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ASPECTS OF THE UPPER PALAEOLITHIC IN CENTRAL EUROPE

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INTRODUCTION

Within the framework of the program SC-004, funded by the Federal Office for Scientific, Technical and Cultural Affairs, the Prehistory Department of the University of Liège has undertaken research in Austria, Romania, Moldova and Ukraine (Crimea). This research consisted of both field excavations and test controls (led in collaboration with local teams), together with revisions of archaeological and faunal materials from previous excavations. None of this would have been possible without the great help of our colleagues and friends in these countries. The following people are thus closely associated with the works presented hereafter: Gerhard Trnka (Wien), Marin Cârciumaru and Cornel Beldiman (Bucarest), Vasile Chirica (Iasi), Ilie Borziak and Valentin Dergacev (Kichinev), Victor Chabai, Yuri Demidenko, Sergei Tatartsev and Alexander Yevtushenko (Simferopol), Alexander Yanevich (Kiev), Anthony E. Marks (Dallas), Vincent Ancion and Marguerite Ulrix-Closset (Liège). Moreover, works led in Austria, Romania and Moldova were undertaken in collaboration with the I.R.Sc.N.B. team (Paul Haesaerts and Freddy Damblon, Brussels).

I. METHODOLOGIES

Methods of investigations were defined as follows: new field excavations, new studies of archaeological materials resulting from previous excavations, new chronological and paleoenvironmental analyses, comparisons with materials from Central and Western Europe and synthesis of these data. This project was thought to be the opportunity for exchange of data and methodologies between teams.

Before the description of the results for each of these sites, what follows is a short summary of the definitions of the different cultural traditions referred to in this article. Early Upper-Palaeolithic traditions, such as the Bohunician (peculiar to Moravia, developed on Levallois debitage), are not considered here.

Aurignacian

Industry brought into Europe by the first Modern Men, with a well developed blade debitage technology, sometimes oriented to the production of bladelets, and presence of end-scrapers and burins on thick flakes (" carinated "), as well as characteristic retouched blades. Differentiation of functional more than cultural character is observed, with - among others - a " Krems-Dufour " facies found in Eastern Europe and including numerous retouched bladelets (Dufour bladelets).

Gravettian

Industry with a well prepared blade technology, producing regular blanks, with backed tools and armatures. Different " stages " have been defined within this research, according to techno-typological aspects (see OTTE, 1981, 1985, 1990; OTTE *et al.*, 1996a), which do not especially correspond to chronological implications.

Stage I: lamellar industries, with microliths, " fléchettes " and microgravettes (faciès A: in Eastern Europe; faciès B: Maisières-Canal in Belgium, with tanged tools).

Stage II: blade industries producing wider blanks, and with numerous retouched,

pointed and truncated blades; and *pointes de la Gravette* (faciès A: in Eastern Europe; faciès B: Perigordian Va in Western Europe; faciès C: Perigordian Vc/Noaillian in Western Europe). The Laugerian/Perigordian VI (Western Europe) may also belong to this stage.

Stage III: blade industries with shouldered pieces, burins on truncation, truncated elements and microgravettes.

Stage IV: of the Mezin type (not considered here).

Stage V: lamellar industries with truncated elements, backed points and truncated pieces.

II. DESCRIPTION OF FIELDWORK

A. Austria

Willendorf II

A lithic collection from a cleaning of the profile undertaken in the Willendorf II site by the I.R.Sc.N.B. team in 1993 has been studied. The aim of this cleaning was to identify the different Gravettian horizons of the site and to obtain samples for anthracology analysis and radiometric dating.

The lithic collection is quite small (167 samples including 318 artefacts and stone fragments). It comes from the entire Gravettian sequence, although the majority of the pieces have been recovered in cultural layer 8 (between 25,800 and 25,230 B.P.) (DAMBLON *et al.*, 1996; HAESAERTS *et al.*, 1996). What is more remarkable with this collection is, despite its very small size, the variety in raw materials: silicified sandstone, quartzite, *chaille*, radiolarite and flint have been used. For the good quality raw materials (flint, radiolarite), the debitage seems to have been very well prepared (presence of crested blades), probably using cores with two striking platforms, for the production of blades and bladelets which were intended to be blanks for tools. The other raw materials were worked with a different technology, using hard percussion (with stone hammer), and producing cruder artefacts (even if those artefacts were conceived as blanks such as blades).

The interesting pieces include raw blades and bladelets made on good and poorer raw materials, and a few tools always made on good quality raw materials (flint or radiolarite). The tools include 1 end-scraper, 1 double burin and 3 retouched blades (among which one can observe 1 denticulated and 1 pointed blade).

B. Romania

Pestera Cioarei (" Raven Cave ", Borosteni)

This cave is located on the southern side of the Carpathian Mountains, near the Bistricoara river. It has been excavated since the 1950s, by Nicolaescu Plopsor (1954), Maria Bitiri and Marin Cârciumaru (1973-1990). Since 1993, a collaboration between Cârciumaru and the U.Lg. team has permitted a revision of the archaeological materials conserved in Bucarest. The sedimentary sequence comprises several Middle Palaeolithic occupation layers and, at the top of the sequence, remains of an Upper Palaeolithic occupation (OTTE, ULRIX-CLOSSET and CÂRCIUMARU, 1996).

The Mousterian occupations took place within temperate phases, at the beginning of the Last Glacial. The fauna is of local origin and includes species of mountain and forest biotopes. The lithic materials show different technologies. Most of the time, the debitage is simple, made on local cobbles of quartz and quartzite, producing flakes with natural edges used as knives or backed side-scrapers. Other raw materials have also been used, such as fine-grained quartzite, in this case with a more elaborated technology, close to the Levallois technology (rare) or the discoidal technology (more frequent, for the production of pseudo-Levallois points). The preparation of the raw materials, however, was not done on the site itself: neither cortical waste nor cores have been found, but only blanks. Among tools are mainly side-scrapers (with marginal retouch) and different types of knives. There are also denticulated pieces. All these data show that the Mousterian occupations of the site are the result of an adaptation to the resources available immediately in the vicinity of the site (fauna, local raw materials).

At the top of the sequence, remains of an Upper Palaeolithic occupation have been

found. This occupation seems to have taken place in a quite cold phase of the Last Glacial. The lithic collection is small. Burins and retouched blades dominate the tool kit, while, again, production remains (such as cores, flakes and waste) have not been found on the site. In general, the technological criteria evoke Gravettian affinities, and one rounded backed piece seems more precisely related to the Late Gravettian. The lithic industry corresponds probably to special activities, at the limits of the reduction strategy, since only prepared blanks and tools are present. This occupation was certainly ephemeral, possibly during a movement of the human group.

Mitoc-Malu Galben

The 1991-95 fieldwork in Mitoc-Malu Galben was undertaken by Vasile Chirica (from the Institute of Archaeology in Iasi), with the U.Lg., I.R.Sc.N.B. and University of Gent teams for, respectively, the archaeological and faunal analyses, the stratigraphical, chronological and paleo-environmental, and the pedological studies. The works of the U.Lg. concerned lithic analysis and faunal analysis.

The site is located on the western bank of the Prut river, near its confluence with a small tributary, on a soft hill of loess deposits that includes several phasis of human occupations during the Upper Palaeolithic (Aurignacian and Gravettian). It had been previously excavated by Vasile Chirica between 1978 and 1990, but such research had already revealed traces of Upper and maybe also Middle Palaeolithic occupations (CHIRICA, 1975, 1989).

Lithic materials from 1978-90 excavations

All of the lithic materials from Chirica's excavations have been studied in order to complete the knowledge of the site given by the new fieldwork. With the help of the stratigraphical analysis of the sequence by Paul Haesaerts (definition of sedimentologic cycles; HAESAERTS, 1993), it has been possible to classify the materials according to their position inside these cycles. This new display of the materials permitted us (1) to highlight the differences in the intensity of occupation of the different phasis, and (2) to give a more precise stratigraphic display of the assemblages (in comparison with the information available from previous excavations). The display of the occupation phasis are defined now as follows (from the top to the bottom): Gravettian IV, III, II and I, and Aurignacian III, II and I.

The revision of the lithic materials permitted an analysis of the patterns of raw material economy in this large workshop site. From both technological and typological points of view, important changes appeared throughout the sequence, for instance concerning the attribution of the Gravettian occupation phasis I-II and III-IV respectively to stages II and III. The remains of occupations consist of concentrations of debitage materials, with very few tools in comparison with the amount of waste, blade and flake blanks, and cores.

In general, the flint is local, of black, blue or grey colour. The only exotic raw materials observed on the site correspond to finished or almost finished tools and (sometimes) blanks (blades, bladelets). For the local flint, different methods of exploitation have been observed, for both the Aurignacian and the Gravettian.

(1) Some concentrations testify to a specific exploitation during which blocks were knapped in order to obtain predetermined blanks (such as long and regular blades or short bladelets), specific to one type of tool or function. These concentrations correspond probably to short occupations, using only one kind of flint. Sometimes, associated tools have been also recovered.

(2) Another kind of behaviour corresponds to a massive debitage of flint, producing an incredible amount of debris. Several successive phases of exploitation of various cobbles can be observed, corresponding to long occupations by numerous knappers. With these concentrations are often found fireplaces, faunal remains, pebbles and blocks of raw material ready to be exploited.

(3) The last kind of exploitation is viewed through large concentrations of cortical flakes and debris, testifying to the preparation of cobbles that have been later taken away. With these pieces are also found products such as blades or bladelets that have been abandoned because of irregularities

or breaks. It is the most difficult strategy to determine.

Some simple analyses tied to the mass of flint knapped in the Aurignacian and Gravettian assemblages have been realised, in order to determine if there were any differences in the production of blanks between these two cultural traditions. They show differences between the Aurignacian phasis, the lower Gravettian phasis and the upper Gravettian horizons:

(1) the laminar production is more developed in the Gravettian than in the Aurignacian;

(2) within one cultural tradition (Gravettian), there is an evolution in the direction of the production of lighter blanks, for instance microblades probably linked to the making of micrograveltes;

(3) the reduction strategy becomes more and more " expensive " in terms of weight needed for the production of blanks (blades, bladelets).

From a technological point of view, the differences between Aurignacian and Gravettian are also clear.

