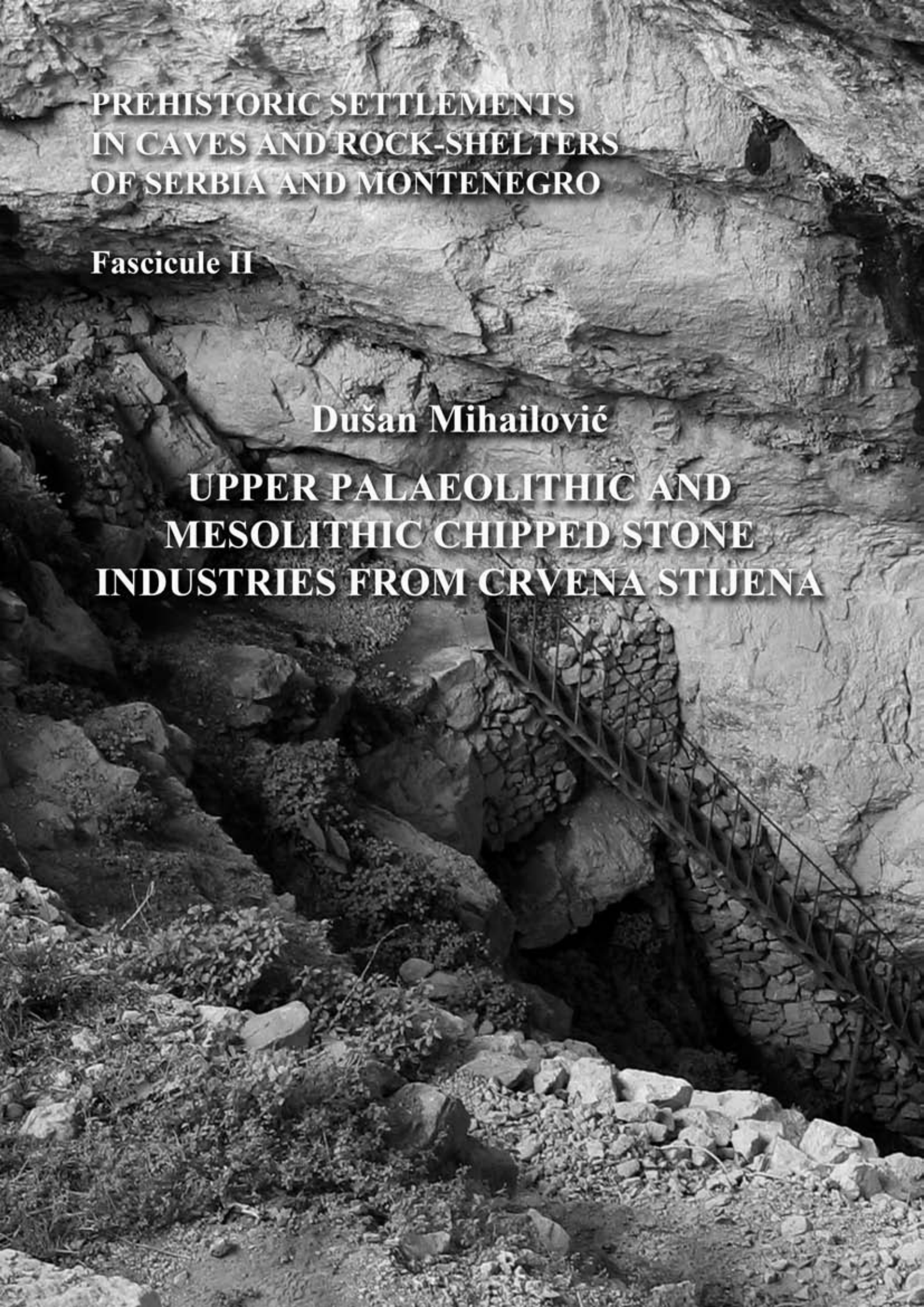

PREHISTORIC SETTLEMENTS
IN CAVES AND ROCK-SHELTERS
OF SERBIA AND MONTENEGRO

Fascicule II

Dušan Mihailović

UPPER PALAEOLITHIC AND MESOLITHIC CHIPPED STONE INDUSTRIES FROM CRVENA STIJENA

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Editor
Miroslav Lazić

Belgrade 2009

Rather long time had passed from the analysis of the material until the publishing of this book. It is, therefore, understandable that it would have never printed unless its publication was supported by many colleagues, friends and associates. I owe my deepest gratitude to Zvezdana Vušović–Lučić, who made possible my examinations and study of the material when the circumstances were far from good, to Ivana Radovanović, Dragoslav Srejović and Milutin Garašanin because their advices and help were of immeasurable importance. My warm thanks are also due to Robert Whallon and the colleagues from Montenegro who invited me to take part in the recent investigations of Crvena stijena and to Vojislav Filipović and Viktor Farčić who helped me in preparing the manuscript for publishing.

