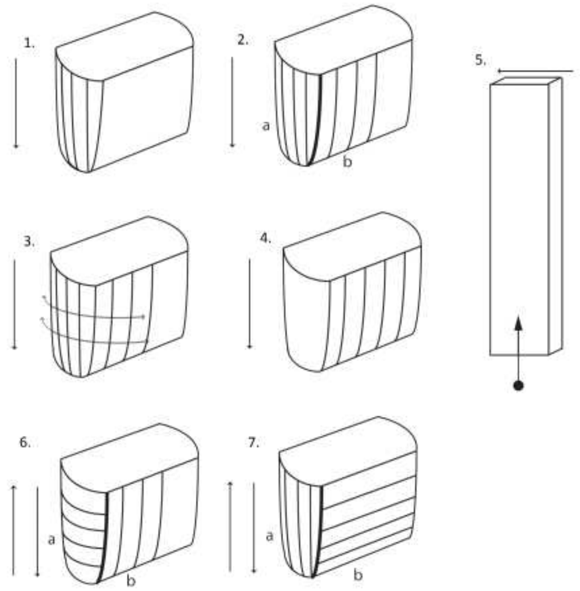

Figure 2 - Core morphology. 1-2, frontal reduction; 3, semi-tournant; 4, reduction starting from the broad face; 5, burin, removals perpendicular to the longitudinal axis; 6-7, orientation change.

blanks. Among the three cores on pebbles, two are *semi-tournant* starting the reduction from the narrow edge of the block, the third one showing two separate flaking surfaces, testifying to a change of orientation over the course of the reduction process. The two cores on flakes display unidirectional frontal and *semi-tournant* reduction patterns, both starting from the narrow edge of the blank slightly expanding on the wide face. The frontal reduction takes place perpendicularly to the flake's long axis. All cores show a plain striking platform, only one being reshaped by a tablet removal. Although they were discarded, four cores of the five retain traces of a thin abrasion on the external ridge

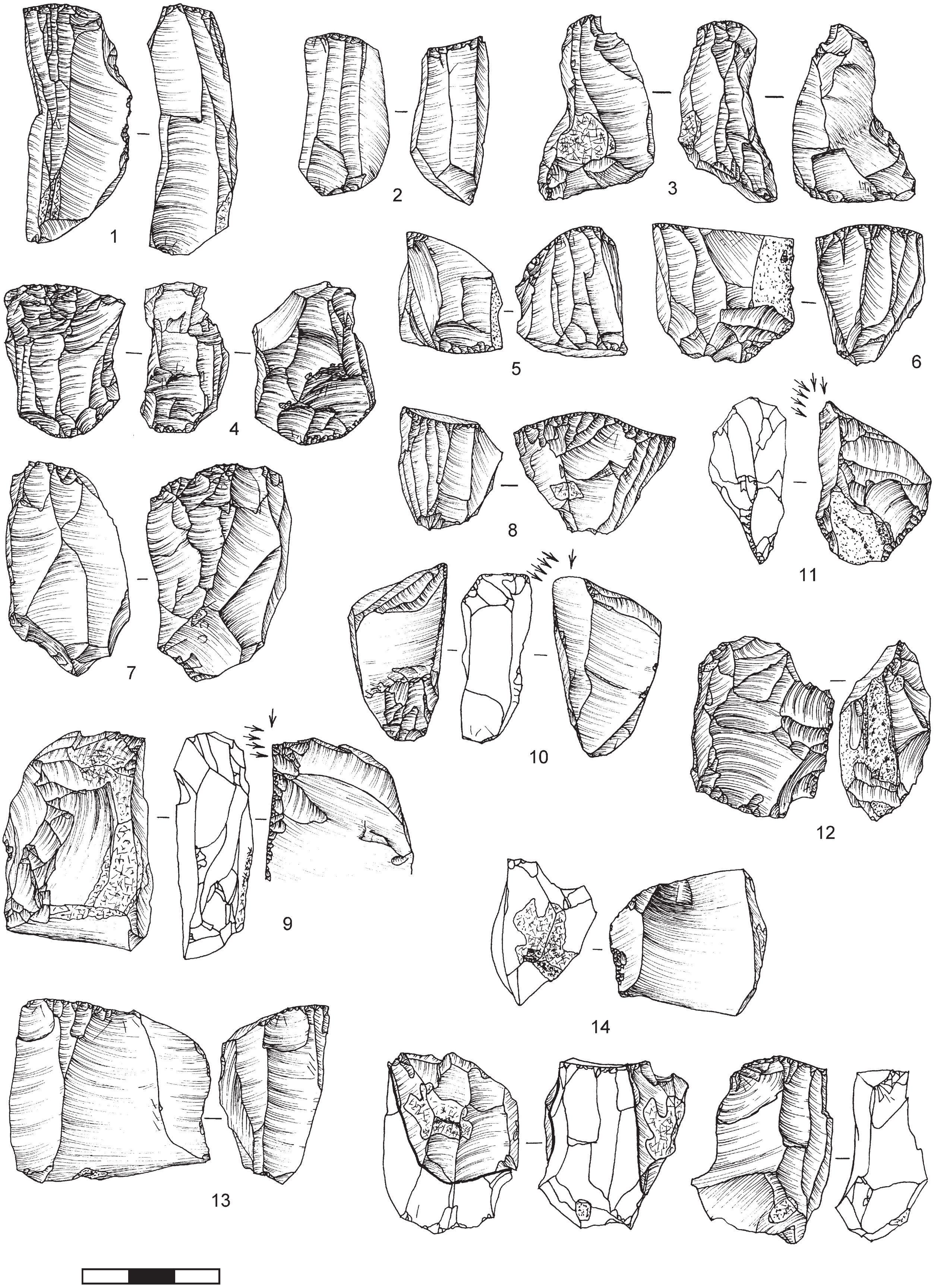

Figure 3 - Cores from sub-levels Fb1&Fb2 (illustrations borrowed with the courtesy of Y. Demidenko).

of their striking platform. All of the complete last removals observed on the core flaking surfaces show a twisted profile combined with an off-axis orientation. Those blanks have lengths between 16 and 26 mm and widths between 3 and 8.5 mm. Flaking surfaces are of a triangular shape due to the convergent orientation of the removals. Their proportions vary between 23 and 27 mm in length and between 7 and 21 mm in width. Only one artifact shows a shorter flaking surface (12 mm length), perhaps due to reduction effects. Lateral management flakes were detached from the striking platform except in one case, for which the flakes were removed from the distal end of the core. From a typological point of view, two cores can be classified as carinated endscrapers, and two as carinated burins (Demars, & Laurent 1992), the remaining item being categorized as a prismatic core.

Laminar blanks

When we compare the samples of unretouched and retouched elements, we observe a similar distribution although retouched blanks are more clustered. Unretouched elements show a mean of 5.7 mm width with a standard deviation of 2.2 mm. Retouched elements show a mean of 4.9 mm width and a standard deviation of 1.6 mm. These two samples belong to the same population(Mann-Whitney, T=UB=2416, p=0.18) (fig. 4-5).

Most of the Fb1 laminar elements show oblique external platform angle, the external ridge systematically showing traces of abrasion. In spite of their small size, artifacts display macroscopic lips on their platform internal ridge. Platforms are plain, showing a thickness of 0.5 mm maximum and a width ranging between 0.1 and 3.5 mm.

Dorsal scars show a majority of unidirectional removals, and when preservation allows us to observe it, a clear trend toward a convergent orientation. Sections are triangular or trapezoidal, with only in a few cases rectangular (naturally backed or *pan revers*).

While the profiles of non-retouched elements seem to be equally represented, the situation is different when looking only at retouched tools. As previously noted (see tabl. 1), almost exclusively microblades have been retouched. Twisted elements represent half of the sample. The curved, slightly curved and straight elements are then equally represented (fig. 6). However, when looking at the orientation of retouched elements, we observe that 10 artifacts out of 14 are off-axis, 2 being axial and 2 others undetermined. Moreover, twisted elements are systematically combined with the off-axis character.

The retouched microblades (fig. 7 & 8) show a majority of direct retouch (n=7), directly followed by inverse retouch (n=6), only one with alternate retouch. Among the artifacts with direct retouch, some are backed combining 90 degrees marginal steep and semi-steep retouch (2 microblades and 1 bladelet) on the right edge, others show a combination of thin and semi-steep retouch on the right edge (n=4), only one showing retouch on the left distal end. Artifacts displaying inverse retouch show mainly thin retouch but also a combination of marginal thin and semi-steep retouch on the right edge (n=4), but also on the

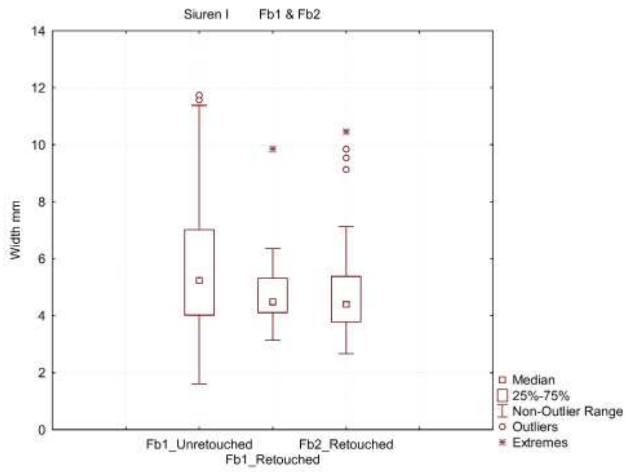

Figure 4 - Box-plot comparing the width distribution between unretouched and retouched elements from sub-level Fb1 and retouched elements from sub-level Fb2. Whiskers are drawn from the top of the box up to the largest data point less than 1.5 times the box height (upper inner fence). The circles represent values which are outside the upper inner fence, considered here as outliers.

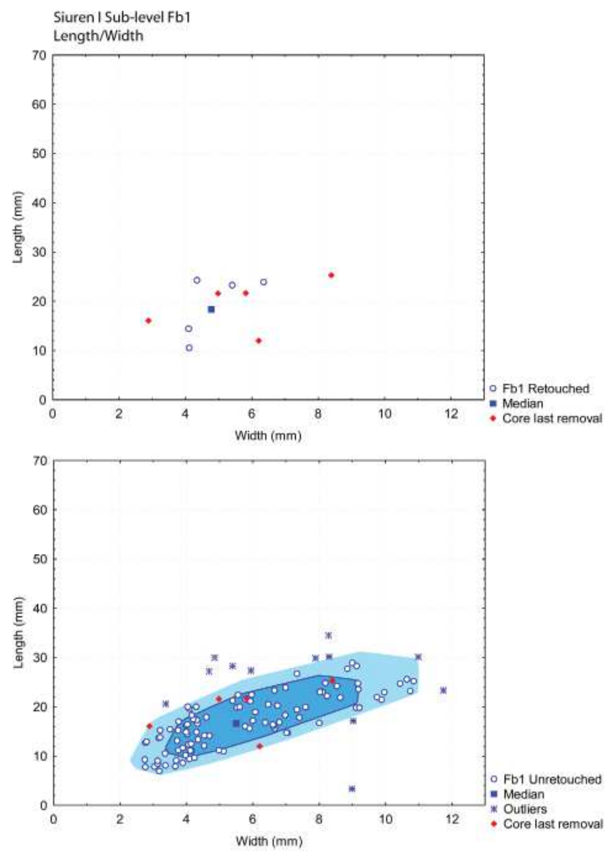

Figure 5 - Bag-plot chart showing the length/width distribution of retouched and unretouched elements from sub-level Fb1, compared with the complete last removals observed on the cores. The dark circle (bag) represent 50% of the observations with greatest bivariate depth. The light circle (loop) represent three times the bag (fence).

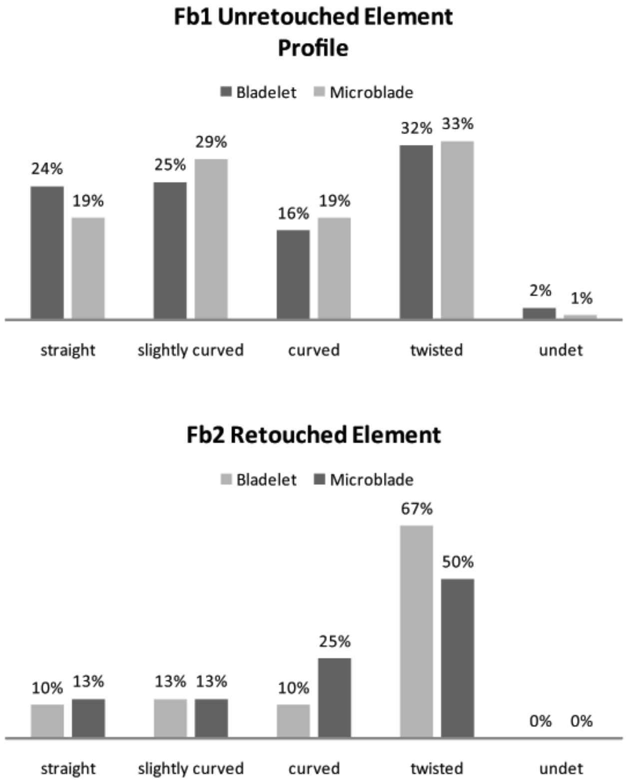

Figure 6 - Sub-levels Fb1&Fb2, laminar element profiles.

left edge (n=2). These artifacts can be classified typologically as Dufour microblades. However, the Dufour *Roc-de-Combe* sub-type, defined as showing a combination of twisted profile and inverse or alternate retouch (Demars & Laurent 1992), is almost absent. If the general morphology of the Dufour microblades comes close to this sub-type, it is by their metric attributes and their off-axis orientation. Actually, only one Dufour microblade displays a clear twisted profile. The single retouched bladelet of the Fb1 sample has a combination of thin and semi-steep direct retouch along the mesio-distal end.

Sub-level Fb2

Generally speaking, Unit Fb2 show strong affinities with Unit Fb1. Retouched bladelets (n=5), retouched microblades (n=51) and cores (n=9) have been analyzed here.

Cores

Five of the cores (fig. 3) are produced on small nodules, three on laminar flakes and one on flake. Six cores show unidirectional removals, five of them following a frontal reduction pattern, only one of them extending slightly on the wide side. Two cores display opposed striking platforms on the narrow edge, the removals following the long axis of the piece. One artifact shows two separate flaking surfaces as the result of a change of orientation over the course of reduction. The external platform

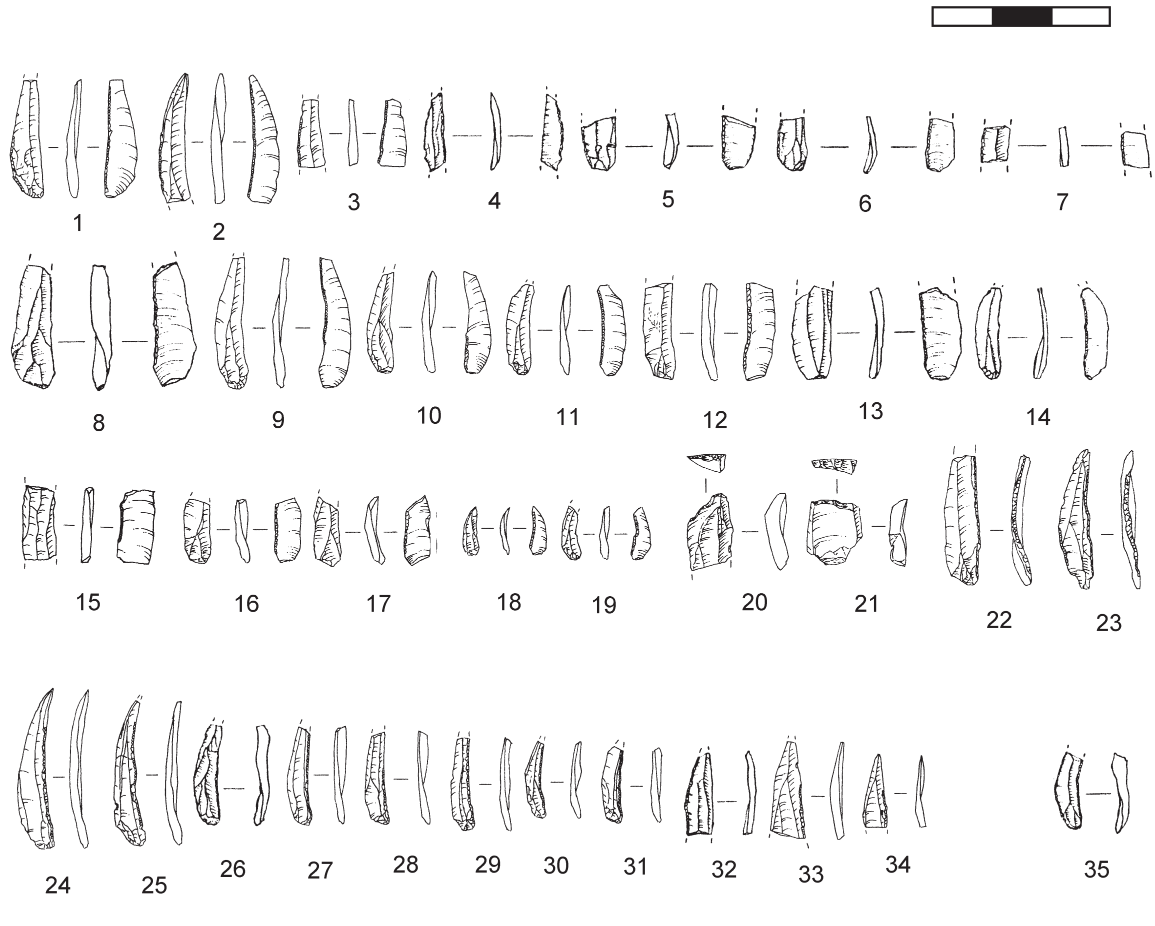

Figure 7 - Retouched bladelets and microblades from sub-levels Fb1 and Fb2 (illustrations borrowed with the courtesy of Yu. E. Demidenko).

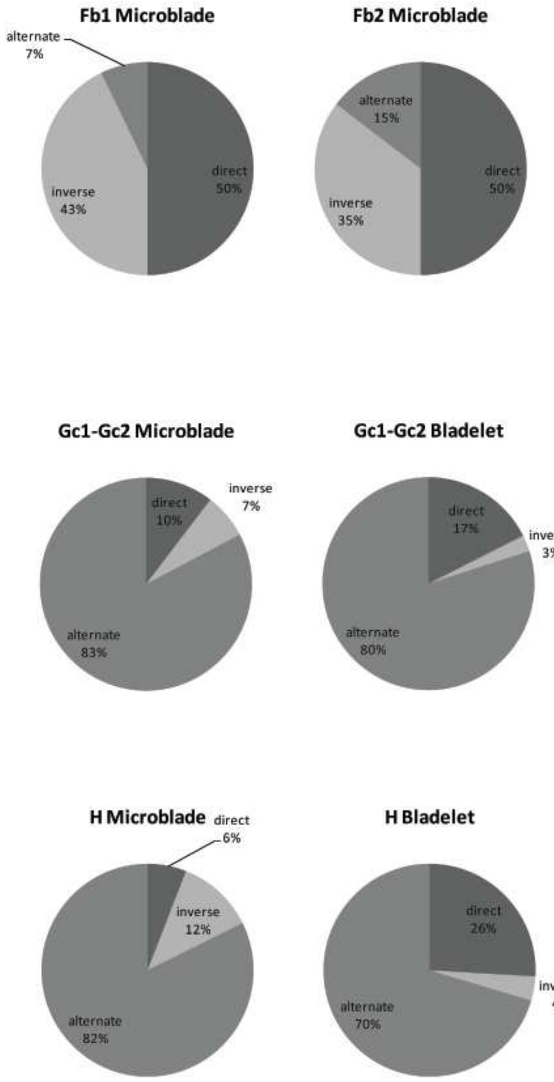

Figure 8 - Retouch location charts.

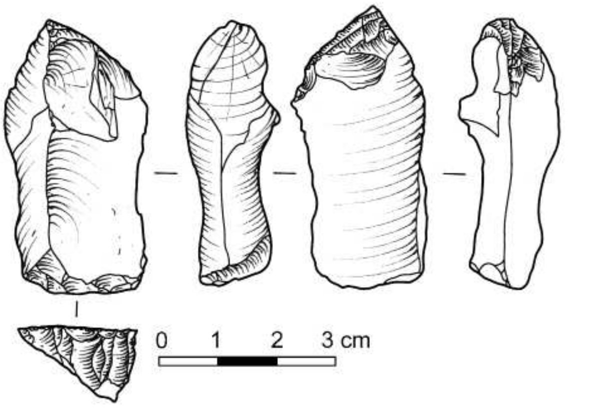

Figure 9 - Sub-level Fb2, Busked burin (drawing by N. Zwyns).

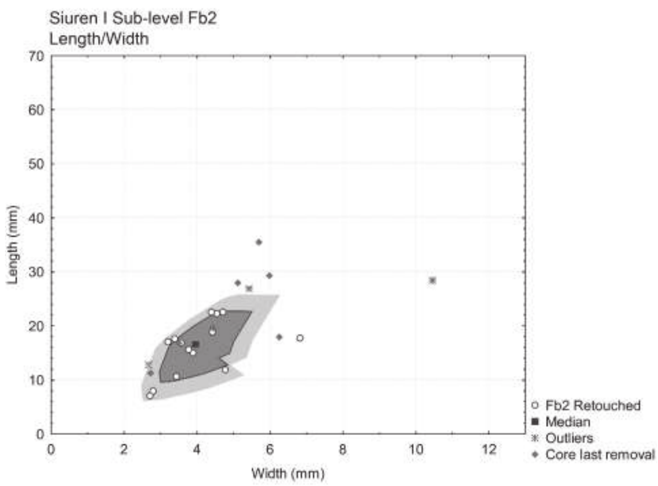

Figure 10 - Bag-plot chart showing the length/width ratio of retouched elements from sub-level Fb2, compared with the length/width ratio of the complete last removals observed on the cores. The dark circle (bag) represent 50% of the observations with greatest bivariate depth. The light circle (loop) represent three times the bag (fence).

angle is oblique and the external ridge shows traces of abrasion. The preserved striking platforms are plain. Flaking surface management is sometimes achieved by the removal of an overshot from the striking platform, and lateral management is mainly performed by flake removals from the striking platform. All observed removals on flaking surfaces show a convergent orientation. From a typological point of view, cores can be classified as carinated burins (n=2), as core-burin (n=1), carinated endscraper (n=1), shouldered endscrapers (n=2), and busked burin (n=1) (de Sonneville-Bordes & Piveteau 1960; Demars & Laurent 1992) (fig. 9). The latter is a produced on a secondary crested blade. One end displays lateral removals perpendicular to the blank's long axis. Removals are stopped by a notch which is surrounded by small retouch. The last microblade removed some of these retouch scars and one of the negatives on the ventral face seems to indicate similar preparation in the earliest stages of the reduction[3]. The opposite end shows chips removals ending with an endscraper morphology.

[3] This indicates that the last microblade removal occurred after the production of the notch (Flas *et al.* 2006).

Laminar blanks

The mean of width measurement is 4.7 mm with a standard deviation of 1.6 mm (figs. 4 & 10). Following the conventional definition, we observe 5 retouched bladelets. Two are of curved profiles, one is slightly curved, one is straight and one is twisted. Three are off-axis, one is axial and one profile remains undetermined. All of them have direct thin/semi-steep retouch. Three of these bladelets have distal retouch somewhat similar to a small truncation, one has a continuous retouch along the right edge and one has proximal retouches on the right edge. Only one is complete with a length of 28 mm. Platforms are plain and abraded on their external ridge and show macroscopic lips.

The retouched microblades (n=51) are clearly dominated by twisted elements, other types of profiles being equally underrepresented (fig. 6). They are transformed by a combination

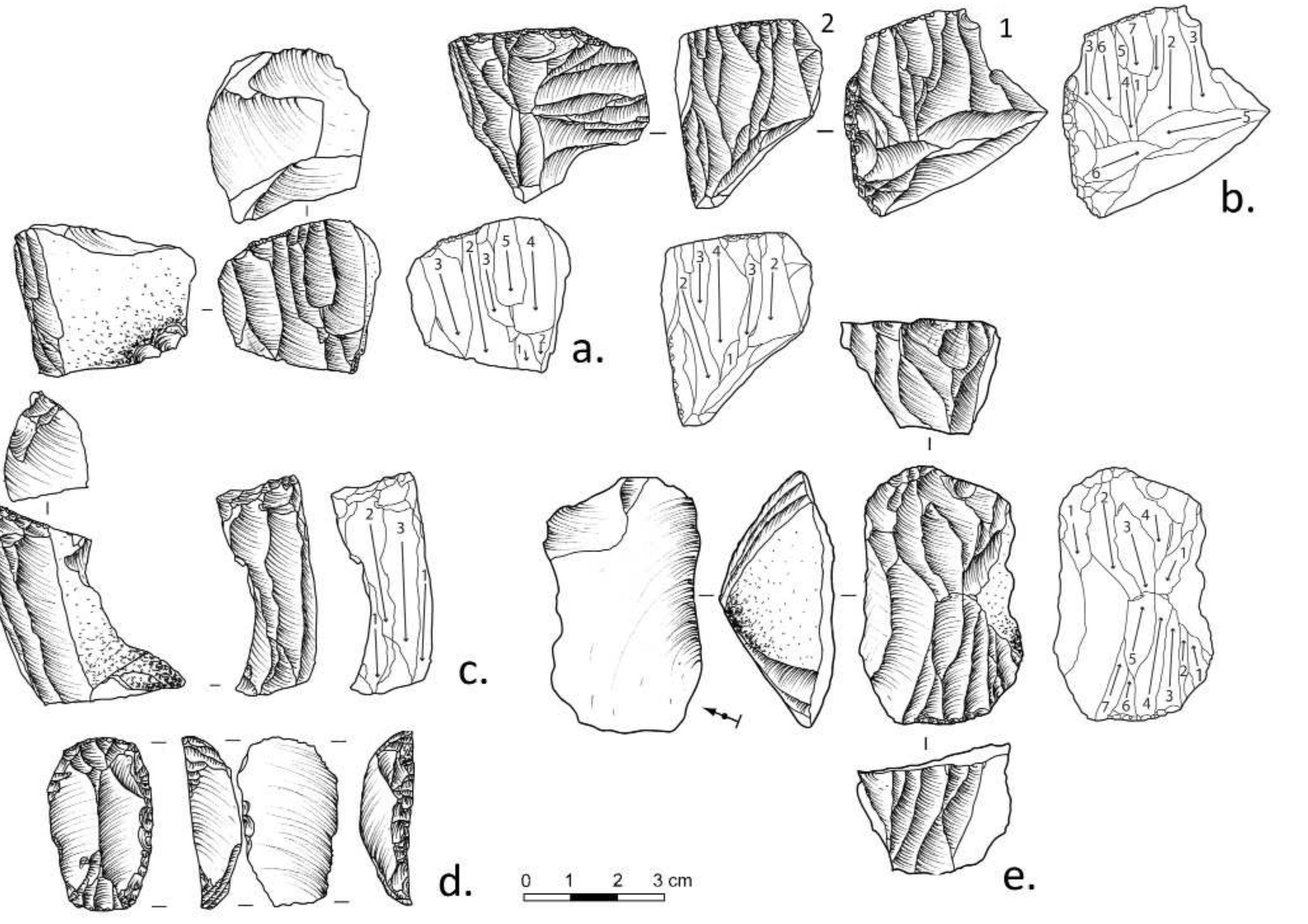

Figure 11 - Unit G, Cores and diacritic reconstruction. The different phases illustrate the chronology of removals; d, endscraper (drawing by N. Zwyns).

of thin and semi-steep retouch. Blanks displaying direct and inverse retouch are almost equally represented with only a few of them showing alternate retouch (fig. 7 & 8). Microblades showing inverse and alternate retouch are typologically classified as Dufour and represent half of the retouched microblades (n=26). Among those Dufour microblades, 19 of the 26 can be assigned to the *Roc-de-Combe* subtype (n=19). The Dufour microblades show a clear pattern of retouch location. Inverse retouch are systematically located along the right edge, and for alternate retouch, direct retouch always follows the left edge. However, artifacts with only direct retouch do not show such a pattern. It is noteworthy that the majority of microblades with direct retouch are also produced on twisted blanks, and that almost all of the retouched blanks are off-axis.