In the Aurignacian (Fig. 1), there are blocks prepared by lateral crests and oblique striking platforms, but a great part of the tools are made on thick flakes, even if the preparation is important. There are also cores made on thick flakes; in this case, bladelets are taken off the lateral edge of the blank. Tool production was determined either by the production of blades (probably taken away, because they are not numerous in most of the concentrations), or by the use of thick blanks for the carinated tools (made by lamellar retouch), blanks which are probably re-used from the wastes of the production of blades (opportunistic strategy) (OTTE and CHIRICA, 1993).

For the Gravettian (Fig. 2), the laminar technology is more evolved and oriented to the production of narrow regular blades (which are almost bladelets in the upper phasis). The cores are well prepared, with one or two striking platforms and were knapped by direct percussion with soft hammer (evidenced by small bulbs). The tools are transformed by bipolar retouch in the case of the backed pieces. Traces of Mousterian technology are very rare, almost limited to the Aurignacian horizons (denticulates, notches and few side-scrapers) (OTTE and CHIRICA, in press).

Typologically, the different assemblages are classic: carinated end scrapers and burins (with also real busked burins), end-scrapers and simple burins on laminar blanks, for the Aurignacian; backed pieces (*pointes de la Gravette*, micrograveltes, shouldered points) for the Gravettian. There are still differences between occupation phasis I and II (on the one hand) and occupation phasis III and IV (on the other hand) within the Gravettian cultural tradition. *Pointes de la Gravette* and micrograveltes are especially abundant in the upper part (phasis III and IV), with the shouldered pieces, while retouched, truncated and pointed blades are characteristic of the lower part (I and II).

Faunal materials from 1978-90 excavations

The faunal materials have been studied according to the results of stratigraphical studies as well.

The Aurignacian faunal collection is characterised by the following species (GAUTIER and LÓPEZ BAYÓN, 1993):

(1) *Bison priscus* and *Equus germanicus*, which correspond to the most hunted species;

(2) *Elephas primigenius* and *Coelondota antiquitatis*, which correspond rather to scavenging activity (or some intrusions) than to real hunting activity;

(3) *Rangifer tarandus*, which is in Mitoc at the most southern limit of its natural extension; its presence on the site seems to be related to specific seasons; the remains comprise mainly female antlers suggesting a strategy of gathering more than hunting;

(4) a few carnivores (*Gulo gulo* and *Canis lupus*).

From a taphonomic point of view, the remains of the Gravettian phasis are slightly different than the Aurignacian ones: *Canis lupus* and *Gulo gulo* are now absent but lion and *Megaceros* appear (opportunistic hunting

and gathering of antlers). The horse and the reindeer are also better represented than in the Aurignacian.

As the site was primarily occupied for the exploitation of the local lithic raw materials, the strategies of hunting were not elaborated, and were probably of two types:

(1) hunting between the main site and the workshop (*i.e.* Mitoc) or when the knappers were on the site;

(2) hunting near the site, using peculiarities of the landscape (such as river passages, natural springs). Some of the remains were still in anatomical connection, showing that the hunting activities were very adaptable and of secondary nature with regard to the exploitation of the lithic raw materials (the whole animal is not completely exploited);

(3) from a palaeontological point of view, the Aurignacian levels show similar quantitites of bovids and equids, while the Gravettian ones seem to concern progressively more the equids than the bovids; so, one can clearly see a progression in the direction of a cold environment; the progressive disappearance of bovids is probably due to a worsening adaptation to the vegetal environment (restricted seasonal availability of vegetal resources) than during the Aurignacian period; the appearance of reindeer confirm this tendency;

(4) nevertheless, some temperate stadials characterise the Gravettian levels (megaceros).

1992-95 Excavations

The 1992-95 excavations were done focusing two strategies. First, a vertical trench was cut through the terraces of the site, in order to define exactly the position of the different occupation phasis. Second, the planimetric excavations of the main Aurignacian layer at the base of the sequence (occupation phasis I) was done in order to clean and prepare a new stratigraphic profile, deeper and more complete than before. The result of the vertical trench revealed the presence of more archaeological horizons than Vasile Chirica had described in his previous publications (1989). He defined four Gravettian and two Aurignacian layers, but it is now strongly ascertained that there are other small remains of Gravettian occupations, even if Chirica had described the main ones, and one more Aurignacian horizon. On the other hand, as most of the materials from the previous excavations had been sorted (of which only the cores, flakes, blades and tools were conserved), it was decided to excavate larger areas in different horizons, in order to obtain technological information about the lithic reduction strategies.

As first result, it should be noted that, above Gravettian phasis IV, a few archaeological materials were sometimes found, but probably not in primary position. In general, the materials obtained there are poor and scarce: very few tools and debitage pieces. A pendant made of bone has been discovered. It was found in a context without any associated faunal or lithic artefacts. Without decoration and fragmentary, this piece nevertheless gives information about the technology used in the production of this kind of bone artefacts: a long bone has been fractured, then the bone flake has been shaped by sawing and breaking of both ends; the lateral edges and the two surfaces were prepared by scraping, then the perforation was realised by boring from both sides after preparation by scraping. This piece is one of the very few of this kind found in the territory of Romania until today (OTTE, CHIRICA and BELDIMAN, 1995).

Horizon IV has been observed in only one square, yielding mainly traces of ashes, burnt bones and flints. Horizon III has not been encountered, but horizon II was excavated in many squares and " followed " all along the main profile. An extended fireplace has been recovered, not very thick, but full of lithic remains, of course mainly burnt (blanks and wastes mostly, with very few blades and no tools). This fireplace has been sampled for anthracology analysis and radiometric dating (DAMBLON *et al.*, 1996). Four meters away from this fireplace, two other hearths were found, much less extended but thicker and yielding more charcoal, surrounded by remains of small workshops which include this time all kinds of products from knapping. Deeper, horizon I has been encountered in one square, yielding remains of two small concentrations of products of debitage, including cores, blades and flakes, and, as usual, many wastes. These works in the

Gravettian concentrations showed clearly variability in the intensity of the occupations: if horizon II seems to be very intensive with remains covering large areas, the other phasis seem to be more reduced in terms of surface and are more widely dispersed.

The same is true for the Aurignacian horizons, but the remains and concentrations are sometimes more extended, especially in the main horizon (I) which has often yielded large workshops including thousands of lithic remains, comprising all kinds of products, from raw cobbles to finished tools.

An extended Aurignacian workshop belonging to the phasis I was also excavated, confirming the nature of the main Aurignacian occupations: large concentrations of lithic (and sometimes faunal) remains, spread around fireplaces. On a surface of 12 sq.m., a small workshop was excavated, consisting of three concentrations of lithic remains, near a fireplace discovered in 1985 by Chirica. This hearth was dated to 31,100 ± 900 B.P. (OxA-1646). Aurignacian occupation phasis I and II are chronologically estimated to 31,000 to 29,500 B.P. (for details on the 14C dates, see DAMBLON *et al.*, 1996; DAMBLON and HAESAERTS, this volume).

The lithic materials were relatively rich for such a small area, including 14 tools and many wastes, blades and flakes. The biggest concentration was located immediately near the fireplace (8 tools and 3 cores come from it). Burin spalls have also been found there. The raw material is local: dark blue (25 %) or grey flint (75 %), for a total weight of 36,5 kg. The flakes are especially abundant, mainly from the preparation of cobbles. The proportion of cortical and non-cortical flakes for both types of flint is identical. The grey flint, however, has been more exploited: it has been used for the production of blades, but only one core has been recovered. Crested blades indicate that laminar production was important, which is confirmed by the presence of core trimming elements. The number of bladelets is important; they correspond either to a special production, or to the remains of the making of carinated pieces by lamellar retouch. It must be noted that no Dufour bladelet has ever been found at Malu Galben; but this workshop and other finds from the recent excavations confirm that they were certainly an important part of the lithic production.

The species spectrum of the fauna found between 1992 and 1995 is not very different than the one observed with the 1978-90 materials. The taphonomical difference between the materials from the upper part of the sequence and the pieces found in the lower part is important. The bones are relatively fresh in the upper part while they are completely surrounded by concretions in the lower part, giving problems in the identification for the Aurignacian and the first Gravettian phasis.

Within one of those " artefact concretions " (which was supposed to be a bone) from Aurignacian phasis I, a complete (even if broken) Mladec type point has been discovered. It is made of bone, of small size and irregular shape but is undoubtedly characteristic of the Eastern Aurignacian tradition (Fig. 3).

The main motivation for the occupation in Mitoc was without any doubt the exploitation of the local raw materials, with different strategies employed according to the time spent at the site itself. For the Aurignacian, occupations appeared to have been separate work areas with no relation between each other and are thus not strictly contemporaneous, while in the Gravettian, it is possible to identify horizons of longer duration of occupation (such as II), for which the traces and remains are more consistent. Abandonment of bone remains in anatomical co-ordination confirm the precariousness of most of the occupations and the focusing on the workshop tasks for both groups.

C. Republic of Moldova

This small country is hemmed in between Romania and Ukraine. Its landscape is made of soft hills, forming a transition between the Carpathian Mountains and the huge Ukrainian and Russian plains. Particular geologic conditions favour both the density of prehistoric occupations and the good conservation of anthropic remains.

The works undertaken by the U.Lg. team were mainly fieldwork and study of archaeological materials for the site of Cosautsi (near Sorocka, along the Dniestr),

which has yielded 21 Final Gravettian horizons extremely rich in cultural remains.

Cosautsi

The site was discovered in 1978 and excavated between 1981 and 1993 under the leadership of I.Borziac (Institute of Archaeology and Ancient History of Kichinev), and since 1994 with the help of the U.Lg. and I.R.Sc.N.B. teams. The site yielded 21 Late Upper Palaeolithic cultural layers on the second terrace on the right Dniestr bank. During twelve field seasons, the remains of more than 70 housing and domestic complexes, more than 35 simple and composite hearths (located either inside or outside the dwellings), more than 100 small lithic workshops, more than 70,000 flint implements (including numerous tools), more than 300 bone, horn and tusk implements, and more than 50 artefacts related to imitative artistic and adornment activities, were found on the site. A child's burial was uncovered within the site. Geological, paleobotanical, archeozoological surveys were carried out. Radiocarbon dates obtained permit the occupations to be dated between 19,500 and 16,000 years B.P.