The book is partially based on author's doctoral dissertation *The Upper Palaeolithic and Mesolithic of Montenegro* (University of Belgrade, 1999).

CONTENTS

INTRODUCTION

The rock shelter of Crvena stijena on the western border of Montenegro (Figs. 1, 2) is one of the most important Palaeolithic and Mesolithic sites in the southeast Europe and the site, which is in many aspects a unique one. More than thirty cultural horizons have been investigated in this rock shelter in the course of earlier excavations reaching to the depth of 20 meters. In contrast to other sites in the southeast Europe almost all phases in the cultural development from the Middle Palaeolithic to the Middle Neolithic have been recorded at Crvena stijena. This site yielded large amount of data not only about changes in the material culture and the way of life of the prehistoric communities but also about the paleoclimatic and paleoecological circumstances during given time. Therefore, it should not be surprising that the interest for Crvena stijena has always been great and why the investigations of this exceptional site are still in progress.

The investigations of Crvena stijena had been conducted relatively long time ago, in the 1950s and 1960s. Even though the excavations had not been carried out within the square grid system and the sediment had not been sifted they were executed very precisely attempting to gather all, even the smallest finds within the stratigraphic context. Besides, Crvena stijena is one of the first sites in this region where the interdisciplinary investigations had been undertaken. These investigations included the analyses of the sediments and macrobotanical remains, fauna and microfauna, identification of raw materials and C14 dating. The results have been presented in detail in many reports, studies and dissertations as well as in the monograph on this site (Баслер 1975).

Unfortunately, the excavations of the rock shelter were undertaken in the time when modern approach in the study of Palaeolithic was just at its outset in this as in many other parts of Europe. Because of that there are not enough data concerning the raw materials, structure of the industry, knapping technology and style of tool manufacture in the published works (Benac, Brodar 1958 and even Баслер 1975). Some authors tried to obtain these data on the basis of the published material (Whallon 1999; Kozłowski 2002), but many problems concerning the attribution and stratigraphic position of certain finds still remained unsolved. Thus, it is not clear even until these days whether the industry from layer X belongs to the Aurignacian or Gravettian, whether the finds from layers VII–V date from final Palaeolithic or Early Mesolithic and whether in the material from the Mesolithic layer also appear the Neolithic elements, which are mentioned in the earlier reports (Малез 1975).

In this work are presented results of the detailed analysis of the artifacts from the Upper Palaeolithic and Mesolithic layers (X–IV) that we had an opportunity to carry out already in 1993. The objectives of these analyses were to acquire the thorough insight in the material, to determine