Sub-levels Gc1-Gc2

The sub-levels Gc1-Gc2 material represents the largest sample studied in this series. A total of 471 laminar elements and 3 cores were analyzed, 40 retouched bladelets and 58 retouched microblades. We also studied retouched laminar elements and cores from sub-levels Gb1-Gb2 and Gd. Although bladelets and microblades are not presented here, they are considered similar to Gc1-Gc2. Four additional cores associated with these sub-levels are described below.

Cores

Although the sample is rich in laminar blanks, the frequency of core-like elements is rather low. Three of the cores are produced on flake or laminar flake blanks, three are on small blocks, and one is on a thin slab (figs. 11 & 12). All cores are unidirectional, worked on both narrow and wide surfaces. Three of the cores show a change of orientation during the course of reduction, with a flaking surface sometimes perpendicular to the previous one (figs. 11b, 12h, 12i). Diacritic reconstructions show the chronology of removals and underline the absence of genuine bi-directionality. Preparation of the flaking surfaces is achieved by lateral overshot/plunged removals or by divergent removals from an opposed platform, giving a triangular shape to the distal part of the flaking surface.

The platform is plain or sometimes reshaped by a tablet removal. Abrasion is still present on the external ridge after the discard. Last removals are between 10 and 44 mm in length for 4.5 to 7.3 mm in width, showing curved or slightly curved profiles (see fig. 12i). Removal scars show a convergent orientation; only one core displays parallel scars. Five of the cores can be classified as prismatic (two of them showing a 90 degrees change of orientation). Two artifacts can be classified as carinated endscrapers. The first one is a bladelet core with two

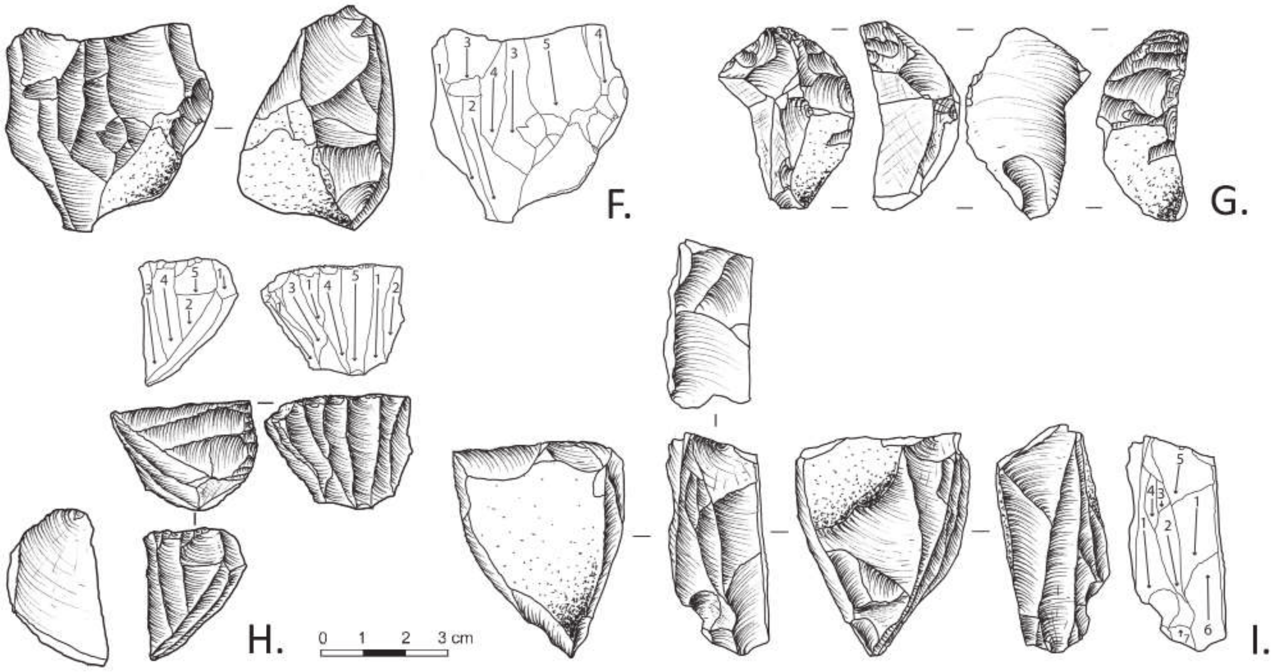

Figure 12 - Unit G, Cores and diacritic reconstruction. The different phases illustrate the chronology of removals (drawing by N. Zwyns).

separate flaking surfaces, taking place on both ends of the blank (double endscraper) (fig. 11e). Diacritic reconstruction shows the exploitation of one side after the other. The second one is smaller but similar in the general morphology (fig. 11d). It is either a tool the result of a sharp reduction or the expression of a need to produce very small blanks. One core has been classified as an atypical carinated endscraper, the last removals being more flakes than bladelets (fig. 12g) (de Sonneville-Bordes & Perrot 1954). The last one is a core on the narrow ridge of a slab, with two consecutive flaking surfaces. Removals in the opposite direction prepare a new striking surface, giving the appearance of bidirectionality (fig. 12i).

Laminar blanks

The unretouched elements have a mean of width measurement 7.8 mm (standard deviation of 2.3 mm) and retouched elements show a mean of 6 mm (1.8 mm of standard deviation) (figs. 13 & 14). Retouched and unretouched elements display an asymmetric distribution and are statistically different (Mann-Whitney, T=UB=9.632^{-12}, p=<0.01).

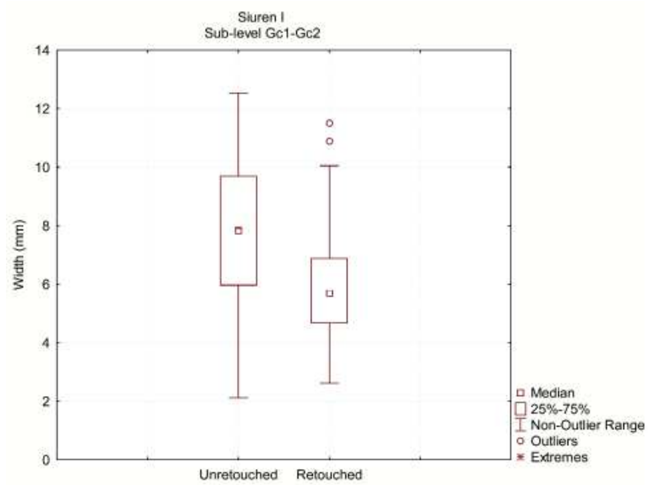

Figure 13 - Box-plot comparing the width distribution of unretouched and retouched elements from sub-level Gc1-Gc2. Whiskers are drawn from the top of the box up to the largest data point less than 1.5 times the box height (upper inner fence). The circles represent values which are outside the upper inner fence, considered here as outliers.

Platforms are plain and show a sharp angle with the ventral face, most of them being lipped with their external ridge bearing traces of abrasion. Dorsal scars are unidirectional and subconvergent. Profiles show a clear trend toward the production of straight elements, followed by slightly curved and curved elements. The twisted elements are virtually absent. This pattern can be observed among retouched and un-retouched elements, bladelets or microblades (fig. 15).

The set of bladelets is largely dominated by alternate retouch (80%), followed by direct (17%) and inverse retouch (3%) (figs. 8 & 16). The same trend can be observed among the microblades, alternate retouch dominating the set up to 83%. So most of the laminar elements display either inverse or alternate retouch can be classified as Dufour and are produced on curved, slightly curved and straight profile blanks (Demars & Laurent 1992). When observable, most of the Dufour are axial. They show a clear pattern of secondary treatment, inverse retouch following the right edge and direct retouch following the left edge (32 out of 32 Dufour bladelets, and 42 of 42 Dufour microblades bearing alternate retouch, 3 of the 4 with inverse retouch). The most common type of retouch is a combination between thin and semi-steep retouch with the inverse retouch tending to be more flattened. Three fragments of Dufour show a tip pointed by alternate retouch.

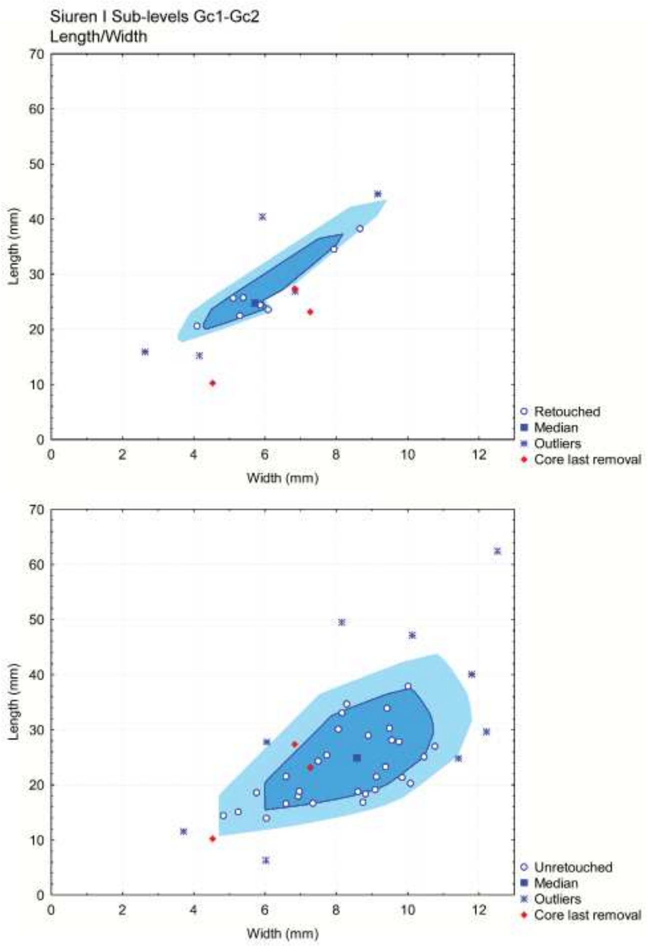

Figure 14 - Bag-plot chart showing the Length/Width distribution of retouched and unretouched elements from sub-level Gc1-Gc2, compared with the complete last removals observed on the cores associated with those sub-levels. The dark circle (bag) represent 50% of the observations with greatest bivariate depth. The light circle (loop) represent three times the bag (fence).

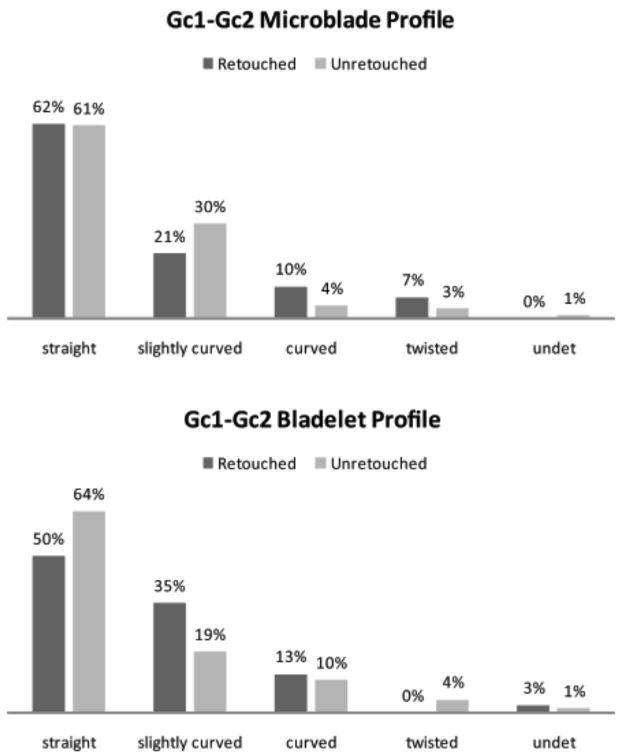

Figure 15 - Sub-levels Gc1-Gc2, laminar element profiles.

We observe lateral damages on some of the Dufour elements, mostly affecting the ventral face along the edge opposed to the retouch (e.g. figs. 16:8-9, 12, 14, 22). A small number of the breakage pattern is similar to experimental impact breakage (Fischer *et al.* 1984).

Artifacts with direct retouch show no pattern of transformation, half of them displaying bilateral retouch. Three of these fragments are clearly typed as Font-Yves/Krems and at least two more likely belong to this category as well. One additional distal fragment is of asymmetrical morphology, thin retouch follow the left edge as steep retouch crops the blank (fig. 16:34).

Unit H

Cores

Four cores are described here. One is made out of a block, one is on a laminar blank, the rest on unidentified blanks (fig. 17). Two of the cores have unidirectional removals on their flaking surface and follow a frontal reduction pattern. Striking platforms are flat or reshaped by tablet removals; three of the cores still show traces of abrasion on their external ridge. External platform angles are oblique. The flaking surfaces are triangular; shaped either by the convergent removals, management overshot and plunged removals, distal shaping, or the preparation of the sides of the core. Diacritic reconstructions show mainly frontal reduction. Although one core seems to be *semi-tournant*, it was difficult to convincingly demonstrate this without refits (fig. 17c). One core is clearly on the edge of the conventional definition of bladelet, the last removal width being of 11.9 mm (fig. 17d). This core is likely to be linked with a larger blade reduction sequence. Three of these cores can be classified as prismatic. The remaining core is produced on a neo-crested blade following a frontal reduction pattern along the longitudinal axis of the blank and could be considered as a carinated endscraper (fig. 17a). Another core can be typed as a *rabot* or carinated endscraper (Demars & Laurent 1992) (fig. 17b).

Laminar blanks

The mean of unretouched elements is 7.8 mm (with 2.3 mm of standard deviation) but when we consider only the retouched elements, we observe a more clustered picture, with a mean of 6.6 mm (1.8 mm of standard deviation). Retouched and unretouched blanks display an asymmetric distribution and are statistically different (Mann-Whitney, T=UB=1392, p=<0.01) (figs. 18 & 19).

Platforms are plain and show oblique external platform angle, the internal ridge of the platform is lipped and the external ridge of the platform shows traces of abrasion. When looking at the profile of laminar blanks, we observe a similar trend as the one described on the larger sample from Unit G (figs. 20 & 21). Bl-

Figure 16 - Retouched bladelets and microblades from sub-levels Gc1 and Gc2 (illustrations borrowed with the courtesy of Yu. E. Demidenko).

adelets show a trend toward curved profiles, although straight profiles are also well represented. The unretouched bladelets, together with the retouched and unretouched microblades, tend to be straight. Dorsal scars are unidirectional and most of the time convergent. Sections are trapezoidal or sometimes triangular.

The retouch location is mainly alternate. Inverse retouch is also well represented (fig. 8). Retouched bladelets and microblades are mainly Dufour, with one complete bladelet and two bilaterally retouched distal fragments typed as Font-Yves/Krems. One fragment is pointed by bilateral steep retouch. In addition,

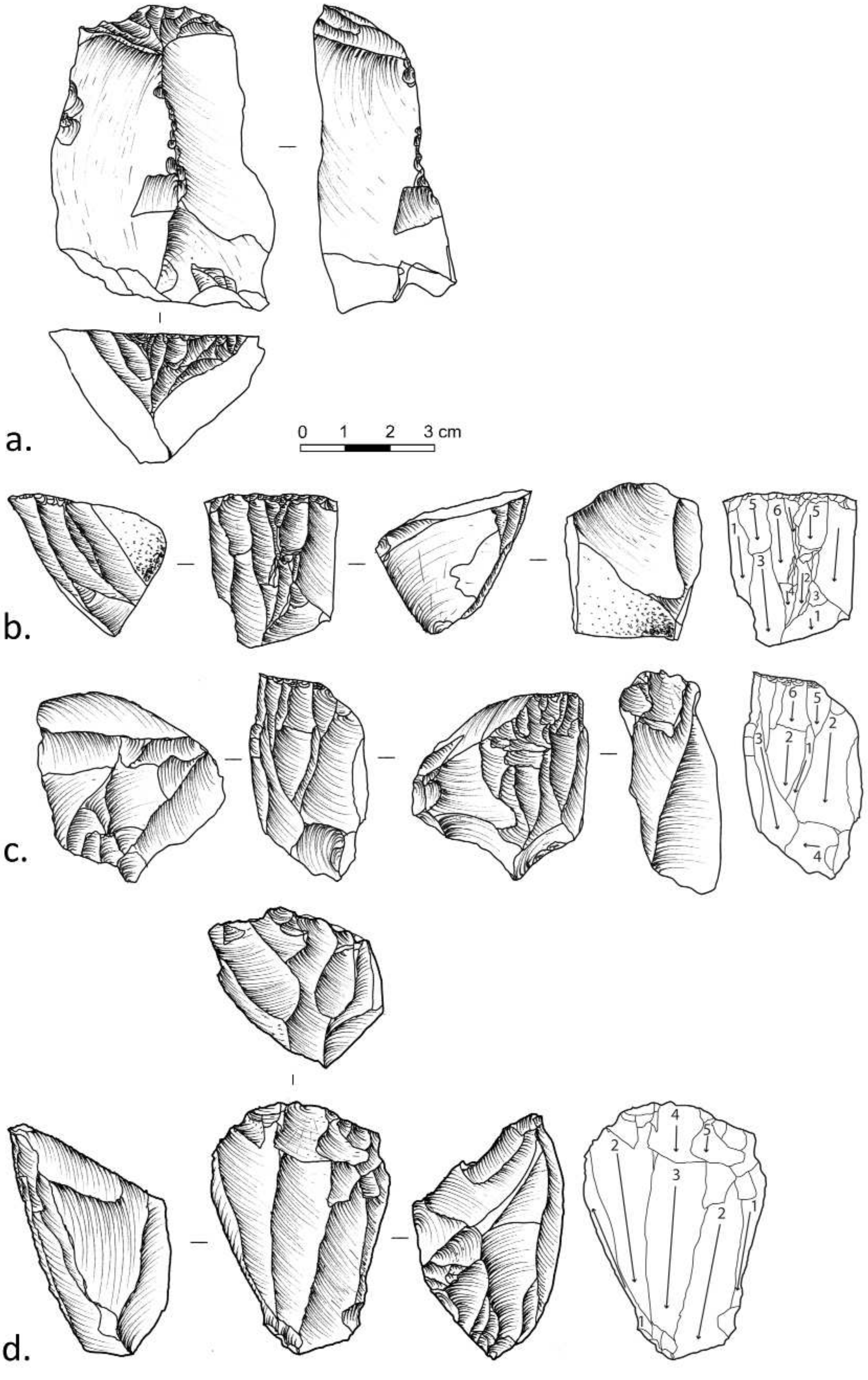

Figure 17 - Unit H, Cores and diacritic reconstruction. The different phases illustrate the chronology of removals (drawing by N. Zwyns).

one proximal bilaterally retouched fragment could be associated to this type. One retouched Dufour show a micro-spall removal from the tip that could be interpreted as evidence of impact.

Summary

The bladelet and microblade production from sub-levels Fb1 and Fb2 show numerous similarities, from the blank produc-

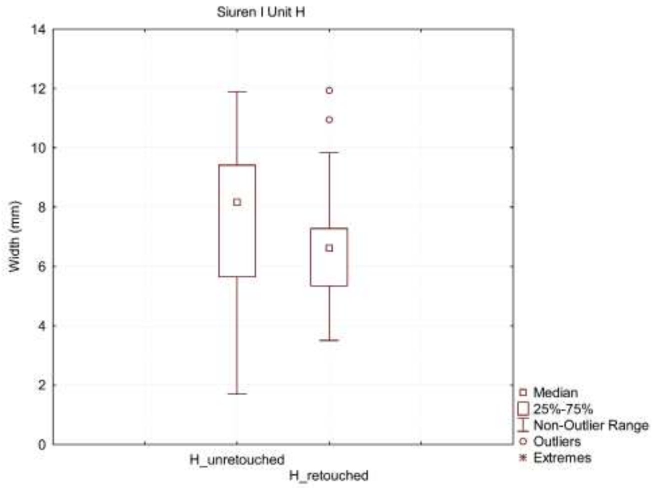

Figure 18 - Box-plot comparing the width distribution of unretouched and retouched elements from Unit H. Whiskers are drawn from the top of the box up to the largest data point less than 1.5 times the box height (upper inner fence). The circles represent values which are outside the upper inner fence, considered here as outliers.

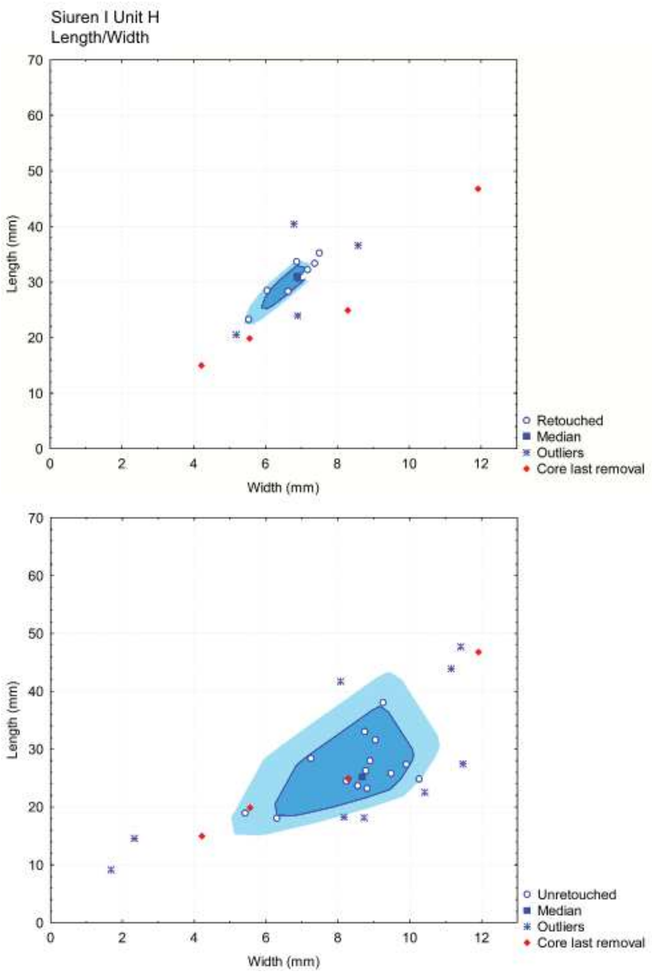

Figure 19 - Bag-plot chart showing the length/width distribution of retouched and unretouched elements fromUnit H, compared with the complete last removals observed on the cores. The dark circle (bag) represent 50% of the observations with greatest bivariate depth. The light circle (loop) represent three times the bag (fence).

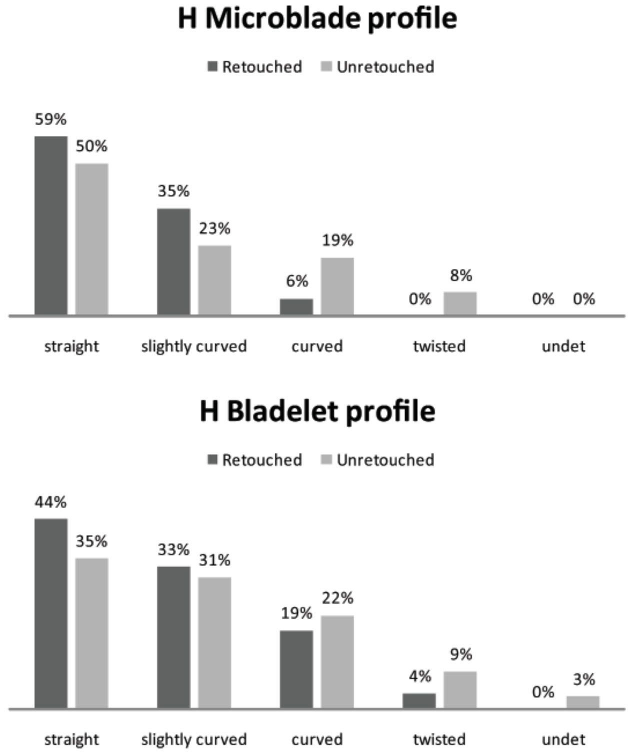

Figure 20 - Unit H, laminar element profiles.

tion to their retouched elements. The use of burins as cores is one element to be underlined. These forms of burins include carinated burins and one busked burin. Some of the last removals are clearly twisted and off-axis. The *debitage* is mainly unidirectional and convergent. Retouched elements from Fb1 and Fb2 show a symmetrical distribution in terms of width, the two groups being statistically analogous (fig. 22) (Mann-Whitney, T=UB=412, p=0.6). It suggests a goal of blank production with a mean of 6mm width which after secondary treatment is narrowed around 4.8 mm. If we ignore the noise caused by outliers and extreme measurements, median values are even lower. If we consider the microblade category starting at 7 mm, it is interesting to see that in sub-level Fb1, only one bladelet has been retouched. If retouched elements are in majority on off-axis blanks, sub-level Fb1 is balanced in terms of profiles. Twisted profiles are dominant, but closely followed by other categories. However, a large majority of retouched elements from Fb2 are on twisted blanks, including Dufour of *Roc-de-Combe* subtype. This uneven situation could be linked to sampling effect, an unidentified functional pattern in this part of the site, but also to the desired morphology of the blank. By trying to produce off-axis blanks from carinated burins or carinated endscrapers, one might increase the number of twisted elements produced. In other words, twisted profiles may not be as important a feature as the off-axis character. We also note the absence of the Font-Yves type among the retouched elements, and the occurrence of three partially backed microblades in Fb1.

In comparison, Unit G[4] and H show a very different picture. Carinated burins are totally absent. The only burins from these

[4] As noted above, we consider here sub-levels Gc1-Gc2 as representative of the entire Unit G, other sub-levels yielding similar results.

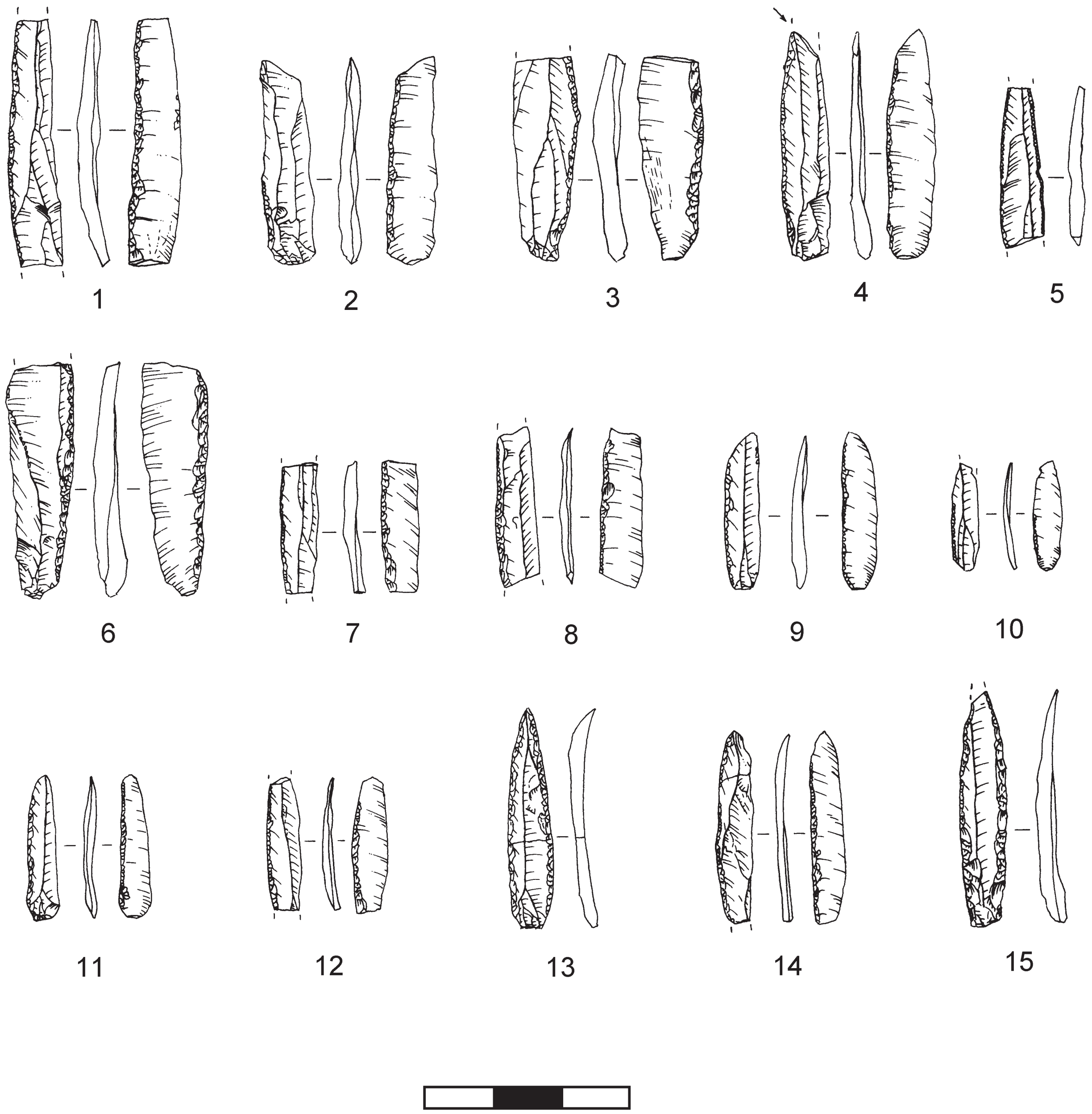

Figure 21 - Retouched bladelets and microblades from Unit H (illustrations borrowed with the courtesy of Yu. E. Demidenko).

samples are mainly *burin d'angle* or on truncation. Cores are unidirectional with a triangular flaking surface tending to convergence. Some of the cores show a carinated endscraper morphology with a broad flaking surface. The largest one shows removals overlapping with the size of the largest laminar elements. Smaller carinated elements are also associated with these units, their last removals falling into the range of the microblade category. From a more general point of view, the frequency of cores is rather low.

