L'INSTITUT D'ARCHEOLOGIE
DE L'UNIVERSITE JAGELLONNE DE CRACOVIE

RECHERCHES ARCHEOLOGIQUES
NOUVELLE SERIE 1

KRAKÓW 2009

MISE EN PAGES
Wydawnictwo i Pracownia Archeologiczna “PROFIL” Magdalena Dzięgielewska

EN COUVERTURE
Trois figurines d’ivoire de site prédynastique de Tell el-Farkha

ADRESSE DE LA REDACTION
Instytut Archeologii Uniwersytetu Jagiellońskiego, ul. Gołębia 11, PL 31-007 Kraków
www.archeo.edu.uj.pl/ra

ISSN 0137-3285

Cette publication est financée aux moyens destinés à l’activité statutaire
de la Faculté d’Histoire de l’Université Jagellonne

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Recherches Archéologiques
SN 1, 2009, 377 – 395
ISSN 0137 – 3285

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The New Middle Palaeolithic Human Occupations in Cave 1 in Klissoura, Greece. The Investigations in 2004 – 2006

Although Middle Palaeolithic of Greece is attested by cave and open-air sites (Darlas 1994; 1999; Kyparissi-Apostolika 1999; Panagopoulou 2002–2004; Papaconstantinou 1988; Papagianni 2000), until recently not a single location with long and rich in situ sequence was documented. The excavations of Upper-Middle Palaeolithic multilayered site at Klissoura, Cave 1 (eastern Peloponnesus) yielded an important data dealing with genesis, stratigraphy of sediments, typological-technological patterns and human activities. Till present only uppermost Mousterian layers VII, VIIa, VIII and X, coming from the limited test pit excavated in 1997, have been analysed (Koumouzelis *et al.* 2001b) showing a microlithic character and a tool kit rich in scrapers, with some convergent tools, and poor in Quina elements and in Levallois debitage. Extension of excavated area during 2001–2006 resulted in numerous MP occupations with open fireplaces, abundant faunal remains and lithic industries, rich in retouched tools, as well as reduced cores and debitage products. Middle Palaeolithic sequence (up to 6.5 m) is represented by numerous high density occupations (from the top till the bad-rock throughout layers VI–XXI) and is still undated so far (TL dating program, realising by N. Mercier and H. Valladas is in progress)[4].

Cave sediments. Middle Palaeolithic sequence (Photo 1)

The Middle Palaeolithic sequence of the Klissoura cave markedly contrasts with that of the Upper Palaeolithic. The layers of the latter are richer in anthropogenic components, and are looser and very stony. They have a gray to whitish coloration due to high amounts of dispersed calcitic ash and other burnt remains. They are also characterized by well defined clay-hearth structures and superimposed ashy layers (Karkanas *et al.* 2004; Koumouzelis *et al.* 2001a; 2001b). In contrast, the upper part of the MP sequence (layers VII–XV, top to bottom) changes gradually but distinctly to more compacted, brownish or reddish fine-grained sediment

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[4] New geological and radiocarbon data (ABOX technique, University of Arizona) obtained 2008 from the MP Layers VI, VII, XVIII and XX, place the Middle Palaeolithic in Klissoura between 40–62 ky BP.

with some stony layers towards the back of the cave. These features are the result of the incorporation of higher amounts of clay and other fine-grained clastic materials in the sediment, indicating the dominance of natural processes during the formation of the upper part of the MP sequence. In addition, the anthropogenic component often appears in the form of discreet sub-layers of multicolored burnt remains in a predominately natural matrix.

Several episodes of natural and anthropogenic sedimentation are defined in this upper part of the MP sequence, separated by clear erosional contacts. Layers XI to XIV consist of alternating reddish clay-rich layers and thin, multicolored burnt layers. Most likely, the formation of the clay-rich layers was the result of surface rainwash that deposited clastic material transported from the hills above the cave. Layers XI to XIV also preserve well-developed carbonate crusts due to cementation of the underlying surface, and thus define small gaps in the depositional process. Layer XI is also a multicolored burnt layer that delineates the end of deposition of layers XVI-XI. Part of this sequence was eroded away forming a depression towards the exterior of the rockshelter. The formed discontinuity truncates layers XI and XII. Layers X and IX are locally strongly lithified and have a whitish color with some dark gray to black intercalation, apparently formed when burnt remains were cemented by the action of surface water. Another erosional event formed a trough that truncated all of the previously deposited layers of the upper MP sequence. The trough runs from the northern profile in the back of the rockshelter to the western profile. The trough is filled with layers XIa and XIb, which are a mixture of burnt remains and natural sediments showing some stratification. At this point, it is unclear whether this sediment filling represents natural filling, or if the trough was used as a dump. Near the back of the cave the trench filling and the sequence below XI are directly beneath layers VIII to VI, which are the result of a combination of natural and anthropogenic processes. They are mostly clay-rich, with a brownish tint, but are occasionally enriched with burnt remains that give a darker color to the sediment. It is clear that natural process in the form of rainwash material, catastrophic erosional events, or even secondary alterations by water action are characteristic features of the upper MP sequence.

The contact between the upper and the lower MP sequence is locally sharp, bringing in contact totally different sediment types: stone-rich reddish clayey sediment of the upper sequence, and fine-grained gray, silty and ashy sediment of the lower sequence. This difference is probably related to the change of the karstic configuration of the cave. At about the time that layer XV was forming, the back chamber of the cave probably collapsed and became the open chimney present today. Thus, surges of rain water, terra-rossa and roofspall entered the cave and produced the depositional and erosional features of the upper part of the MP sequence.

The lower MP sequence (XVI to XX) is highly coherent and fine-grained with signs of post-depositional chemical alteration that become dominant in the lowermost layer, XX. The alteration is in the form of phosphate nodules, and phosphate reaction rims around limestone boulders. There is also a gradual increase in the inclination of the layers towards the entrance from the top to the bottom of the lower MP sequence.

Layers XVI and XVII consist of alternating gray and whitish ashy sub-layers with considerable lateral continuity. Layer XVIII is brownish-gray, silty, and very rich in bone and lithics. The large amount of artifacts gives almost a stony appearance

to the layer. Layer XIX is dark gray, silty and homogeneous. Layers XXa, XXc, and XXf have a considerable amount of burnt remains in the form of whitish and black lenses. In contrast, layers XXa, and XXb are light brownish, silty and less anthropogenic. The lateral variation of XXa is layer XXa1, which is reddish and defined by a considerable terra-rossa component. Layers XXe and XXf are moderately cemented by large amounts of phosphate veins and nodules, which also have a major sand component. Layer XXg is a loose, gray, sandy layer probably forming a cut-and-fill structure inside layers XXe and XXf. Layer XXI is found only towards the eastern wall of the cave, forming a small dark red fan that rests directly on the limestone bedrock of the cave. It consists of terra-rossa with large amount of limestone boulders and gravel with signs of intense phosphate alteration. The contact between layer XXI and the rest of the overlying sequence is a discontinuity, likely reflecting a major environmental change.

Although it is premature to make definite conclusions, it seems that the majority of the MP sequence was deposited under a more humid climate in relation to the UPL. In particular, the lowermost sand-rich layers seem to have been deposited by running water, probably by the river that is flowing along the gorge of Klissoura and at the time the sediments were deposited was flooding the area close to the cave. This has probably resulted in a rise of the water table that facilitated the observed chemical alteration of the sediments. Phosphate in the alteration features was most likely released by decayed guano present at that time in large amounts in the cave (c. f. Karkanas *et al.* 2000).

Lithic assemblages

A sample of 37,441 artefacts coming from 14 layers was studied (Table 1). This preliminary paper describes new lithic assemblages unearthed during excavations in 2004 through 2006 in layers XVI, XVII, XVIII, XIX, XX and XXI and some analyses realised during this period.