The materials recovered on the site permit to interpret the processes of Gravettian culture formation on the territory of Moldova, its development and its typological and morphological contents.

Radiometric investigations

In order to continue the study of the site chronology, samples of bone, necessary to clarify the chronology of the cultural layers, were taken from various layers of the site. Other samples (charcoal) collected by the I.R.Sc.N.B. were also taken to compare the results of both methodologies. The results (Table 1) show that the main investigated occupation layers correspond to a short period of time (19,000-17,000 B.P.), which is confirmed by the lithic study which evidence no typological or technological differences within the materials from those archaeological layers.

Archaeozoological investigations

The fauna of layers 4-10, obtained until 1994, have been analysed to continue the study of the mammal fauna of the various site layers. It was revealed that *Rangifer tarandus*, making up more than 70 % of the osteological material, dominates the fauna; only the first levels present a variant in which *Bison* dominates. As a rule, the faunal remains of *Bison priscus*, *Bos* and *Equus latipes* Gr. are of a subordinate significance. The definitions were made by A.David and T.Obada, with the help of I.López Bayón for the archaeological surveys and the identification of the materials found in May 1994. More than 2,000 bones and fragments have been studied on the whole.

Recent archaeological works

Layer 4 of the site was excavated, notably in 1994 within the area of 28 sq.m. The layer is bedded in loess, dressed with fine-grained quartz sand. Within the surveyed area, the remains of a housing and domestic complex was recovered: round, it had a diameter of 3,2-3,5 m and a hearth in its centre. The correlation between the borders of the complex and the cultural layer surrounding it is determined by more abundant cultural remains within the limits of the complex, and by lime- and sandstone blocks marking the margins. The hearth with a diameter of 0,95-1,05 m was in the central part of the complex and represented a spot of fired soil, mixed with ash and small bones on its surface, from 7 to 13 cm thick. 557 flint implements, faunal remains (belonging mainly to reindeer), a borer (made of tubular bone) and a polisher fragment (made of reindeer horn) with linear scratched ornamentation on its external side, were found on this area. The flint implements - 557 pieces - are represented by wastes of knapping, and 26 working tools, including 16 burins, 3 backed blades, 2 scrapers and retouched blades. In 1995, layer 4 was again excavated, within an area of 52 sq.m. It yielded 3 more hearths, one of which was found within the limits of a small, rounded housing complex, and two others with a diameter of 0,60-0,90 m, located outside the complexes. One of these hearths was surrounded by 3 limestone blocks. The faunal remains were fragmentary and rare. The lithics were represented by 229 flint pieces, among which were 11 cores, 22 tools, among which the burins dominated. A flat pebble with scratched ornamentation on its both sides was found in this layer.

Layer 5 was studied on an area of 22 sq.m. It yielded housing complex and

workshop remains, and more than 200 flint pieces, among which were burins, 1 big backed blade and retouched blades.

Layers 6a, 6b, 6c, 6d, 7, 8 and 10 were then excavated in test pits. Each of them yielded a certain amount of flint materials and animal bones. Hearth remains were recovered.

Layer 6a was a fairly rich layer. It yielded numerous flint implements, remains of a hearth (partially studied), and fauna. The flint articles were represented by 4 cores, 34 blades, 98 flakes. The working tools were represented by 3 burins, 3 backed blades; the other pieces were atypical. The bone tools were represented by a fragment of a spindle-shaped point, made of reindeer horn.

Layer 6b was studied over an area of 8 sq.m. The materials obtained from this layer are scarce: 32 flint objects (2 cores, 12 blades, 1 borer, 1 end-scraper and flakes) were found. The remains of two reindeer bone accumulations and an ochre spot were marked.

Layer 6c was very rich in archaeological materials. The investigated territory yielded 123 flint objects, among which there are 6 cores, recovered in the layer within the limits of a small workshop, 34 blades and 12 tools, among which there are 2 end-scrapers, 5 burins, 3 backed blades and retouched flakes. The bone pieces were represented by a fragment of needle, made of tubular bone and by a borer. The fauna (more than 600 bone fragments) mainly belong to horse and reindeer.

Layer 6d is less abundant, but contains a hearth with a diameter of 0,65-0,70 m and a fired ground area (thickness of 5-12 cm). The hearth was surrounded by limestone blocks. Lithics were represented by 61 flint implements. Among those were 12 cores, 4 blades and flakes. The working tools were represented by 8 burins and 2 backed blades. The fauna is represented by about 120 bone fragments, mainly of reindeer.

Layer 7 was scarce as in the previous years. It yielded numerous small coals, 7 pieces of the same flat pebble, and 13 flint implements among which are cores and 1 burin. The faunal remains were represented only by reindeer teeth.

Layer 8 was also scarce. It yielded a hearth edge, stretching in the eastern direction, 76 flint implements, among which were 2 cores, 12 blades, 2 end-scrapers and a backed blade. The remaining finds include bone fragments, flakes, flint fragments and a splinter of a schist plate.

Layer 9 was represented by a small bone accumulation stretching in the northern direction into the uninvestigated part of the site, by 123 flint implements among which there were 7 burins, 2 end-scrapers, 6 backed blades and flakes. As before, the reindeer bones were most dominant.

Layer 10 was the lowest investigated layer of the site and was represented by 226 flint implements, among which were 12 working tools - 6 end-scrapers made on blades, 1 circular carinated end-scraper, 3 burins and some atypical pieces. A bone splinter and a fragment of a spindle-shaped point were also recovered. The fauna is scarce (reindeer bones).

Lithics

All the layers correspond to the final Gravettian tradition, as is also known in the same area at Molodova V (upper layers: VI to I) (BORZIAC, 1991, 1993). The technology and the debitage, as well as the tools, are identical throughout the sequence, indicating that the different occupations took place in a relatively short period of time (confirmed by radiometric dates) and that no real change in cultural traditions appeared during that period (OTTE *et al.*, 1996b).

The production of blanks is oriented to short narrow blades, very regular, corresponding to the blanks on which the tools are made. Among these, end-scrapers, burins and borers of different types, but always made on blades, are specially abundant. Retouched bladelets are also characteristic, often of the backed type (Fig. 4, 5).

Bone artefacts

The bone artefacts from the whole sequence were studied by I. López Bayón (*in* OTTE *et al.*, 1996b). Like the lithics, no significant differences from one layer to another have been encountered, suggesting that the cultural tradition represented at

Cosautsi was very stable. Different types of pieces have been identified, according to their techno-morphological characteristics (Fig. 6):

(1) *Hafting pieces*: these are made on easily available raw material (reindeer antlers) and roughly achieved, constituting tools themselves or being part of composite pieces. Lingby type pieces, " axes " or " hammers " are found as well as percutors. Different parts of the piece may serve as the active edge. Preparation was done by percussion, and scraping and polishing were intended to give a less crude aspect.

(2) *Pointed tools*: these are mainly simple or double hunting spear points, sometimes decorated (but which does not seem to have a functional purpose). They are made on reindeer antlers and mammoth ivory, with a great variability for the size of their section (some are very thin and fragile). Within this group also fall borers made on bone, often with part of the articulation conserved for grasping. Finally, some pieces are very simple, without any morphological standardisation and very crude preparation (scraping).

(3) *Tools with diffuse active parts*: they consist of pieces of bones or reindeer antlers, with lateral edges and/or distal or proximal ends showing evidence of use on other materials. Their utilisation eradicated evidence of preparation techniques, and has sometimes led to a morphological deformation. In this group are specific polishers with parallel edges and important evidence of activity at the distal end.

(4) *Tools with linear active parts*: these are knives made on rib or reindeer antlers, with parallel utilised edges, thin with a more or less circular section.

(5) *Harpoons*: two pieces of this type have been found. One is atypical but the other one is clearly shaped, with thinning of the proximal end and a bi-conical perforation.

(6) *Needles*: an important set of needles has been recovered throughout the sequence. Some are large (around 10-15 cm) but the average size is around 5-7 cm. Very well prepared by careful polishing, they often show evidence of reutilization (two perforations or more, or traces of broken perforations). Tubular bones (of birds and little size mammals) have also been found with these pieces: in one case the needle was still stuck inside one of those tubes, indicating the intention of protection of these very fragile tools.

The extreme variability of this bone industry implies clearly that the site is of the long-term type and that many different activities took place there, in almost all levels.

D. Crimea

Works led in Crimea were undertaken together by the Stone Age Department of the Crimean Branch of the Institute of Archaeology of Ukraine in Simferopol (dir. Victor Chabai) and by the U.Lg. team, since 1994. The purpose was to clarify the significance of the Siuren I industry and its relation with the Aurignacian tradition.

Siuren I

The site is located in south-west Crimea, along the left bank of the Belbek river, 15 km from Bakhchisarai. It is composed of two large shelters referred to as Siuren I and Siuren II. The second shelter yielded mainly Late Upper Palaeolithic materials. The first one was excavated by Merejkowski at the end of the 19th century and between 1926 and 1929 by Bonch-Osmolowski (1935). In 1957, Vekilova published a synthesis of the data available from these excavations, including stratigraphy, lithics and fauna (see OTTE *et al.*, 1996c, 1996d; DEMIDENKO *et al.*, in press).

The interest in conducting new excavations at this site is based on the data from the previous excavations. These works revealed that the site was the oldest Upper Palaeolithic site in Crimea and - at that moment - the only one with an Aurignacian occupation. Bonch-Osmolowski recognised three stages of Aurignacian. From the top to the bottom, he defined an upper Aurignacian that would be called now Gravettian, a middle Aurignacian which is classical in terms of Western definitions, and a lower Aurignacian that also included Middle Palaeolithic type artefacts. The lower layer was the richest and yielded around 20

Mousterian points and side-scrapers as well as a few other types of Mousterian tools. Upper Palaeolithic tool types in this level included core-like end-scrapers and burins, many retouched bladelets and other typical Upper Palaeolithic tools. The middle layer yielded only two Mousterian side-scrapers, and the Aurignacian diagnostic pieces were more classical: carinated end-scrapers and burins, busked burins, but fewer retouched bladelets. The upper layer included typical backed blades and bladelets. As no other lower Aurignacian sites were known at that time between Western Europe and Crimea, it was clear for Bonch-Osmolowski that the Siuren I assemblages from the lower and middle layers demonstrated a local evolution from the Middle to the Upper Palaeolithic.