Laminar blanks show a trend toward the production of straight microblades bearing alternate or inverse retouch, the latter systematically along on the right edge (almost 100% for both Gc1-Gc2 and H). These are typologically attributed to Dufour. Although outliers are easily noticed, the median of width is relatively small. We note the presence of pointed bladelets and microblades. Clear Font-Yves/Krems points have been recognized, a few bilaterally retouched mesio-distal or distal fragments being highly similar. At least three distal fragments of Dufour microblade underline the pointed morphology of some of these tools when the latter is observable. We also note the presence of an asymmetrical point similar to those found in Proto-Aurignacian context, as at Le Piage, or Fumane (Broglio *et al.* 2005; Bordes *et al.* 2010) and some intermediate Font-Yves tips showing bilateral steep retouch.

The morphology of unit H retouched elements is similar to unit G, tending clearly toward slightly curved or straight profiles, with alternate or inverse retouch.

When we compare the retouched blanks from Unit G with the sample from Fb2, we observe significantly different with distri-

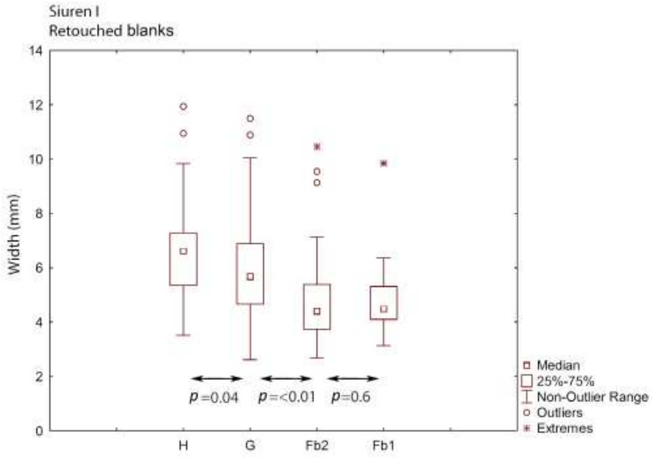

Figure 22 - Box-plot showing a general comparison of the width between the sub-levels and Unit studied, with p-values of Mann-Withney U-test. Results are considered significant when <0.01 0-hypothesis assumes a symmetric distribution. Whiskers are drawn from the top of the box up to the largest data point less than 1.5 times the box height (upper inner fence). The circles represent values which are outside the upper inner fence, considered here as outliers.

butions (Mann-Whitney, T=UB=1467, p=<0.01) (fig. 22). However, when compared, Fb1 and Fb2 retouched element widths are similar. Unit G and unit H samples also show comparable distributions although unit G blanks tend to be slightly narrower (Mann-Whitney, T=UB=1680, p=0.04)[5]. In other words, based on the width, the largest set of retouched elements from Fb1-Fb2 and G-H variants are significantly different from each other. Nevertheless, Fb1 is analogous to Fb2 and G is analogous to H. These observations are confirmed when looking at the width means differences ($F(3, 210) = 11.7$, $p = <0.01$). Tukey's pairwise comparisons underline the similarities between units Fb1 and Fb2 and between units G and H while showing significant differences between those two groups. The difference between Fb1 and Gc appear significant only with a 96% level of confidence, level G tending to have numerous small size blanks.

Sub-levels Fb1 and Fb2 are oriented toward the production of smaller blanks that are most of the time slightly retouched, making the width difference between unretouched and retouched elements less sharp than in the case of Unit G or Unit H. In these assemblages, the metric attributes of the blanks are less clustered. This variability is balanced by an intensive and systematic alternate retouch which tends to crop the blank.

Discussion

The differences expressed in terms of bladelets and microblades between units Fb1-Fb2 and G-H have to be understood in the context of a technological change in hafting strategies. It is very likely that such elements take part in composite objects for which we are missing the organic component. As observed in different chronological contexts, the general aspect of a lithic assemblage is strongly influenced by the morphology of pointed elements. In other words, the morphological attributes of the lithic component in hunting weapons will shape part of the lithic assemblage. In this view, the Fb1-Fb2 assemblage seems driven by the need to produce off-axis microblades, concomitantly displaying twisted profiles. One of the technological options to obtain such blanks is to use the narrow edge of a flake or laminar blank, giving to it a burin-like morphology. They differ from those considered as tools mainly by their lack of sharp edges and the multiple removals on their flaking surface.

[5] Although the null-hypothesis can be rejected with a 95% level of confidence (p=<0.05).

	Fb1	Fb2	Gc	H
Fb1	0	0.99	0.04	<0.01
Fb2	0.46	0	0.01	<0.01
Gc	3.78	4.24	0	0.44
H	5.91	6.37	2.12	0

Table 3 - Tukey's pairwise comparisons (p-values are in the upper right corner)

Such elements are entirely absent from Units G and H, where the focus is more on straight blanks. The only carinated elements in the sample are endscrapers. Thick or short endscrapers yield similar blanks, with only variation in size. In the absence of long refit sequences, it is not possible to observe any clear continuity between the blade and the bladelet/microblade production.

One of the important observations made is that both Fb1-Fb2 and G-H assemblages are mainly characterized by the production of microblades rather than bladelets. Although blade production was not analyzed here, we could not find any evidences of a continuum in their production in Unit Fb1-Fb2. Looking at the Fb1 unretouched element width values, we can observe that the curve show a positive skew (skewness: 0.7) (fig. 23). The frequency decreases as we approach the 12 mm cut-off. It thus seems rather likely that both blade and bladelet/microblade groups would yield a bimodal distribution.

The same histogram shows different results for Units G and H (fig. 24). The artificial cut-off is highly visible among unretouched elements, the negative skew implying a possible link with blade production (e.g. Gc1-Gc2 skewness: -0.2). In general, retouched elements show a positive skew and a more clustered picture (e.g. Gc1-Gc2 skewness: 0.8), reflecting a reduction of the width by retouch. Among the cores observed, only one from Unit H shows a possible link between these two productions, being between the two categories at the time of discard. In spite of a significant occurrence of blade and technical flakes within both assemblages, blade cores remain absent. However, we observe that some cores illustrate an independent reduction sequence. Therefore, the continuum between blades and bladelets (if there is any), is not the only way leading to the small-sized blanks.

Although this material will be put into context in the forthcoming chapters, some contextual remarks can be formulated here. From a regional point of view, the sample from Fb1 display similarities the material from the Aurignacian from Kostenki 14 volcanic ash level. Although showing older radiometric dates, the assemblage is also oriented on the production of microblades, rather than bladelets, but with slightly curved or curved

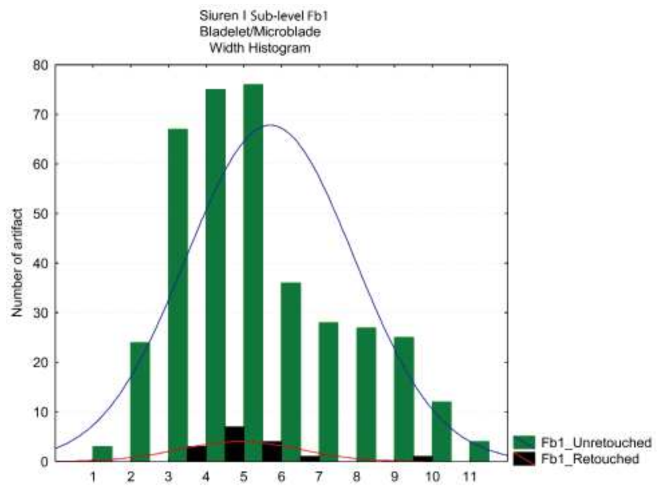

Figure 23 - Sub-level Fb1, histogram of the width values of retouched and unretouched elements.

profiles (Sinitsyn 2003a). The Aurignacian I from Mitoc-Malu Galben also shows technological affinities with this assemblage although no retouched microliths could be identified in the small sample studied (Noiret 2005; Noiret *et al.* in press).

Unit Fb2 could fit in the same comparison, although the discrete occurrence of busked burin is noteworthy. This type of artifact is almost absent in any Central European Aurignacian assemblages, but clearly associated with the Evolved Aurignacian in Western and North-Western Europe (Chiotti 2003; Flas *et al.* 2006). Recently, similar artifacts have been reported in the assemblage from Kostenki 14 level VIb. However, this assemblage shows an unusual association between Aurignacian technology and bifacial elements (Sinitsyn 2003b).

Units G and unit H, as previously observed (Demidenko 2001; Demidenko & Otte 2001; Demidenko 2008a), display a high degree of technological and typological similarity with the Proto-Aurignacian from Western Europe. This comparison is reinforced by the results of this analysis, bladelet and microblade technology being one of the main criteria to identify this techno-complexes. The Early Kozarnikian, although associated with dates around 38 kyr is the most comparable assemblage in the area. Apart from this example, Proto-Aurignacian remains poorly documented in Eastern Europe (Tsanova 2008). Some reworked material from the north-eastern shore of the Black Sea (Kamennomostskaya lower layer, Shyrokiy Mys) could represent evidence for similar occupations, although the absence of a clear chronological and stratigraphic context sharply limits possibilities of comparison (Demidenko 2001; Demidenko & Otte 2001; Demidenko 2008a).

From a technological perspective, the analogy with the European Proto-Aurignacian (Units G-H) and the Recent Aurignacian is the most relevant (Fb1-Fb2). In this context, Siuren 1 is one of the key sites in Eastern Europe as it displays these two variants in a single sequence. Although the radiometric dates seem slightly younger than the neighboring Aurignacian sites, the Fb1-Fb2 unit fits with the expected range of the Evolved Aurignacian, and certainly not with a Late Glacial Maximum industry (Zwyns 2004). The Proto-Aurignacian attribution mainly relies on the techno-typological attribution of the collection, and on its stratigraphic location. As will be discussed in more detail in the comparison chapter, we believe that this attribution remains the most likely.

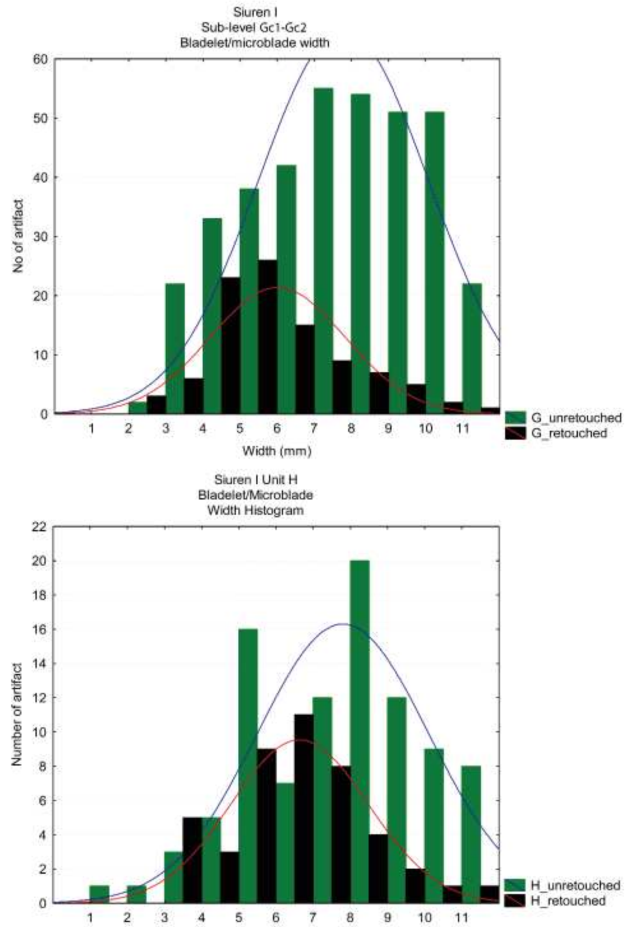

Figure 24 - Sub-level Fb1, histogram of the width values of retouched and unretouched elements.

Acknowledgments

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Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 375-385.

20 - THE SIUREN I ARCHAEOLOGICAL INDUSTRIAL SEQUENCE SEEN THROUGH THE SITE'S HUMAN OCCUPATION EVENTS

Yuri E. DEMIDENKO

Introduction

Now, after the description and analysis of the Siuren I 1990s excavation archaeological finds with detailed comparisons with the published and unpublished records of the site's 1920s excavations, and new clarifications of the complete archaeological context at Siuren I, we are able to "reconstruct" the Siuren i archaeological industrial sequence. For such "reconstruction", not only the data on lithic assemblages and their strata are required, but also all information on other kinds of archaeological material (bone tools and non-utilitarian shell, tooth and antler objects), as well as multidisciplinary data - absolute AMS dates, paleoenvironmental analyses (fauna, microfauna, mollusks) – in order to create summaries for each industry and human occupation event and their characteristics and position within the Crimean and European Paleolithic.

There is another aspect regarding the Siuren I archaeological industrial sequence. As already strongly emphasized in the Preface and Chapter 1, the Siuren I archaeological industrial sequence has always been considered as exclusively containing Upper Paleolithic industries: either for a relatively short time period - Aurignacian alone (e.g., Bonch-Osmolowski 1934) or for the entire Upper Paleolithic (e.g., Vekilova 1957). It is now possible to argue for a much broader industrial and chronological framework for the Siuren I archaeological industrial sequence - from the very end of the Middle Paleolithic to the Final Paleolithic/"Crimean Azilian". The Siuren I rock-shelter has become a key site in Crimean prehistory for this time range.

Altogether the Siuren I archaeological industrial sequence is proposed to contain the following Paleolithic industries related to **seven** human occupation events:
(1) the Middle Paleolithic/Crimean Micoquian Tradition Kiik-Koba type industry in the 1990s Units H and G/1920s Lower layer;
(2) the Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry in the 1990s Units H and G/1920s Lower layer;
(3) the Upper Paleolithic/Late Aurignacian of Krems-Dufour type industry in the 1990s Unit F/1920s Middle layer;
(4) the Upper Paleolithic/Late Aurignacian of Krems-Dufour type industry in the 1990s Unit E/lowest finds of the 1920s Upper layer;
(5) the Upper Paleolithic/Gravettian industry in the 1990s Unit D/3rd horizon in the 1920s Upper layer;
(6) the Upper Paleolithic/Epi-Gravettian industry in the 1990s Unit A and some finds in "Humus Deposits"/2nd horizon of the 1920s Upper layer;
(7) the Final Paleolithic/"Azilian" Shan-Koba type industry of uppermost finds in the 1920s Upper layer.

Based on this archaeological sequence, each industry and human occupation event will be discussed in order from bottom to top. It should be noted that there is significant variability in available information for each human occupation event and associated finds, leading to some clear differences for each summary.

The Middle Paleolithic/Crimean Micoquian Tradition industry of the 1990s Unit H and Unit G/1920s Lower layer

Results of data analysis for the different Siuren I Middle Paleolithic industrial components have been presented in separate chapters here, but the Middle Paleolithic component in the 1990s Units H-G and the 1920s Lower layer was not discussed as a complete find complex. Therefore, on some aspects of the Middle Paleolithic human occupation event and associated artifacts will be described here in more detail than is usual for a summary description.

Lithic assemblages: composition and industrial features

The total number of lithic artifacts is quite limited for this complex. The known artifact quantities from both the 1920s and the 1990s campaigns are as follows: 5 cores, 60 tools and 23 retouch flakes/chips, in total only 88 artifacts. To this number we could probably add about 40 more retouch flakes and chips not identified in the 1920s collections, given the nearly 1 to 1 ratio of tools to retouch flakes/chips in the 1990s collections. On the other hand, estimation of the number of unretouched debitage pieces (first of all, flakes) will probably never be quantified due to the difficulty in morphological separation from Aurignacian flake debitage in the 1990s Units H and G/the 1920s Lower layer collections. Nonetheless, taking into consideration the definite intensive "on-site thinning and rejuvenation" processes for bifacial and unifacial tool treatment and the rarity of cores, the assumed presence of about 60 more flakes would seem to be an optimal maximal estimation to add. Thus, all in all, the Siuren I Middle Paleolithic complex would not exceed about 200 flint artifacts. Accepting the this estimated maximum and the composition of different artifact categories, we can summarize the common techno-typological features of this complex.

Technology

The presence of only non-Levallois radial cores (5 items/about 2.5%), the selection of only flakes as blanks for all 60 tools and consideration of flake size for retouched pieces indicate that flake production was the main and even exclusive aim of primary reduction processes both inside and outside the rock-shelter. Without forgetting some influence of secondary treatment processes to reduce tool size, we are inclined to argue that small- and medium-sized flake production took place - no more than in 4.0 cm long and wide pieces, and only a few with an overall size between 4.0-6.0 cm, taking into consideration metric data for tools. No other specifications on regular primary ("core-like") flaking technology is possible from the available limited data.

Typology

Both small- and medium-sized flake primary production and intensive "on-site thinning and rejuvenation of tools" led to the dominance of small unifacial tools with more than retouched one edge. The exact subdivision of 53 unifacial tools (88.3%) into distinct categories of points and scrapers is impossible because Vekilova (1957) classified all convergent forms as points, which differs from our classification approach. At the same time, this enables us to know the number of all convergent points and scrapers together - 37 items/69.8%. The other 16 unifacial tools are represented by simple, double and transversal scrapers - 15 items/28.3% and 1 transversal denticulated piece (1.9%). Shape types of the unifacial convergent tools are semi- and sub-trapezoidal, -triangular, -crescent and leaf shaped. Various dorsal and ventral thinning techniques are quite typical of both convergent and non-convergent unifacial tools as well. Bifacial tools number 7 pieces (11.7%) and are similar in shape to the unifacial tools. They are also characteristized by a basic "plano-convex " treatment leading, aside from tool shaping, to some flake production (Demidenko 1996, 2004). Production and especially intensive thinning and rejuvenation of both bifacial and unifacial tools are indicated on the numerous retouch flakes/chips. From the 1990s excavations, they can be listed in detail by each defined type: 1 bifacial shaping flake; 2 bifacial thinning flakes; 1 resharpening flake of a bifacial convergent tool's tip; 1 resharpening flake of a unifacial convergent (asymmetric) tool's tip; 17 simple retouch flakes; 1 "Janus/Kombewa" retouch chip from basal ventral thinning of a tool. To these 23 retouch items from the 1990s excavations, 5 additional analogous pieces identified on part of the 1920s collection should be added: 2 bifacial thinning flakes and 3 small resharpening chips of unifacial convergent (asymmetric) tools' tips. The presence of some cortex on dorsal surfaces of 1 bifacial shaping flake (Unit H) and 2 simple retouch flakes (levels Gc1-Gc2 and Gb1-Gb2) are the only possible evidence "on-site production" of tools, while all other 25 retouch pieces from both the 1920s and the 1990s investigations are non-cortical and, by their other morphological features, should be viewed as evidence "on-site thinning and rejuvenation" of tools resulting in such typical "waste products". Here we should also not forget the remarkable presence of a semi-trapezoidal dorsal scraper made on a bifacial shaping flake in level Gc1-Gc2 that points to some selection of tool retouch flakes for subsequent secondary treatment and, at the same time, it also strengthens the assumed paucity of unretouched debitage in this Middle Paleolithic complex.

Numerically, tools and retouch flakes/chips, adding an estimated 40 more pieces for the latter, account for about 60 items each, about 30% each within the assumed total find complex.

All the flint artifact data, taken together with facts supporting quite long distance transportation of flints to the rock-shelter, as for the Middle Paleolithic, we come to the conclusion that mainly finished tools were brought to the Siuren I rock-shelter with further multiple repreparation during probable use in specific activities during the occupation.

Variability in lithic assemblages by archaeological level

Taking into account Anikovich's (1992) comments on the presence of Middle Paleolithic artifacts in all artificial horizons of the 1920s Lower layer, which corresponds to personal observations of the 1920s finds at Kunstkamera Museum in November 1999, and the occurrence of these pieces in all four stratigraphically distinct hearth/ashy levels of the 1990s excavations Units H-G, we can assume similar characteristics for the lithic assemblages associated with each human occupation event during the entire Middle Paleolithic episode at Siuren I, represented only by a small number of flints. Some additional data also confirm this view. Bifacial tools were only found in level Gc1-Gc2 during the 1990s excavations, but retouch flakes from bifacial tool shaping (production), thinning and rejuvenation, aside from level Gc1-Gc2, also occur in Unit H. Among the 1920s Middle Paleolithic flints studied by us in November 1999, two bifacial tools are found in two neighbouring squares but in different artificial horizons - sq. 12-Д/horizon 8 and sq. 12-E/horizon 5 and two bifacial thinning flakes are in sq. 12-Г/horizon 4 (fireplace) and in sq. 12-Ж/horizon 2. The spatial and depth distribution for these bifacial tools and rejuvenation by-products principally attest to their occurrence throughout the entire sequence of the 1920s Lower layer. Returning to data from the 1990s excavations, identification of other kinds of retouch flakes and chips from repreparation and partially initial formation of probably unifacial tools in all four hearth/ashy levels is also notable as, for example, one Middle Paleolithic unifacial tool type and four retouch flakes/chips were found in level Gd. At the same time, we should recall that level Gc1-Gc2 is characteristized by almost half of all Middle Paleolithic artifacts from the 1990s excavations - 13 tools and 8 retouch flakes (in total 21 pieces/48.8%), while Middle Paleolithic artifacts from the other three hearth/ashy levels are about 2-3 times less common: Unit H - 3 tools and 7 retouch flakes (in total 10 pieces/23.3%), level Gd - 1 tool, 3 retouch flakes and 1 retouch chip (in total 5 pieces/11.6%) and level Gb1-Gb2 - 3 tools and 4 retouch flakes (in total 7 pieces/16.3%). These quantitative data clearly demonstrate that level Gc1-Gc2 is the main one within the Siuren I 1990s Units H-G Middle Paleolithic sequence, deserving some attention in discussion of the nature of Middle Paleolithic human occupations at the site.

Bone tools and non-utilitarian objects

The only kinds of bone and non-utiliatarian objects from the Siuren I 1920s Lower layer/1990s Units H and G collections (Middle and Upper Paleolithic) which can be associated with the Middle Paleolithic Micoquian complex are "unintentional" bone retouchers found during both the 1920s and the 1990s excavations. Initially, Bonch-Osmolowski recognized that "... two bone retouchers (anvils), served for working edges rejuvenation of rather rare archaic (Yu. D. - Middle Paleolithic flint tools) forms" (1934:149) in the Lower layer. Later, Vekilova added to these two bone retouchers nine more similar pieces, but with less intensive use wear, and, importantly, published drawings of the two best items (1957:298 and fig. 26, 12-13 on p. 295). Taking into consideration both the special attention by Bonch-Osmolowski to definition of bone retouchers in the Crimean Paleolithic and his convincing identification of them in several other Middle Paleolithic complexes (Kiik-Koba, upper layer; Chokurcha-I; Adji-Koba and Shaitan-Koba) (Bonch-Osmolowski 1940:117-122) and only two illustrations of such pieces for Siuren I by Vekilova, it is better to stay on the safe side and accept the presence of just two "true" bone retouchers there. Summing up findings of bone retouchers exclusively in the Siuren I Lower layer (not in the Middle and Upper layers at all), as well as their characteristic presence in only Middle Paleolithic sites in the Crimea aside from Siuren I (see in this context data on very recently published and well-photographed bone retouchers from Crimean Micoquian Tradition assemblages at Kabazi-V and Chokurcha-I sites [Yevtushenko 1998; Veselsky 2008; Chabai 2004]), we agree with Bonch-Osmolowski and associate the Siuren I Lower layer 1920s bone retouchers with Middle Paleolithic tools there. Moreover, the "accent" revealed by us on intensive flint tool thinning and rejuvenation secondary treatment processes for the Siuren I Middle Paleolithic complex is in good agreement with the occurrence of bone retouchers there as noted by Bonch-Osmolowski. Similarly, two bone retouchers from level Gc1-Gc2 of the 1990s excavations should be also associated with the Siuren I Middle Paleolithic/Crimean Micoquian Tradition occupation (see also Akmetgaleeva this volume).

On the other hand, all "intentionally made" bone tools and non-utilitarian objects found in the Siuren I 1920s Lower layer/1990s Unit G, in our opinion, are connected to the Early Aurignacian of Krems-Dufour type industry.

Fauna data as indicators of hunting activity and use of its results

This is probably the most difficult aspect to understand clearly with respect to the Siuren I Middle Paleolithic human occupation. The problem arises from the fact that the clearest finds from the 1920s and the 1990s excavations are from both the Middle Paleolithic/Crimean Micoquian Tradition industry and the Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry. Faunal remains from each archaeological layer, unit or level are thus necessarily of "mixed origin" – the results of hunting activity by both Middle and Upper Paleolithic inhabitants of the rock-shelter. How is it possible to resolve this problem of mixing and to separate out specifically Middle Paleolithic fauna ? There are several following possible approaches for such studies.

(1) Keeping in mind the "pure Aurignacian" characteristics for the 1920s Middle layer/ 1990s Unit F assemblages, we could compare fauna species lists from these layer and levels with those for the 1920s Lower layer/ 1990s Units H-G levels to select game animals that occurred only in the latter layer and levels.These animals could only have been hunted by Middle Paleolithic Neandertals.

(2) Then, we could compare all indicative game animals from the Siuren I 1920s Lower layer/1990s Units H and G with the fauna data from Crimean Micoquian Tradition sites to determine possible similarities in hunted species that would strengthen the arguments related to the Middle Paleolithic fauna species selected during the previous step.

(3) Finally, comparing the Siuren I 1920s Lower layer/1990s Units H and G main game animals with the "pure Aurignacian" fauna data from Merejkowski's 1879-1880 excavations could potentially offer insights into final separation of Middle Paleolithic fauna.

Unfortunately, these three studies did not throw actual light on the matter. First, basic fauna representation for the 1920s Lower layer/ 1990s Units H and G and for the 1920s Middle layer/ 1990s Unit F shows the same range of hunted animals:- *Saiga tatarica, Bos* sp., *Equus* sp., *Cervus megaceros, Cervus elaphus* (Vekilova 1957: tabl. 2 on p. 254; 1971: tabl. 3 on p. 124; Lopez Bayon 1998; Patou-Mathis this volume). Stressed by Vekilova, the importance of the absence of *Rangifer tarandus* and *Hyaena spelaea* (although the latter species was not hunted) in the Middle layer and their presence in the Lower layer seems to be dubious because the presence of these two species was established on the basis of only 2 and 4 identified bones in the 1920s excavations, while they were not found during the 1990s excavations at all. Merejkowski's fauna data also do not help to demonstrate significant differences between the 19th century lower and middle layers. Moreover, the listed main prey for Siuren I are also typical for principally all Crimean Middle Paleolithic sites (Vekilova 1971; Kolosov *et al*. 1993; Chabai & Monigal 1999).

Thus, the only one way remaining to examine the Siuren I Middle Paleolithic/Crimean Micoquian Tradition fauna exploitation is to argue that it was based on the same ungulate species hunting by Neandertals that was also typical for the Early Aurignacian of Krems-Dufour type industry *Homo sapiens*. Of course, some preferences in animal species hunting are quite possible between these different inhabitants of the Siuren I rock-shelter, but with the available data, this cannot be evaluated further.