Table 1. Klissoura. Sample of Middle Palaeolithic artefacts

	VI	VII	VIIA	VIII	X	XIB	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	TOTAL
CHIPS	1711	1189	1334	1270	820	101	29	82	649	698	1542	1543	4141	493	15602
CHUNKS/ FRAGMENTS	607	0	244	425	297	15	2	13	40	34	64	75	259	19	2094
PRE-FORMS	0	0	0	0	2	1	1	0	1	0	3	0	2	0	10
CORES	36	23	29	43	49	12	17	10	35	19	40	56	148	70	587
FLAKES	571	705	742	945	1044	287	263	241	638	547	862	1288	4791	1489	14413
BLADES	41	22	22	20	33	9	17	14	18	14	20	41	439	265	975
RETOUCHED TOOLS	103	95	108	240	340	106	89	61	212	150	254	202	1028	677	3665
HAMMER-STONES	1	0	0	5	2	0	0	0	2	3	2	1	12	0	28
RESHARPE-NING FLAKES	1	0	0	0	7	2	6	2	4	6	6	3	8	4	49
CHOPPERS	0	0	0	0	2	0	0	0	1	0	0	0	1	0	4
TESTED BLOCKS	2	0	0	0	0	0	0	0	0	0	0	5	5	2	14
TOTAL	**3073**	**2034**	**2479**	**2948**	**2596**	**533**	**424**	**423**	**1600**	**1471**	**2793**	**3214**	**10834**	**3019**	**37441**

Layer XVI

The overall studied lithic material includes 2,793 artefacts (Table 1). The industry is dominated by chips (55.2%), flakes and their fragments (30.8%), retouched tools (9.1%). Small fragments, chunks (1.2%), blades and bladelets are rare (0.7%). Ilam is 3.6. Cores, as it is in all Mousterian layers, are not numerous (1.4%). The frequency of retouching tools is significant (9.1%): the quantity of them is higher than in Middle Palaeolithic uppermost layers (2.8%–6.2%). Raw materials are commonly chosen: domination of radiolarite, followed by flint. Other kinds of rocks are seldom (quartz, limestone). Burnt artefacts do also occur. Artefacts show no traces of heavy alteration (patina on flint), nor mechanical demolition. As previous ones, this industry shows microlithic sizes. Unfortunately we do not know the initial dimensions of blocks. It seems that they were not so large, taking into consideration the rare small chunks found in the Palaeolithic sequence and in the vicinity of the cave. Dimensions of cores, of blanks and of tools evidence an intensive core reduction, despite an "microlithic background". However among the little variety of blanks, the biggest ones were transformed into tools (the average flake sizes are lower than the average tool sizes).

Blanks are short (length is slightly higher than width) and massive. More than 70% of flakes are not cortical; cortical and semi-cortical blanks are rare (5.7% and 3.8%); cortex is mainly lateral. Dorsal blank patterns are dominated by unidirectional (35.7%), centripetal (32.9%). Levallois evidence is scarce (only 10 Levallois centripetal flakes and a core). IL is about 3. Debordant small flakes are common, as well as asymmetrical *déjeté* flakes with scalene and trapezoidal shapes. Cores (Table 2) are not numerous (40 pieces); most of them belong to the full debitage stage or they are close to exhaustion. Flat centripetal (6), unidirectional (6) and discoidal (4) cores are most common, that corresponds with blank dorsal patterns. Platform preparation was realized mostly by one single blow (42.9 %); faceting is mediumly used: IFlarge = 43.1 – IFstrict = 19.4. Technique of blank detachment is characterized by direct use of hard hammerstones (2 pieces). This hypothesis is also supported by the predominance of obtuse internal butt angle (85 %) and well-developed bulbs (77.3 %). Thus the reduction sequence was orientated to non-Levallois flake production by means of direct recurrent unidirectional, centripetal and discoidal methods. Retouched tool kit is rich (254 pieces) and it is predominated by side-scrapers (77 %), consequently of small sizes and made on short and thick flakes, followed by retouched flakes (10%). Other tools are rare (table 3). Radiolarite was more frequently used than flint for tool production. Among side-scrapers, the more commonly encountered ones are lateral (54%), then less numerous oblique, transversal and canted (*déjeté*) ones, with some convergent types.

Layer XVII

The material coming from this layer reflects techno-typological Middle Palaeolithic character. It does not show any peculiar feature that is different from the ones of other Mousterian industries in this cave. Industry is rich in lithic material: studied sample comprise 3,214 artefacts. The assemblage is dominated by chips (48%), flakes and their fragments (40%), retouched tools (6.2%). Small fragments and chunks (2.3%), cores (1.7%), blades and bladelets are rare (1.2%). Ilam is 4. Cores is represented by mostly centripetal and unidirectional types (31% of each) and discoidal (19%). Other types are fewer representatives. The majority of flakes are non-Levallois with prevailing of

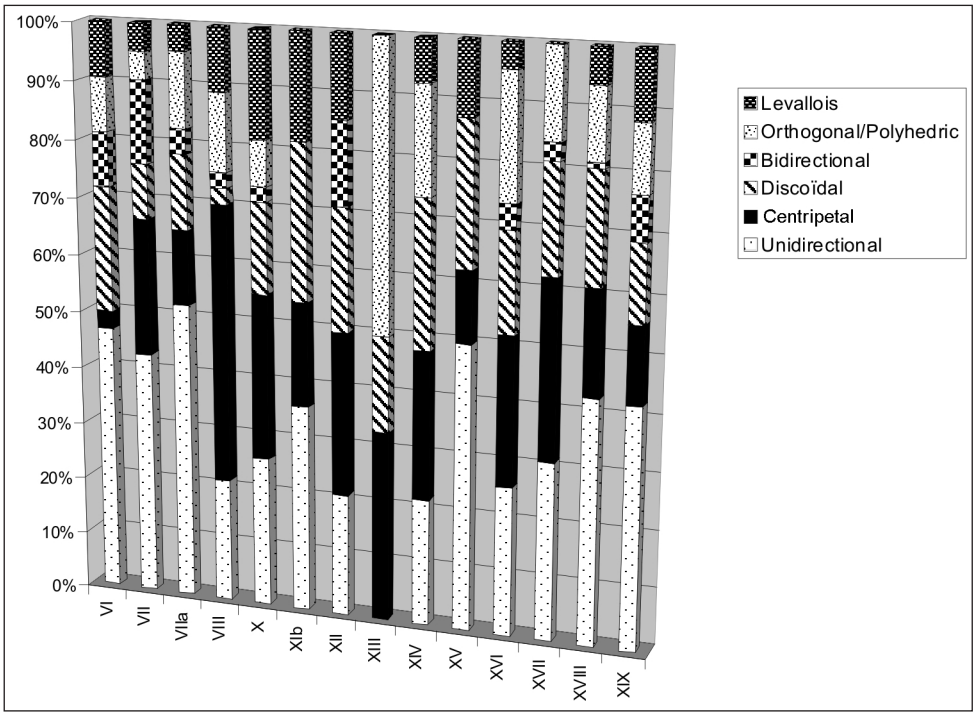
unidirectional and centripetal dorsal pattern. Levallois Index is low: 1.2. Final products, which are mostly flakes, are rather thick, short and asymmetrical, often debordant. While IFlarge somewhat decreases (from 43.1 in layer XVI to 37.2), IFstrict does not show the same tendency (19.4 in layer XVI – 19.3 in layer XVII). The technique of obtaining blanks is strictly direct, usually with use of a hard hammerstone.