The stratigraphic position of the different assemblages and their typological characteristics were not clear, however, and no chronological information was available. It is interesting to note that often these materials were considered as late Aurignacian, for instance by Anikovich (1992). According to him, the assemblages of the lower layer with Aurignacian artefacts and a few, but very characteristic, Middle Palaeolithic pieces, and of the middle layer, are not older than the late glacial maximum, based on the presence of cold fauna. The whole problem required new excavations and C14 dating to determine exactly the nature of this industry (either " transitional " or " Aurignacian ").

During 1994, the profiles of a 1927 trench were cleaned and samples taken for new radiometric dates. Some of the layers described during the old excavations were recovered and sampled for new dates. Several cultural horizons were identified. It was clear then that the layers corresponded to lenses of artefacts and charcoal.

New excavations

The stratigraphy shows a succession of lithological units, including several horizons of rockfall and sterile sediments. Three cultural layers were observed and investigated. The uppermost one (A) was found above the blocks, probably not in primary context, and has yielded non-consistent reworked materials (lithics and ceramics, but no fauna). A few isolated pieces were found in lithological units 8 and 9.

In 1995, the blocks above the tunnel were removed and a new surface was prepared for the excavations. The middle and lower layers, F and G, were the focus of investigation. F has yielded most of the archaeological materials. Layer G yielded few lithics and faunal remains. Since there is not yet a geological analysis of the sequence, information about the formation processes of these layers is not well known. Subdivisions were made in the field for these layers. They are probably not discrete cultural horizons (refitting is possible between pieces coming from different horizons) and some of these subdivisions result from the reworking of parts of living floors possibly by water action (the excavations are located under the dripline of the shelter).

At that moment, layer " F " was already excavated and had produced a typical industry of Aurignacian tradition, characterized by the abundance of Dufour-Krems type bladelets and by the presence of carinated pieces. No Middle Palaeolithic pieces was found. The 1996 excavations were concentrated on the set of underlying layers, called " G " and " H ". While Aurignacian pieces (carinated end-scrapers and Dufour bladelets) are still present, some differences appear in relation to layer F. First, the blanks used for the retouched bladelets show a different shape, more elongated and less twisted; while these pieces still correspond mainly to Dufour bladelets, it is evident that the method of production of these blanks was different. In addition, a small but important number of non-Aurignacian pieces has been found. Without being very typical of the Middle Palaeolithic, they do not correspond to any pieces found in the overlying layers.

Fauna

The fauna, often very fragmented, is mainly composed of herbivore remains (LÓPEZ BAYÓN, in OTTE *et al.*, 1996c, 1996d).

Saiga is the main game and different parts of the skeleton are found on the site, indicating that butchering was probably done at the site itself. Red deer is the second most important game, but its anatomical representation is different: hind- and fore-legs are most commonly found, with a few teeth. It is probable that the butchering was done near the kill site and that the

mandibles were brought for purposes other than consumption, such as the production of pendants (perfored *Cervus* and *Vulpes* canines were recovered). The presence of other animals, such as elk, horse, wild boar and bovines, seems to be the result of more opportunistic hunting. The presence of fox (*Vulpes vulpes*) and hare (*Lepus*) should be considered broadly as intrusions. The activity of fox may also be responsible of the presence of bird and rodent remains.

In general, the percentages of species in the new collection do not correspond to what has been published by Vekilova. It is worth noting that the fauna of this collection cannot be considered as "cold" (there is no reindeer or arctic fox), but should be considered as temperate.

Archaeological materials

Concerning the lithic assemblages, a great diversity of raw materials has been observed, with primarily fine grained flint of very good quality, but also other materials of poor quality. Often the good flint is represented by plaquettes with two cortical sides.

Materials found in layer A are not consistent, and correspond to disturbed horizons. Materials found in layers C, D and E are also disturbed but contained three convergent pieces which are the only evidence for an archaic component in the site during our excavations. Their stratigraphical position is not clear, however, because they were found during cleaning of the trench profiles.

The two main layers (F and G) yielded debitage and tools characteristic of the Aurignacian tradition (OTTE *et al.*, 1996c, 1996d) (Fig. 7, 8). Most of the cores are small, prismatic, with uni- or bipolar orientation for the production of flakes or bladelets. There are also cores made on thick flakes or plaquettes; in this case, the bladelets are taken off the lateral edge of the blank. In general, there are many more flakes than blades. True blades are rare, they are often irregular and broken, but there was significant production of bladelets. In general, the size of the blanks, and therefore also the tools, is small. Debitage and tools, as a rule, have almost no cortex, indicating that primary reduction was not done at the site.

End-scrapers and burins predominate among tools, and are made on blades or often on thick flakes. Simple or double end-scrapers on blades or flakes have been found, as well as carinated types. Burins include types on truncation, dihedral or angle burins for those made on laminar blanks, or carinated for those made on thick blanks. There are no busked burins. Finally, there are some retouched flakes and blades. An important part of the tool kit is composed of retouched bladelets, most of them of Dufour type, but one Font Yves point has been recovered, and some others are true backed bladelets, sometimes truncated. Most of them are twisted.

A few bone artefacts were recovered, with use impacts or traces of human activity. There are, among others, a small shouldered sagaie, a long perforator made on a large herbivore rib (about 16 cm long), and some fragments of long bones which have blunt and/or retouched edges, but no typological standardisation.

Comments

Four carbon-14 dates are available, realised on the materials sampled in 1994 during the cleaning of the sides of the trench. Two were done on charcoal and failed, giving dates of 10,000 BP and 250 BP, due to contamination by modern roots. The two others were done on bones and gave results of:

29,950 ± 700 BP for layer F
28,450 ± 600 BP for layer G

These results do not correspond to a stratigraphical inversion, but in fact are identical from a statistical point of view.

Nevertheless, the following conclusions can be presented (DEMIDENKO *et al.*, in press).

The assemblages of Archaeological Unit F (old Middle Layer), as well as the Unit G (old Lower Layer) and Unit H assemblages, correspond to industries of the Aurignacian of Krems-Dufour type. Moreover, they should be separated into two subtypes: (1) the assemblages from Unit F, and (2) the assemblages from Units G and H. This interpretation demonstrates the correctness of Bonch-Osmolowski's preliminary assumption that the assemblages of the Lower Layer of

Siuren-I were similar to those of Krems-Hundssteig (Austria).

Middle Palaeolithic tool types are an integral part of the assemblages of Units G and H, showing the real relationship between the Siuren I subtype of the Aurignacian of Krems-Dufour and the problem of the Early Upper Palaeolithic.

The absolute chronology of the Upper Palaeolithic sequence of Siuren I is not yet clear. The new AMS dates (ca. 29,000 B.P.), however, indicate that a proposed date of the Last Glacial Maximum of Pleniglacial B (20,000 - 18,000 B.P.) for old Lower layer/new Unit G and old Middle layer/new Unit F should definitely be rejected.

III. SYNTHESIS OF THE OBTAINED DATA

The above-mentioned archaeological contexts and materials can be integrated into a cultural vision according to the successive modes of occupation on the grand plains during the Upper Pleistocene. These propositions must be viewed in the context of this current knowledge, and revised as new data become available. Their presentation here, however, highlights the substantial contribution of the SSTC funded research, questions perspectives which are limited by their regionalism, and opens new paths of research and insight into European prehistory. This synthesis concerns the main sites at which the U.Lg. team has been working, but also others with an important archaeological background (Dolni Vestonice, Kostenki), which were studied from a stratigraphical or paleo-environmental point of view by others teams of the network.

Willendorf II (Austria)

In a gorge of the Danube and oriented North-South, the Wachau, a number of Lower Austrian Gravettian sites, are located in thick loess sequences. The continuity and duration of the sedimentation give to these sites a particular significance in the interpretation of the regional "facies" recognised for this pan-European tradition. The Willendorf II site particularly is well-known throughout the literature for its density of occupations and for the female figurine coming from layer 9. The other regional assemblages can be linked clearly with one of the phases defined from Willendorf II: Aggsbach, Langelois, Krems.

Research by the I.R.Sc.N.B. and the U.Lg. in 1981 and by I.R.Sc.N.B. team in 199[illegible] concentrated on the opening and the analysis of the Willendorf II site. On the whole, the profile was cleaned, new 14C dates have been systematically realised and a revision o the lithic industry permitted the definition of technical phases (HAESAERTS, 1990a; HAESAERTS *et al.*, 1996; OTTE, 1990). In comparison to the assemblages found during the old excavations, a new sequence has been constructed by integration of the typological criteria with the paleoclimatic phases marked within the sequence and supported by the dating.

Therefore, below the Aurignacian occupations, Willendorf II includes a Gravettian sequence spread from 30,000 to 24,000 B.P. and comprises the main facies recognised in that cultural tradition. At the bottom (cultural layers 5-6), the industries are microlithic, accompanied by "fléchettes" made on bladelets (Stage I; similar to the lower stations in Dolni Vestonice). The middle stage (II) (cultural layers 7-8) comprises more massive industries, made on large, wide blades, often pointed and, apparently, of diverse utilisation (as in Langelois). The upper stage (III) (cultural layer 9) includes characteristic shouldered pieces (Kostienki points) and a very regular laminar industry. To this stage belongs the female figurine.

The review of this sequence permits one to judge, by the stratigraphy alone (relative chronology), the order of succession of assemblages which were otherwise dispersed, and therefore able to recognise the chronological trends. Also, the richness of the industries allows a precise definition of each technological stage. Finally, the integration into a paleo-climatic sequence allows the establishment of comparisons to regions outside Lower Austria. For example, the recognised sequences at Dolni-Vestonice and at Pavlov are thereby placed at the bottom of the Austrian sequence (Stage I). The upper level of Kostienki I, on the Don River, is placed in the Austrian sequence at the top of Gravettian evolution (Stage III). Considered within the general European framework, the Willendorf II sequence is important for the

Perigordian facies because in South-Western Europe, the " fléchette " industries (called "Bayacian") appear at the base of the "Upper Perigordian." Well established chronologically in Austria, these industries suggest a migratory movement since the beginning of the Gravettian development, movement which is probably at the origin of the western groups posterior to the Aurignacian. This phase, located at the beginning of the climatic degradation, will correspond to a cultural entity literally pan-European, soon divided into different provinces during the most rigorous climatic phase of the recent Würm.