Characteristics of human occupations and their variability within the entire occupational event

The Middle Paleolithic/Crimean Micoquian Tradition Neandertals periodically and only partially occupied the Siuren I rock-shelter across an area of about 100 sq. meters as established by the 1920s and the 1990s excavations, and did not expand their activity and living areas into the rock-shelter's central inner part investigated by Merejkowski in 1879-1880. The entire occupation event is seen through the presence of Middle Paleolithic flint artifacts in four stratigraphically distinct archaeological hearth/ashy levels observed in the 1990s Units H and G and in three hearth/ashy levels of the 1920s Lower layer. Artifact numbers differ for each occupation episode, clearly evidenced by the 1990s excavation data where level Gc1-Gc2 contained almost 50% of all identified Middle Paleolithic flints. At the same time, the numerical artifact differences between several occupation episodes are within the same range of industrial composition and features with the general emphasis on tool thinning and rejuvenation. Thus, the Siuren I Middle Paleolithic/Crimean Micoquian Tradition Neandertal occupations were characteristic of highly "ephemeral stations" - very brief visits associated with a specific activity.

Proposed chronology

The Units H and G accepted AMS dates on ungulate bone samples from Oxford and Beta labs are grouped around 31 and 28,000 BP. None of the paleoenvironmental data (fauna, microfauna and mollusks) show the presence of any specific cold-loving species from the 1990s excavations, pointing to rather temperate climatic conditions for the 1990s Units H and G (Lopez Bayon 1998; see Patou-Mathis, Markova, Mikhailesku this volume). Given this, it is possible to geochronologically date the Siuren I Middle Paleolithic/Crimean Micoquian Tradition Neandertals occupation event to either the Arcy Interstadial (31500-30000 BP) or the Maisières Interstadial (29300-28000 BP) of the Last (Würm) Glacial. We are inclined to support the former (Arcy) Interstadial period. In our opinion, the presence of the Early Aurignacian of Krems-Dufour type industry, unknown in Europe after the post-Arcy period, in these cultural bearing sediments, as well as the certain disappearance of Middle Paleolithic Neandertals after the post-Arcy period, additionally may attest to the proposed Arcy Interstadial for the Siuren I geochronological position.

Position of the industry within the Crimean Micoquian Tradition

According to the geochronological considerations, the Siuren I Middle Paleolithic industry is a very late one within the Crimean Micoquian. Moreover, the presence of many "déjeté/off-axis", trapezoidal, and triangular and leaf-shaped unifacial and bifacial points and scrapers, as well as their thinning and rejuvenation processes, allows us to situate the Siuren I Micoquian industrial type affinity within the Crimean Micoquian Tradition. It has definite techno-typological features of the Kiik-Koba type industry where, among sites of Crimean Micoquian Tradition of this particular type, the Buran-Kaya-III, layer B find complex was also dated by Pettitt (1998) by AMS to 29-28 000 BP. So, the long claimed statement of the exclusive presence of sites with Kiik-Koba type industry only in Eastern Crimea (e.g., Gladilin 1976, 1985; Kolosov 1986; Kolosov *et al.* 1993; Stepanchuk 1991; Chabai *et al.* 1995; Chabai & Marks 1998) does not correspond to current data and should be reconsidered (see Demidenko 2004). Thus, the Siuren I rock-shelter should also be regarded as the site with Kiik-Koba type industry of the Crimean Micoquian Tradition in Western Crimea. Further, the Siuren I Kiik-Koba type industry "ephemeral stations" data generally correspond to the Micoquian (Ak-Kaya type industry) "ephemeral stations" of Kabazi-II, Unit II and Sary-Kaya in the Crimea through the following features: "... a high percentage of tools, an absence or rarity of cores, ... extremely low artifact densities, ... blank to core and tool to core ratios are extremely high, ... limited on-site production and the high incidence of tool importation, ... production of unifacial tools on bifacial thinning/rejuvenation flakes" and fireplaces absence (Chabai & Marks 1998:362-363 and tabl. 15-2 on p. 364). At the same time, the Micoquian open-air "ephemeral stations" at Kabazi-II and Sary-Kaya are characterized mainly by "...butchering of megafauna" (Chabai & Marks 1998:363), while the same main economic activity cannot be claimed for the Siuren I Kiik-Koba type industry rock-shelter "ephemeral stations". There was quite probably a specific and limited economic activity performed by Neandertals at Siuren I that may be indicated by the presence of two typical resharpening flakes from the tips of unifacial and bifacial convergent (asymmetric and symmetric) tools, one "Janus/Kombewa" retouch chip from basal ventral thinning of a tool out of a total of 20 tools from the 1990s excavations, as well as three resharpening chips from unifacial convergent (asymmetric) tools' tips in the 1920s collection, which are unknown in the Micoquian open-air "ephemeral stations" but instead known from some Crimean Micoquian "short-term camps" (e.g., Starosele, level 1 and Kabazi-V) and some "unique camps" (e.g., Buran-Kaya-III, layer B of Kiik-Koba type industry), although with a much higher tool frequency (Demidenko 2003, 2004). Adding to these specific rejuvenation pieces the overall abundance of retouch flakes in the Siuren I Kiik-Koba type industry find complex, we may indeed highly speculate on Neandertal economic activity at the rock-shelter.

All in all, the Siuren I Middle Paleolithic/Crimean Micoquian Tradition Kiik-Koba type industry of the 1920s Lower layer/1990s Units H and G has specific "ephemeral station" features and is dated to ca. 30000 BP, assumed to be situated geochronologically to the Arcy Interstadial of the Last (Würm) Glacial period, placing it into a very late expansion of the Crimean Micoquian.

The Upper Paleolithic/Early Aurignacian of Krems-Dufour type industry of the 1990s Units H and G/ 1920s Lower layer

Finds of this occupation event have already been thoroughly described and analyzed in several chapters of this volume, enabling a real summary to be presented here.

Assemblages: Composition, variability by archaeological level and industrial features

This industry is represented by about 15000 artifacts (including about 80 core-like pieces and about 800 tools) from the 1920s

Lower layer and 5348 pieces (including 27 core-like pieces and 425 tools) from the 1990s Units H and G. Data on the 1879-1880 excavations are not used here because of their incomplete characteristics. Thus, in a total investigated areas of about 100 sq. meters, nearly 21000 lithic artifacts were recovered.

For the most detailed understanding of the internal composition of the assemblages, the 1920s Lower layer and the 1990s level Ga should be excluded. It has been shown that the former does not provide exact numbers for many artifact categories and the latter is too poor in finds and, for example, lacks such important artifact categories as core-like pieces and waste from production and rejuvenation of tools. On the other hand, the 1990s assemblages from Unit H and three hearth/ashy levels of Unit G (Gd, Gc1-Gc2 and Gb1-Gb2), treated by the same artifact classification method and representing all artifact categories, are the most appropriate for clarification of their composition and variability.

Representation of the main artifact categories in these four assemblages is shown in the following percentage ranges: core-like pieces - 0.5-0.6%, core maintenance products - 2.2-2.9%, debitage - 27.8-39.8%, tools - 5.4-9.8%, waste from production and rejuvenation of tools - 0.2-1.9%, debris - 45.1-63.4%. These show that core-like pieces and core maintenance products are of similar frequency; waste from production and rejuvenation of tools is nearly identical for each assemblage; debitage, tools and debris indices indicate a broader range of variability in representation. The notable thing, however, is that individual indices within the percentage intervals for the latter three artifact categories show successive patterns of change throughout the archaeological sequence from the lower level (Unit H) to the upper level (Gb1-Gb2). Debitage is characterized by a decreasing pattern: 39.8% for Unit H, 35.5% for level Gd, 35.0% for level Gc1-Gc2 and 27.8% for level Gb1-Gb2. Tools also show a decreasing trend: 9.8% for Unit H, 9.0% for level Gd, 8.5% for level Gc1-Gc2 and 5.4% for level Gb1-Gb2. Debris (chips, uncharacteristic debitage pieces and chunks), on the other hand, show an increasing pattern: 45.1% for Unit H, 52.0% for level Gd, 52.3% for level Gc1-Gc2 and 63.4% for level Gb1-Gb2. These changing trends through the archaeological sequence can be interpreted as follows. Lower general productivity of primary flaking processes for blanks is associated with an increased emphasis on secondary retouching processes as evidenced by the increase in the percentage of chips in the sequence - 36.6% for Unit H, 37.6% for level Gd, 38.9% for level Gc1-Gc2 and 52.3% for level Gb1-Gb2. Matching these chip data with a decrease in tools, we can infer the exportation of some finished and rejuvenated tools from the site. A gradual increase in microblades through the sequence can also be observed (for debitage *sensu stricto* - 10.1% for Unit H, 13.0% for level Gd, 13.5% for level Gc1-Gc2, 21.8% for level Gb1-Gb2 and for debitage *sensu lato*, including tools and core maintenance products - 15.1% for Unit H, 19.0% for level Gd, 18.6% for level Gc1-Gc2, 24.6% for level Gb1-Gb2) seem to further confirm these interpretations since microblade production was mainly technologically connected to the reduction of intensive bladelet cores and carinated pieces that also produces more chips.

Typologically, the most valuable artifact categories (core-like pieces and tools), taking into account their low frequency, some unclear core fragments and from 18.2% to 28.4% of non-indicative tools such as notches ("neutral tool types"), retouched pieces and unidentifiable tool fragments in these four tool-kits, could only be structured and compared through the presence/absence of some of the categories and types. On the level of core analysis, it can be said that the generalized presence of bladelet cores in each of the four assemblages is clear; bladelet "carinated" cores are missing only in level Gb1-Gb2 assemblage, while they are present in the other three levels. This difference of the level Gb1-Gb2 should not be taken as very significiant because a carinated end-scraper and a thick shouldered end-scraper are noted in this level, and these and other carinated and thick nosed end-scrapers are known in the other three levels. Recall that, based on the classification system, all of these core and end-scraper types of "carinated pieces" have about the same techno-typological value, in general showing the range of variability in "carinated reduction" in each assemblage. On the level of tool analysis, it can be said that the main tool categories (end-scrapers, burins, retouched blades, "non-geometric microliths") and their particular types are present in each of the four tool-kits. Four other tool categories show a varying presence in these tool-kits. Truncations are present in Unit H, levels Gd and Gc1-Gc2 but absent in level Gb1-Gb2. Aurignacian-like retouched blades are noted only in level Gc1-Gc2 with a single item and almost the same relates to scaled tools with two found in this level, although a unique composite tool (a scaled tool/burin on a concave truncation) of level Gb1-Gb2 should also be noted. Two additional composite tools are again characteristic only for level Gc1-Gc2. The complete absence of truncations, Aurignacian-like retouched blades and the partial absence of composite and scaled tools in Unit H, levels Gd and Gb1-Gb2 may be quite easily explained. First, these tool categories are in total represented by either a small number or just single pieces (e.g., Aurignacian-like retouched blades) in both the 1920s Lower layer and the 1990s Units H and G. Second, level Gc1-Gc2 contains 48.4% of all tools for the four assemblages and the occurrence of these tool categories there is likely due to the better chance of representation there.

Thus, these rather detailed analyses of the composition and variability of the 1990s assemblages in four levels lead to two conclusions. The first is that in grouping together all available data on the 1920s Lower layer and the 1990s Units H and G assemblages, we observe a quite homogeneous Early Aurignacian of Krems-Dufour type industry. The second consists in some changing (developmental?) trends within this homogeneous industry which are visible in changes in percentages of artifact categories, the increased role of microblade production and in the representation of some tool types at the top of this archaeological sequence – the presence of an atypical carinated end-scraper with non-lamellar retouch, a unilateral/flake end-scraper and all dihedral burins (*sic*!) only in levels Gb1-Gb2 and Ga during the 1990s excavations.

Now let us briefly take a look at the general characteristics of these assemblages.

Technology

Primary flaking processes were mainly directed toward bladelet *sensu lato* production (40.3-51.1% of bladelets and microblades together in debitage *sensu lato* (including tools and core maintenance products) from bladelet cores among which the most characteristic are Aurignacian carinated types.

Typology

Typological structures of the 1920s Lower layer and the 1990s Units H and G tool-kits correspond to the observed technological characteristics of the assemblages. "Non-geometric microliths" compose about 40% of all tools in the 1920s Lower layer and about 60% of all tools in the 1990s Units H and G. In our "sample-like" assemblages of 1990s Unit H and levels Gd, Gc1-Gc2 and Gb1-Gb2, "non-geometric microliths" constitute from 58.9% to 67.6% of all tools (excluding, of course, Middle Paleolithic types from the calculation). The most characteristic "non-geometric microlith" types are Aurignacian with flat and semi-steep micro-scalar and/or micro-stepped retouch - numerous " Dufour bladelets" (bladelets and microblades) with bilateral alternate retouch - 63.2-72.0% in Unit H and levels Gd, Gc1-Gc2, Gb1-Gb2 of the 1990s excavations and some "Krems points" with bilateral alternate and bilateral dorsal retouch - 7.0% in Unit H and 2.5% in level Gc1-Gc2. Indicative Upper Paleolithic tool types are represented by the following categories in decreasing order: burins with angle and on truncation types dominant and dihedral type subordinate, occurring notably at the top of this archaeological sequence during the 1990s excavations (levels Gb1-Gb2 and Ga), as well as the absence of carinated types in Units H and G and possibly a very minor presence in the 1920s Lower layer; end-scrapers with rare but typical carinated and thick/flat shouldered/nosed types and dominance of simple flat types mostly made on unretouched blades; scaled tools; truncations; retouched blades and only a very few pieces with "Aurignacian-like heavy retouch"; perforators.

Bone tools and non-utilitarian objects

The Siuren I Early Aurignacian is also characterized by distinct sets of bone tools and shell beads in the 1920s Lower layer and the 1990s Units H and G find complexes. The bone tools from the 1990s excavations (see Akhmetgaleeva this volume) are flat points with pointed tips not clearly isolated and a single shouldered awl with a long sting. The shell beads (see Mikhailesku this volume) are as follows: fresh water river mollusk – *Theodoxus transversalis*, terrestrial snails – *Helix lucorum taurica* and *Helicella dejecta*, marine mollusk – *Apporhais pes pelicani*. It is worth stressing a unique feature for the presence of *Aporrhais pes pelicani* in the Siuren I Early Aurignacian. This Black Sea marine mollusk was already a fossil for the period when Aurignacian groups settled at Siuren I. At the same time, a detailed shell bead analysis has recently been done for Riparo Moshi in Italy by Mary Stiner (1999) and *Aporrhais pes pelicani* species was only present in layer G associated with a kind of Proto-Aurignacian industry and not in any of the other numerous archeological levels there. Moreover, *Aporrhais pes pelicani* was a living species for layer G Aurignacian inhabitants at Riparo Mochi. The latter "shell bead" once again confirms that the noted Siuren I non-lithic artifacts are quite common for the European Early Aurignacian of Krems-Dufour type/Proto-Aurignacian which are also characterized by the complete absence of split-based bone points so typical of the Western and Central European Aurignacian I assemblages.

Fauna data as indicators of hunting activity and use of its results

The 1920s Lower layer and the 1990s Units H and G fauna data (Vekilova 1957, 1971; Lopez Bayon 1998; Patou-Mathis this volume) have already been discussed in relation to hunting activity during the Middle Paleolithic/Kiik-Koba type industry of the Crimean Micoquian Tradition occupation. The conclusion that hunting of the same main ungulate species (*Saiga tatarica, Bos* sp.*, Equus* sp., *Cervus megaceros, Cervus elaphus*) by the Siuren I Upper Paleolithic/Early Aurignacian of Krems-Dufour type *Homo sapiens* remains the most probable. It can only be added that, aside from being food sources, animal bones were also used by these modern *Homo sapiens* for intentional bone tool production. There is, however, one more very special fauna subject for the 1920s Lower layer data that can also be connected to the Siuren I Early Aurignacian subsistence strategy – the (unusual for Crimean Middle Paleolithic) presence of hare (*Lepus timidus*), fish – sea salmon (*Salmo trutta labrax*) and river trout (*Salmo trutta subsp. (fario)?*), and some birds – *Lagopus lagopus*, *Perdix perdix* and *Tetrao tetrix* (see Vekilova 1957: tabl. 2, 4-5 on p. 254-255, 257). The latter species can be associated with the Early Aurignacian.

Characteristics of human occupations and their variability within the whole occupational event

The Upper Paleolithic/Early Aurignacian of Krems-Dufour type *Homo sapiens* periodically occupied the entire currently known area of the Siuren I rock-shelter - about 160 sq. meters in total. The entire occupation event is evidenced by the presence of Early Aurignacian artifacts in four stratigraphically distinct archaeological hearth/ashy levels from the 1990s Units H and G and in three hearth/ashy levels in the 1920s Lower layer. These 3-4 levels (occupation episodes) have different artifact counts. The best evidence is that 43.2% of all finds from the 1990s Units H and G (including level Ga) come from level Gc1-Gc2 alone. At the same time, it can be stated that these 3-4 archaeological levels have very similar occupation characteristics. First, each level contains several usually well-separated hearth/fireplaces and/or ashy clusters. Artifact density ranges from low to medium (with no debris) per 1 sq. meter on average for the 1990s Units H and G - 30.8-38.3 pieces for Unit H, levels Gd and Gb1-Gb2 and 91.9 pieces for level Gc1-Gc2. Flint density is about three times higher in level Gc1-Gc2 in comparison to the other three levels in Units H and G, which may be explained either by more intensive and longer duration of occupation for this archaeological level or by assuming that this level contained the remains of more than one (2-3?) visits to the rock-shelter. Data are not available to select one or the other of these hypotheses; both could explain the relative artifact density for level Gc1-Gc2 in the Early Aurignacian archaeological sequence. Data on flint exploitation and main industrial features of assemblages are also similar in the four levels of the 1990s Units H and G. In total, these data point to "ephemeral" or "short-term" occupations. We inclined to support the latter choice - "short-term" camps - due to the presence of hearths/

fireplaces and/or ashy clusters, bone tools and production of non-utilitarian objects (shell beads). The complete cycles of primary and secondary flint treatment processes typical of these levels additionally strengthens this choice - "intensive short-term camps" - and, at the same time, do not seem to evidence any specialized economic activity but rather all-round economic activity taking place at the rock-shelter during the short length of each visit.

Proposed chronology

As discussed and proposed for the Middle Paleolithic/Crimean Micoquian Tradition Neandertals occupation, we also propose that the Siuren I Early Aurignacian of Krems-Dufour type *Homo sapiens* occupation might be dated geochronologically to the Arcy Interstadial of the Last (Würm) Glacial, ca. about 30 kyr BP.

Position of the industry within the Crimean Upper Paleolithic

In terms of present knowledge about the Crimean Upper Paleolithic, the Siuren I Early Aurignacian of Krems-Dufour type industry fails to fit into any of the previously defined local Upper Paleolithic industries on the peninsula. On the other hand, it is connected to many European complexes of the Early Aurignacian of Krems-Dufour type industry/Aurignacian 0/ Proto-Aurignacian, as discussed in the previous chapter.

The Upper Paleolithic/Late Aurignacian of Krems-Dufour type industry of the 1990s Unit F/ 1920s Middle layer

As for the Siuren I Early Aurignacian, data on the 1920s Middle layer and the 1990s Unit F finds and their comparisons in this volume for the Late Aurignacian industry are also quite sufficient for summarizing its representation.

Assemblages: Composition, variability by archaeological level and industrial features

The total assemblage includes about 5632 pieces (including 51 core like-pieces and 189 tools) from the 1920s Middle layer and 7575 pieces (including 23 core-like pieces and 182 tools) from the 1990s Unit F. Merejkowski's and Vekilova's data on the 1879-1880 excavations will not be used here as their incomplete characteristics do not provide enough information; they show, however, that finds associated with this industry were also present in the rock-shelter's inner central part. Using only data from the 1920s and the 1990s excavations, we have about 13200 lithics from an excavated area totalling about 110 sq. meters.

Compositions and variability of the assemblages are not easy to discuss in much detail, however. First, the 1920s Middle layer is known to us as a single assemblage with no subdivision into several assemblages related to more than one (at least, two) archaeological level. Second, due to lack of systematic sieving in the 1920s, frequencies of chips and microblades/bladelets are inaccurate. Third, relating to the 1990s Unit F, out of four recognized archaeological levels and assemblages, level Fb1-Fb2 contains 6900 artifacts or 91.08% of all Unit F finds. Thus, the 1920s Middle layer and the 1990s Unit F assemblages can only be discussed by presenting the main features of the industry and then the presence/absence of characteristic techno-typologically core and tool types, followed by an attempt to trace its variability throughout the archaeological sequence.

Technology

Primary flaking processes were based on reduction of both bladelet "regular" and Aurignacian "carinated" (mainly single-platform) cores with plain acute striking platforms with edge abrasion and "carinated tools" (end-scrapers and notably burins), resulting in pronounced microblade production - 50.3% in level Fb1-Fb2 and 45.7% of all Unit F debitage *sensu lato* (including tool blanks and core maintenance products).

Typology

Tool-kits for this industry are notable for the presence of the following Aurignacian types among "Indicative Tool Types": carinated and flat/thick shouldered/nosed end-scrapers; and carinated burins, including some busked burins. The prevalence of dihedral burins over angle and on truncation burins is clear and is in accordance with the occurrence of serial carinated burins. A few perforators and truncations are also present, while scaled tools and retouched blades so typical of the Lower layer/Units H and G are completely absent. "Non-geometric microliths" comprise 42.3% of the 1990s Unit F tools and are dominated by Aurignacian "Dufour bladelets" with lateral ventral retouch and "pseudo-Dufour bladelets" with lateral dorsal retouch, both formed by fine marginal retouch and made on microblades with "off-axis" and even dejete removal directions with twisted general profile.

Composition and variability of the assemblages

As we do not have precise data for the 1920s Middle layer debitage pieces - most are broken and "masked" under Vekilova's category of "chunks and flint fragments" which number about 5000 pieces, we can only use the 1990s Unit F assemblages for this analysis.

Despite striking differences in numerical representation of lithic artifacts for each level of Unit F (Fc - 63 pieces; Fa3 - 407 pieces; Fa1-Fa2 - 205 pieces; Fb1-Fb2 - 6900 pieces), there are some obvious similarities in relative frequencies of the main artifact categories: core-like pieces – 0-0.5%; core maintenance products - 2.3-7.9%; debitage - 27.3-57.2%; tools - 2.2-6.3%; waste from production and rejuvenation of tools – 0-1.0%; debris - 28.6-67.2%. Immediately notable is significant variation in core maintenance products in each assemblage that renders the absence of core-like pieces in level Fc unimportant. Next, tools and waste from production and rejuvenation of tools have internally similar indices and again the absence of the latter category in level Fc is replaced by 6.3% of tools (4 pieces) in that level. Thus, the only real differences are related to debitage and debris frequencies which are correlated. The lowest percentage of debitage (27.3%) for level Fb1-Fb2 corresponds to the highest percentage of debris (67.2%) for that level. On the other hand, the highest percentage of debitage (57.2%) for level Fc corresponds to the lowest percentage of debris (28.6%). Taking into consideration these data and the small size of the area for Unit F (12 sq. meters) excavated in the 1990s, it is possible to argue that the numerically insignificant assemblages of levels Fc, Fa3 and Fa1-Fa2 represent small fractions and/or peripheral sections with non-intensive primary and secondary flint treatment processes of three Late Aurignacian occupation episodes, while the level Fb1-Fb2 assemblage attests to very intensive all-round primary and secondary flint treatment processes by Late Aurignacian humans.

Interestingly, these differences in assemblage composition do not reflect any techno-typological changing trends in this part of the Siuren I archaeological sequence. Both the 1920s Middle layer and the 1990s Unit F assemblages have the same characteristic core and tool types. A closer look at the four Unit F assemblages again reveals similar types. Different Aurignacian bladelet "carinated" cores occur in level Fb1-Fb2 (7 of the 20 core-like pieces) and level Fa3 (both core-like pieces are of such types) and they are absent in level Fa1-Fa2 where the single core is a flake/bladelet multiplatform one which definitely underwent intensive multiple reduction phases of possibly any kind, including "carinated". Both Aurignacian "Indicative Tool Types" and "non-geometric microliths" are also identified in each level with no any particular changes in occurrence. Thus, from the basic techno-typological positions of the four Unit F assemblages, we have a quite uniform Late Aurignacian of Krems-Dufour type industry. Accordingly, the variability in representation of the different artifact categories can be viewed as the result of different degrees of intensity of human occupation at the rock-shelter.

Bone pieces and non-utilitarian objects

By these artifact types, the Siuren I Late Aurignacian 1920s Middle layer/1990s Unit F complex is also very different from the site's Early Aurignacian, as is the case with lithic artifact types. Bone pieces (see Akmetgaleeva this volume) include points with circular sections, some bone debitage pieces and a single broken polar fox tooth pendant in which a hole was first drilled from both sides, followed by an attempt to chisel through it, causing the pendant to break. Shell beads (see Mikhailesku this volume) include one marine mollusk species (*Gibbula maga albida*) and three freshwater river mollusk species (*Theodoxus fluviatilis*, *Theodoxus transversalis* and *Lithoglyphus naticoides*).

Fauna data as indicators of hunting activity and use of its results

The 1920s Middle layer and the 1990s Unit F fauna data (Vekilova 1957, 1971; Lopez Bayon 1998; Patou-Mathis this volume) are consistent in showing the following main hunting preferences of the Siuren I Late Aurignacian communities. *Saiga tatarica* was the main species hunted, while *Cervus elaphus* was much less representative but still recognized by Lopez Bayon as the focus of specialized hunting. Other species (*Equus* sp., *Bos* sp.) were probably the focus of more opportunistic hunting. The high level of fragmentation for many animal bones in level Fb1-Fb2 again confirms the lithic data regarding the intensity of human occupation at this level. Also, as has been suggested for the Siuren I Early Aurignacian occupations, the Late Aurignacian occupations of the 1920s Middle layer are known by the presence of hare (*Lepus timidus*), and the same bird species – *Lagopus lagopus*, *Perdix perdix* and *Tetrao tetrix*, with no occurrence of any fish, however (see Vekilova 1957: tabl. 2, 4-5 on p. 254-255, 257). Thus, the two two industrially different Aurignacian occupations at Siuren I show that Crimean Early Upper Paleolithic human communities (presumably *Homo sapiens*) were exploiting a wider range of resources, in addition to the same ungulates that the Neandertals hunted.

Characteristics of human occupations and their variability within the whole occupational event

The Upper Paleolithic/Late Aurignacian of Krems-Dufour type industry *Homo sapiens* groups periodically and certainly partially occupied the Siuren I rock-shelter. The greatest density of lithic and bone artifacts, and fauna finds of the 1920s Middle layer in the rock-shelter's central part around its drip-line area (sq. 12-Ж, З, 16-Е, Ж, 16-И, 15-Ж) is in accordance with data from the 1990s Unit F investigations (sq. 10, 11-Ж, З) and, therefore, the view expressed by Vekilova on this particular area as «a center of human occupation for the Middle layer» (1957:306) also finds further confirmation in our new investigations. Other areas of the rock-shelter with the Middle layer present are of definite peripheral nature (Vekilova 1957:304-306) with fewer finds. At the same time, some of Vekilova's data on the Middle layer and data on archaeological sequence of Unit F allow us to make some more definite determination regarding human occupations of the Siuren I central area around the drip-line zone. Vekilova notes that "... almost on each square was defined a hearth/fireplace. There were two hearth levels in some squares. The most intensive hearth levels were traced on sq. 15-E and 12-Ж where they were up to 25 cm thick» (1957:306). These observations show that at least two archaeological levels were present within the Middle layer and many separate hearth/fireplaces (at different depths?) as well in that area. The 1990s excavations of Unit F revealed a single thick hearth/ashy archaeological level (Fb1-Fb2) and three more levels (Fc, Fa3, Fa1-Fa2) with separate fireplaces (no hearths) and/or ashy clusters. The archaeological and fauna finds for the four levels of Unit F also show that the same kind of economic activity took place during each occupation (level) but with different degrees of intensity. Levels Fc, Fa3 and Fa1-Fa2 have very low artifact densities (with no debris) per 1 sq. meter - from 3.8 pieces in level Fc and 10.9 pieces in level Fa1-Fa2 to 20.3 pieces in level Fa3. Each of these levels with a fireplace and/or ashy clusters can be considered as rather minor remains of probably a single "ephemeral" human occupation. On the other hand, level Fb1-Fb2 has an average density of 188.5 lithic items (with no debris) per 1 sq. meter. Adding to these statistics the very intensive "on-site" primary and secondary flint treatment processes and especially the mass microblade production, the only occurrence of bone tools and non-utilitarian objects in this level for Unit F, nine hearths/fireplaces and ashy clusters, it is clear that level Fb1-Fb2 was a sort of "base camp" for Late Aurignacian groups at Siuren I. Although the structures and spatial distribution of hearths/fireplaces and ashy clusters evidence that they were not all contemporaneous, both very numerous and characteristic "on-site" flint treatment and fauna exploitation processes actually evidence intensive and quite prolonged features for perhaps several human occupations of level Fb1-Fb2. At the same time, the main numerical difference in techno-typological structures between Unit F "ephemeral stations" and "base camp" assemblages is the rarity of "non-geometric microliths" for the former and their abundance for the latter, which can be explained through different degrees of intensity of flint exploitation due to different patterns in economic activities of Late Aurignacian of Krems-Dufour type industry human groups.