The tool kit displays a dominance of side-scrapers (68%) on retouched flakes, blades, points, knives notches and denticulates (Table 3). Among side-scrapers, simple types (lateral, transversal, oblique) are more numerous, followed with double and *déjeté* types. As for tool production, radiolarite was mostly used (73.2%), followed with flint (21.4%) and quartz (3.6%). "Common", debordant or rare Levallois flakes were often modified into tools (91.4%). Tools on blades and on elongated blanks are less frequent. Retouch is mostly scalar, semi-steep, less steep, sometimes marginal (non-invasive), with rare bifacial, flat and sub-parallel varieties and no evidence of Quina type. Ventral retouch is rare.

Layer XVIII

The lithic industry of layer XVIII is strikingly numerous (10,834) and represents high density occupation with rich debitage products and retouched tools (Table 1). Some technological characteristics have been changed. Unidirectional debitage is well represented, mostly by flakes and blades with unidirectional dorsal patterns (48.7%), and by corresponding cores (41.1%). In layer XVIII blank unidirectional pattern clearly prevailed over centripetal (10.8%)

Table 2. Klissoura. Cores



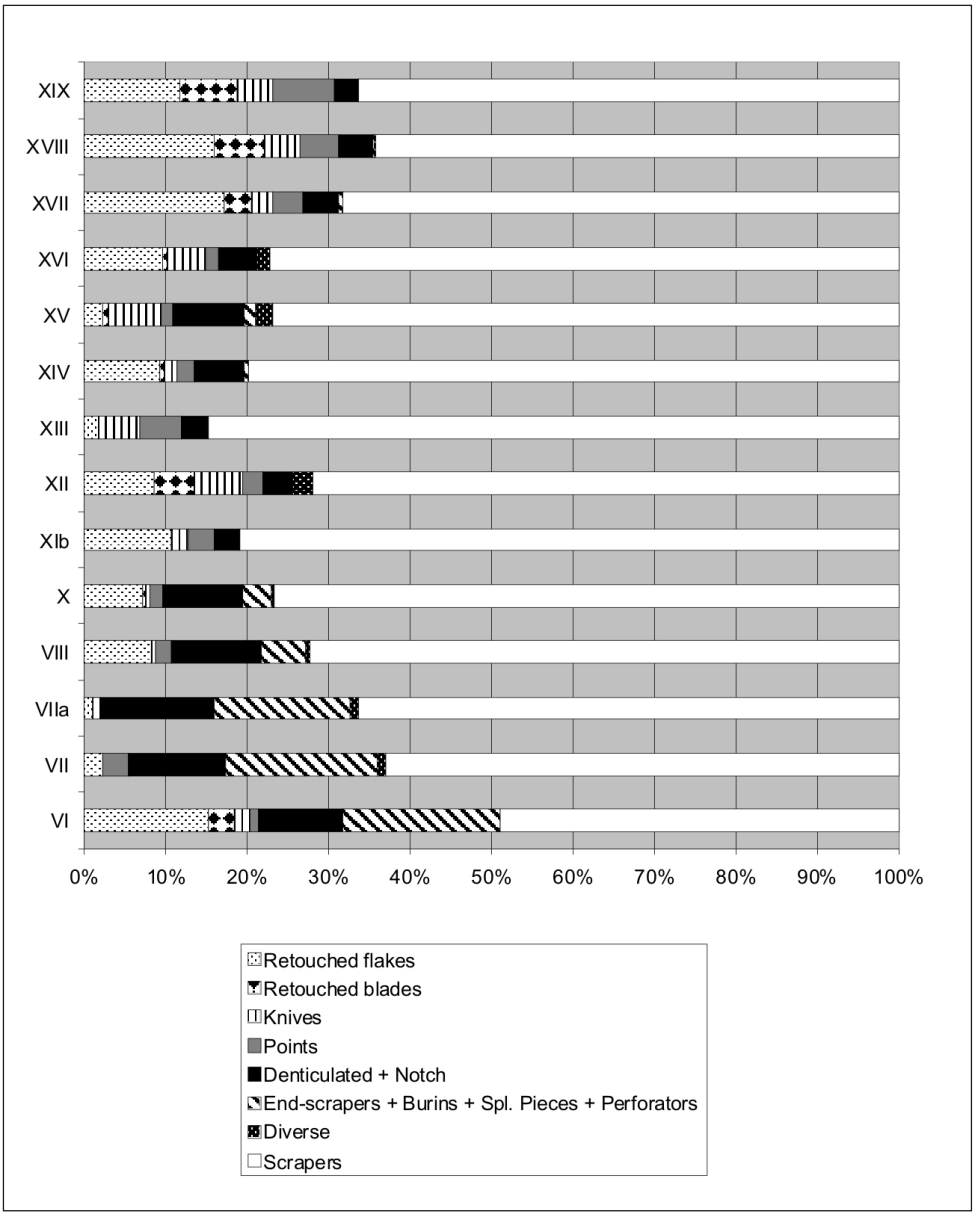


Table 3. Klissoura. Tools

in comparison with uppermost layers. Percentages of discoidal and centripetal cores decreased till 18.6% and 17.6%. Cores are often broken (40) or reduced to minimum sizes. Levallois flake cores were recorded: 4 lineal and 2 recurrent. Levallois debitage is represented mostly by flakes, rare blades and points. IL increased slightly (2.8). On

the other hand, blades become common (Ilam=9.7) and were often (including Levallois blades) modified into retouched tools (18.6%). General faceting indexes is rather low: IFlarge=32.1 and IFstrict=15.7. It should be stressed, that faceting was much higher for flakes (IFss=8.4; IFs=16.5; IFl=32.1) than for blades (IFss=3; IFs=7,5; IFl=20,4), when plain (58.3% against 51.8%), linear (10.6% against 3%) and punctiform (17.5% against 1.9%) butts are more common for blades than for flakes. Blades with parallel scars have mostly plain butts (67.9%) and together with linear and punctiform reach 83.4%, when faceted buts are very rare (4.1%). On the other hand, Levallois blanks are well faceted (IFss=45.6; IFl=86.8) keeping however some plain butts (10.8%).

Tools are extremely numerous (1.028/9.4%). They express the same composition: dominance of side-scrapers (64.2%), slight increase of points and retouched blades. As a usual, single side-scrapers are dominant (75.2%), including lateral and less abundant transverse and oblique types. Multiple scrapers are represented by: double, canted *(déjeté)*, convergent as well as some crescent, *limaces,* oval, trapeze, rectangular and angled varieties. Retouch is mostly scalar, less frequent marginal; rather often steep and invasive. Quina retouch also occurred. Retouch position is mostly direct; bifacial is rare. Convergent tools (scrapers and points) are rather frequent. Points proportionally increased (4.7%). Two main classes of point occurred: Mousterian elongated and short, often massive. Both Mousterian point categories are subdivided on symmetrical and asymmetrical, even with long retouched convergent edges, forming different shapes: triangular, scalene, *déjeté,* perforator-like, beak-like, crescent, leaf-shaped, including bi-pointed. They vary also according to the selected blanks with respective elongation and mass (blades, flakes and even *plaquettes),* as well as to type of retouching: marginal, scaled and steep invasive, Quina, rarely bifacial and flat. Some points show a distal or base thinning, ventral or dorsal. Numerous tips were found, however their precise identification, as well as some convergent pieces is not always clear. Different kind of points were recognised throughout all MP sequence, however all this variability could be find only in lowermost layers XVIII, XIX and XX.

Layer XIX

This lithic assemblage is rich (3,019) and display also high density occupation, taking into consideration overall thickness of sediments in layer XIX. Debitage products are abundant with high percentages of flakes (49.3%) and sudden rise of blades (8.7%). Cores display similar pattern with domination of unidirectional items (flat, often with invasive last negative and transversal proportions; some partially turned). Other types (bi-directional, centripetal, discoidal, orthogonal/polyhedral and Levallois) exhibit nearly the same proportions. Levallois technology is represented by cores: flake lineal (3), recurrent (2) and point (1) pieces, as well as by flakes, rare points and blades. IL is 5.2. Non-Levallois blade production is confirmed by rather high Ilam (12.6%) and by presence of crested blades. Butt faceting displays similar trend.