Dolni Vestonice (Czech Republic)

This site in Southern Moravia is one of the principal Palaeolithic sites in Central Europe. The occupied area corresponds to important loess deposits in which long paleoclimatic sequences can be established. Numerous archaeological assemblages are present in these. The intensity of the Gravettian settlements has permitted the Czech archaeologists to address several aspects of the way of life of the Palaeolithic people, including hunting strategies, settlement patterns and artistic production. It has been possible to define technological and typological variables of each of the assemblages of the site, including the abundant bone and ivory components. The loess deposits at the bottom have been separated in a series of lenses, each of which correspond to an occupation unit. These were organised in chronological sequences in order to realise a scheme of general succession. This local sequence has been then included within palaeo-climatic stages recognised elsewhere and dated with a series of new samples for radiocarbon (see OTTE, 1981; DAMBLON *et al.*, 1996; HAESAERTS, 1990b; KLIMA, 1995).

At Dolni Vestonice I (stations C-D), the principal technical stage presents a tool kit made on bladelets, with numerous microlithic pieces (Stage I) (OTTE *et al.*, 1996a). The bone industry is well developed, with sagaie points and domestic tools. Predation was oriented mainly toward mammoth and other steppe animals, such as horses and bison. The density and variety of occupations seem to indicate a permanence of the habitat, close to sedentism. The whole is located at the end of the Inter-Pleniglacial , within a still temperate episode of which the clement conditions has favoured the proliferation of occupations. The Moravian centre constituted a point of demographic and cultural expansion for the rest of Central Europe, diffusing through the hills to the Russian plains and the south-west of France.

Mitoc-Malu Galben (Romania)

Located at the eastern border of Romania, the Prut valley comprises on its banks important loess deposits that frequently include Palaeolithic occupations. Long excavated by the Romanian archaeologists, several sites have yielded long sequences of human occupations. The good state of conservation of the archaeological materials has permitted to define keys for the technical evolution in the Upper Pleistocene. Moreover, the Dniestr valley, to which the Prut Valley is closely related, constitutes a transitional zone between the hill area of Central Europe and the Ukraino-Russian plains. In this situation, it is thus possible to consider the possible influences joining the cultural areas of these two important European regions.

The site of Mitoc is located on the terrace of the Prut, near the confluence with a small tributary. This disposition at the edge of the terrace has favoured the regular trapping of soft sediments in which the Palaeolithic occupations were preserved. Although very important from a regional point of view, the Mousterian has not yet been reached in the sequence during new excavations. The long sequence recently studied has yielded, on 15 m of height, Aurignacian industries at the bottom and Gravettian occupations at the top. The Aurignacian was well preserved and a Mladec type point was recovered, confirming the unity of this tradition of widespread expansion in the whole of Europe. The superimposed loess deposits include a long series of Gravettian occupations, always in relation with the extraction and treatment of local flint cobbles. Broad techno-typological units were identified by Vasile Chirica between 1978 and 1990.

Recent fieldwork showed that the situation was somewhat more complex, but the newly distinguished archaeological units were always of small extension, corresponding to ephemeral occupations. Clear stages of technological evolution, however, can be

distinguished. The study of the lithic materials found during previous excavations and their correlation with the sedimentological sequence established by Paul Haesaerts (I.R.Sc.N.B.) have permitted the possibility of defining them and putting them into chronological order on the basis of C14 dating. Thus, an evolutive rhythm can be defined (OTTE *et al.*, 1996a): it is possible to see the transition from industries with retouched and pointed blades (Stage II) to industries with shouldered pieces and points (Stage III). This sequence is comprised between 28,000 and 22,000 B.P. It constitutes a key between the assemblages from Central Europe (Willendorf II, Dolni Vestonice) and those from the Russian plain (Kostienki). Widespread cultural areas are then reconstructed, even if the direction of the expansion is still to be defined (because of the lack of precision with the radiometric dating).

When put together with the sequences from Moldova (Cosautsi) and Ukraine (Molodova V), the area of Mitoc forms a very important stratigraphical, palaeogeographical and cultural entity because it yields numerous sites, long sedimentological sequences and evidence of very dense human occupations. This regional entity is still poorly known and has been little evaluated, until today, for its role in the genesis of the European cultural traditions.

Cosautsi (Republic of Moldova)

On the Western banks of the Dniestr, a hill constituted of soft sediments include a long sequence of Palaeolithic installations. The " opening " of the site seems to be related to the formation of a new terrace by the river; its " closing " is probably related to a point of equilibrium reached by its external relief respectively to the adjacent hills. The reconstruction of the environment, as well as the new dating obtained by the I.R.Sc.N.B. team, permit the placement of this sequence within the second Pleniglacial (from 19,500 to 16,000 B.P.). The site gives the continuity of the Mitoc archaeological sequence.

The different bone tools show patterns of hafting, partly justifying the techno-typological peculiarities observed in the lithic materials. Reindeer antlers, frequently used as handles or for lithic points, give, in negative, the disposition of the now detached lithic pieces. In comparision to Mitoc, there is a development in the direction of the complexity of composite tools. The diversification of the tool kit (for the used raw materials) explains partly the multiplication of microlithic pieces attested in most of the Eastern sites of the Late Glacial (Mezin, Mezirich). These patterns of adaptation correspond to the last stages of evolution of the Eastern Epigravettian traditions. On the one hand, the sequence of Cosautsi is a prolongation and a complement to the ones from Mitoc and Molodova V (it corresponds to Stage V; OTTE *et al*, 1996a); on the other hand, it establishes a contact with the large Eastern territories where these traditions were maintained in large open-air sites.

Siuren I (Crimea, Ukraine)

The Crimean peninsula was linked to the continent for the period in study. Its southern hills are part of a prolongation of the Caucasus mountains, and its northern plains are part of the Ukrainian plains. Within the Crimea are thus both the transition between the Eastern plains and mountains and conditions of natural shelters in caves and rockshelters. The double shelter of Siuren in Western Crimea is constituted of two areas divided by part of the bottom wall coming in front of the site. Excavated many times, it has yielded very distinctive occupations. The second shelter yielded mainly Late Upper Palaeolithic occupations, while the first one yielded industries of the Early Upper Palaeolithic (transitional from Middle to Upper Palaeolithic according to the previous excavators).

A huge fallen block had preserved a part of the deposits, which is where the new excavations concentrated, yielding *in situ* Aurignacian occupations. The stratigraphy of the sediments under the fallen block was first established, showing traces of several human occupations. The block was then removed and extensive excavations undertaken. Two main Aurignacian layers were discovered, dated by radiocarbon of 28,500-29,500 B.P. Fauna and bone tools are well preserved. The study of the materials is not yet finished, but the Aurignacian presence is assured.

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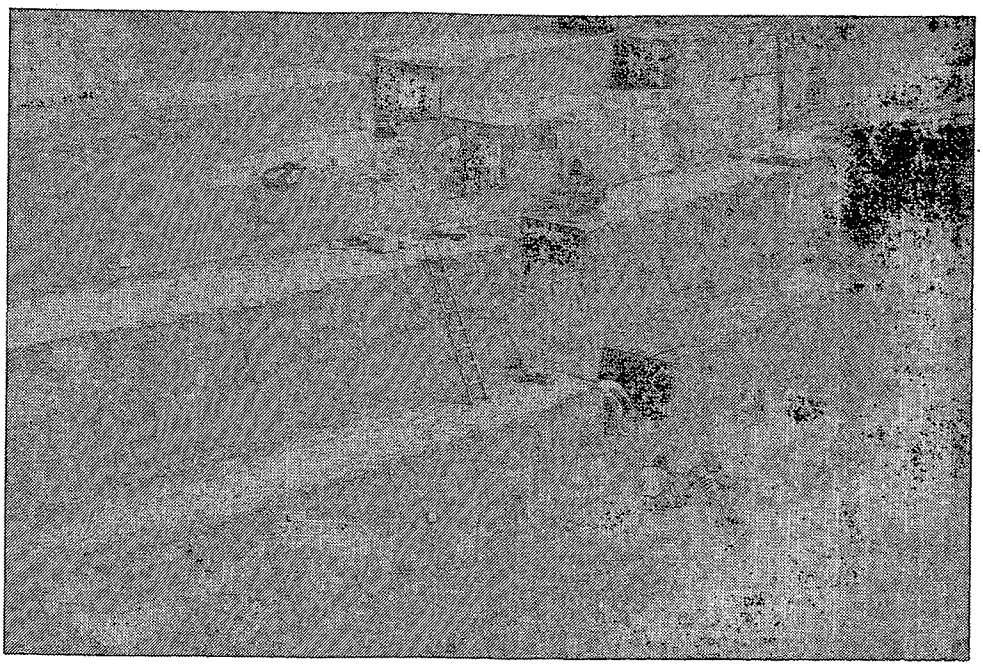

Photo 1. Mitoc-Malu Galben (Romania). General view of the sequence.

Photo 2. Siuren I (Crimea). General view of the double shelter (I on the left, II on the right).