Proposed chronology

Keeping in mind the geochronological considerations and the preference of the Arcy Interstadial (ca. 31500-30000 BP) for the Siuren I 1920s Lower layer/1990s Units H and G Middle Paleolithic/Kiik-Koba type industry of the Crimean Micoquian Tradition and Upper Paleolithic/Early Aurignacian of Krems-Dufour occupations, we should also determine the geochronological position for the 1920s Middle layer/1990s Unit F Late Aurignacian of Krems-Dufour occupation. A series of AMS dates for Unit F levels in the range of 31 – 27,000 BP and paleoenvironmental data (this volume) are identical to Units H and G, making the connection of this Late Aurignacian event to the Arcy Interstadial the more probable. Also, the later Maisières Interstadial (29300-28000 BP) cannot be completely excluded regarding the Late Aurignacian industrial features for the 1920s Middle layer/1990s Unit F assemblages. Thus, at present we cannot make a synonymous geochronological determination here, accepting the equal possibility for these two interstadials as likely candidates for the time span corresponding to the Late Aurignacian occupation at Siuren I.

Position of the industry within the Crimean Upper Paleolithic

Like the Siuren I Early Aurignacian of Krems-Dufour type industry, this Late Aurignacian of Krems-Dufour type industry does not have any similar industrial manifestations in the Crimea, and only the pan-European comparisons presented earlier contribut to understanding its position within the European Aurignacian.

The Upper Paleolithic/Late Aurignacian of Krems-Dufour type industry of the 1990s Unit E/Lowest Finds of the 1920s Upper layer

Data on this occupation are quite limited. Therefore, the summary analysis will be done with no special headings for "step-by-step" detailed descriptions as done above for the three Siuren I basal occupations and their industries.

Stratigraphically, Unit E occupies the uppermost part in the archaeological sequence of the Siuren I 1920s Middle layer and 1990s Unit F. Along with this, it was considered by us to be separate from the Unit F archaeological sequence due to the presence of clear and thick culturally sterile deposits between them. Moreover, some of the Aurignacian tool types of the presumably stratigraphically lowermost finds in the 1920s Upper layer can also be connected to 1990s Unit E.

Only lithic artifacts of both the 1920s and the 1990s excavations are related to this occupation; seven flints are known for Unit E. Despite such scarcity, two pieces are very indicative: a bladelet single-platform "advanced carinated" core and a bladelet narrow flaked core/"carinated burin". Similar pieces - a thick shouldered end-scraper and a bladelet narrow flaked core/"carinated burin" - are also represented among the 1920s Upper layer finds. All three very characteristic Aurignacian core and tool types have direct analogies in Unit F assemblages that, from an industrial techno-typological point of view, allow us to consider this industry as belonging to the Siuren I Late Aurignacian of Krems-Dufour type industry of the 1920s Middle layer/ 1990s Unit F, and this fourth human occupation event as the most recent Aurignacian one at Siuren I. The absence of "non-geometric microliths" among the 1990s Unit E finds may be explained by the very limited and minimal flint treatment processes carried out during this "vey ephemeral" (less than 1 artifact per 1 sq. meter on average) visit(s) to the rock-shelter. At the same time, the absence of any indications of industrial changes through time from the assemblages from Unit F to Unit E suggests that the chronological gap between these two Late Aurignacian occupation events was very short, allowing us to consider both as different manifestations of the same Late Aurignacian of Krems-Dufour type industry at Siuren I. The presence of just a few unidentifiable bone fragments in Unit E give no data regarding hunting activity and fauna exploitation during this Late Aurignacian occupation.

The Upper Paleolithic/Gravettian industry of the 1990s Unit D/3rd horizon of the 1920s Upper layer

Like the above final Late Aurignacian occupation, the Gravettian occupation at Siuren I rock-shelter does not "boast" very detailed data. Its summary is thus also quite limited.

Only lithics are again known for this occupation. The 1990s Unit D assemblage is composed of just eight artifacts although two are quite indicative: a blade and a bladelet double-platform bidirectional cores with elongated proportions (length - 6.6-6.5 cm and width - 5.2-2.9 cm). The find concentration in the rock-shelter's central area around the drip-line zone (sq. 15, 16-Ж) with a single hearth/ashy lens in the 1920s 3rd horizon of the Upper layer also has two similar cores - blade/bladelet double-platform bidirectional ones again with elongated proportions (length - 7.3-6.8 cm and width - 3.6-2.8 cm). Such cores are completely unknown in both stratigraphically underlying Aurignacian assemblages and stratigraphically overlying Epi-Gravettian and «Azilian»/Shan-Koba assemblages. To these cores are techno-typologically connected a series of backed pieces from the 1920s Upper layer finds with bidirectional scar pattern and/or elongated proportions among which the most indicative items are a Gravettian point with truncated base, three shouldered pieces and «a microsaw». These tools are again different from the numerous (more than 100) «simple» backed pieces in the 1920s Upper layer which we consider as belonging to the site's Epi-Gravettian industry; backed pieces with thick abrupt retouch are absent from the Siuren I Aurignacian assemblages.

Thus, the Siuren I Gravettian industry is based on, from a technological point of view, reduction of rather large and elongated blade/bladelet double-platform bidirectional cores and, from a typological point of view, on production of backed pieces. Such techno-typological industrial features are typical for European Gravettian industries.

Chronologically, we propose to view the Siuren I Gravettian as dated between 27000-20000 BP. The lower chronological limit is suggested on the basis of the assumed maximum upper time limit of 27000 years BP for the Aurignacian at the site, whereas the upper chronological border is typical of the European Gravettian *sensu stricto*. At the same time, the presence of shouldered pieces and "a microsaw" in the Siuren I Gravettian further clarifies this chronology, making its framework much narrower – ca. 23000-20000 years BP since these tool types are mainly restricted to the Central and Eastern European Late Gravettian during this time frame.

Taking into consideration the rare finds from a single assumed archaeological level distributed in a limited central part of the rock-shelter, we suggest that the Gravettian occupation is either an "ephemeral station" or a "short-term camp". A decisive choice is hard to make, although the presence of a hearth/ashy lens in this archaeological level may favor a "short-term camp".

The Upper Paleolithic/Epi-Gravettian industry of 1990s Unit A and some finds in Humus Deposits/2nd horizon of the 1920s Upper layer

This occupation event is reconstructed by us on the basis of rather poor and, importantly, non-indicative finds in 1990s Unit A, several non-*in situ* backed pieces from the 1990s humus deposits and analysis of most of the numerous and techno-typologically clear finds of the 1920s Upper layer's 2nd horizon.

Uppermost in the 1990s excavations Siuren I archaeological sequence, the Unit A Upper Paleolithic assemblage is composed of 82 flint items but, unfortunately, neither cores and debitage nor tools exhibit any indicative types or sorts of *fossiles directeurs* that would enable industrial attribution within Upper Paleolithic technocomplexes. In this situation, we can only suggest their correspondance to most finds in the 1920s Upper layer's 2nd horizon. At the same time, a series of five backed bladelets and microblades (including three pieces with "projectile damage") from the 1990s non-*in situ* humus deposits quite resemble many backed pieces in the 1920s Upper layer and likely form an integral part of the latter Epi-Gravettian industry. So, the 1920s Upper layer's 2nd horizon data are the main source of information for the Siuren I Epi-Gravettian occupation and its industry.

The 1920s Upper layer's 2nd horizon is found in both western and central areas of the rock-shelter. The central area is marked by the presence of no less than three archaeological levels within the 2nd horizon and each of these levels was accompanied by a hearth/ashy lens in sq. 13-Е, Д and 15-Е, Ж. No less than 3000 flint artifacts are related to the Epi-Gravettian industry. Technologically, this is based on intensive reduction of bladelet single-platform and double-platform cores with shortened metric proportions (mainly 2.9-3.9 cm long) in about equal percentages. Typologically, end-scrapers and burins seem to be represented by less than two dozen examples each, whereas backed bladelets and microblades with thick abrupt retouch are much more common - more than 100 items, including a few «microgravettes» and «a rectangular» piece.

Partial and differing representation of the Epi-Gravettian finds throughout the rock-shelter's investigated area in which only a limited central area contains a multi-level archaeological sequence with three hearth/ashy lenses strongly suggests that the Siuren I Epi-Gravettian occupation event reflects periodic occupation episodes in some parts of the rock-shelter ranging from "ephemeral stations" to "short-term camps".

Industrially, the Siuren I Epi-Gravettian industry should be analyzed together with other Crimean Epi-Gravettian complexes from Adji-Koba and Buran-Kaya-III, but at the moment none of these three assemblages has been classified in detail and, therefore, it is only possible here to argue for the general similarity between these Crimean Epi-Gravettian complexes. Taking into consideration the common predominance of "simple" backed bladelets and microblades in these tool-kits, we could suggest generic links between the Crimean Epi-Gravettian and the Central European Epi-Gravettian and, specifically with its two provinces - the Middle Danube Basin Epi-Gravettian dated to ca. 20000-18000 BP (Hromada & Kozlowski 1995) and the Romanian East Carpathian Epi-Gravettian area dated to ca. 18000-15000 BP (Chirica 1989). With no definite absolute dates yet available for the Crimean Epi-Gravettian complexes, we have no other choice than to accept very wide chronological ranges for them between ca. 20000-15 000 BP.

The Final Paleolithic/"Azilian" Shan-Koba type industry of the 1920s Upper layer's uppermost finds

This occupation is defined only through analysis of the available published and unpublished data from the 1920s Upper layer. There is no data on the "Azilian" Shan-Koba type industry from the 1990s excavations, given that any related finds were not found in the rock-shelter's central area where our new limited excavation block was located.

Two distinct, spatially discontinuous "Azilian" Shan-Koba type industry find spots have been distinguished at Siuren I - the eastern and the western ones. Taking into account their "independence" one from another, they deserve separate analyses.

The eastern find spot is restricted to sq. 24-Е, Ж with a total area of 8 sq. meters (4 x 2 m). Overall quantity of finds is less than 100 flints, including two typical Shan-Koba segments and eight shortened end-scrapers. No mixture with Upper Paleolithic finds (Gravettian *sensu lato* artifacts of the 1920s Upper layer) is noted for this "Azilian" Shan-Koba find spot. The assumption by Bonch-Osmolowski that these finds belong to the Siuren II "Azilian" complex seems to be the most probable and, therefore, their analyses should be conducted together with the Siuren I "Azilian", beyond the scope of this book.

The western find spot is evidenced by the presence of "Azilian" Shan-Koba type industry flint and bone artifacts in sq. 8, 9-В, Г and 10, 11-Г (about 8 sq. m in total) of the 1st and 2nd horizons of the 1920s Upper layer. All «Azilian» indicative types (two flint segments and an unfinished segment/obliquely retouched «Azilian» point, all «bone pieces» - a bone awl, an engraved broken red deer antler, two broken red deer and beaver tooth pendants) were discovered in sq. 8, 9-В, Г near a single hearth («late/Mesolithic», according to both Bonch-Osmolowski and Bibikov). Unfortunately, all these and surely some other «Azilian» finds were then grouped together with stratigraphically lower Epi-Gravettian artifacts by Bonch-Osmolowski into a «uniform» 2nd horizon of the Upper layer collection from the site's western area. Because of this, it is not possible to determine other artifact categories and types for this «Azilian» complex and, therefore, we may only assume the presence of some end-scrapers, burins and debitage pieces with no precise data for them. Thus, the complete artifact composition for the Siuren I western «Azilian» find spot remains unclear and we can only consider this particular very small spot as evidence of a single very short visit to the rock-shelter by «Azilian» people with limited and still unknown economic activity at an «ephemeral station» or «short-term camp».

Long and wide metric proportions of segments on «rough» blanks and the «bone pieces» of the Siuren I western «Azilian» finds spot have direct analogies in the Crimean «Azilian» Early Shan-Koba type industry complexes - e.g., Shan-Koba rock-shelter, layer 6. On the basis of comparison to these «Azilian» complexes, it is quite possible to geochronologically situate the Siuren I western find spot to the Alleröd Interstadial of Final Pleistocene (ca. 11800-10800 BP) as has been proposed for the Shan-Koba rock-shelter, layer 6 (Zaliznyak & Yanevich 1987:11; Bibikov *et al.* 1994:166). In addition, warm-loving fish species (*Rutilus frisii* and *Leuciscus cephalus*) found in the 1920s Upper layer connected by us to the two "Azilian" finds spots further support the proposed Alleröd Interstadial interpretation.

Concluding remarks

The summarized data on the Siuren I archaeological industrial sequence seen through the site's seven human occupation events certainly evidences the great diversity of Paleolithic industries present at the site with respect to both archaeological characteristics and chronology. The time period for the different Paleolithic occupation events at the site ranges chronologically from about 30/28000 BP to about 12/11000 years BP, nearly 20000 years. This is a quite long chronology, starting with the Kiik-Koba type industry of the Crimean Micoquian Tradition at the the very end of Middle Paleolithic and the Early Aurignacian of Krems-Dufour type at the beginning of the Upper Paleolithic to the Final Paleolithic. At the same time, it is not possible to argue that the archaeological sequence at this particular and clearly very important Crimean Paleolithic site reflects local development the seven industries represented. Instead, we see discontinuity in the development of the archaeological sequence of very different Paleolithic complexes representing many separate and discrete visits to the rock-shelter by "independent" human groups with no relations or connections between them with respect to their lithic technological traditions. The only exception can be proposed for the Early and Late Aurignacian of Krems-Dufour type industries here, on the basis of changing trends in assemblages recovered from the 1990s Units H and G toward the presence of tool types that would seem to be characteristic of the 1920s Middle layer/1990s Unit F assemblages. But these industrial changing trends (the appearance of dihedral burins, a carinated atypical end-scraper, a unilateral/flake end-scraper only at the top of the Units H-G sequence in levels Gb1-Gb2 and Ga) are still too minor too argue for real transitional processes that, in conjunction with even the maximum supposed chronological framework for these two Aurignacian complexes (30000-28000 BP), cannot be really used yet for substantiation of local Aurignacian development through time at Siuren I, although these facts should to be kept in mind. Moreover, aside from the Middle Paleolithic occupation, for which the Kiik-Koba type industry is surely very late one within the local Crimean Micoquian Tradition, after the Last Interglacial on the peninsula, all of the other Siuren I six occupation events are evidence of non-local "visitors" in Crimea, arriving there from western and northern territories and, accordingly, archaeologically connected to the Central and Eastern European Aurignacian, Gravettian, Epi-Gravettian and Final Paleolithic industries.

Despite the many new contributions regarding the archaeological context at Siuren I on the basis of the new 1990s excavations, analyses of the new data and of the data from the site's earlier investigations, all aspects of the site's occupations and their industries have not been resolved. Only the first four occupation events (Kiik-Koba type industry of the Crimean Micoquian Tradition, Early and Late Aurignacian of Krems-Dufour type) are more or less well-understood now, although additional AMS dates and pollen analysis would certainly significantly clarify and broaden the dataset. On the other hand, the other three Gravettian, Epi-Gravettian and Final Paleolithic occupations, stratigraphically related to the site's upper cultural deposits, were only briefly described and several hypotheses proposed, without detailed accompanying analyses. To explain these three occupation events, further research is required including new excavations of the upper cultural sediments, although it will be difficult to find an appropriate, even limited, area, for such fieldwork with good preservation of *in situ* deposits, and detailed techno-typological and spatial and stratigraphic distribution analysis of the 1920s Upper layer collection stored in St.-Petersburg (Russia). These studies would specify the techno-typological features of the Siuren I Gravettian, Epi-Gravettian and Final Paleolithic complexes for more valid evaluations of their archaeological positions within the related Central and Eastern European and the Crimean technocomplexes, as well as other characteristics of their occupation events - for example, fauna data which are uncertain for these complexes.

Such disparity in explanation of units usually occurs for archaeological multi-level sites when not all occupation events and associated assemblages are equally understood for objective and subjective reasons. As we have seen, this is also the case at the Siuren I rock-shelter. When more work is done, more work is often additionally needed...

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
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21 - LOOKING EAST

Marcel OTTE

Pour cette période (40,000-35,000 BP), les sites abondent dans l'immensité de l'Asie, jusqu'aux confins de l'Himalaya. L'ensemble de l'Iran actuel n'a fourni que des sites de type aurignacien analogues à Siuren, avec abondance de lamelles, souvent appointées (Arjeneh) ou à retouches marginales (Dufour). Les fouilles récentes les situent à la même période (Otte *et al.* 2007) et la masse des fouilles anciennes n'a livré que cela (Hole & Flannery 1967). Cet Aurignacien s'assortit de pièces à dos, comme dans le Magdalénien occidental, et de pièces circulaires à retouches plates bifaciales. Les supports moustériens, décelés à la base, suggèrent une origine locale. Cette dépendance au "Moustérien du Zagros" est plus nette encore à Warwasi, où la continuité est complète (Otte & Kozlowski 2007). Le Moustérien, réalisé sur blocs courts disponibles localement, tend vers le débitage lamellaire vers le milieu de la séquence pour se poursuivre en Aurignacien classique de cette région (Baradostien), où les fouilles menées par Gilles Berillon vers le nord (Berillon *et al.* 2006) et par Saman Heydari-Guran vers le sud (Heydari-Guran *et al.* 2009) ont obtenu les mêmes résultats. Nos nombreuses prospections dans tout l'Iran actuel n'ont permis d'y trouver que cette seule industrie pour la première moitié du Paléolithique supérieur (Otte & Kozlowski 2007). Le plateau iranien auquel il faut adjoindre Shanidar (aujourd'hui en Irak) (Solecki 1955) contient une énorme masse de cet Aurignacien avec outils sur lamelles et burins carénés ; il constitue d'ailleurs la seule entité technique de cette immense région. Plus tard, l'élaboration des pièces à dos sous forme triangulaire (Zarzien) le fera basculer dans la phase récente du Paléolithique supérieur, comme au Levant (Ohaba) et en Ouzbékistan (Kul-Bulak ; Flas *et al.* 2010). Cette dernière région marque la transition vers les éléments à lames massives (Obi-Rakhmat ; Derevianko [éd.] 2004) plongeant jusqu'à 80.000 ans ! et qui se dirigent tout droit vers Kara-Bom (40.000 ans dans l'Altai ; Goebel *et al.* 1993 ; Derevianko *et al.* 1998), où un Paléolithique supérieur très particulier s'amorce. Il sera retrouvé jusqu'en Mongolie (Dereviano *et al.* 2004) et dans le nord de la Chine (Otte 2010). Ici se situe la profonde différence entre les populations chinoises qui en dérivent (Turner 1989, 1995) et celles de l'autre côté du Xinkiang, en Asie centrale. Au cœur de nos comparaisons se situent aussi les sites du Caucase (Nioradze & Otte 2000 ; Bar-Yosef *et al.* 2006) dont les caractères sont identiques à ceux d'Iran dans la phase développée (Baradostien).

For this period (40,000-35,000 BP), sites are abundant across the vast expanse of Asia, to the Himalayas. The entirety of modern Iran has provided only Aurignacian sites comparable to Siuren, with an abundance of bladelets, often pointed (Arjeneh) or with marginal retouch (Dufour). Recent excavations situate them within the same period (Otte *et al.* 2007) and earlier excavations also recovered them (Hole & Flannery 1967). Such an Aurignacian includes backed pieces, as in the western Magdalenian, and circular pieces with flat bifacial retouch. Mousterian supports, recovered at the bottom of the sequence, suggest a local origin. This dependence on the "Zagros Mousterian" is even clearer at Warwasi, where continuity is complete (Otte & Kozlowski 2007). The Mousterian, made on short locally available blocs, tends towards bladelet production in the middle of the sequence to be followed by the classic Aurignacian in this region (Baradostian). Excavations by Gilles Berillon to the north (Berillon *et al.* 2006) and by Saman Heydari-Guran to the south (Heydari-Guran *et al.* 2009) have obtained similar results. Our many surveys across modern Iran have found only this industry for the first half of the Upper Paleolithic (Otte & Kozlowski 2007). The Iranian plateau to which we must add Shanidar (today in Iraq) (Solecki 1955) contains an enormous quantity of this kind of Aurignacian with bladelet tools and carinated burins; it constitutes moreover the only technological entity in this immense region. Later, the development of backed triangular pieces (Zarzian) would mark the onset of the recent phase of the Upper Paleolithic, as in the Levant (Ohaba) and in Uzbekistan (Kul-Bulak; Flas *et al.* 2010). The latter region marks the transition to elements with massive blades (Obi-Rakhmat; Derevianko [ed.] 2004) going back to 80,000 ans (!) and leads straight to Kara-Bom in the Altai (40,000 BP; Goebel *et al.* 1993 ; Derevianko *et al.* 1998), where a very particular form of Upper Paleolithic arises, spreading as far as Mongolia (Dereviano *et al.* 2004) and the north of China (Otte 2010). Here is situated the profound difference between the Chinese populations that derive from it (Turner 1989, 1995) and those on the other side of Xinkiang, in Central Asia. At the heart of these comparisons are also found the sites of the Caucasus (Nioradze & Otte 2000; Bar-Yosef *et al.* 2006) for which traits are identical to those in Iran during the developed phase (Baradostian).

Du côté africain, les sites d'Égypte (Vermeersch [éd.] 2002) et du Néguev (Marks 1977) livrent des ensembles orientés vers la production de lames à partir d'un Levallois spécialisé (exactement comme dans l'Altai), mais qui ne pouvaient pas aboutir aux technologies lamellaires, telles l'Aurignacien, le Baradostien, le Fumanien, l'Olchévien, etc. Tous ces ensembles sont marqués par l'abondance des lamelles, autant comme supports d'outils que de procédés de façonnage (grattoirs, burins "busqués"). L'emploi de pendeloques et de colorants accompagnent régulièrement ces ensembles, sans qu'ils ne puissent porter davantage la valeur "symbolique" que tout objet reproduit selon le même schéma mental. La symbolique est propre à l'humanité, partout, toujours. Les restes osseux, clairement engagés vers la modernité anatomique, se retrouvent à Mladeč en grand nombre (Teschler-Nicola [éd.] 2006) et à Buran Kaya III (Prat *et al.* 2011).

Cette population, chargée de souvenirs paléo-anthropiens, ira en se radicalisant vers l'ouest européen, où finalement Aurignaciens et Hommes modernes seront considérés comme synonymes (Henry-Gambier 2005). Ces effets de radicalisation des entités ethniques et culturelles se retrouvent à toutes époques et en toutes régions. Car il s'agit de s'y définir dans un milieu où l'étrangeté domine toujours davantage ; les populations des extrémités continentales (Aborigènes, Aïnous, Sans, Fuégiens, Inuits, Pygmées) l'illustrent encore, où l'innovation est suspecte et les mariages mixtes interdits.

Dans l'Asie paléolithique, une sorte de "couloir" s'étirait du Sud-Est au Nord-Ouest, entre la Sibérie et l'Afrique et dans lequel l'Homme moderne migra et posa les bornes de sa mythologie menacée en créant ses reflets matériels, désignés aujourd'hui encore comme œuvres d'art. Chargés d'esprit, elles le furent avec véhémence, et leur langage plastique fut aussi harmonieux, à nous yeux qu'aux leurs, car il s'agit de la culture mille fois transmise et répétée.

L'Aurignacien de Crimée, décrit avec grands détails dans ce volume, possède la clé de cette démarche : là non plus, il ne dispose pas d'ancêtres régionaux, là aussi il constitue une cassure sur les traditions moustériennes sublimées ailleurs. L'introduction des machines à lancer (arc, propulseur) implique une tout autre conquête cinétique que les javelots lancés à la main. Cette efficacité, tendue vers de larges espaces, favorise la rapide expansion ethnique, dont les humbles "lamelles" témoignent en abondance. Une fois franchi ce passage entre Caucase et Oural, l'extension de peuples nouveaux, de leurs mythes et de leurs techniques s'enclencha alors largement vers le reste du continent.

From the African coast, sites in Egypt (Vermeersch [ed.] 2002) and the Negev (Marks 1977) yield assemblages oriented toward blade productions using a specialized Levallois technique (exactly as in the Altai), but which did not lead to bladelet technologies, such as the Aurignacian, the Baradostian, the Fumanian, the Olchevian, etc. All of these assemblages are marked by the abundance of bladelets, as much as blanks for tools as producing through shaping (end-scrapers, "busked" burins). The use of pendants and colorants systematically accompany such lithic assemblages, but they focus more on the "token" value of the object rather than objects systematically produced according to a single mental schema. Symbolism is proper to all humanity, everywhere, always. Bone remains, clearly indicating anatomic modernity, have been found at Mladeč in large number Teschler-Nicola [éd.] 2006 and at Buran Kaya III (Prat *et al.* 2011).

This population, charged with paleo-human memories, would, in radicalizing, move toward western Europe, where finally Aurignacians and modern humans would be considered synonymous (Henry-Gambier 2005). Such effects of radicalization of ethnic and cultural entities are found in all periods and in all regions since it is a matter of being defined in a context where strangeness always dominates; the populations on the continental extremities (aborigines, Ainu, San, Fuegian, Inuit, Pygmies) demonstrate this still today, where innovation is suspect and mixed marriages forbidden.

In Paleolithic Asia, a kind of "corridor" extended from the southeast to the northwest, between Siberia and Africa and through which modern humans migrated and set the boundaries of its threatened mythology by creating its material embodiment, designated even today as works of art. Full of spirit, they were vehement, and their plastic language is as harmonious to our eyes as it was to theirs, because it involves culture a thousand times transmitted and repeated.

The Aurignacian of the Crimea, described in detail in this volume, holds the key to this approach: once again, it does not have regional roots, but constitutes a break with Mousterian traditions that took place elsewhere. The introduction of thrown weapons (bow, atlatl) implies an entirely new cynegetic conquest than hand-thrown spears. This effectiveness, aimed at large species, favored rapid ethnic expansion, which the humble "bladelets" evidence in abundance. Once crossed this passage between the Caucasus and the Urals, the expansion of new people, their myths and their technology, started largely to the rest of the continent.

Translated by Rebecca Miller

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22 - CONCLUDING CONSIDERATIONS

Yuri E. DEMIDENKO

After the many chapters presenting detailed data on the Siuren I assemblages, it should be clear that the Lower and Middle deposits are represented by Upper Paleolithic Archaic Aurignacian and Middle Paleolithic Micoquian artifacts in the 1920s Lower layer/1990s Units H and G, and by only Upper Paleolithic Late/Evolved Aurignacian artifacts in the 1920s Middle layer/1990s Unit F. This is the basic interpretation after all of the analyses carried out. It should be recalled that the Siuren I rock-shelter is the only site in all of Central and Eastern Europe with *in situ* archeological levels with a sequence of two Aurignacian *sensu stricto* industries differentiated by the kinds of retouched microliths – one with mainly Dufour microliths of Dufour sub-type and the other with Dufour and pseudo-Dufour microliths of Roc-de-Combe sub-type. Given this, it is possible to argue for the Pan-European distribution of both Aurignacian industries, not restricting them only to Western Europe. At the same time, going outside of Europe and considering Siuren I and other North Black Sea region Aurignacian complexes within a wider geographical range, including Near Eastern and Middle Eastern materials, it is possible to study the Aurignacian phenomenon more profoundly and broadly.

But what was happening with the present author when he was publishing articles on the Siuren I materials from the site's lower and middle deposits before the present book? This is of interest to show here for our readers as demonstrates some obvious difficulties in understanding the Siuren I material encountered by both Western and Eastern (former Soviet Union) colleagues. Sometimes this is funny, but sometimes not.

Western Side Problem

The "Western side of the problem" is related to the Siuren I Archaic Aurignacian geochronology. Accepting all the Aurignacian archeological definitions proposed for Siuren I, including that for the 1990s Units H and G – Early Aurignacian of Krems-Dufour being an equivalent for the more common terms of Archaic Aurignacian/Proto-Aurignacian with Dufour microliths of Dufour sub-type, most of our Western colleagues are usually unable to agree with the supposed geochronological attribution of the Siuren I Aurignacian finds – the Arcy Interstadial with two AMS OxA dates around 28,000 BP, obtained in the 1990s. Such a negative geochronological view is certainly understandable as such Archaic Aurignacian/Proto-Aurignacian assemblages are radiocarbon dated in Western Europe to a period 37/36-34/33,000 BP. Therefore, the Arcy Interstadial for the Siuren I Archaic Aurignacian would appear to be too recent for most of our Western colleagues. What was and still is possible to state regarding the geochronological problem?