Tool kit is remarkably representative (677 pieces) was mainly produced on radiolarite and flint flakes (including Levallois – 6.2%) as well as on blades (19%).Percentage of side-scrapers is slightly decreased (65.1%), giving the place for retouched flakes, blades, points, knives (mostly naturally backed) and rare denticulates and notched pieces. Points are variable as in layer XVIII. Clear domination of lateral side-scrapers (239 items or 62%) on transversal (28), oblique

(16), double (34), convergent (28), *déjeté* (17) etc was recorded. Convergent tools comprise 16%. Retouch is mostly obverse scalar, also semi-steep or steep, invasive (less marginal) and sometimes of Quina type.

Unit XX

Layers from "a" till "g" of this Unit yielded several industries (less dense in comparison with previous assemblages) however rich in tools and debitage products. Levallois cores as well as unidirectional (flat and partially turned), orthogonal and discoidal ones were found. Levallois flakes and blade with faceted butts occurred. Some blanks were transformed into scrapers or were used directly. Blades are more frequent than Levallois blanks. Upper Palaeolithic blade production is attested by crested blades (e.g. two-sloped). Unidirectional dorsal scar pattern prevails. Retouched blades are common. Also, blades were selected for manufacturing of side-scrapers and points. The dominance of scrapers persists. Among trivial lateral types trapezoidal and bifacial crescent pieces occurred. Convergent tools are numerous (including scrapers, *limace* and points). Among points elongated (triangular and asymmetrical), small (triangular, massive) were recorded.

Layer XXI

In the lowermost layer rare Middle Palaeolithic artefacts (discoidal core, canted scraper) were found. The bad-rock was reached at the depth of 760 cm.

Conclusions

The general structure of all Middle Palaeolithic assemblages exhibits the dominance of small debitage/retouching products: chips (<1.5 cm) and small fragments as well as small flakes. Mostly moderate to rather high presence of tools and some retouching products (re-sharpening flakes) in contrast with low quantity of cores was documented. In essential counts (without chips, chunks and fragments), the flakes dominated other categories of lithic artefacts, where tools occupied second position. The percentage of cores and blades is the lowest. Whereas the cores percentage is still low throughout all sequence, blades become frequent in lowermost layers XVIII and XIX. Tested blocks, chunks (as raw material reserve) as well as hummerstones, knapped pebbles are absent or occurred in very small quantity in several, also mostly lowermost, layers. Thus, lithic artefact composition of MP assemblages suggests on-site core reduction, tool production and using. A few differences in artefacts composition were documented throughout MP sequence. The most considerable is increase of blades/bladelets in the oldest MP assemblages.

Radiolarite group dominates in all Palaeolithic layers in Cave 1. Flint is always in the second place. Other rocks play a little role in the knapping activity. However, in the middle and lowermost layers, limestone and especially quartz were used more often. On the other hand, some rare materials (such as chalcedony) become scarce and occurred in small quantity in lowermost layers. Nothing changed about the quality and the quantity of the used materials: small sizes of initial chunks, *plaquettes* and fragments; average quality of most of modified stones which produces many examples of faked burin fractures (Siret accident), hinging and breakage. The raw materials features (and especially of some types of radiolarite) show a rather high level of diffused bulbs of flakes, which probably gives a wrong impression about using soft hammers.

Three main types of cores are dominant: unidirectional, centripetal and discoidal (with high section). Unidirectional flake and blade/bladelet cores are more numerous in

the uppermost two layers (VII and VIIa) and in lowermost layers (XV, XVIII and XIX). Often they are transversal with last invasive broad flake negative. Rare cores bear traces of preliminary preparation (crest) and partially turned flaking surface. Platforms normally are plain. Bi-directional cores are scarce, however occurred more frequently also in upper and lower part of the sequence (layers VII and XIX).

Centripetal and discoidal cores (in the same proportions or c>d) prevail in the middle part (layer VIII or XIV). Levallois cores occur, as well as desired flakes, in restricted quantity without clear tendency of increasing throughout MP sequence. Levallois cores in uppermost layers are as frequent as in lowermost and become more numerous in the middle part. Flake Levallois cores are often lineal as well as recurrent. Point and blade cores are rare. Fragmented and non-identifiable exhausted cores are common in the lowermost layers.

The majority of chunks are represented by small pieces of raw material. Tested larger items were found only in XVII – XIX layers. Pre-cores are rare and occurred in small numbers in layers X, XV, XVII and XIX.

Blades occurred in a small quantity in most MP layers. Considerable increasing of blade/bladelet component was recorded in the three lowermost layers. For the first time Crested blades and flakes appeared for the first time in these layers. Also, increase of unidirectional cores (mostly exhausted) corresponds to high blade composition. Levallois Index is low throughout all MP industries. Levallois blanks occurred in all layers in different low proportions without clear quantitative tendency for changing.

Rarity of primary and partly covered by cortex flakes and blades in all assemblages attests of-site initialisation of debitage.

As for platform preparation, plain buts dominate in all Mousterian layers (40 – 60%), with no clear tendency to decreasing. Generally faceting indexes are rather low or medium.

The technique of blank production is no surprise: well developed bulbs (> 70%) and obtuse angles (70 – 90%) attests mainly application of hard hammerstone (whose using slightly increases via lower part). Blade production in the lowermost industries was also based on hard hammer technique: lipping is low (2.9%) and diffused bulbs are less frequent than in any other layer (5% against 11 – 24.4%).

Several co-existed parallel debitage systems were identified in the upper layers VII, VIIa, VIII and X (Koumouzelis et al., 2001b). They were also used for flake recurrent production during the time-span of the rest of MP industries:

1) unidirectional recurrent method with no preliminary preparation of flaking surface (direct "flat" exploitation) and platform (naturally plain or single-blow); accompanying bi-directional and orthogonal mode;
2) discoidal method or conique/bi-conique centripetal method (Sitlivy 1996) uni- and bifacial with secant exploitation;
3) centripetal non-Levallois method with "flat" non-secant (in a parallel direction with the working surface) exploitation;
4) centripetal recurrent and linear Levallois flake method.

The finality of different debitage methods remains the same:

a) broad and some elongated, massive, flakes derived from unidirectional method;
b) short, rather thick flakes, often debordant with (Fig. 1:13) extended prepared butt (discoidal, centripetal non-Levallois methods);
c) preferential flakes with centripetal preparation (Fig. 2:5 – 7) as well as secondary flakes (Fig. 1:9,10; 2:15) obtained from Levallois lineal or recurrent cores. Platforms