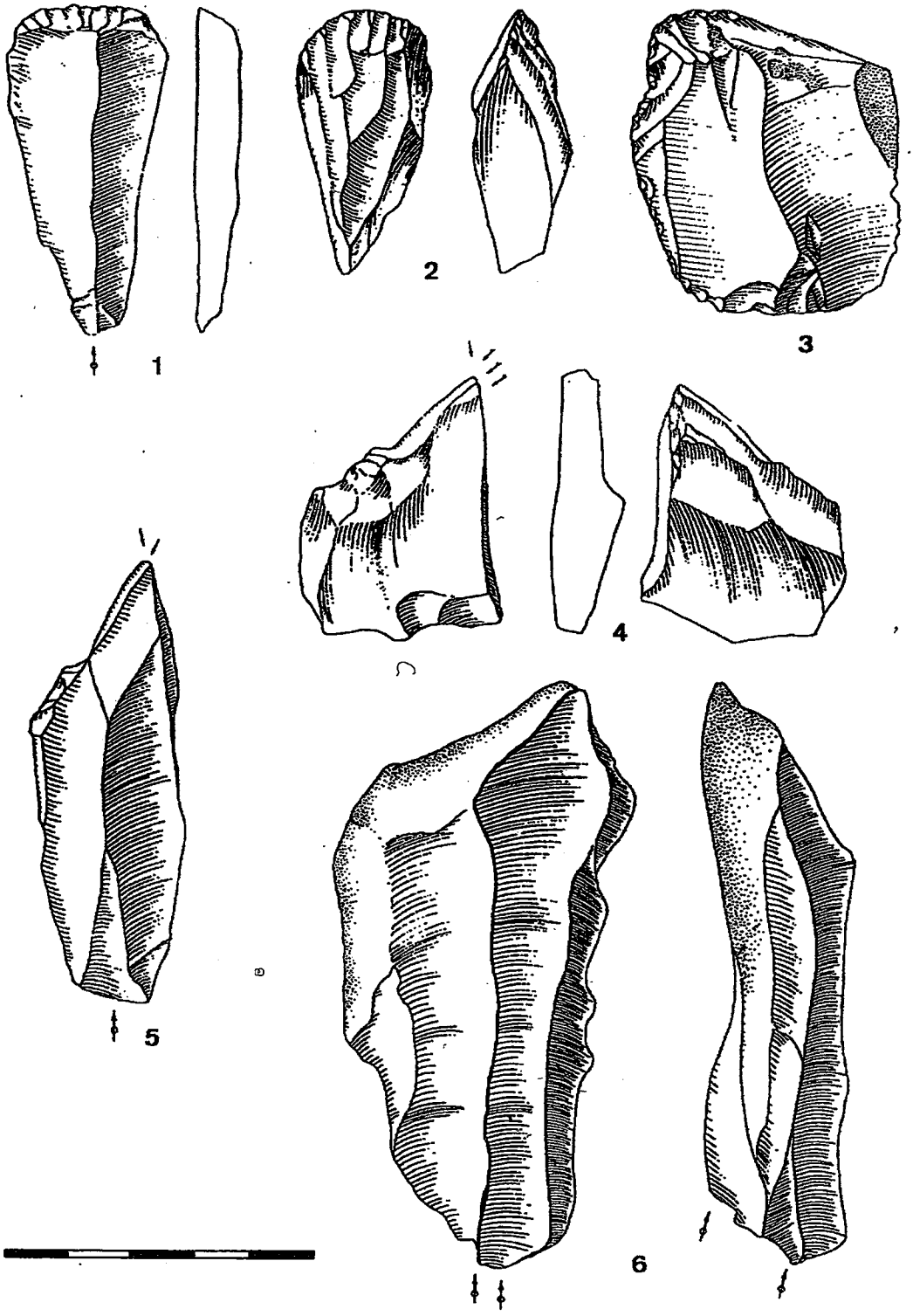

Fig. 1. Mitoc-Malu Galben. Aurignacian. 1. End-scraper on blade; 2. lamellar core; 3. nosed-scraper; 4. busked burin; 5. dihedral burin; 6. refitting of 2 blades.

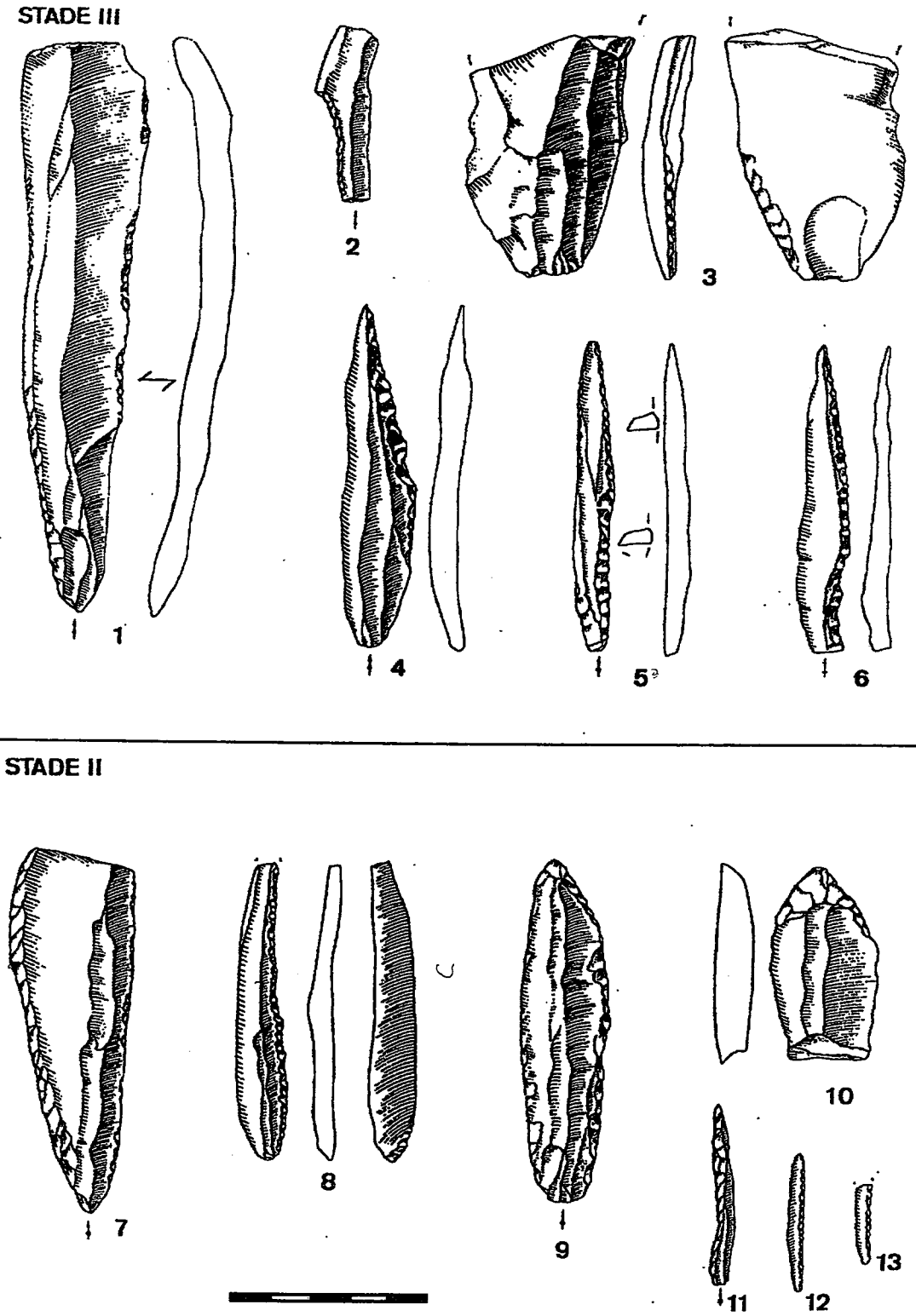

Fig. 2. Mitoc-Malu Galben. Gravettian. *Stage III* : 1. truncated blade; 2. shouldered piece; 3. double burin on break (with base thinned by Kostienki technique); 4. Gravette point; 5-6. shouldered points. *Stage II* : 7. retouched blade; 8. Gravette point; 9-10. pointed blades; 11-13. microgravettes.

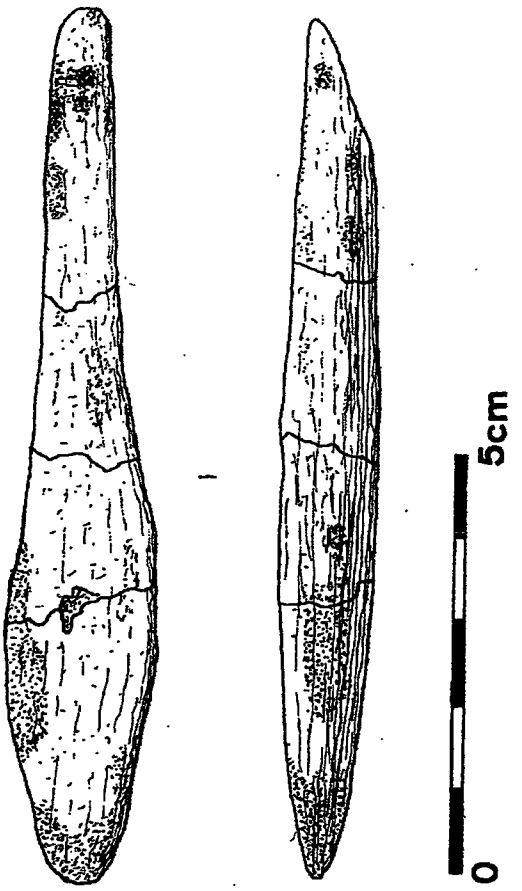

Fig. 3. Mitoc-Malu Galben. Aurignacian. Mladeč point on reindeer antler.

Layers	Square	Depth (m)	Material	B.P.	Sigma	Lab. code
2 c	E-J 14	-7,83	bone	17900	200	OxA-5233
3 b	E-J 14	-8	bone	17900	180	OxA-5234
3 b	P 10	-7,9	bone	18000	180	OxA-5235
3	E-J 14	-8,13	bone	17840	180	OxA-5236
3 a	E-J 14	?	bone	18000	180	OxA-5237
4	surface 94	?	bone	17840	180	OxA-5257
5	P 9	-8,6	bone	18060	180	OxA-5238
5	test 1	-9,33	bone	18140	200	OxA-5247
6 a	P 9	-8,87	bone	18780	200	OxA-5248
6 b	P 7	-9,2	bone	18940	220	OxA-5249
6 b	test 1	-9,82	bone	18560	200	OxA-5256
6 c	test 1	-9,87	bone	18860	200	OxA-5255
7	test 1	-10,38	bone	18980	220	OxA-5250
9	test 1	-10,82	bone	19060	220	OxA-5251
9	test 1	-10,86	bone	19060	200	OxA-5252
9	D 6	-9,75	bone	19080	220	OxA-5253
10	E 6	-10,12	bone	18980	200	OxA-5254

Table 1 – Cosautsi. Gravettian. *Stage V*. Recent AMS dating.