The simple answer is that the period from 31-28,000 BP is still within the Aurignacian time span and not in the much younger LGM, as has been suggested by some Eastern European colleagues (see below). There were and still are two possibilities for interpreting the late radiocarbon chronology. First, we should keep in mind the combined effect of Heinrich Event 4, the Laschamp geomagnetic excursion, a phase of increased 10Be concentration during the cosmogenic nuclide peak and the Campanian Ignimbrite eruption that took place in Western Eurasia around 40-39,000 years ago, according to 40Ar/39Ar dating (see Fedele et al. 2008). The events clearly show the significant radiocarbon anomaly for the time period containing C14 dates between 42 and 27,000 BP. The important thing is that the Early Aurignacian of Krems-Dufour/Proto-Aurignacian find complexes are also known in Italy (open-air site Serino and Castelcivita Cave) directly below the Campanian Ignimbrite eruption ashy level and the archeological layers are radiocarbon dated to around 32-31,000 BP, showing a discrepancy of about 7-8,000 actual years. Moreover, the supposed small number of Early Aurignacian of Krems-Dufour/Proto-Aurignacian assemblage might also originate from the Kostenki 14, cultural layer of volcanic ash from the Campanian Ignimbrite eruption (Central Russia) with an AMS date of ca. 32,000 BP (see Sinitsyn 2003a; Sinitsyn & Hoffecker 2006; Hoffecker *et al.* 2008). This may further support the Italian data, although there are some doubts regarding the Kostenki 14 site cultural layer in volcanic ash stratigraphy – that it might be not covered by the ashy layer, but rather lie <u>on</u> (sic!) or only partially within the ashy level (Lisitsyn 2006:116, 118-119), which would indicate deposition of the Aurignacian finds after the Campanian Ignimbrite eruption. This stratigraphic comment would very radically change the chronology for the earliest Proto-Aurignacian *Homo sapiens* penetration into Central Russia, showing the correctness of the AMS date of ca. 32,000 BP (GrA lab). Moreover, there is also a problem with the particular Aurignacian attribution for the Kostenki 14 artifacts. This find complex was discovered by Sinitsyn during the 1998-2001 excavations (Sinitsyn 2003a). The archeological level was recognized in ashy sediments with some spot distributions for a total area of less than 10 sq. meters. Accordingly, relatively few finds were recovered at this open-air site. Indeed, less than 500 flint items, including tiny chips, were discovered, accompanied by some fragmented faunal remains with the notable presence of many hare and polar fox bones, as well as some fragmented bone tools and personal adornment pieces. Despite such artifact rarity, Sinitsyn came to a conclusion regarding the Aurignacian nature of the complex and the presence of Aurignacian retouched microliths that can be "identified as Dufour bladelets, and, more precisely, as Roc-de-Combe variety" (Sinitsyn 2003a:11). The same conclusion of the Roc-de-Combe-like twistedness of these microliths was also made by Demidenko after personal observation in St.-Petersburg (Russia) in 2001. Accordingly, the level might belong not to the European Proto-Aurignacian with Dufour sub-type bladelets, but, instead, to an Evolved/Late Aurignacian. More information, both stratigraphic and archeological, on the Kostenki XIV, ashy level and its archeological finds are needed for better understanding of this very interesting Aurignacian aspect for Eastern Europe. Therefore, it seems too early to use the Kostenki 14 Aurignacian data to develop hypotheses regarding the earliest Aurignacian human migrations.

At any rate, still taking into account the probable radiocarbon anomaly for the time period in between 40,000 and 30,000 BP, it is quite possible to speculate that the Siuren I, Units H and G AMS dates might be indeed too young and just represent the dispersal of Proto-Aurignacian *Homo sapiens* not only throughout the southern territories of Central and Western Europe, but also in Eastern Europe as well. In favor of this case, an attempt was made to obtain new AMS dates for the Siuren I Units H and G in 2009 and 2010. The results, however, provide no further definite results, being again ca. 31-28,000 BP and show either younger dates than expected or lack enough collagen for secure dates.

At the same time, it should not be forgotten that bone preservation is fairly good for the Siuren I archeological sequence. Therefore, there is also a possibility put forward by Nigst (Max Plank Institute associate, also involved in the new dating program for Siuren I) that already obtained dates for Units H and G might be indeed too young because of poor collagen preservation in the Siuren I animal bones. This is certainly possible. The Siuren I dating problem recalls the situation for the Early Upper Paleolithic sequence at Uçagızlı Cave in south-western Turkey. A good series of more than 20 AMS dates ranging between ca. 41 and 29,000 uncal BP has been obtained for the level sequence, mainly on carbonized plant material, and some marine mollusk shells used to date the Early Ahmarian levels at the top of the Early Upper Paleolithic sequence. At the same time, it is worth noting a comment on the condition of the fauna: "The macrovertebrate assemblages from Uçagızlı Cave are large and well-preserved. Bone mineral preservation is generally very good, whereas collagen preservation is very poor (J. Pearson, pers. comm.)" (Kuhn *et al.* 2008:104-105). So, there may be a similar situation in which the well-preserved ungulate bones at Siuren I indeed do not have enough collagen, causing their dating to fail or provide results that are too young.

The second possible explanation lies in the field where we can still rely on the 31-28,000 BP dates for Siuren I Units H and G AMS dates and consider why the Siuren I Archaic Aurignacian is so late in the southern part of Eastern Europe – the Arcy Interstadial, for the moment. We will return to the late Siuren I Archaic Aurignacian topic below, considering some possible reasons for this.

Eastern Side Problem

The "Eastern side of the problem" is much more complicated in comparison to the Western one. The problem's roots originate in the points of view of the entire East European Aurignacian subject proposed by M.V. Anikovich in the early 1990s and still supported by him. Therefore, they need some particular discussion.

Anikovich's view

In his 1992 article in the *Journal of World Prehistory*, Anikovich announced the very late geochronology for the 1920s excavation Siuren I Aurignacian Lower and Middle layers already discussed in the present volume (see Chapter 1). Why this was done is clearly seen by his direct statement cited here: "The faunas of both the lower and the middle horizons indicate a steppe-semidesert landscape and severe climatic conditions (Vekilova 1957:256, 1971:140). Thus, we can assume that the lower and middle horizons were close in time and date to a marked cold spell" and "[i]t therefore seems most likely that the lower and middle horizons date to the maximum cold of Upper Valdai (ca. 20,000-18,000 B.P.)" (Anikovich 1992:223-224). Also accepting the absence of any "mechanical admixture" for "the "Mousterian complex" in the lower layer of Siuren I", Anikovich (1992:224-225) came to the conclusion that "the collection from the lower layer of Siuren I must reflect ties between local "Mousterians" and, probably, intruders, who brought with them developed Upper Paleolithic cultural traditions" and, at the same time, "the material in the middle layer shows the rapid obsolescence of Middle Paleolithic traditions and a complete dominance of Upper Paleolithic techniques", which led to his final conclusion: "The likely geological age of the lower and middle layers suggests that the Middle-Upper Paleolithic transition occurred in the Crimea much later than in most of Europe". It is strange that in stating such a late geochronology for the two Siuren I Upper Paleolithic layers in 1992, Anikovich did not mention the fact that this conclusion was not properly his own, but he actually joined with the opinion of the very famous Soviet geologist I.K. Ivanova (Moscow) expressed as early as the late 1960s (Ivanova 1969). This is confirmed by citing Anikovich again, this time his 1991 habilitation dissertation thesis in Russian: "The cold-loving fauna that is connected to lower cultural layer (of Siuren I – Yu.D.) indicates that the time of layer's existence was, highly likely, the last climatic minimum of Upper Valdai (18-20,000 years ago). Exactly so the layer was dated by geologist I.K. Ivanova" (Anikovich 1991:19-20). Citing Ivanova's early 1980s opinion on the matter: "There are no doubts that maximum cold conditions, so clearly reflected in fauna and floral structure of Siuren I rock-shelter, are connected to noted in the global scale cooling of Second half of

Würm/Valdai (20-18,000 BP)" (Ivanova 1983:29), it is obvious that Anikovich just followed Ivanova's hypothesis.

It is also important to bear in mind Anikovich's archeological approach in describing the Siuren I Upper Paleolithic find complexes. He has never identified any core and/or tool type as proper to the Aurignacian, which is probably why the Siuren I Upper Paleolithic assemblages were analyzed by him within the context of his Aurignacoid technocomplex and never as Aurignacian *sensu stricto*.

Taking a step back from the strict Siuren I subject, it is very important to cite Anikovich's techno-typological definition of his "Aurignacoid technocomplex", that was developed by him in the early 1990s and is still in use by him with no modifications, and then analyzing it as having these data, it will be much easier then to understand the whole Aurignacoid problem in Eastern Europe.

"Blady primary flaking technique is directed to production of big massive blades. Microblades are, if they occur at all, usually amorphous and often similar to chips. It is characterized by an intensive edge retouch that is far deep on a blank's surface. Burin blow technique is at evolved stage. Flat retouch is rare or absent at all. The tool-kit is characterized by forms made through application of intensive edge retouch on high blades: Aurignacian blades, end-scrapers and points on them. Different forms of short high end-scrapers are associated with them. Dihedral multifaceted pieces are characteristic among burins. Microtools, when present, are usually made by a fine edge retouch, often alternate (Dufour bladelets)" (Anikovich 1991:34-35, 2003:15-16).

It is worth analyzing the Aurignacoid definition using true European Aurignacian tool determinations. Aurignacoid microblades are "usually amorphous and often similar to chips", while Aurignacian microliths are bladelets and microblades with elongated metric proportions. "An intensive edge retouch" seems to be characteristic of supposedly "Aurignacian blades, end-scrapers and points" of Aurignacoid complexes, whereas Aurignacian retouch is invasive and clear stepped. In this case, so-called retouched blades, end-scrapers and points of Eastern European Aurignacoid industries are not true Aurignacian ones. There is also no guarantee that Aurignacoid "short high end-scrapers" are analogous to Aurignacian carinated typical end-scrapers with lamellar retouch. Quite the opposite, Paleolithic archeologists of the ex-Soviet Union usually mean by the term "high end-scrapers" pieces with non-lamellar retouch on thick blanks, that at best are carinated atypical end-scrapers in European terminology. "Dihedral multifaceted burins" are claimed to be the most characteristic for Aurignacoid complexes, but, at the same time, the most Aurignacian different carinated burin types (specific dihedral asymmetrical multifaceted ones) are the best represented among burins of Late/Evolved Western and Central European Aurignacian and Central European Epi-Aurignacian. Accordingly, it is not necessarily that Aurignacoid dihedral multifaceted burins are in fact Aurignacian *sensu lato* carinated burins. The Aurignacoid microtool description appears to be a combination of Aurignacian and non-Aurignacian morphological features. Yes, Aurignacian Dufour bladelets of Dufour sub-type are the most characterized by alternate retouch, although the retouch is not "a fine edge retouch", but its genuine Aurignacian variants are micro-scalar and micro-stepped. At the same time, Aurignacian Dufour bladelets of Roc-de-Combe sub-type usually have ventral retouch that is also marginally abrasive. Thus, the Aurignacoid technocomplex, according to Anikovich's data, by definitions of its characteristic tool types, does not match with genuine Aurignacian or Epi-Aurignacian industries in the rest of Europe.

Turning back to Anikovich's geochronological and archeological points of view on the 1920s excavation Siuren I Lower and Middle layers' artifacts, as well as his "*Aurignacoid technocomplex*" definition, it should be acknowledged that they have significantly influenced the opinions of some Ukrainian colleagues.

Sapozhnikov's view

For example, I.V. Sapozhnikov (Odessa), much supported and developed in more detail Anikovich's position on the Siuren I 1920s Lower and Middle layer finds (Sapozhnikov 2002, 2003, 2005). First, he completely agreed with the Last Glacial Maximum geochronological positions for the Siuren I sediments based on the fauna, geology and radiocarbon dates. Faunal data used by him to support the LGM period are the presence of reindeer and polar fox that are supposed to be permanent residents of the Crimean peninsula during a prolonged time, the second half of the Last Glacial (Sapozhnikov 2002:54). There are, however, some real contradictions to this opinion. On one hand, reindeer remains are known for some Crimean Middle Paleolithic sites, while its occurrence in Siuren I is only restricted to its 1920s *Lower* layer with just two bones. Remembering the complete absence of any reindeer bone in the 1990s Units H, G and F, it seems incorrect to use only very rare reindeer bone remains as a serious indicator for a "prolonged cold spell" within the Siuren I lower layers. On the other hand, polar fox bone remains are well-represented in both the 1920s Lower layer and the 1990s Units H and G. But their presence could be better explained not through simply the paleontological presence/absence of the species, but due to Paleolithic human selection: polar fox bone remains are indeed very rarely known in just a few Crimean Middle Paleolithic sites with single bones at best, while the Siuren I polar fox bone data are abundant. Having such different polar fox situations in the Crimean Middle Paleolithic and Early Upper Paleolithic records, it is much more reasonable to argue for some specialized Aurignacian *Homo sapiens* hunting of prime-adult polar foxes, as well as red foxes, for their fur used for clothes at Siuren I Units H and G (see Chapter 5), which is typical for the Upper Paleolithic *Homo sapiens* life way, but is completely unknown for Middle Paleolithic Neandertal survival strategies. This is why the polar fox presence in the Siuren I lower sediments is a new cultural marker, but not a climatically valued feature. At the same time, it is also worth noting the absence of any true cold-loving small mammal species for Siuren I both in the 1920s Lower and Middle layers (Vekilova 1971:126-127) and the 1990s Units H, G and A (see Chapter 6). Thus, no fauna data points out the LGM period for these Siuren I deposits unless, however, someone such as Sapozhnikov uses 1940s-1960s approaches for faunal interpretations. Similarly, the 1930s-1960s geological approaches have been also applied by Sapozhnikov for understanding of the Siuren I sequence. Indeed, he uses the arguments of 1940s and 1960s geologists N.I. Nikolaev and I.K. Ivanova, leading to his conclusion that "nobody … was able to falsify with any arguments the known to all specialists conclusion of leading geologists that practically all cultural bearing sediments of the site are deposited in one lithological strata package connected to the maximum of Würm III, in other words … from 22 to 16.5 000 years ago" (Sapozhnikov 2003:240; see also Sapozhnikov 2002:54, 2005:185). What can be done to respond to this statement? First, all the geological data represented in the present volume clearly show the variable geological contexts for Units H, G and F and they certainly do not represent a single lithological unit. Second, one of the basic geological approaches in understanding sediment sequences in caves, grottos and rock-shelters in the 1930s-1960s was based on the assumptions that thick limestone *éboulis* strata reflect very cold and arid Pleistocene periods. As the Siuren I deposits are full of many angular limestone *éboulis*, the Soviet geologists attributed the rock-shelter's entire sediment sequence to a very cold phase (Nikolaev 1940) that later was placed into the LGM period (Ivanova 1969, 1983). But two circumstances have to be seriously considered. On one hand, the geologists did not pay attention to the fact that the Siuren I rock-shelter is located within a rather soft and fragile Danish tier of limestone beds of the Belbek river valley. The Siuren I limestone beds' softness and fragility is very definitely seen through continuous intensive weathering of the rock-shelter's limestone walls and roof, even today during the Holocene Interglacial, causing a great number of modern angular limestone *éboulis* to heavily cover the rock-shelter's modern floor. On the other hand, the 1930s-1960s geological approach is now obsolete and no longer applied in studies of Paleolithic sites in caves, grottos and rock-shelters. If Sapozhnikov, as an archeologist, is not aware of this from the geological literature, he still should be aware of it from various archeological publications where the approach was discussed prior to his Siuren I interpretations (e.g. Rigaud 2000:326). Finally, Sapozhnikov completely rejected the radiocarbon dates for the Siuren I rock-shelter: the three uncalibrated AMS dates from Oxford on ungulate bone samples after the site's 1990s excavations – two around 28,000 BP for Unit H and level Ga and one around 29,000 BP for sub-level Fb2. He considered the AMS dates as absolutely inconsistent because dates from level Ga and sub-level Fb2 have a "reverse chronology" as the "depth difference in between them is no less than 1.4-1.5 m whiles a difference in dates is only 250 years". Accordingly, he came to "a sad conclusion: the received dates rather complicated the Siuren I dating problem (not a really complex one!) than clarified it" (Sapozhnikov 2005:181; see also Sapozhnikov 2002:47). Why did Sapozhnikov come to such sad conclusions about the Siuren I dates and stratigraphy? First, he really believes in all radiocarbon dates with their precise numbers, which is why the dates for Unit H and level Ga, on one hand, and the date from sub-level Fb2, on the other hand, are reversed for him. He actually does not know much about real analyses of C14 dates with their sigma data (1 sigma or 2 and their implications). In this case, he would consider that the three Siuren I AMS dates around 29 and 28,000 BP are statistically identical (Pettitt 1998). Second, he considers the Siuren I stratigraphic sequence with a number of limestone *éboulis* lenses and some huge limestone blocks as being similar to loess sequences at open-air sites with continuous slow sedimentation. Therefore, he does not realize that the limestone blocks of, for example, the third rock-fall level (lithological stratum 13) separating mostly level Ga and sub-level Fb2, were not the result of a continuous sedimentation process, but certainly a one-time sedimentation event resulting from partial collapse of the rock-shelter's ceiling. Moreover, several limestone *éboulis* lenses in the sediments of Units H, G and F, separating the dated Unit H and sub-level Fb2, also reflect rapid sedimentation rates at the site, creating a thick sequence for the units. As a result, all these sedimentation data once again repeated here definitely point out a short time period for the deposition of the nearly three meter thick Siuren I sequence, which is why the AMS dates are close one to another.

Finally, Sapozhnikov (2002:47,54, 2005:182-184) also completely rejected any Aurignacian *sensu stricto* characteristics of the Siuren I Lower and Middle finds, as well as the presence of any Middle Paleolithic artifacts within the 1920s Lower layer/the 1990s Units H and G, proposed by the present author in a series of articles published before the present volume. He attributed finds from the 1920s Lower layer/the 1990s Units H and G as representing "Gravettoid Epi-Aurignacian that partially corresponds to the former Aurignacian V of the French scheme" and the Middle Paleolithic unifacial tools there "do not fall out from the Upper Paleolithic technocomplex", while the presence of a few bifacial tools "can be interpreted as an extraneous mechanical admixture, brought to the site from a Mousterian settlement". Finds from the 1920s Middle layer/the 1990s Unit F were attributed by Sapozhnikov to an "Aurignacoid Epigravettian". Such unusual and heterogeneous industrial definitions proposed by Sapozhnikov for these Siuren I materials are based on his following statements regarding the artifacts. The Siuren I 1920s Lower layer/1990s Units H and G "Gravettoid Epi-Aurignacian" term became valid for Sapozhnikov and, respectively, "the material characteristics do not allow us to consider the site's lower layer horizons lithic industry as Aurignacian, that is related to the time of Typical Aurignacian I-IV and not even talking about Aurignacian 0 there" because Sapozhnikov "does not see there any expressive core-like carinated end-scraper; there are very few "nosed", "*à museau*" and "pointed" end-scrapers; both end-scrapers on "strangled" blades and end-scrapers with working edges on their blanks' butts are absent" and "there are no retouched chips or micropoints of Dufour type". Sapozhnikov's interesting Siuren I Lower layer Upper Paleolithic artifact characteristics can be completed by some of his notions on retouched microliths where, aside from dominating "microblades and blades with alternate retouch," he stressed the presence of "blades and microblades with a backed edge and fine ventral retouch, as well as uncommon points of Gravette type and even rarer points with two backed edges, some of them recalling pieces of Krems type". The basis for Sapozhnikov's Siuren I 1920s Middle layer/1990s Unit F "Aurignacoid Epigravettian" definition is also worth consideration. First, he simply stated that "the considering find complex does not contain any Aurignacoid elements" because "there are not only core-like or high end-scrapers, but also retouched micro-chips". He also made the following additional comments while describing some flint classes and tools: "a series of micropoints should be attached to a micro-Gravette type and ca. ten pieces are retouched microchips with twisted profile, among which 4-5 examples can be defined as micropoints of Dufour type" citing illustrations by the present author of Dufour and pseudo-Dufour microblades of Roc-de-Combe sub-type (see Demidenko 2002b: fig. 8); "the so-called Yu.E. Demidenko's "carinated burins" are just "cores" and "there are no large retouched blades, a number of end-scraper types and Krems type points" there. As a result, having such unusual Aurignacian tool type understandings for the Siuren I find complexes, similar, however, to Anikovich, Sapozhnikov created at Siuren I an Aurignacian 0 assemblage with Dufour bladelets of Dufour subtype (1920s Lower layer/1990s Units H and G Upper Paleolithic artifacts) and an Aurignacian II-IV/Evolved Aurignacian assemblage with Dufour and pseudo-Dufour microblades of Roc-de-Combe sub-type (1920s Middle layer/1990s Unit F), following here strictly French terms, "Gravettoid Epi-Aurignacian" and "Aurignacoid Epigravettian" assemblages, respectively. Taking a closer look at his Siuren I artifact descriptions, we clearly understand his problems and also his near-zero knowledge of the Aurignacian, which is again comparable to the Soviet Paleolithic archeologist approach in the 1950s and 1960s, which still survives today thanks to Anikovich. It is also important to bear in mind that Sapozhnikov personally studied some Siuren I artifacts, but only the labeled ones, in 1986 at Kunstkamera Museum (St.-Petersburg), so it was reasonable to expect from him some real new data, but this was definitely not the case. His problems are evident when we look once again at his proposed tool type classification and compare it with our own. For the 1920s Lower layer/1990s Units H and G Upper Paleolithic, our bladelet "carinated" cores and carinated end-scrapers *sensu lato* (including thick nosed/shouldered ones) turned out to be absent in Sapozhnikov's data; there are no flat nosed/shouldered and ogival end-scrapers in our data and very few of them ("nosed", "*à museau*" and "pointed" end-scrapers") in Sapozhnikov's data that is a common feature in the European Aurignacian 0 assemblages; his accent on the absence of end-scrapers on Aurignacian blades ("end-scrapers on "strangled" blades") is also a common feature for the Aurignacian 0, while "end-scrapers with working edges on their blanks' butts" is only Sapozhnikov's enigmatic Aurignacian typical tool type. Regarding the retouched microliths, the absence of any "retouched chip or micropoint of Dufour type" would really surprise anyone who knows something about Aurignacian 0 microlith features and, moreover, his notions of "blades (sic!) with alternate retouch", "blades (sic!) and microblades with a backed edge" and some "points of Gravette type" leave no doubt as to his complete misunderstanding of Aurignacian Dufour, pseudo-Dufour and Krems microlith types in the Siuren I Lower Aurignacian assemblage. At the same time, Sapozhnikov's rejection of the true Middle Paleolithic Micoquian artifact component presence in the Siuren I Lower deposits shows both his incompetence for the Middle Paleolithic by which he is not able to recognize the difference between true Micoquian unifacial tools and simple retouched flakes occurring in Upper Paleolithic assemblages, and his incomprehension that the presence of bifacial tool treatment flakes and chips in these collections makes impossible his hypothesis of just bringing of a few Middle Paleolithic bifacial tools to Siuren I rock-shelter from a Middle Paleolithic site. Taking Sapozhnikov's data on the Siuren I 1920s Middle layer/1990s Unit F flint tools, his conclusion is quite surprising – "the considered find complex does not contain any Aurignacoid elements". We do not know exactly what is hidden under his Aurignacoid elements, but regarding the true Aurignacian core and tool type presence, the Siuren I Evolved Aurignacian is much more Aurignacian, having, for example, the entire carinated core/tool type package (cores, end-scrapers and burins) in comparison to the Siuren I Aurignacian 0 with the absence of carinated burins, although it is a well-known difference between these Aurignacian industries. Therefore, Sapozhnikov's accent on the absence of "core-like or high end-scrapers" in the Siuren I assemblage is not understandable, as well as his identification of our carinated burins as just cores. The latter statement is really funny as the Siuren I Unit F bladelet narrow flaked cores/"carinated burins" and carinated burins *sensu stricto* are functionally, of course, cores for twisted and "off-axis" microblade primary flaking removal, but, typologically speaking, they are Aurignacian carinated burins and nothing else. We should simply not mix typological, technological and functional matters for Paleolithic flint objects as by mixing them someone could classify, for example, retouched blades as "knives" or "jack-planes" etc. Sapozhnikov states that he did not see any "retouched microchips" but, then mentions "ca. ten pieces" that are "retouched microchips with twisted profile". He should know that all of these pieces are typical Dufour and pseudo-Dufour microblades of Roc-de-Combe sub-type, including "micropoints" of "a micro-Gravette type" also defined by him. He should also know that Aurignacian blades with stepped retouch and Font Yves/Krems points are absent in Evolved Aurignacian assemblages.

Thus, following Anikovich's Aurignacoid approach, Sapozhnikov has managed to construct from the two truly Siuren I Aurignacian assemblages some weird hybrids during the LGM period. As it seems to the present authors, the observed Aurignacian and Aurignacoid problems come from the following archeological misunderstandings. Sapozhnikov, like Anikovich and many other colleagues from the former Soviet Union, knows little about the internal structure of the Aurignacian *sensu stricto* where there are three different industries: Aurignacian 0/Proto-Aurignacian, Aurignacian I/Early Aurignacian and Aurignacian II-IV/Evolved Aurignacian for the time span between ca. 38-28,000 uncal BP. There is also the former Aurignacian V industry or Epi-Aurignacian industry dating to the LGM (ca. 22-18,000 uncal BP) with only two Aurignacian-like industrial features – carinated atypical end-scrapers and tiny pseudo-Dufour microliths made on chips and shortened microblades with marginal dorsal abrasion retouch and flat or slightly incurvate, but not twisted, general profiles for the "North Black Sea region Epi-Aurignacian of Krems-Dufour type" (e.g. Demidenko 1999, 2008a). Accordingly, the ex-Soviet Union colleagues, when discussing the Aurignacian/Aurignacoid topic, constructed in their minds a mixed and static industry having Aurignacian I/Early Aurignacian and former Aurignacian V/Epi-Aurignacian features with sometimes only additions of strangely understood carinated burins, which were for them simply dihedral multifaceted ones. Coming to the retouched microlith details, it is also obvious that they nearly always confound true Dufour pieces of both Dufour and Roc-de-Combe sub-types with the North Black Sea region Epi-Aurignacian of Krems-Dufour type microliths and some Epigravettian and even Gravettian backed pieces. This is why Anikovich and his supporters have a great variety of actually non-Aurignacian *sensu stricto* industries for their various Aurignacoid industries: a Middle to Upper Paleolithic transitional "bidirectional blady pointed" Levallois Bohunician-like industry from Kulychivka, lower layer (Western Ukraine); a specific Spitsynskaya EUP industry from Kostenki XVII, lower layer; a Jerzmanowician-like industry from Kostenki VIII, upper layer; various Gravettian industries from Kostenki IV, upper layer and Kostenki IX (Middle Don River region, Russia); an Epi-Aurignacian industry from Radomyshl (Northern Ukraine); North Black Sea Epi-Aurignacian industry of Krems-Dufour type from Muralovka and Zolotovka I sites (Lower Don River region, Russia); mixed and industrially heterogeneous complexes of North Black Sea Epi-Aurignacian industry of Krems-Dufour type and an Epi-Gravettian industry from Rashkov VII and VIII (Moldova); an Epigravettian assemblage from Anetovka II (Southern Ukraine) (see Demidenko 2004b, 2008b), not mentioning here some more of Sapozhnikov's hybrid assemblages of "Gravettoid Epi-Aurignacian" and "Aurignacoid Epigravettian" based again on either mixed and/or non-*in situ* materials (see also Demidenko & Nuzhnyi 2003-2004). As a consequence of these industrial "Aurignacoid" exercises, the "Aurignacoid technocomplex" became dated to a long period between ca. 38 and 18-17,000 BP, similar to the Aurignacian geochronology in the first half of last century.