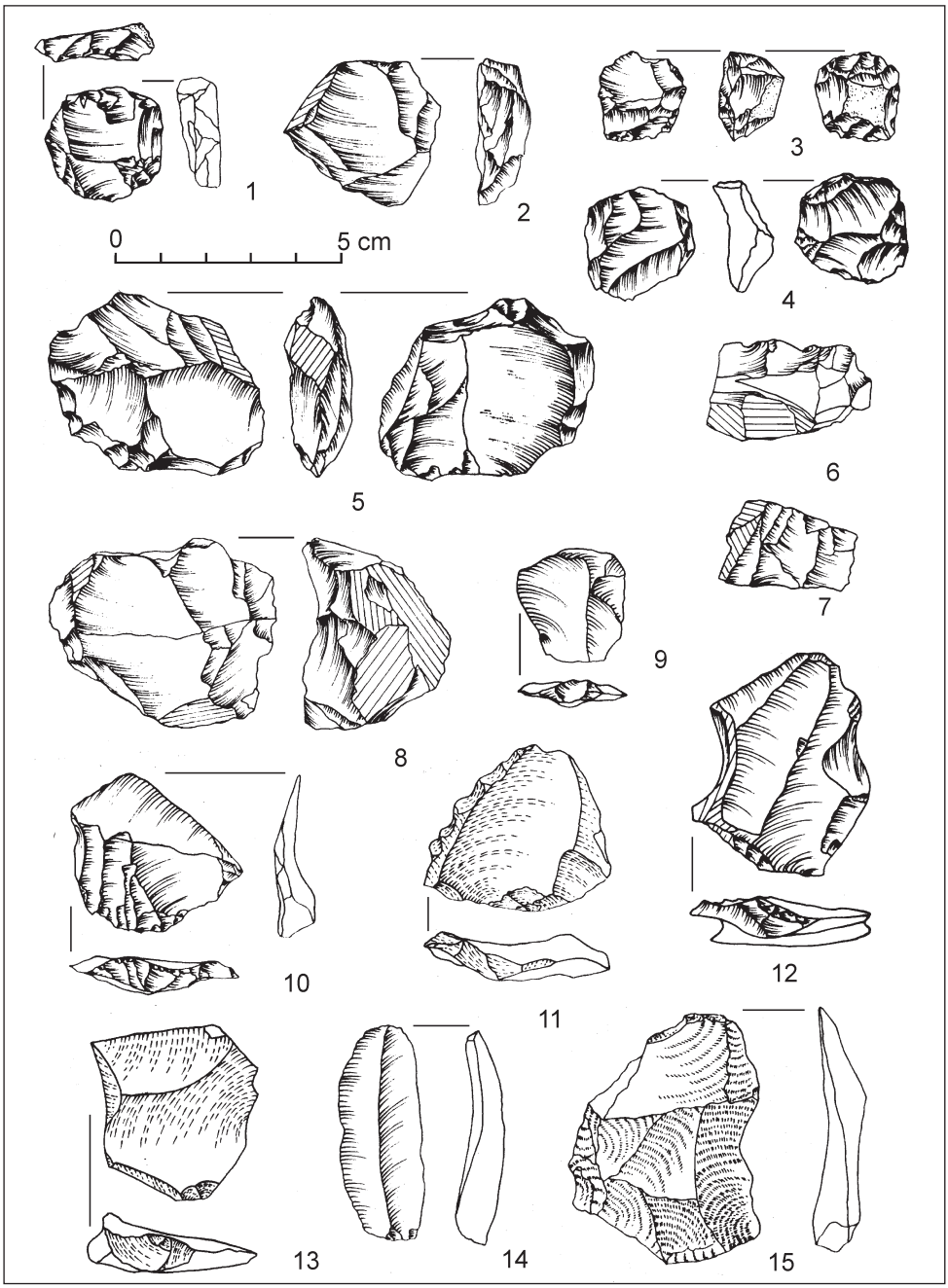


Fig. 1. Klissoura. Levallois cores (1, 2, 4) and flakes (9, 10, 12, 15), centripetal cores (3, 8) and debordant flake (13), orthogonal (8), uni- (6), bi-directional cores (7), denticulated tool (11), blade (14). MP: layers X (3), XI (5, 13, 14), XII (1), XIII (8, 9), XIV (12, 15), XV (2, 4, 6, 7, 10, 11)

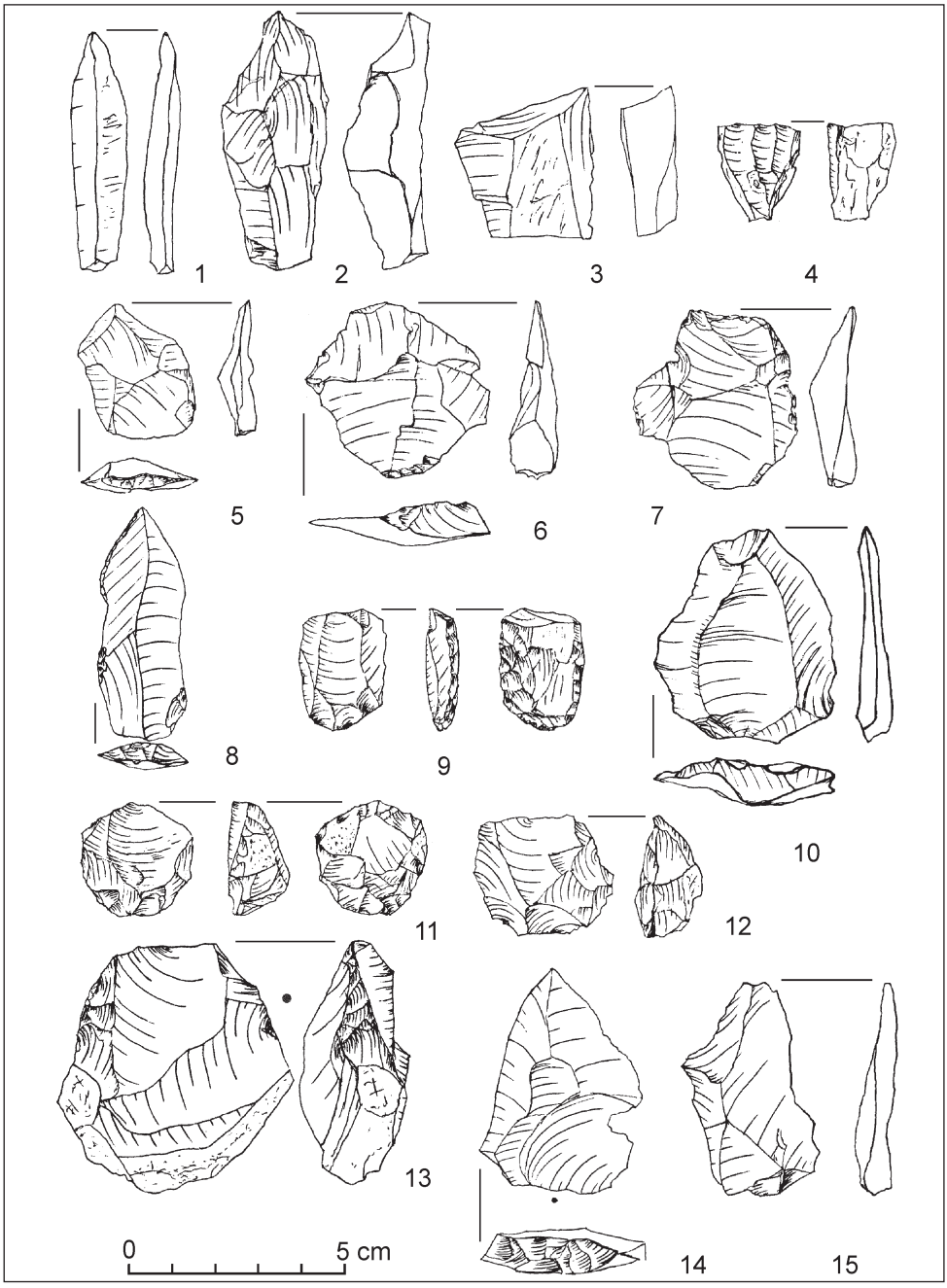


Fig. 2. Klissoura. Blades (1, 3), crested blade (2), blade core (4), Levallois flakes (5–7, 15), Levallois blade (8), Levallois cores (9, 11–13), points (10, 14). MP layers: VII (10), VIII (5, 7, 8, 9, 11), XIV (14), XVII (4, 12, 15), XVIII (1), XXc (2, 3), XXg (13)

were faceted, sometimes prepared by single blow.