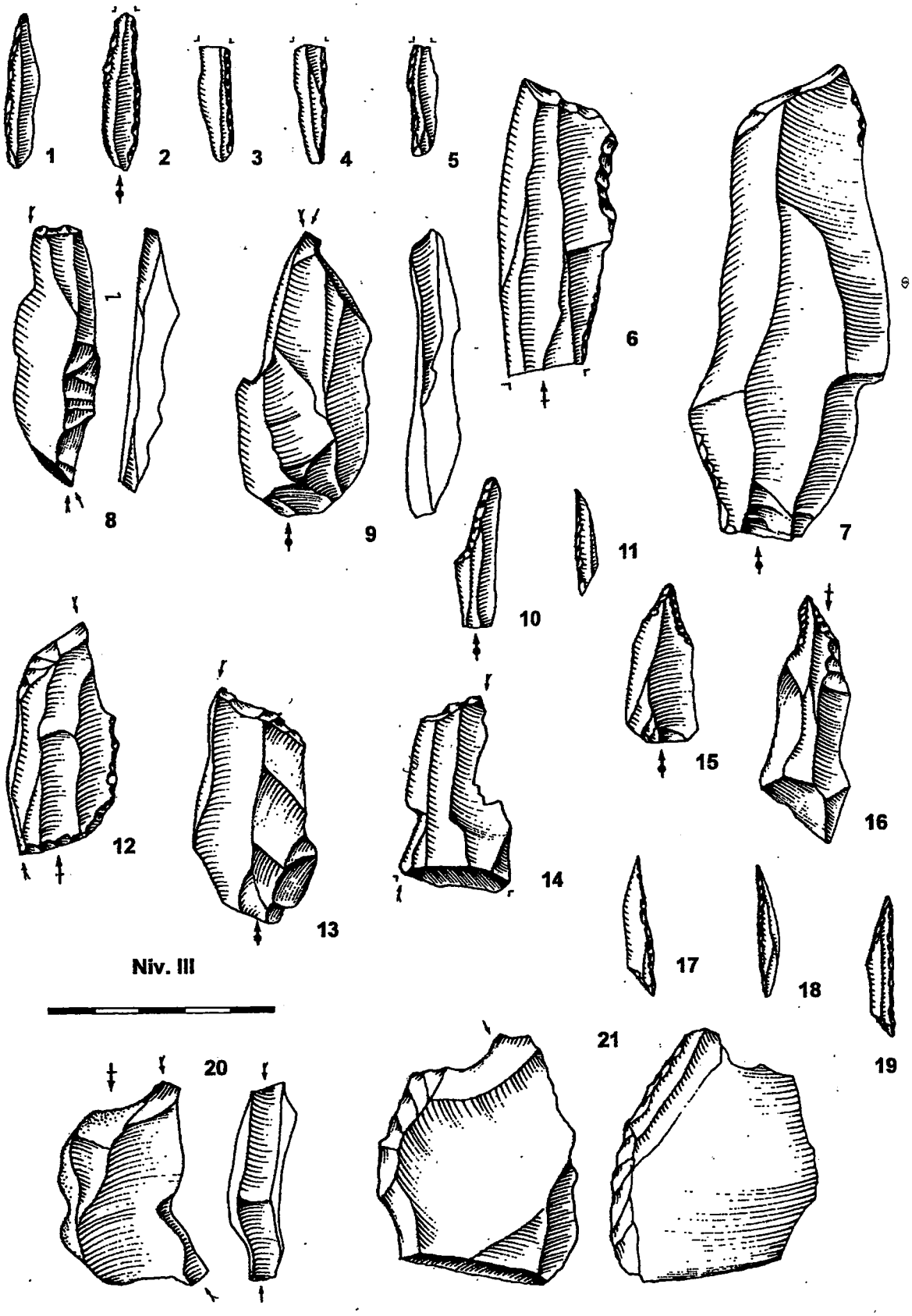

Fig. 4. Cosautsi. Gravettian. *Stage V.* Level III: 1-2, 11, 17-19. microgravettes; 3-5. retouched bladelets; 6-7. truncated blades; 8, 12-14. burins on troncature; 9. dihedral burin; 10. truncated bladelet; 15-16. borers; 20. double burin; 21. *burin plan.*

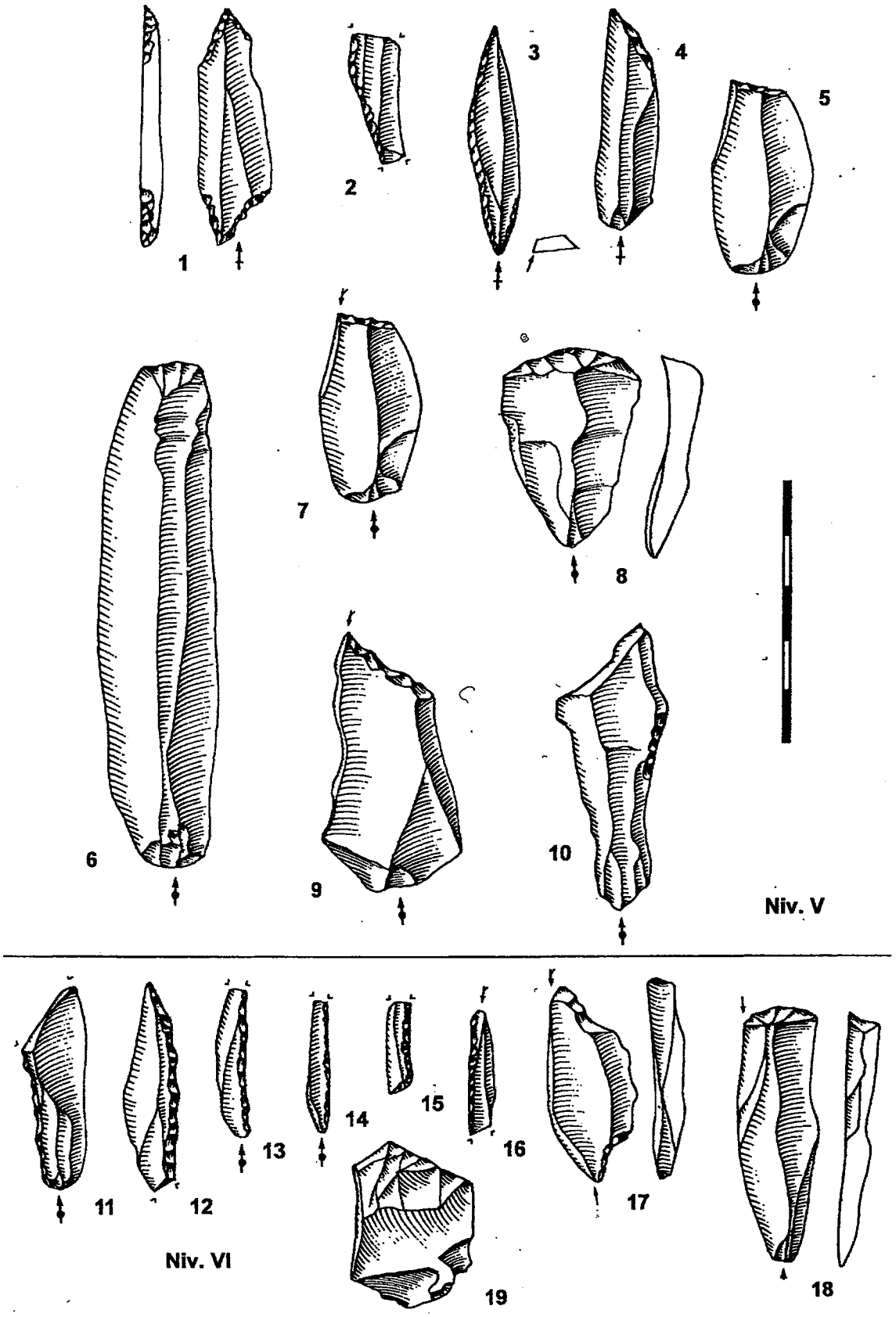

Fig. 5. Cosautsi. Gravettian. *Stage V.* Level V: 1. double borer; 2. shouldered element; 3. Gravette point; 4-5. truncated elements; 6. end-scraper on blade; 7, 9. burins on troncature; 8. endscraper ; 10. lateral retouched blade. Level VI : 11. shouldered element; 12. Gravette point; 13-16. micrograveltes; 17. double burin on troncature; 18. burin on end-scraper; 19. retouched flake.