All in all, we cannot agree with an Aurignacoid attribution for the Siuren I two Aurignacian assemblages, or with the rejection of the Middle Paleolithic Micoquian component for the 1920s Lower layer/1990s Units H and G assemblages. At the same time, we fully understand that any criticism of the Aurignacoid proponents, even with all the arguments presented here, will not influence them quickly and only a slow and permanent accumulation of new published data and arguments might change the situation. This, however, also explains the positions of some of our well-known European colleagues (J.K. Kozlowski and F. Djindjian) who actually support the Russian and Ukrainian Aurignacoid colleagues in their interpretations of the Siuren I Aurignacian assemblages. For example, it is well seen in the following citation of one of their joint publications: "Siuren 1 (Crimea) (Vekilova 1957; Otte *et al.* 1996). Level Fb1 = late Aurignacian = 29,550 BP (?) or mixed Mousterian-Epigravettian layer (?)" (Djindjian *et al.* 2003:42). It is especially interesting that Kozlowski studied some of the 1920s excavation Siuren I labeled artifacts at Kunstkamera Museum (St.-Petersburg) in the 1960s and in all his previous publications, the Siuren I Upper Paleolithic finds from the lower and middle deposits were Aurignacian, while Djindjian, visiting St.-Petersburg in the 1990s and 2000s, never examined the Siuren I artifacts. Therefore, with such Western-sided support, there is little chance that Anikovich and/or Sapozhnikov would change their interpretations of the Siuren I archeology and geochronology. This is one of the reasons why our descriptions of the situation are so detailed here: to show all colleagues the complexity of the interpretations of the Siuren I Aurignacian.

Stepanchuk's view

Another Ukrainian colleague, V.N. Stepanchuk, is also well-known for his actual Aurignacoid exercises in Eastern Europe (see, for example, Cohen & Stepanchuk 1999, 2000-2001; Stepanchuk & Cohen 2000-2001) and for the unusual hypothesis for the youngest Middle Paleolithic Neandertals in "Crimean refugia" – "there are foundations to believe that Ak-Kaya (Micoquian – Yu. D.) and Kabazi (Western Crimean Mousterian/Levallois-Mousterian – Yu. D.) industries survive till 23-24,000 BP and 18-20,000 BP, respectively" (Stepanchuk 2005:209). Stepanchuk has proposed another interpretation for the role of Middle Paleolithic Micoquian finds within the Siuren Lower deposits that are rich in Early Aurignacian of Krems-Dufour type artifacts, based on his analysis of the published data from both the 1920s and the 1990s excavations at the rock-shelter. "I find more grounds to claim in favor of a hypothesis on contacts between incoming (into the Crimea – Yu.D.) Aurignacian people and local Neandertal people that became apparent in a form of direct joint habitation by different human groups being bearers of Middle Paleolithic technological traditions and Dufour Aurignacian traditions" at Siuren I rock-shelter ca. 29-28,000 BP (Stepanchuk 2001-2002:320). Later, he again viewed the joint occurrence of a few Micoquian and many Aurignacian artifacts at Siuren I lower archeological levels "as evidence of peaceful contacts between Archaic and Modern humans" (Stepanchuk 2006:207) for both this site and all of Eastern Europe, which was then used by him as the basis for acculturation-like hypotheses constructing many Early Upper Paleolithic "symbiotic archeological find complexes".

Although Stepanchuk's idea, like any other hypothesis has the right to be proposed, it is quite difficult to imagine such joint (*sic!*) and multiple modern *Homo sapiens* and Neandertal groups' habitations of the same living floors with no sharing as is clear from the archeological data, for several different archeological levels. This is why the separate occupations of the rock-shelter by Micoquian Neandertals and Aurignacian *Homo sapiens* (see Chapter 16) is more plausible, keeping in mind the rapid sedimentation rates at the site, such that rich Aurignacian living floors simply enveloped the rare Micoquian finds there.

Thus, another aspect of the Siuren I archeological context is interpretation differently, showing once again some uniquely East European views of actions and interactions of different Paleolithic human groups.

Our interpretations

But keeping to our own interpretations, we can demonstrate some other "doors" that are now opened for the range of Aurignacian *sensu lato* questions, not only in Eastern Europe but also for all of Western Eurasia.

First, the Siuren I Early Aurignacian of Krems-Dufour type/Aurignacian 0/Proto-Aurignacian/Archaic Aurignacian materials play a crucial role in understanding possible routes of *Homo sapiens* bearers of the industrial tradition into the vast territories of the southern part of Eastern Europe, as it is still the only *in situ* assemblage with absolute dates there. There are still two possibilities to resolve the human dispersion question. The first is based on the assumption that the existing AMS dates for Siuren I, Units H and G are too young for these Aurignacian finds. This is why these Siuren I materials can be still used as indicators for a general penetration of *Homo sapiens* across the whole entire southern territory in Europe during the time range between 38-37-33-32,000 uncal BP or before the Campanian Ignimbrite eruption event. The second possibility is to accept the dates at hand and to examine the Proto-Aurignacian peopling of Europe in a more complex way, as has been previously suggested. Accepting the existing AMS dates, which are also supported by the Siuren I fauna, microfauna and malacofauna data and general Crimean Paleolithic geochronology, it was already possible to propose another scenario for appearance of Proto-Aurignacian *Homo sapiens* in the south of Eastern Europe (Demidenko 2008a:101). Here we can add the Campanian Ignimbrite eruption event in combination with Heinrich Event 4, the Laschamp geomagnetic excursion, a phase of increased 10Be concentration during cosmogenic nuclide peak that certainly seriously influenced the sociocultural and environmental system of Paleolithic human groups for their survival through various climatic effects that included severe volcanic-winter conditions over a period of several hundred years (see again Fedele *et al.* 2008). Because of these events, Zilhao even suggested that "the area available for human settlement in Europe must have contracted by as much as 30%, implying a major population crash (fig. 9)" (Zilhao 2006b:192). Adding to this reasonable demographic hypothesis the fact of a significant ashfall area for Central and Southern Italy, the Balkans, Asia Minor and North Black Sea region (Fedele *et al.* 2008:838, fig. 1), it is possible to speculate about the unsuitable nature of these territories in South-Eastern Europe for any migrations into them of possible incoming human groups during some time period after the Campanian Ignimbrite eruption. If this was the case, then we can understand why Proto-Aurignacian/Aurignacian 0 human communities known in the south of Western Europe around the Hengelo Interstadial before the Campanian Ignimbrite eruption event did not move intensively into Eastern European territories and only later, around the Arcy Interstadial, they came to be known there by simply infiltrating from Western Europe where these human communities, again because of the Campanian Ignimbrite eruption event, were territorially restricted mainly to the southern areas. Accepting such a scenario, the presence of some Proto-Aurignacian sites in Austria (Krems-Hundssteig), in the Banat region of Romania (Tincova, Romanesti-Dumbravita I-II and Cosava), in North-Western Bulgaria (Kozarnika, layer VII) and in the Ukrainian Transcarpathian region (Beregovo I) throughout the Danube river basin area in the eastern part of Central Europe, adjacent to the considered East European region with the Siuren I Proto-Aurignacian at its central southernmost part (the modern Crimean peninsula), further points out the use by Proto-Aurignacian *Homo sapiens* of an easterly route of the "Danube Corridor" for their dispersal into the south of Eastern Europe. Indeed, it is clearly possible to imagine the Danube pathway of these humans from Lower Austria (Krems-Hundssteig) down to the river basin areas in the Banat and Ukrainian Transcarpathian regions and then on to the mouth of the Danube with easy straight access to Western Crimea (Siuren I) across then-dry land of the present-day Bay of Odessa. Moreover, with access to the dry land of the present-day Sea of Azov during the Würmian Interpleniglacial, it is also possible to trace another movement of these Proto-Aurignacian *Homo sapiens* to the north-west (the present-day Lower Don river area) where the Chulek I surface find site is known with its small, but typologically indicative flint assemblage. This assemblage, like the Siuren I Proto-Aurignacian materials, is also characterized by some strong European Proto-Aurignacian typological features with the most obvious seen in a series of retouched microliths with fine ventral basal thinning (Demidenko 2008b:121). Among the tool-kit's 39 retouched microliths, there are 11 microliths with such secondary treatment, which is 28.2% of all 39 microliths or 35.5% of 31 Dufour and pseudo-Dufour bladelets *sensu lato*. It has already been proposed that "the ventrally thinned "non-geometric microliths" be called the Chulek-I type" (Demidenko 2000-2001:151). This rather unusual additional treatment of the Chulek I microliths is known for some European Proto-Aurignacian Dufour bladelets (e.g. Fumane in North-eastern Italy) but seems to be completely absent for Near Eastern and Middle Eastern Aurignacian microliths. Moreover, taking into consideration the absence of Chulek I type microliths among the Siuren I Proto-Aurignacian microliths, it is also necessary to suggest a multiple process of Proto-Aurignacian *Homo sapiens* penetration into southern territories of Eastern Europe from the west and not to see it as a simple one-time event. It has also been previously suggested (Demidenko 2008a) that further movement of the Proto-Aurignacian *Homo sapiens* to the east can be seen through the presence of Proto-Aurignacian materials at Kamennomostskaya Cave and Shyrokiy Mys. Paleogeographical factors also support such a hypothesis. Continuing from the mouth of the Danube into the Crimea, there is no other way than to lengthen this "migration line" to North-western Caucasus with the Kuban river basin where the two above-noted sites are known south of its valley. But a closer techno-typological look at the respective Upper Paleolithic materials of the two sites (Demidenko 2008b) does not allow us to support the Proto-Aurignacian *Homo sapiens* movement there, using the materials presently available. The Kamennomostskaya Cave and Shyrokiy Mys Upper Paleolithic assemblages are in fact industrially similar to some Early Aurignacian Levantine assemblages (e.g. Ksar Akil rock-shelter, levels XII-X) by the presence of such specific elements as serial lateral carinated pieces (Kamennomostskaya cave) or a dominance among retouched microliths of items with fine Ouchtata-like dorsal lateral retouch (Shyrokiy Mys) among basic Proto-Aurignacian techno-typological features. Thus, it is possible to argue for two directions of Proto-Aurignacian/Archaic Aurignacian *Homo sapiens* migrations into the south of Eastern Europe. On one hand, there were possible migrations from the west, from Central Europe, via the "Danube Corridor" in an eastern direction, seen through Upper Paleolithic assemblages from Siuren I, Lower cultural bearing sediments and Chulek I. On the other hand, there were also possible migrations from the south, from the Levant, following the Black Sea eastern shore line (Demidenko in preparation), reflected by the assemblages from Kamennomostskaya Cave and Shyrokiy Mys.

Arguing in favor of these proposed migration hypotheses, it makes sense to consider P. Mellars's hypotheses regarding penetration into Europe of Early Aurignacian/Aurignacian I and Proto-Aurignacian *Homo sapiens* from the Levant because central roles there were played by both the southern European territories occupied by Proto-Aurignacians and the Danube valley as the "main road" for Early Aurignacians on their way into Europe (Mellars 2004, 2006a, 2009) that are rather widely accepted by many colleagues. For Mellars, there are data that "tend to support the model of two separate routes of dispersal of anatomically modern populations across Europe, one primarily along the Danube valley associated with the dispersal of the "classic" Aurignacian, and the other along the Mediterranean coast represented by the bladelet dominated Fumanian industries, and both deriving from the hypothetically ancestral Emiran and Ahmarian populations within the east Mediterranean Levantine region (Figure 18.2)" (Mellars 2009:349). Taking additionally his data and the directions of migrations as indicated by arrows on his map (Mellars 2009:341, fig. 18.2), we see some particular features for the two proposed routes across Europe during 45,000-35,000 calendar years ago that deserve specification and discussion.

The Proto-Aurignacian *Homo sapiens* dispersal migration arrows pass, with some uncertainty, through Turkey and the Balkan Peninsula, due to the lack of Proto-Aurignacian sites there, on to northern and central Italy and then from northern Italy to the Mediterranean coast of France and further to both northern Spain and south-western and central France, with the only arrow before Italy leading to the Danube river where Krems-Hundssteig is located. Now, taking additionally Kozarnika, layer VII with uncalibrated AMS dates between 39 and 36,000 BP in Bulgaria, it is reasonable to place the migration arrow for the "Proto-Aurignacian spot" in the Balkans further to Mediterranean Western Europe, but it is also located less than 50 km south of the Danube valley, showing actual use of Proto-Aurignacian *Homo sapiens* of the "Danube Corridor". Then, accepting the first Proto-Aurignacians penetration into Western Europe through the Balkans, using Krems-Hundssteig in Austria, Banat Proto-Aurignacian sites in Romania and Beregovo I in the Ukrainian Transcarpathian region, all within the Danube river basin, it can only be argued that the Proto-Aurignacian rotational movement to the east through the "Danube Corridor" down to the Crimea (Siuren I) and Lower Don river area (Chulek I) could have lasted until the Arcy Interstadial (ca. 30,000 uncal BP). Accordingly, the "Danube Corridor" was actually of great importance for Proto-Aurignacian *Homo sapiens* dispersal throughout Europe in both western and eastern directions.

Mellars's Aurignacian I *Homo sapiens* dispersal route does not relate directly to the present study, although there is not total agreement on some particular aspects of the matter (see also Conard & Bolus 2003, 2008; Zilhao 2006b; Teyssandier 2006; Nigst 2009).

At the same time, arguments regarding starting "industrial and chronological points" of the two Aurignacian migration routes from the Levant into Europe should be considered with some criticism.

Comparisons with the Ahmarian

Starting from Bar-Yosef's opinion that the European Mediterranean Proto-Aurignacian resembles the Levantine Ahmarian (Bar-Yosef 2003), many colleagues argue about such similarity and the origin of the Proto-Aurignacian from the Early Ahmarian, taking into consideration the earlier chronology for the latter technocomplex's sites. To confirm this, it is enough to directly cite Mellars, Zilhao and Teyssandier, colleagues who very often have different positions on Early Upper Paleolithic questions, but interestingly holding nearly the same but independent positions on this particular question. At the same time, it is worth noting Mellars's position as he is the only one who mentions specific Levantine sites and assemblages, whereas Zilhao and Teyssandier discuss only the basic Early Ahmarian industry.

Mellars expressed his opinion as follows: "I would suggest … that these Near Eastern bladelet technologies (Yu.D. – materials used: "Levantine Aurignacian B" assemblages from levels 9-11 at Ksar Akil" in Lebanon and Boker A Early Ahmarian assemblage in Israel) could well represent the immediate source of the highly distinctive Fumanian/Proto-Aurignacian industries along the Mediterranean coastline of Europe, and reflect the dispersal of new populations across this region which was largely if not entirely separate from that reflected by the dispersal of the "classic" Aurignacian technologies via the Danube valley and subsequently into the northern and western zones of Europe" (Mellars 2009:346; see also Mellars 2004:463). In the same article, he detailed his typological arguments for the Near Eastern assemblages: "high frequencies of these small retouched bladelet forms, which fall into the same two broad categories of large "Dufour" forms (often shaped by means of inverse retouch on the ventral as opposed to the dorsal faces of the bladelets) and more sharply pointed "Font Yves" or "El Wad" forms".

Zilhao was very short and straightforward: "Technologically and typologically, the Protoaurignacian is virtually indistinguishable from the Early Ahmarian of the Levant. Its Font-Yves points, for instance, are exactly the same things as the latter's El Wad points" (Zilhao 2006b:190).

Teyssandier added more bladelet details for the analysis: "Similarities between Proto-Aurignacian and Early Ahmarian assemblages are particularly significant in terms of blade and bladelet core reduction methods and retouched bladelet morphologies (e.g. certain El-Wad points resemble the Font-Yves points of the Proto-Aurignacian, Belfer-Cohen, Gorring-Morris 2003). The convergences are also of particular significance when examining the general "allure" of blade and bladelet blanks, often standardized and regular, narrow and elongated and with a predominant rectilinear profile. All these technological and stylistic patterns well differentiate the Early Ahmarian and the Proto-Aurignacian on the one hand from the classical Early Aurignacian on the other hand. Moreover, as in the Proto-Aurignacian, the Early Ahmarian industries include few examples of organic productions and the predominant use of shells for ornaments, as recently demonstrated in levels F–H of Üçagizli for instance" (Teyssandier 2006:25).

The seemingly commonly accepted idea does not, however, appear as promising to us. First, when colleagues mention the Early Ahmarian for the discussion, they do not pay attention at all to the technological and typological differences between Negev, Sinai and Jordan Southern Levantine Ahmarian assemblages, including the Boker A open-air site, and the Mediterranean Northern Levantine Ahmarian assemblages in Northern Israel, Lebanon and southernmost Turkey, including the Ksar Akil rock-shelter. The southern assemblages (e.g. Boker A site), technologically, are characterized by evident blade/bladelet and strictly bladelet primary flaking processes based on reduction of single-platform and elongated cores. Usually, core reduction was carried out on the narrow sides ("Narrow-fronted" cores, after Davidzon & Goring-Morris 2003) with fewer cores for which wide fronts were also used for reduction. Having such basic core reduction data (see papers in Goring-Morris and Belfer-Cohen 2003), the overwhelming majority of blady debitage is represented by bladelets. The northern assemblages (e.g. Ksar Akil, levels XIX-XVI, Üçagizli Cave, levels C-B), technologically, are based on mainly primary reduction of double-platform bidirectional blade and blade/bladelet rectangular and sub-cylindrical wide-fronted cores, such that blades and to a much lesser extent bladelets are known among the blady debitage (see Bergman 1987). Such northern-looking assemblages are represented by only single examples in the south (e.g. Lagama XVI– see Bar-Yosef and Belfer 1977:72-76) that confirms the regional Early Ahmarian variability. The respective technological differences are well reflected in various types of points and retouched microliths. These tools of the southern assemblages are mainly composed of elongated variously retouched el-Wad points and pieces with lateral dorsal retouch on narrow blades and bladelets, while tools of the northern assemblages are best represented by dorsally retouched Ksar Akil points on blades with a few retouched bladelets. Moreover, retouched blades and especially bladelets, including pointed elements, often compose nearly half or more in the southern tool-kits, whereas such tools are much less represented in the northern tool-kits. Indeed, the southern and northern Early Ahmarian assemblages are different enough from one another to represent at least two different facies of the Early Ahmarian. The techno-typological differences between the two regional Early Ahmarian assemblages were known early on and are very well expressed by the following 1980s comment: "As J.L. Phillips exclaimed when shown the Early Ahmarian material from levels XX-XVI at Ksar Akil, "my material [from Sinai] does not look anything like this" (Bergman 2003:185). Accordingly, if the three European colleagues discussed above would like to connect the European Proto-Aurignacian with the Levantine Early Ahmarian, they at least should use data on the Southern Levantine materials that are, however, the most territorially distant Levantine region to Europe. But still the Early Ahmarian assemblages in the Southern Levant are also in fact techno-typologically different from the European Proto-Aurignacian assemblages, such as the characteristic Proto-Aurignacian bladelet "carinated" cores have much shorter flaking surfaces than the Ahmarian cores, some carinated end-scrapers and dominant alternately regularly retouched Dufour sub-type bladelets and microblades are nearly completely unknown or represented by a very few pieces among the Early Ahmarian assemblages. Moreover, the three European colleagues' accent on the similarity or near-identical characteristics of the Proto-Aurignacian and the Early Ahmarian microliths does not reflect reality except for their very basic production on bladelets *sensu lato* with either flat or incurvate general profiles without abrupt retouch. First, the Southern Levantine Early Ahmarian microliths are characterized by a significant portion of pointed elements (el-Wad points) among the "non-geometric microliths" (different items on bladelets *sensu lato*), if they are present in each specific assemblage at all, either including them or not into the category of points on blades. This is shown in recently published tool composition data for Southern Levantine Early Ahmarian assemblages (see Phillips & Saca 2003:105, tabl. 9.1). Taking the most important (C14 dated, *in situ* and quantitatively abundant assemblages) related sites with numerous points, Boker A (Negev) and Lagama VII (Sinai), the predominance (*sic!*) of points over all the other retouched bladelets is clear: ca. 69% of points (84 specimens) among the "non-geometric microliths" for Boker A (calculated according to Jones *et al.* 1983:288, tabl. 9-5) and ca. 55% of points (387 specimens) among the grouped points and retouched bladelets for Lagama VII excavated tool sample only, although the point category includes some items on blades (calculated according to Bar-Yosef & Belfer 1977:49, tabl. 9). At the same time, no European Proto-Aurignacian "non-geometric microliths" sample shows a percentage of Font-Yves/Krems points more than 8-10%. Such high numerical representation of points among Early Ahmarian microliths is conditioned by the assemblages' blade/bladelet primary flaking particularities where indeed "the makers wanted to produce a single type of end product: a non-cortical distally pointed blade (e.g., Coinman 1998a:44; Ferring 1988:334 and 348)" (Monigal 2003:127). And once again the same conclusions on the recent Jordanian Early Ahmarian materials – "Elongated blanks in Ahmarian assemblages were produced and used primarily for pointed implements made on the small blades and bladelets. Initially (Yu. D. – for the Early Ahmarian), the emphasis was on producing a variety of el-Wad point types" (Coinman 2003:160-162). Furthermore, the Early Ahmarian points are quite variable based on retouch placement. For example, ventrally retouched points compose ca. 63% of all points on bladelets at Boker A. Also, alternatively retouched points are present among 28 el-Wad points on bladelets at Boker A but their exact percentage is unknown from the published data; one of their retouched edges is almost always very weakly and partially retouched. The Lagama VII point data demonstrate, however, the almost exclusive presence of dorsally retouched items. The recently published Early Ahmarian data from Jordanian Wadi al-Hasa are somewhere between the Boker A and Lagama VIII point data – "… el-Wad points tend to exhibit retouch on both edges, often by inverse retouch (19.1%), but more commonly as obverse retouch (69.9%). Retouch on both edges or alternating inverse/obverse retouch along the same edge is less frequent" (Coinman 2003:162). The Early Ahmarian points are also rather elongated as many of them are more than 5 cm long. Finally, the Early Ahmarian point retouch is also characterized by many partially and discontinuously retouched edges (see Jones *et al.* 1983:300, fig. 9-9 and Monigal 2003:128, fig. 11.9 for Boker A; Coinman 2003:163, fig.13.11 for Wadi al-Hasa sites). The retouch edge data are again interconnected to basic convergent/pointed shape for the majority of points' bladelet blanks, so that it was not necessary to modify them by any regular retouch, also known early on: "These tools (Yu. D. – el-Wad points and retouched blade-bladelets) all exhibit minor retouch; i.e., the debitage blank closely approximates the final morphology of the tool. In this sense, the Early Ahmarian technologies can be considered "specialized," in that blade blanks with specific morphology were the focus of the reduction strategies (Ferring 1988:342). Quite the opposite is known for the European Proto-Aurignacian points on bladelets. They are usually characterized by the great dominance of dorsally retouched items (proper Font-Yves points), rarer alternately retouched items (proper Krems points) and nearly no ventrally retouched points; the occurrence of mainly pieces under 5 cm long and just a very minor percentage, if at all, of more elongated (> 5 cm long) items; the great significance of regularly and continuously retouched items. Thus, the two European and Levantine Early Upper Paleolithic industries are in fact different in terms of points on bladelets and the significance of the points within the retouched microlith samples. The retouched bladelets further confirm the differences between the two industries with the absolute predominance of specimens with dorsal lateral and/or bilateral retouch for the Early Ahmarian assemblages, while the Proto-Aurignacian bladelets have mainly alternate bilateral retouch.

In sum, the proposed hypothesis regarding techno-typological "similarities" between the European Proto-Aurignacian and the Levantine Early Ahmarian or even their "indistinguishable" characteristics are not supported by a closer look at the data from any of the Northern or Southern Levantine Early Ahmarian assemblages and comparisons to the European Proto-Aurignacian.

Comparisons with Levantine Aurignacian B

At the same time, Mellars' attention to the Ksar Akil rock-shelter, levels XI-IX (Lebanon), referred by him as ""Levantine Aurignacian B" assemblages", deserves further attention. The first point that should be mentioned is that these Ksar Akil levels do not actually belong to the "Levantine Aurignacian B" phase, as most Paleolithic specialists working with the Levantine Upper Paleolithic agreed in the 1970s-1980s, rather an Aurignacian *sensu lato* sequence (levels XIII-VI) above the last Early Ahmarian *sensu stricto* (level XVI), is subdivided, according to artifact characteristics, into the following phase structure: levels XIII-XI – "Levantine Aurignacian A"; levels X-IX – "Levantine Aurignacian B"; levels VIII-VI – "Levantine Aurignacian C" with additional reservations for the taxonomic status of level VI (see Copeland 1975:342-343; Bergman 1987:7-9). Accordingly, Mellars grouped together materials from both "Levantine Aurignacian A and B" phases (level XI and X-IX) into his "Levantine Aurignacian B" phase. Second, his statement that the Ksar Akil Aurignacian *sensu lato* assemblages from levels XI-IX are "analogous bladelet industries" to the Boker A Early Ahmarian assemblage (Mellars 2009:346) is also incorrect. Taking a closer look at the Ksar Akil levels XII-XI (level XIII has too few flints and even rarer tools for detailed descriptions) and level X (level IX is partially mixed with artifacts from overlying level VIII) with Bergman's Ksar Akil 1937-1938 London collection data (Bergman 1987), there is no other way than to agree with his subdivision of materials from the three levels into two different Levantine Aurignacian phases. Flints from the "Levantine Aurignacian A" phase of Ksar Akil, levels XII-XI are characterized technologically by Ahmarian-like blade/bladelet single-platform core reduction processes with production, however, of mainly twisted and "off-axis" blades and bladelets from elongated cores, where the former debitage type dominates within the debitage. Typologically, burins outnumber end-scrapers and up to three-fourths of burins are dihedral; el-Wad points and retouched bladelets compose ca. 16-17% of all tools, but percentages of el-Wad points either absolutely dominate among these two tool categories in level XI (ca. 85%) or remain very common in level XII (ca. 66%); carinated tools, depending on the particular level, are either ca. 15% (level XII) or 28% (level XI) among the levels' tool-kits, and a remarkable percentage is composed of specific lateral carinated pieces. Bergman's data can be complemented by more specific comments based on his typological details for these Ksar Akil levels, some minor artifact observations of levels XII-XI by Demidenko in 1993 and 1995 at Peabody Museum (Harvard University, Cambridge, USA) and recently, very similar materials from layer 3 at Yabrud II rock-shelter (Syria, A. Rust excavations) in Cologne (Germany) analyzed by Demidenko in 2009. These specifications are related to the question of the internal typological composition of carinated tools. Bergman did not separate carinated end-scrapers and carinated burins from one another, rather grouping them as a combined tool category – carinated tools produced on debitage blanks. But our observations allow us to say that there is a very great prevalence of carinated burins *sensu lato* within the carinated tools, while typologically defined carinated end-scrapers number just a few specimens. Moreover, the carinated burins are represented by a variety of types with serial numerical representation of each type: strictly simple carinated burins, flat-faced carinated burins/*burin caréné plan*/"*Ksar Akil burins*" or, in the European Aurignacian tool terminology, *burins des Vachons* (see Perpère 1972) and, finally, items with rather wide burin-like verges termed for similar items at Siuren I, Late/Evolved Aurignacian Unit F as bladelet narrow flaked cores/"carinated burins". These lateral carinated pieces are also techno-typologically connected to the group of carinated burin types. Also, worth noting are the abundance of el-Wad points mainly on blades, although rather narrow, and less much common than el-Wad points on bladelets, as well as the dominance of twisted and "off-axis" items for blady debitage and tool blanks. Accordingly, the great importance of carinated burins and twisted and "off-axis" blades and bladelets for the Ksar Akil, levels XII-XI has the following two implications. First, the unambiguous mistake made by Mellars in his attempt to directly connect the European Proto-Aurignacian with the Ksar Akil, level XI material can be seen, as all the noted specific features of the latter assemblage are not known for the former assemblages. Second, it is quite surprising to see the evolved Aurignacian features (the abundance of different carinated burin types) at the very beginning of the "Levantine Aurignacian" industrial-chronological sequence. Therefore, it also becomes understandable why de Sonneville-Bordes attributed carinated burins-rich assemblage from layer 3 at Yabrud II as "*Aurignacien récent*" (Sonneville-Bordes 1956) – she simply followed the already established French Aurignacian standards. All in all, doubts about any Aurignacian *sensu stricto* industrial attribution for the "Levantine Aurignacian A" (e.g. Bergman 1987, 1988, 2003; Belfer-Cohen & Bar-Yosef 1999; Bar-Yosef 2000, 2006) seem to be reasonable, recalling its Early Ahmarian-like primary reduction characteristics. The materials of Ksar Akil, levels XII-XI, as well as very similar finds from Yabrud II, layer 3, might be an industrially special and chronologically rather late variant of Early Ahmarian variability in which its specific feature is pronounced with different carinated burin-like reduction strategies to produce some small-sized twisted debitage. This proposal finds further support when we look at Early Ahmarian Lagaman site materials from Sinai. Indeed, some rare, but typologically definite carinated burins sporadically appear there (e.g. Lagama V – Bar-Yosef & Belfer 1977:51, fig. 18, 2; Lagama XII – Bar-Yosef & Belfer 1977:68, fig. 29, 11), but they can even also occupy a signification portion of all burins – 5 pieces of all excavated 23 burins (21.7%) at Lagama VII (Bar-Yosef & Belfer 1977:60, fig. 25, 1-2), which is probably the most typical Early Ahmarian assemblage for the entire Gebel Maghara region. At the same time, carinated end-scrapers are either again represented by single items (Lagama V) or completely absent (Lagam VII and XII). Similar percentages up to 25% of carinated burins among all burins are also known for some more Early Ahmarian sites in the Levant, the most clear examples of which are the Early Ahmarian type-site Erq el-Ahmar, layers E – D (Neuville 1951) and Yabrud II, layers 5-4 (Rust 1950). This is why it is possible to suggest the existence of a separate facies of Early Ahmarian with some carinated burin technology already used prior to any proper Aurignacian industry occurrence in the region, which is, however, missing in the Ksar Akil rock-shelter archaeological sequence.