These are the principal methods used throughout MP sequence of Klissura cave. Levallois strategy, however, was less common than unidirectional or discoidal and centripetal.

Several additional technologies were recognised:

– Levallois unidirectional convergent for broad points: sporadically appeared across all sequence e.g. in layers VII, XIV and XIX (fig. 1:11; 2:10, 14).

– Levallois recurrent unidirectional for elongated blanks: e.g. in layer VIII (Fig. 2:8–9) and more frequent in lowermost layers.

– Blade non-Levallois methods: a) direct (with no preliminary shaping) exploitation of flat and partly turned cores with plain non-faceted platforms (Fig. 2:4) (mostly reduced uni- rarely bi-directional, narrow-faced or polyhedral cores); b) prepared (crests lateral or central) flaking surface with plain platform formation (rare volumetric cores with crest remnants, however series of crested blades: two-sloped (Fig. 2:2) and lateral. Both modes of core reduction resulted in several final blanks: long blades with straight profile, narrow thin or thick with high triangular and trapezoidal section (Fig. 2:1,3) as well as small blades including bladelets. Blades occurred in restrict numbers in all MP assemblages, however prepared volumetric Upper Palaeolithic method was attested only in lowermost layers (XVIII, XIX, XX) resulted in their productivity.

Tools of all classes were often produced on small and rather thick flakes. In the case of non-invasive retouch it is possible to identify type of blanks for tool production. It was usual to choose for side-scrapers and backed knives debordant (Fig. 1:12–13; 4:11) and asymmetrical (of-axes) short flakes as well as natural backed blanks (Fig. 3:10,19; 4:4). Primary blanks were used episodically or in restrict quantity. Rarely *plaquettes* of radiolarite were selected (Fig. 3:3). Reduced cores were also transformed in scrapers (Fig. 2:9). Modified Levallois blanks (Fig. 1:11; 2:7) occur in small quantities. Blades (Fig. 3:4; 5:11,12) were selected much more often; the highest level of blade tools (18–23%) was recorded in layers XVIII, XIX and XX as well as gradual decreasing of them via the top. Nevertheless non-Levallois flakes were mostly used for tool production (>77%).

MP layers are still characterised by a small sized tool kit with tendency for bigger blanks, especially blades and tools on blades in the lowermost unit. The tool production was achieved mainly by scalar semi-steep and steep retouch; other kinds of retouch were less often used e.g. sub-parallel, flat, Quina, bifacial, sometimes plano-convex (Fig. 4:5,11) and irregular. However Quina and semi-Quina retouch occurred sporadically, sculpturing massive side-scrapers (Fig. 3:2,20), *limaces* (Fig. 4:12–13) and other convergent tools, but especially in lowermost layers (e.g. 5.3% to all complete tools and 7.6% to scrapers/points in layer XIX). Usual retouch is not invasive, nor heavy. Many of tools show in-significant marginal blank modifications. Nevertheless, new rich tool samples display examples of covering, unifacial and heavy retouch as well as bifacial pieces (scrapers, points). Heavy modifications often occurred in lowermost layers. Direct retouching is dominant (e.g. 89.9% in XVI) in Klissoura inventories. Ventral position of retouch (Fig. 3:9; 4:2) occurs rarely in all layers. Bifacial retouch reach about 3% (e.g. layers XV and XVI), alternate modifications is not common. Various kinds of truncation and thinning (basal, distal and back) of side-scrapers, knives and especially points (Fig. 5:2,9,14) were observed; however such tool modifications

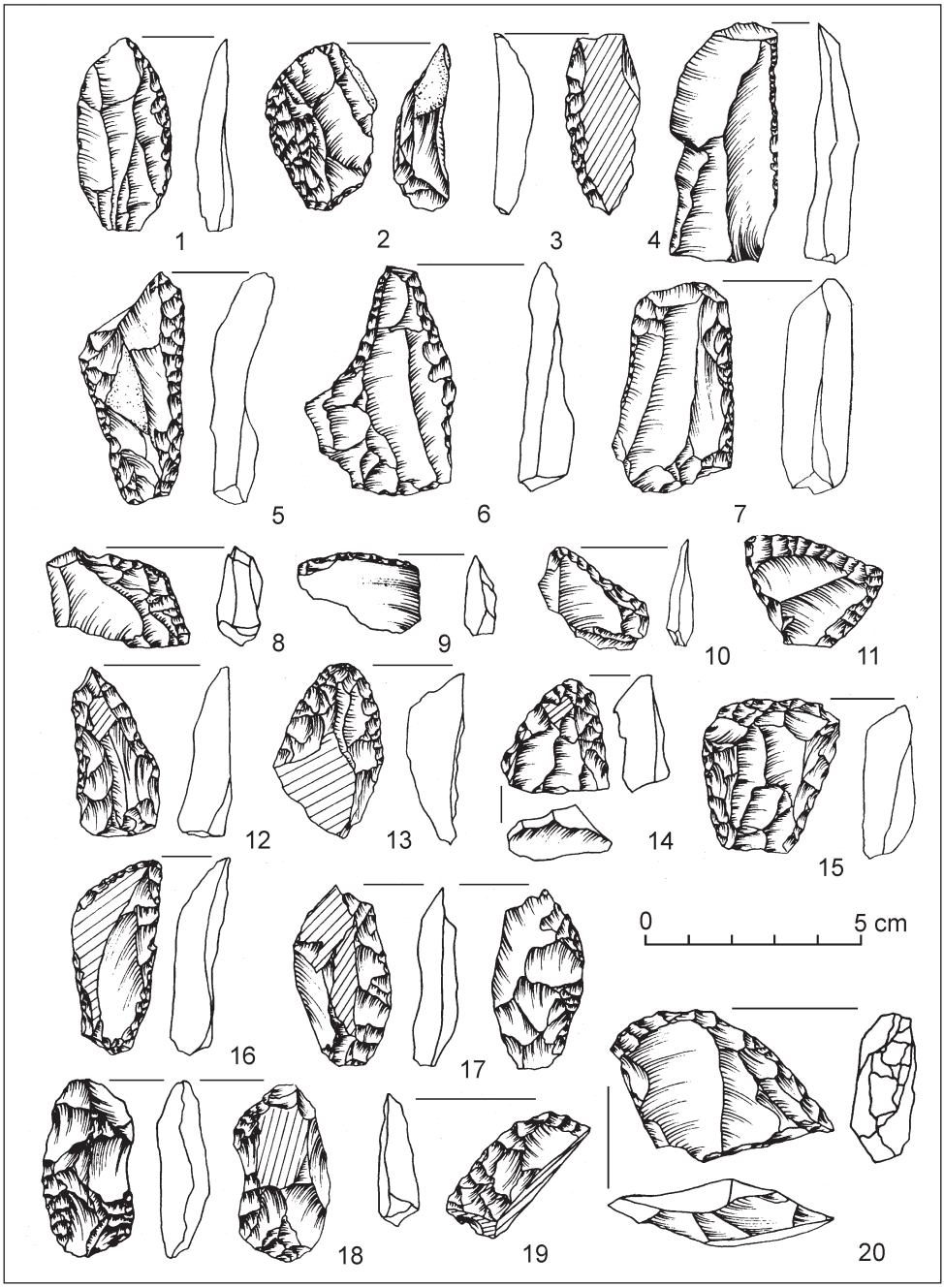


Fig. 3. Klissoura. Scrapers: lateral (1–4), double (5–7), angled (8), transverse alternated (9), canted 10–12), convergent (13, 14, 16), trapezoidal (15), bifacial (17, 18), oblique (19), transverse, Quina (20). MP layers: X (12), XI (18, 5–7, 10), XII (15–17), XIV (1, 3, 4, 11, 14, 19, 20), XV (2, 8, 9, 13)