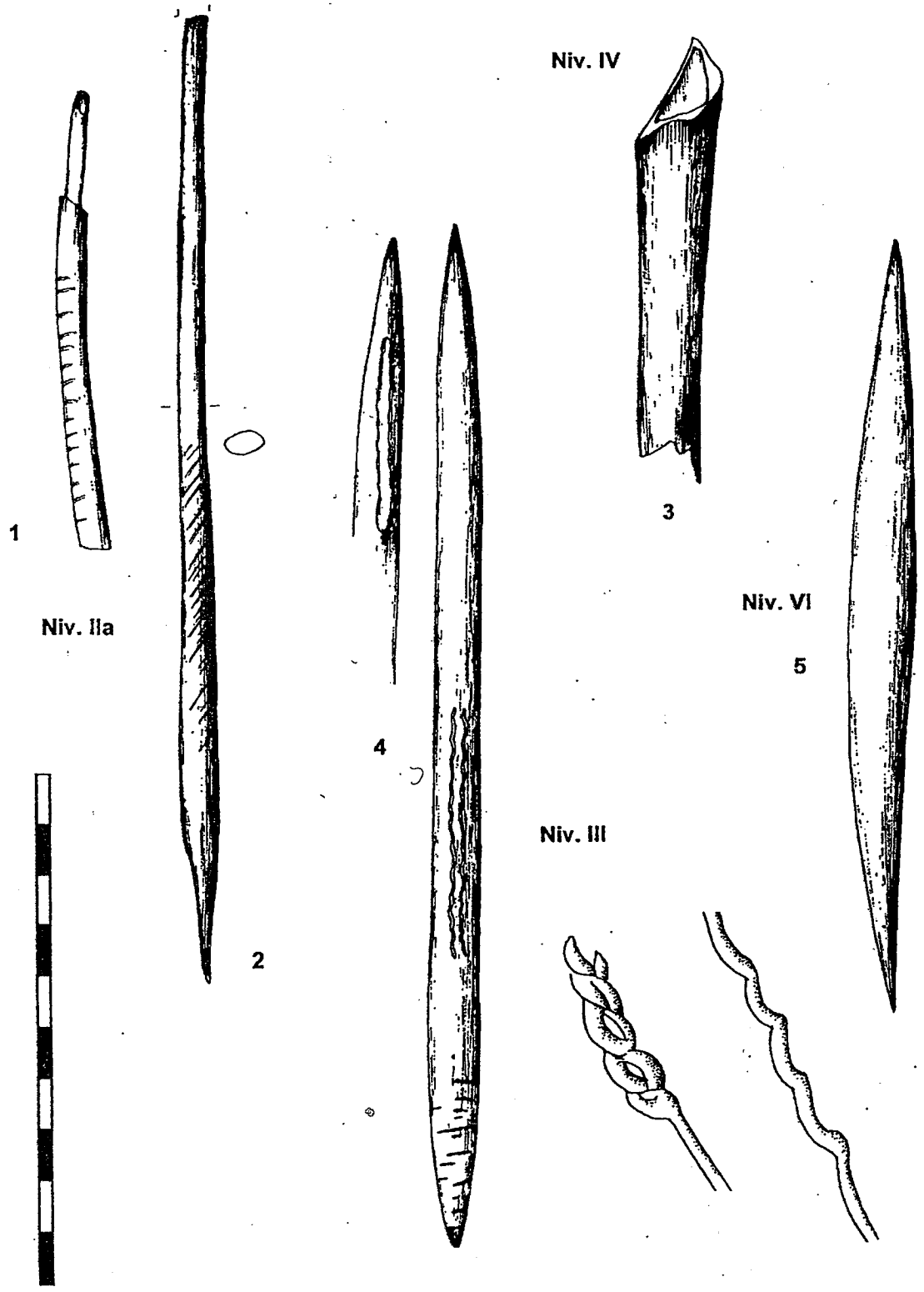

Fig. 6. Cosautsi. Gravettian. *Stage V.* 1. tubular incised bone with eyed-needle stored within; 2. double bevelled incised point on ivory; 3. tubular bone with anthropic distal break; 4. bi-pointed decorated *sagaie* (ivory); 5. bi-pointed sagaie (ivory).

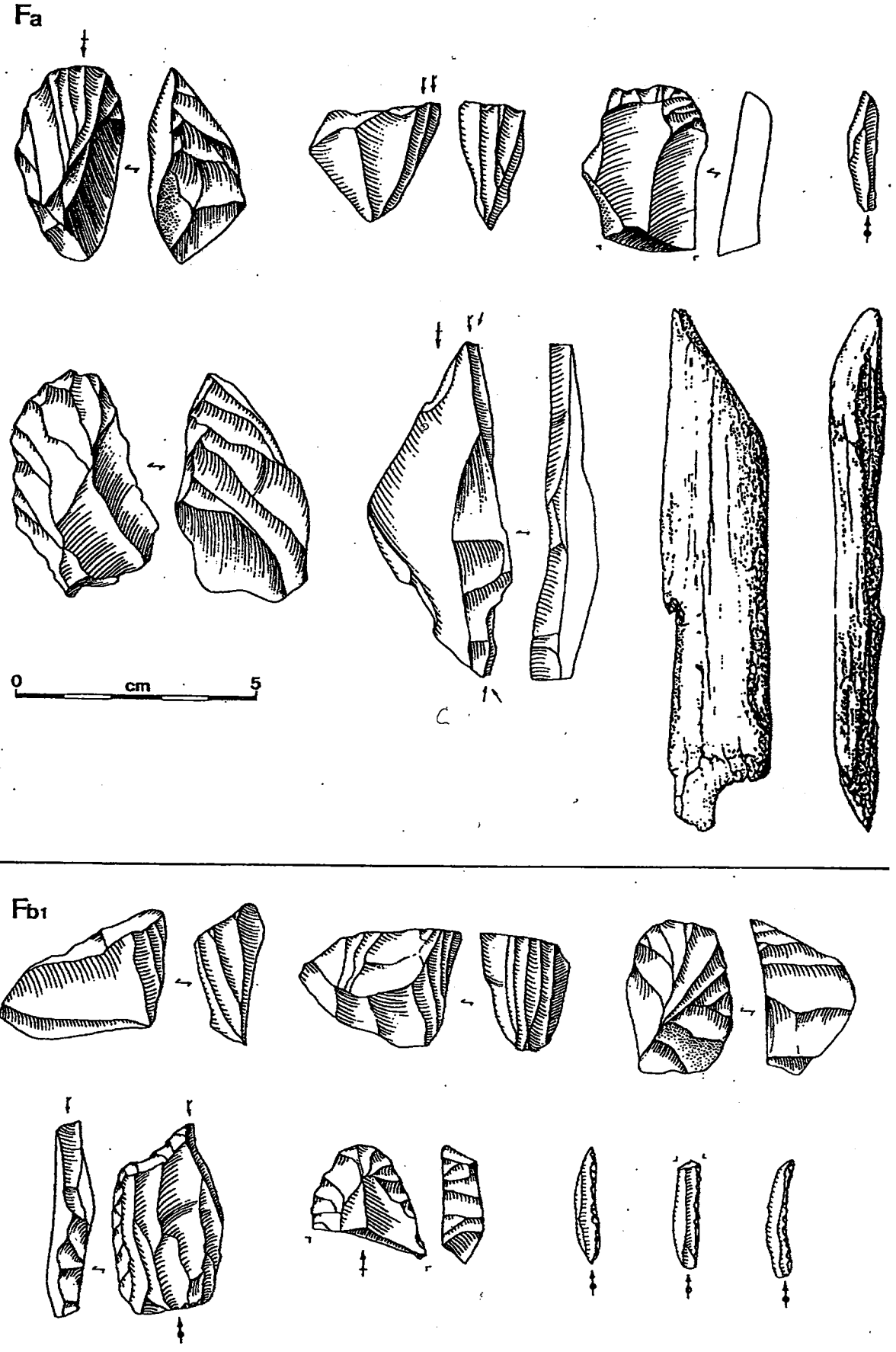

Fig. 7. Siuren I. Aurignacian. Level Fa: 1, 5. carinated end-scraper; 2. bladelet core; 3.end-scraper; 4. bladelet; 6. double dihedral burin; 7. bone tool with blunt edges. Level Fb1: 8-9. bladelet cores; 10. carinated end-scraper; 11. burin on troncature; 12. end-scraper; 13-15. Dufour bladelets.

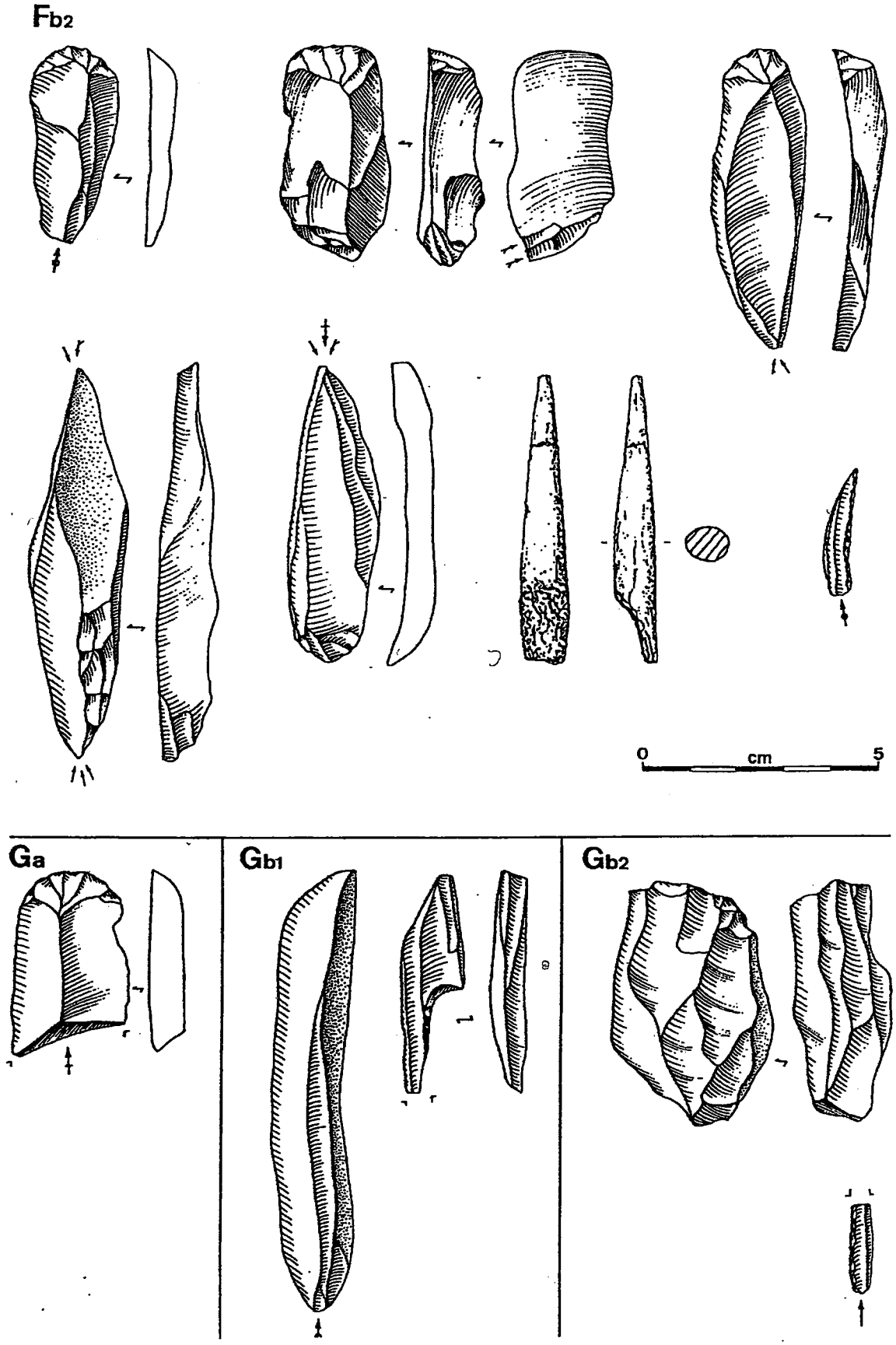

Fig. 8. Siuren I. Aurignacian. Level Fb2: 1. end-scraper on blade; 2. end-scraper / *burin plan*; 3, 5. end-scrapers / dihedral burins; 4. double dihedral burin; 6. small shouldered sagaie; 7. Dufour bladelet. Level Ga : 8. end-scraper on blade. Level Gb1: 9. blade; 10. dihedral burin. Level Gb2: 11. core; 12. Dufour bladelet.