Moving up through the Ksar Akil "Levantine Aurignacian" sequence, we come up to level X, which was grouped with level XI by Mellars as the Ksar Akil "immediate source" representative of the European Proto-Aurignacian. Bergman's data on Level X (Bergman 1987) with some limited artifact observations of level X by Demidenko in 1993 and 1995 at Peabody Museum (Harvard University, Cambridge, USA) can be briefly summarized as follows. First, artifacts are clearly different from those in underlying levels XII and XI. Technologically, blade/bladelet primary reduction strategies are again based on flaking of mainly single-platform cores, but (*sic!*) the resulting blady debitage is different; it now has mostly non-twisted and "on-axis" morphological characteristics; bladelets predominate over blades. Typological features also show significant changes. End-scrapers outnumber burins. Dihedral burins slightly dominate over burins on truncation/lateral retouch. El-Wad points and retouched bladelets together account for ca. 31% of all tools and it is notably the highest proportion of these two tool categories within the entire "Levantine Aurignacian" sequence at Ksar Akil. Moreover, these two tool categories are numerically equivalent: 270 el-Wad points and 273 retouched bladelets. Dorsally retouched el-Wad points, including some items with Ouchtata retouch, are complemented here by the only known example for levels X and IX in the Ksar Akil Aurignacian sequence of an "el-Wad point variant"/"Abu Halka point", having in addition to dorsal lateral retouch some ventral lateral and basal retouch, thus with some similarities to points with alternate bilateral retouch (Krems points in European terminology). Dorsally retouched items prevail among retouched bladelets where the proportion of items with ventral and alternate retouch only reaches ca. 30%. Like all blady debitage, the el-Wad points and retouched bladelets are non-twisted and "on-axis". Carinated tools number only ca. 11%, that about two and a half times less than was known for the level XI tool-kit. More than that, for the first time for Ksar Akil, the significance of carinated end-scrapers and the much decreased role of carinated burins is clearly seen in the levels XIII-X sequence. Lateral carinated pieces still occur, but are also less common. Finally, Aurignacian blades and end-scrapers on Aurignacian blades, still numbering a few examples, seem to be represented by some very typical examples, including even some strangled items.

All these data on the Ksar Akil, level X assemblage indicate for the first time in the entire Levantine Early Upper Paleolithic record some real techno-typological similarities to the European Proto-Aurignacian. Additional new specifications on the Ksar Akil, level X assemblage are based on as yet unpublished observations on the Peabody Museum, Harvard University collection by T. Tsanova and N. Zwyns. These colleagues with a good knowledge of the European Aurignacian and particularly the Proto-Aurignacian, clearly identified core and tool types that are very typical for the Proto-Aurignacian: bladelet "carinated" cores, carinated and thick nosed/shouldered end-scrapers, and even a few definite Dufour bladelets and Krems points with alternate bilateral retouch (Tsanova and Zwyns, pers. comm. to Demidenko in 2009). But there are still some differences between the European Proto-Aurignacian and the Ksar Akil, level X assemblages that are best expressed by the presence in the latter of many dihedral and some carinated burins, some lateral carinated pieces, dominance of dorsally retouched bladelets and half of all "non-geometric microliths" comprised by el-Wad points, features which are not typical for the former assemblages at all. Therefore, it is still not possible to make a very definite and straightforward Proto-Aurignacian *Homo sapiens* migration route from the Levant into Europe.

Comparisons with North-Western Caucasus and Near/Middle East

But widening the European southern territories, where most of the sites with Proto-Aurignacian layers are known, into the North Black Sea region, we come back to two important sites with Proto-Aurignacian-like flint assemblages in North-Western Caucasus – Kamennomostskaya Cave, lower layer and the Shyrokiy Mys open-air site. Recently (Demidenko 2008b), it was suggested that one can see definite techno-typological connections of these two assemblages with the Ksar Akil, levels X-IX, "Levantine Aurignacian B". Now, after Demidenko's work with Yabrud II, layer 3 and further analysis of the Ksar Akil, levels XII-XI and X assemblages, further specifications are now proposed for comparisons between the North-Western Caucasus and Levantine materials. Materials from Kamennomostskaya Cave, lower layer with lateral carinated pieces and some carinated burins fits more precisely into the "Levantine Aurignacian A" assemblages (Ksar Akil, levels XX-XI and Yabrud II, layer 3). The Kamennomostskaya blady debitage and tool-blank data with prevalence of non-twisted and "on-axis" items over twisted and "off-axis" ones (see Demidenko 2000-2001) now find an explanation in poor excavation methods used in 1961, where most of the small-sized debitage and "non-geometric microliths" would have been lost. The same can be said about the Yabrud II, layer 3 assemblage where most of the debitage pieces were not kept after the early 1930s excavations. Accordingly, if there were better controlled and performed excavations at Kamennomostskaya Cave, there could be at least some dominance of twisted and "off-axis" blady debitage and "non-geometric microliths" there. As a result, Kamennomostskaya Cave should be connected to the "Levantine Aurignacian A" with all the data presently available. On the other hand, the Shyrokiy Mys materials still most closely resemble the Ksar Akil, level X assemblage, although the former has some minor differences – a subordinate position of dihedral burins, absence of both carinated burins and lateral carinated pieces in the North-Western Caucasian site. Such differences can be regarded as not too important, falling within the range of industrial variability.

Thus, instead of the direct industrial similarities between the European Proto-Aurignacian and the Levantine Early Ahmarian and "Levantine Aurignacian B" proposed by our European colleagues, leading to proposed migrations of Levantine *Homo sapiens* into the southern areas of Central and Western Europe, we do not see significant techno-typological similarities for these European and Levantine Early Upper Paleolithic industries. At the same time, it is possible to postulate similar characteristics between the "Levantine Aurignacian A" (Ksar Akil rock-shelter, levels XII-XI; Yabrud II rock-shelter, layer 3) and Kamennomostskaya Cave, lower layer, on one hand, and between the "Levantine Aurignacian B" (Ksar Akil rock-shelter, level X) and Shyrokiy Mys open-air site. Having no preceding Early Upper Paleolithic assemblages with Aurignacian-like characteristics in Northern Caucasus, very different from the Levantine situation, it is, therefore, reasonable to again put forward the idea of migrations of Levantine *Homo sapiens* to North-Western Caucasus based on these archeological materials. Moreover, given the different archeological data for the two sets of Levantine and North Caucasian Upper Paleolithic assemblages, migrations from the Levant to Northern Caucasus should be regarded as not a single event, but with at least two waves.

Understanding the migration possibilities along the eastern shore of the Black Sea, we also need to look at geographically intermediate Early Upper Paleolithic/Proto-Aurignacian – Aurignacian-like assemblages. The only known possible related assemblages are Baradostian ones in the Zagros Mountains region of Iraq and Iran. Since 1994, when D. Olszewski and H. Dibble first renamed the Baradostian as the Zagros Aurignacian (Olszewski & Dibble 1994), much more is now known about the Early Upper Paleolithic there (e.g. Olszewski 2007; Olszewski & Dibble 2006; Otte *et al.* 2007; Otte & Kozlowski 2007; Bordes & Shidrang 2009). Taking the Yafteh Cave and Warwasi rock-shelter Early Upper Paleolithic assemblages into consideration, as the most important stratified sites for the Zagros Upper Paleolithic, and, at the same time, excluding Middle Paleolithic features for the Warwasi Upper Paleolithic levels as possibly being an intrusive component from the underlying Zagros Mousterian levels, their Proto-Aurignacian features are clear, including mostly non-twisted and "on-axis" blady debitage characteristics. But as is the case with the general Levantine Early Upper Paleolithic trend where most el-Wad points and retouched bladelets have dorsal lateral and/or bilateral retouch, this is also typical for the Early Zagros Aurignacian. Thus, it cannot be excluded that the proposed human migration route between the "Levantine Aurignacian B" (Ksar Akil, level X) and Shyrokiy Mys might be connected via the Early Zagros Aurignacian sites and their archeological materials. It is not easy at all to find materials comparable to the "Levantine Aurignacian A" (Ksar Akil, levels XII-XI) and Kamennomostskaya Cave in the Zagros Mountains region, as the early phase of the Zagros Aurignacian seems to be occupied by chronologically later "Levantine Aurignacian A-like" assemblages, while its late phase looks very much like European Late/Evolved Aurignacian with Dufour and pseudo-Dufour microblades of Roc-de-Combe sub-type. The only other possibility is Shanidar Cave, layer C. The Shanidar Upper Paleolithic materials served as the archeological basis for designation of the original "Baradost industry" by R.S. Solecki (1955:415) following the advice of D. Garrod. Recently, Olszewski and Dibble (1994, 2006), comparing the Shanidar, layer C materials with Warwasi Upper Paleolithic assemblages, surely included the former materials within the Zagros Aurignacian, while Bar-Yosef (2000:137) suggested, with no details, however, that the blady Shanidar Upper Paleolithic materials "would correlate at best with the Ahmarian". Before a detailed study of the Shanidar Upper Paleolithic flint assemblages, it is possible to now argue that Olszewski and Dibble, and Bar-Yosef might both be right to some extent. The most prominent techno-typological features of the Shanidar assemblages are "a blade-tool industry" and an abundance of various carinated burins including flat-faced ones to which Solecki saw similar burin examples among the Ksar Akil, level XI flints (see Solecki 1955:415-416). Accordingly, by these features, the Shanidar Upper Paleolithic might be comparable to either the "Levantine Aurignacian A" or the Late Zagros Aurignacian. Resolving the Shanidar Upper Paleolithic industrial attribution will add much to understanding of the Aurignacian *sensu lato* for the Near and Middle East and surrounding regions.

What is left?

And what is left after all of these possible European Proto-Aurignacian and Levantine Early Upper Paleolithic archeological interrelations? The Levantine sites representing the Ahmarian and "Levantine Aurignacian A and B" assemblages are radiocarbon dated between ca. 39/37-32,000 uncal BP. The European Proto-Aurignacian sites are believed to be dated between 38/36-34-32,000 uncal BP. The Zagros Aurignacian C14 dates for Shanidar Cave, layer C and Yafteh Cave had obtained a rather wide chronological range between ca. 38,000 and 28,000 uncal BP in the 1950s and the 1960s (see Hole & Flannery 1967:153, tabl. I). However, during new excavations at Yafteh Cave directed by M. Otte in 2005, new AMS dates were obtained from Beta Analytic: ca. 35,500 (240 cm below datum) and ca. 33,500 (150 cm below datum) uncal BP (Otte *et al.* 2007:93, tabl. 5). Remembering some uncertainty regarding radiocarbon dates for the range between 40-30,000 radiocarbon uncal BP, we surely can use the Early Upper Paleolithic assemblages to make technological and/or typological comparisons in terms of human migration hypotheses.

With the currently available data, there are no very direct techno-typological data that would allow us to support Mellars's, Zilhao's and Teyssandier's hypotheses of strong archeological similarities between the European Proto-Aurignacian and Levantine Ahmarian and/or "Levantine Aurignacian A and B" assemblages. Only the latter, the "Levantine Aurignacian B" (first of all, Ksar Akil, level X assemblage as the most published in detail, and then the respective assemblages from Antelias and Abu Halka Caves) shows real similarities to the European

Proto-Aurignacian, but a dominance of el-Wad points and dorsally retouched bladelets among "non-geometric microliths" probably reflects some significant differences in their use as projectile point components. So, additional both artifact data and theoretical reflections are needed to determine a possible connection between the two industries. The Early Zagros Aurignacian (e.g., Yafteh Cave, lower levels) seem to be techno-typologically comparable to the Ksar Akil, level X assemblage. Accordingly, the proposed human migration route from the Levant through the Zagros Mountains region to the eastern shore of the Black Sea region in North-Western Caucasus (Shyrokiy Mys site) looks probable. Moreover, before these "Levantine Aurignacian B" humans moved to the north, the same migration route may have been used by "Levantine Aurignacian A" (Ksar Akil, levels XII-XI) humans – Shanidar, layer C (Zagrous Mountains region) and Kamennomostskaya Cave, lower layer (North-Western Caucasus). At the same time, the Ksar Akil, level X assemblage of "Levantine Aurignacian B" could be considered only as an "initial industrial source" for the European Proto-Aurignacian, if we additionally accept some significant changes in microliths use for projectile points where for the latter assemblages proportions of dorsally retouched bladelets are much lower, replaced by much more common alternatively retouched items among the "non-geometric microliths". Thus, it is really too early to place a definitive arrow showing human migration arrow from the Levant to showing an origin of European Proto-Aurignacian there.

These considerations of the Levantine Early Upper Paleolithic record indeed demonstrate some problems with its understanding as much additional work has to be done for assemblages relating to the "Levantine Aurignacian A and B" types. Moreover, there are also problems relating the two Aurignacian-like industry types within the European Aurignacian record. As was shown for the assemblages from Ksar Akil, levels XII-XI and Yabrud II, layer 3 belonging to the "Levantine Aurignacian A", one of the most striking techno-typological features is the serial presence of various carinated burins *sensu lato*, including both flat-faced carinated burins, also known as *burin caréné plan*/"*Ksar Akil burins*"/*burins des Vachons* and so-called lateral carinated pieces and bladelet narrow flaked cores/"carinated burins" that certainly technologically caused the dominance of twisted and "off-axis" bladelet *sensu lato* debitage, recalling the near-complete absence of typologically defined carinated end-scrapers there. Taking separately these techno-typological features alone, someone could again make de Sonneville-Bordes's 1950s interpretation that such complexes were similar to the French "*Aurignacien récent*". However, the "Levantine Aurignacian A" clearly stratigraphically precedes the typological equivalent of European Early Aurignacian/Aurignacian I in the Levant: "Levantine Aurignacian C" (complexes like Ksar Akil, levels VII-VII). Therefore, the following re-structure of Levantine Aurignacian industries, based on the Levantine and European Early Upper Paleolithic record, can be proposed. "Levantine Aurignacian A" could be a special variant of the Early Ahmarian where carinated burins *sensu lato* and twisted and "off-axis" bladelet debitage reflect a search for a new production system for microlith blank manufacture, which is why its assemblages feature Ahmarian and Aurignacian techno-typological features (see among others Bergman 1987, 1988, 2003; Marks and Ferring 1988). "Levantine Aurignacian B" can be considered as a rough equivalent to the European Proto-Aurignacian/Aurignacian 0 with some special features seen in the many dorsally retouched bladelets, including pointed elements, and the presence of some Aurignacian blades that also occur in the seemingly similar assemblages from Shanidar Cave and Shyrokiy Mys site. Finally, "Levantine Aurignacian C" reflects mostly a striking similarity to the European Early Aurignacian/Aurignacian I. At the same time, it is difficult to propose any real comparable assemblages in the Levant to the European Late/Evolved Aurignacian with Dufour and pseudo-Dufour microblades of Roc-de-Combe sub-type, despite the fact that the Aurignacian *sensu stricto* in the Levant is usually compared to Aurignacian assemblages containing "comma-shaped" microblades similar to Roc-de-Combe, due to their variable chronological positions between ca. 32 and 17,000 BP, although the Late Zagros Aurignacian (materials from upper Aurignacian levels at Yafteh Cave and Warwasi rock-shelter) and Siuren I, Unit F are very much like the Western European Late/Evolved Aurignacian with Roc-de-Combe sub-type microliths. Finally, the absence of European Proto-Aurignacian sites in North-Western Caucasus, where their presence would be expected due to the eastern route of the "Danube Corridor", might be explained by the appearance of "Levantine Aurignacian A and B" sites (Kamennomostskaya Cave and Shyrokiy Mys): the eastern part of the Great North Black Sea region was already occupied by *Homo sapiens* communities with Levantine roots who did not allow European *Homo sapiens* to penetrate there.

But all our archeological comparisons and considerations of course need in further research with European, Near Eastern and Middle Eastern Early Upper Paleolithic artifact complexes. New perspectives in this regard do exist. Aside of new site material analyses (e.g. Umm el Tlel in Syria), re-analyses of some long-known sites (e.g. Ksar Akil, levels XII-X; Antelias Cave, level IV; Abu Halka Cave, level IVc in Lebanon; Yabrud II, layers 3-2 in Syria) related to "Levantine Aurignacian A and/or B" industry types can add much to our knowledge of these industries. Also remembering the Early Upper Paleolithic levels of Shanidar Cave, Warwasi rock-shelter and Yafteh Cave in Iraq and Iran, it is also reasonable to expect more new data on these materials. As a result, any new human migration hypotheses will be supported by reliable archeological data.

In this respect, we can say that the following 2003 appeal of Ch. Bergman, "to date, no comprehensive comparison of lithic technology involving the European Aurignacian and Levantine Aurignacian has been undertaken. Such a study may help to resolve issues related to cultural affinity beyond simple reference to artifacts of similar appearance" (Bergman 2003:194), has begun to be met and new and already ongoing studies will contribute greatly to clarify the situation.

All of these considerations and hypotheses regarding the European, Near Eastern and Middle Eastern Early Upper Paleolithic were inspired by the Siuren I Aurignacian material analyses, again underlining the importance of this site for us, and possibly for some of the present readers. More absolute dates for Siuren I *in situ* levels with two different Aurignacian industry types will also clarify our ideas on initial Aurignacian *Homo sapiens* penetration into the south of Eastern Europe.

Demidenko Y.E., Otte M. & Noiret P. (dir.) - *Siuren I rock-shelter. From Late Middle Paleolithic and Early Upper Paleolithic to Epi-Paleolithic in Crimea.*
Liège, ERAUL 129, 2012, p. 403-405.

23 - PERSPECTIVES

Marcel OTTE & Pierre NOIRET

Ce gigantesque abri partiellement effondré nous a livré l'essentiel de ses secrets, même si, hélas ! l'âge des industries n'est pas absolument assuré, apparemment en raison d'une altération biochimique affectant les restes osseux.

Idéalement situé entre l'Asie et l'Europe, il marque le point de passage d'un continent à l'autre lors de l'une des principales expansions de l'Aurignacien et de l'Homme moderne vers l'ouest. Une seulement, car les ensembles streletskiens et sungiriens par exemple, dans la Plaine russe, en illustrent probablement une autre : considérés dans leur ensemble, ils attestent l'existence d'une autre forme ancienne du Paléolithique supérieur, associée à Homme moderne.

Avec le recul offert par un tel travail et de tels efforts, il faut constater la régionalisation extrême des Néandertaliens à l'Europe et, inversement, l'extension, partout ailleurs, de la modernité anatomique. L'anatomie de l'Aurignacien se réduit à l'une des innombrables formules connues, étalées selon le processus de gracilisation, tant de fois évoqué, démontré, illustré depuis Franz Weindenreich, André Leroi-Gourhan et Andor Thomas. Dans une simplification à peine outrancière, nous pouvons considérer que le globe entier fut alors « moderne », sauf quelques péninsules isolées, telles l'Europe, l'Australie, l'Extrême-Orient russe, là où les échanges géniques limités réduisaient l'impact des critères mécaniques propres aux humanités modernes. À mesure de son isolement, toute population tend à préserver ses caractères archaïques.

Comme en Iran, au Levant ou dans le Caucase, les cultures « Proto-Aurignaciennes » ont très probablement migré vers l'ouest à partir d'un noyau centre-asiatique (Iran, Afghanistan) car là, une telle cassure n'apparaît pas. La séquence de Siuren I, relativement « récente » (vers 30 mille ans BP pour le niveau F et sans doute d'avantage pour les niveaux G et H), se place à un moment peut-être avancé de ce qui sera appelé « Aurignacien » en Extrême Occident. Deux composantes principales constituent ses critères techniques : les lamelles appointées pour le tir précis à l'arc et la sagaie en bois de cervidé pour le tir puissant en steppe ouverte. Les deux armes furent alternativement utilisées selon les besoins et les situations, mais surtout en vue du prestige conféré au chasseur.

This enormous, partially collapsed, rock shelter has yielded most of its secrets, even if, alas, the age of the industries is not absolutely confirmed, apparently due to biochemical alteration of the faunal remains.

Ideally located between Asia and Europe, it marks the point of passage from one continent to the other during one of the main expansions of the Aurignacian and modern humans toward the west. One only, because the Streletskian and Sungirian groups for example, in the Russian Plain, probably reflect another expansion phase: considered together, they demonstrate the existence of another early form of the Upper Paleolithic, associated with modern humans.

With the perspective offered by such research and efforts, one can observe the extreme regionalization of Neandertals in Europe and, inversely, the extension, everywhere else, of anatomic modernity. The anatomy of the Aurignacian is reduced to one of many known formulas, spreading by the process of gracilization, mant times mentioned, demonstrated and illustrated since the work of Franz Weidenreich, André Leroi-Gourhan and Andor Thomas. In a barely extreme simplification, we can consider that the entire world was "modern", except for isolated peninsulas such as Europe, Australia and the Russian Far East, in places where limited genetic exchanges reduced the impact of the mechanical criteria proper to modern humans. Commensurate with their isolation, each population tends to preserve its archaic traits.

As in Iran, the Levant or the Caucasus, the "Proto-Aurignacian" cultures quite likely migrated toward the west from a Central Asian center of origin (Iran, Afghanistan) because there, such a break is not observed. The sequence at Siuren I, relatively "recent" (around 30,000 BP for layer F and probably older for layers G and H), is situated at a perhaps more advanced period that can be called "Aurignacian" in the European "Far West". Two main components constitute its technological criteria: pointed bladelets for precise bow shooting and cervid antler for powerful shooting on the open steppe. Both weapons were alternatively used depending on needs and circumstances, but especially in view of the prestige conferred on the hunter.

Le matériel archéologique retrouvé à Siuren I évoque une spécialisation fonctionnelle, mais des activités distinctes de celles liées à la prédation portée vers l'antilope saïga ont pu y être menées, non retrouvées dans les sondages des années 1990. En effet, l'abri est extrêmement vaste et certaines zones ont pu abriter des structures plus élaborées à côté des foyers, voire des témoins d'activités spirituelles. Quoiqu'il en soit, les lamelles et les pièces carénées ne représentent qu'un aspect limité de la riche civilisation aurignacienne, dont l'art est avant tout celui de l'apparence, par l'image (Clottes *et al.* 2011), la sépulture (Kostenki 14) et l'outil. Fondamentalement, nous avons affaire pour la première fois à des formes exhibées davantage qu'utilisées, à des formes matérialisées et perpétuelles. Ainsi, peut-on suivre cette tradition à travers toutes les directions et au fil de tous ses stades évolutifs.

Derrière le gigantesque travail de terrain mené à Siuren, où d'immenses blocs furent retirés, une partie de la vie humaine se révèle dans ses axes originaux : la mise en forme des blocs en roches siliceuses afin d'obtenir les lamelles appointées et courbes, l'économie de ce matériau cassant et homogène, la réserve ainsi permise des blocs en vue de leur utilisation ultérieure. Toute la gamme des gestes lithiques était ainsi disponible, dans l'optique du Paléolithique ultérieur dans son ensemble.

L'abri naturel de Siuren était idéalement placé pour observer les troupeaux, autant que pour s'y rassembler, tout en retrouvant facilement l'habitat dans le paysage. Cette situation fut d'autant plus favorable lorsque la mer d'Azov fut exondée et la continuité continentale ainsi garantie de l'Iran à la Crimée, en liaison directe. Accessoirement, ce rayonnement permettait aussi l'extension vers le Levant, où l'Ahmarien ne possède aucune racine locale, à l'inverse de l'Iran, où les industries de Warwasi montrent leurs racines moustériennes. L'Ahmarien se présente désormais comme une extension latérale de ce « Proto-Aurignacien » asiatique. Un des noyaux du Paléolithique supérieur de type aurignacien fut révélé là, en Asie centrale, dans sa potentialité géographique et spirituelle.

Une démographie extrêmement dense fut sans doute associée à ces zones orientales, jouant un rôle crucial dans l'extension rapide de l'Aurignacien à l'ensemble du continent européen et au Proche Orient. Mais la mise en place de nouveaux comportements, dont témoigne la généralisation de l'emploi d'armes en matières dures animales, correspond à une véritable « cassure » opérée avec les règles néandertaliennes de prédation animale, telles qu'on les observait durant deux cent mille ans. Les animaux furent ainsi privés de leur essence métaphysique et désormais représentés à traves les images plutôt que via leurs trophées. Il n'est pas anodin, en effet, de constater la coïncidence entre l'apparition des pendeloques, la chasse à la sagaie et la représentation artistique des animaux, désormais considérés comme des « choses » extérieures à leur statut sacré. Ce bouleversement entraîna, non seulement la succession de différentes traditions artistiques étalées sur une dizaine de millénaires, mais surtout la distinction entre le destin des animaux et celui des humains, qui ne cessera de se dégrader jusqu'au Néolithique.

Après tant d'années d'efforts et de recherches intenses de tous les côtés de l'Europe, voilà enfin un problème élucidé : celui de

The archaeological material recovered at Siuren I suggests functional specialization, but activities distinct from those linked to saiga antelope predation may have also been carried out, but not evidenced in the 1990s excavations. Indeed, the rock shelter is extremely vast and certain zones may have contained more elaborate structures next to hearths, or even evidence of spiritual activities. Regardless, the bladelets and carinated pieces represent only a limited aspect of the rich Aurignacian civilization, for which art is above all that of appearance, by images (Clottes *et al.* 2011),, burials (Kostenki 14) and tools. Fundamentally, for the first time we have forms exhibited more than used, materialized and eternal forms. In this way we are able to follow this tradition in all directions and through its developmental stages.

Behind the enormous fieldwork carried out at Siuren I, where huge blocks were removed, part of human life is revealed in its original axes: the preparation of blocks of siliceous stone to obtain pointed and curved bladelets, the economy of this brittle and homogeneous material, the stocking of such blocks for later exploitation. The entire range of lithic actions was thus available, in the view of the later Paleolithic as a whole.

The natural rock shelter of Siuren was ideally placed to observe herds, as well as to gather there, easily finding shelter in the landscape. This situation was even more advantageous since the land beneath the Azov Sea was exposed and continental continuity was guaranteed from Iran to the Crimea in direct liaison. Secondarily, such radiation also enabled expansion toward the Levant, where the Ahmarian has no local roots, unlike Iran, where the industries at Warwasi show Mousterian roots. The Ahmarian is now seen as a lateral expansion of this Asian "Proto-Aurignacian". One of the birthplaces of the Upper Paleolithic of Aurignacian type has been identified in Central Asia, with its geographic and spiritual potential.

An extremely dense demography was probably associated with these eastern zones, playing a curcial role in the rapid expansion of the Aurignacian accross the Near East and the European continent. Yet the establishment of new behaviors, as the widespread adoption of the use of weapons in hard animal materials shows, corresponds to a veritable "break" with the Neandertal patterns of animal predation, such as has been practiced for 200,000 years. Animals were thus deprived of their metaphysical essence and now represented via images rather than trophies. It is not trivial, indeed, to note the coincidence between the appearance of pendants, sagaie hunting and the artistic representation of animals, now considered as "things" external to their sacred status. This change would involve, not only the succession of different artistic traditions over 10,000 years, but especially the distinction between the destiny of animals and that of humans, which would continually degrade until the Neolithic.

After so many years of effort and intense research all over Europe, one problem has finally been solved: that of the arrival of the Aurignacians, progressing from Central Asia, equipped with thrown weapons and having a robust metaphysics, expressed in images, for which lineages will never end and which will from l'arrivée des Aurignaciens, progressant à partir de l'Asie centrale, équipés d'armes propulsées et disposant d'une métaphysique charpentée, exprimée par l'image, dont les filiations ne s'arrêteront jamais et qui désigneront désormais l'appartenance ethnique et l'immense diversité de fonctions associées jusqu'à l'orée des temps historiques.

now on designate ethnicity and the immense diversity of associated functions up to the start of the historical period.

Translated by Rebecca Miller

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