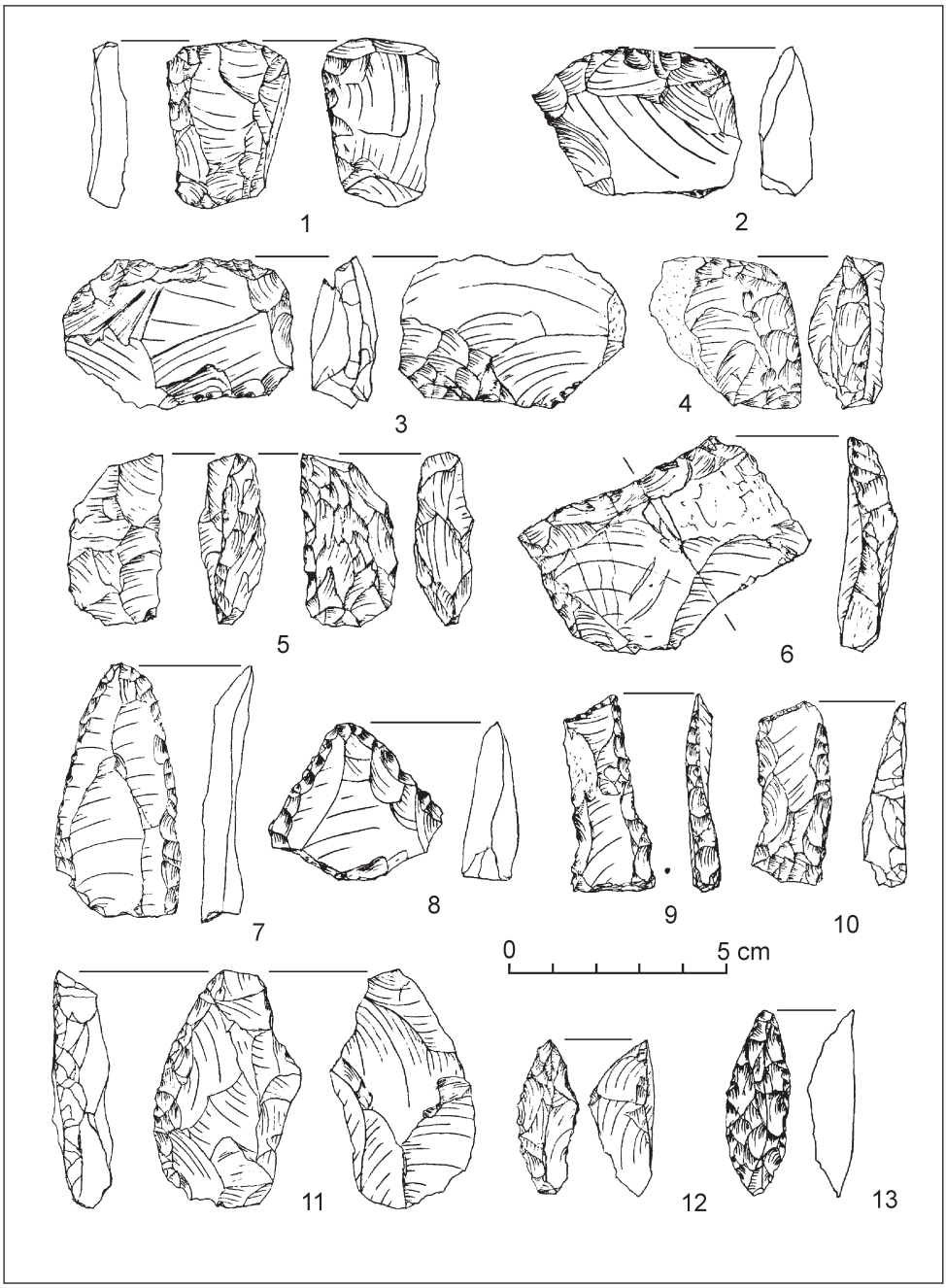


Fig. 4. Klissoura. Scrapers: bi-truncated-faceted (1), transverse (2–3), angled (4), crescent bifacial, resemble Prondnik knife (5), canted (6), convergent (7, 8), trapezoidal (9, 10), crescent, bifacial (11), limace (12–13). MP layers: VII (7), X (4, 11, 12), XI (10), XII (1), XIII (8), XV (2, 3, 5,), XVI (6, 9), XVIII (13)

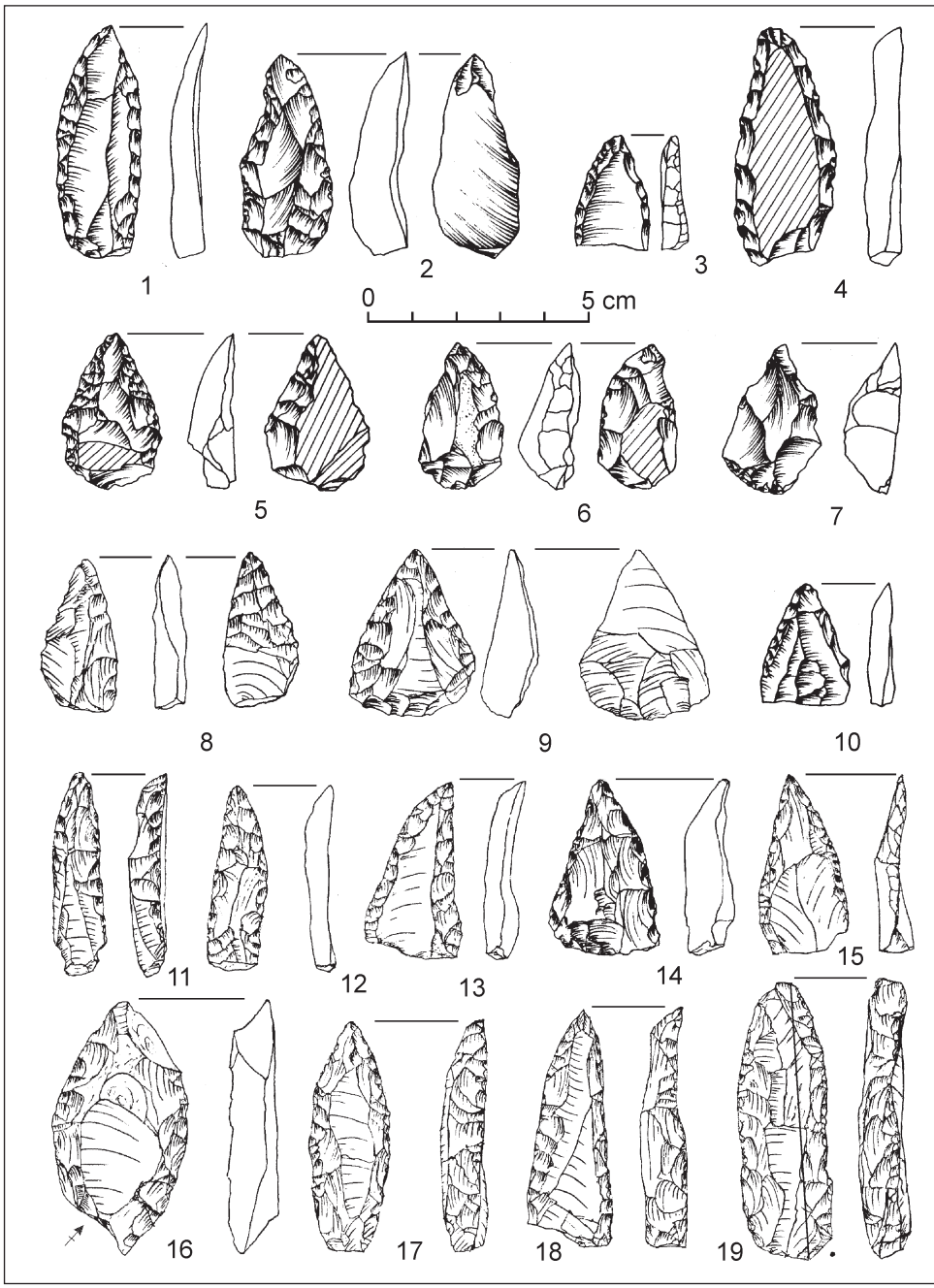


Fig. 5. Klissoura. Points: elongated (1, 11, 12, 17, 18), distally thinned (2), Tayac (7), bifacial (5, 6, 8), proximally thinned (9, 10, 14), asymmetric (13), leaf-shaped (16). Scraper: convergent (19). MP layers: VII (13), VIII (12, 15), X (18, 19), XI (2, 3, 6, 10), XIII (7, 17), XIV (4, 11, 14), XV (1, 5), XIX (8), XX (16), XXc (9)

appeared additional in comparison with a big mass of ordinary scrapers. It seems that tool production, their future reduction and re-using varies according to initial blank. Ordinary flakes and some blades were used directly or were partly modified (retouched, thinned, truncated pieces). Majority of such blanks were transformed by means of scaled and marginal retouch into single scrapers, denticulates etc. Reduction of these tools via multiple items was not significant and resulted in domination of simple lateral scrapers. Also, when it is the case, scrapers (even multiple) have light retouch, which slightly modified initial blank. On the other hand, large and thick flakes and blades (with high section) were intensively reduced by abrupt, steep and Quina, invasive, covering and bifacial retouch into various scrapers (single and multiple)*, limaces,* points and some retouched blades.

Side-scrapers are dominating among the retouched tool types. An increase of the side-scraper percentage and the maximum can be seen in the middle part (layer XIII) when the lowest ratio occurred in the top (VII, VIIa) as well as in the bottom (XVIII, XIX) (Table 3). This fact is due to rather high level of Upper Palaeolithic types (18%–16.8%) in uppermost assemblages and points, retouched flakes and blades in the lowermost layers. Thus, gradual disappearance of Upper Palaeolithic types of tools in layers VII, VIIa and VIII (end-scrapers, burins, perforators and particularly numerous splintered pieces) and their replacement by an exclusively Mousterian tool-kit from layer XI (by side-scrapers, points) is well documented (Fig. 3:1–20; 4:1–13). UP tools are absent or occurred only by single pieces in lower layers (XIV–XIX) even when retouched blades appeared in big portions (XVIII, XIX). Mousterian points were found in all layers (except layer VIIa) after extension of a test pit (Fig. 5:1–19). They are stay in low proportions (1.4%–3.7%) and become more representative in layers XVIII (4.7%) and XIX (7.5%). Different kind of points were recognised throughout all MP sequence, however all this variability could be find only in lowermost layers XVIII, XIX and XX. Single scrapers prevailed over multiple. The ratio of lateral scrapers is high, especially in layers X, XIV, XVIII and XIX). *Limaces* occurred not in all layers however they are characteristic in the middle and especially in the lowermost layers (1–2%). Generally altogether convergent tools (including scrapers and points) are rather representative in Klissoura MP sequence comprising 10–25%. Other scrapers as angular (Fig. 3:8; 4:4), alternate, truncated-faceted (Fig. 4:1), as well as with continuous, peripheral working edge and sometimes with bifacial retouch e.g. trapezoidal, rectangular, oval and crescent are scarce and do not occurred in all layers (Fig. 3:15,18; 4:5,9–11). Nevertheless, the last categories e.g. crescent scrapers are more frequent in lower part: from layer XIV till XX. Here some scraper and tool pre-forms appeared, especially in layer XIX.

Other types, such as denticulates, retouched flakes occurred in moderate and low amounts (2.6–11.9% and 7–17% respectively). Notches and natural-backed knives are not numerous. The last could reached in some cases 4.4% to 6.5% (layers XV–XIX with isolated examples of retouched backed knives). Other types are represented by single items and were found in separate layers: *raclette,* truncated and thinned flakes, bec, composite tools, “chopper”. Unidentifiable tool fragments are common (about 10%) and sometimes reach 25% (XVI). Together with other broken tools (especially scrapers and tips from convergent pieces) they are very abundant.

The tool fragmentation, which is rather common, can express the high level of their using, their reduction, their re sharpening and, in some cases, some post-depositional effects, which should be verified.

In sum, new data recorded from Klissoura Cave 1 and preliminary inter-assemblage study exhibits significant technological variability, homogeneity of many industries, some common features with regional *in situ* MP occupations as well as peculiar technological and typological features, specific tendencies and changes throughout long Klissoura sequence.

Acknowledgements
1) Fonds National de la Recherche Scientifique, l'Unité de Recherches EVEH – Université de Liège.
2) S.S.T.C. project MO/38/003 and Belgian Science Policy MO/38/010 (Brussels).
3) Research Fellowship, F.N.R.S. (K. Sobczyk: F.N.R.S., Université de Liège).

Nowe dane na temat środkowopaleolitycznego osadnictwa w Jaskini 1 na stanowisku Klissoura w Grecji. Badania w latach 2004 – 2006

Artykuł prezentuje wstępne opracowanie środkowopaleolitycznych poziomów z Jaskini 1 w Klissourze. Stanowisko położone jest w Argolidzie, w miejscowości Prosymna (NE części Peloponezu). Występowanie środkowopaleolitycznego osadnictwa na terenie Grecji potwierdzone zostało zarówno na nielicznych stanowiskach jaskiniowych, jak i otwartych. Jak dotychczas poza Klissourą nie odkryto stanowiska jaskiniowego udokumentowanego dużymi i bogatymi sekwencjami *in situ*, pochodzącymi ze środkowego paleolitu. Badania licznych nawarstwień górno- i środkowopaleolitycznych stanowiska Klissoura Jaskinia 1 dostarczyły ważnych danych do genezy i stratygrafii sedymentów, tworzenia typologiczno-technologicznych modeli, jak i rekonstrukcji ludzkiej działalności. Dotychczas prezentowane były tylko górne poziomy mustierskie a więc warstwy VI (warstwa mieszana z górnopaleolityczną), VII, VIIa, VIII i X. Wskazywały one na mikrolityczny charakter inwentarza bogatego w zgrzebła (w przewadze zbieżne) i ubogiego w elementy Quina oraz w debitaż lewaluaski. Rozszerzenie powierzchni badawczej wykopu w latach 2001 – 2006 pozwoliło na stwierdzenie istnienia bogatego osadnictwa w jaskini, wraz z dużymi rozwleczonymi ogniskami, licznymi szczątkami różnorodnej fauny i przemysłem kamiennym bogatym w narzędzia retuszowane, formy rdzeniowe, jak i produkty debitażu. Środkowopaleolityczna sekwencja (sięgająca w głąb do 6,6 m) jest reprezentowana przez liczną i bardzo zwartą okupację osadniczą, od warstwy zawierającej zmieszane elementy górnopaleolityczne ze środkowopaleolitycznymi do dna skalnego, t.j. przez warstwy VI – XXI. Nadal jak do tej pory nie jest datowana metodą TL (program datowania tą metodą realizowany jest przez N. Mercier i H. Valladas). Dane geologiczne oraz nowe pojedyncze daty C14 (datowanie z 2008 r. w Laboratorium Uniwersytetu w Arizonie) z warstw VI ,VII, XVIII i XX, pozwalają umieścić środkowy paleolit Klissoury w ramach środkowych faz ostatniego zlodowacenia pomiędzy 40 a 62 tys. lat BP.

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Photo 1. Klissoura. Trench A – west profile