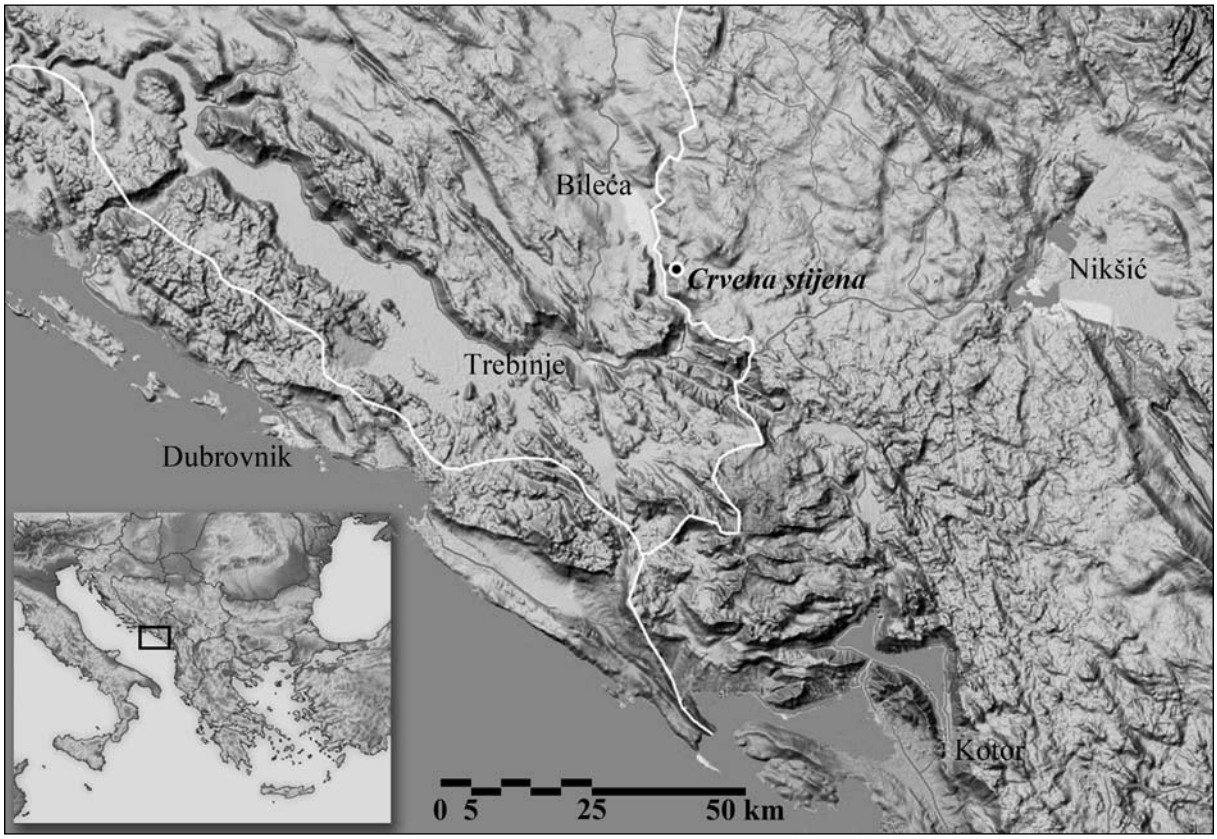

Fig. 1 Geographical position of the site

cultural and relatively chronological position of the assemblage and to reconstruct the activities of human groups within the dwelling place and its surroundings. Already at that time we tried to comprehend the industries from Crvena stijena within broader regional context (Михаиловић 1998; Mihailović 1998; 1999). In this book, however, we intend to take a further step having in mind the interpretative potential of the gathered material and the distinctiveness of the site itself.

There are many factors, which impede the analysis and interpretation of the remains from Crvena stijena: in the Regional Museum in Nikšić is missing the field documentation and material from the excavations, there are no data about the spatial distribution of the artifacts, and there is just a few absolute dates. Therefore, it is clear that importance of Crvena stijena could be understood only if we examine the existing material within wider spatial and chronological framework and in the context of the evolution of the Upper Palaeolithic and the Mesolithic in this area. On the other hand, Crvena stijena offers remarkable possibilities for the studying of long–lasting trends in the material culture and in all other aspects of evolution of the Upper Palaeolithic and the Mesolithic in the Balkan Peninsula (Baković *et al.* 2009). In comparison with other sites in the southeast Europe only at this site could be followed almost all transitional periods; from the Middle to the Upper Palaeolithic, from final Palaeolithic to the Early Mesolithic, from the Early Mesolithic to the Late Mesolithic and from the Mesolithic to the Neolithic. The continuous inhabitation of Crvena stijena was certainly influenced by geographic and topographic position of the site as well as by paleoclimatic and paleoecological characteristics of the region. Just because of that we paid special attention in this work to the climatic, ecological and social factors of the cultural changes.

The reconstruction of the region paleoecology is essential for the comprehension of settling and economy of hunter–gatherer communities. However, the importance of this region could be seen also in the fact that Mediterranean region considering the climatic, ecological and geographic aspects was a transitional zone between the steppic regions in the south and east of Europe and glaciated regions in the north. Besides, it seems that there are reasons to assume that western part of

Fig. 2 Palaeolithic and Mesolithic sites in Montenegro

the Balkan Peninsula in the glacial periods was a refugium not only for the flora and fauna (Hewitt 2004; Tzedakis 2004; Weiss and Ferrand 2007), but also for the human communities (Ginter *et al.* 1994). A question could be asked in that context to what extent the climatic and ecological factors, i.e. factors of isolation and adaptation influenced cultural changes in certain regions and how much cultural influences and population movements were also important.

The understanding of social factors is one of the most important preconditions for the comprehension of cultural changes despite the fact that method of social study is not clearly defined in the Palaeolithic and the Mesolithic. There was an attempt, in recent times, to recognize the role of the individual in creation of the social networks (Gamble 1999; 2007), to explain the acculturation in the transition from the Middle to the Upper Palaeolithic from the aspects of social proximity (Tostevin 2006) and to analyze the transition to the Neolithic from the aspect of social and cultural interactions between hunter–gatherer and farming communities (Zvelebil 1986; 2001). The macro–phenomena, except the phenomena documented in the Epipalaeolithic and the Pre–Pottery Neolithic of Anatolia and the Near East (Cauvine 2000) are still not sufficiently studied. The cultural changes in the transition periods are studied in this work from the aspect of social and cultural openness on the group or wider social level.

We decided on ecological and social approach in our study because of the geographic position and ecological characteristics of the southeast Balkans and the distinctiveness of Crvena stijena as a site. In the area inhabited even in the glacial periods, on the border of influences from east and west, from the coast and the hinterland, Crvena stijena represents one of the most distinct monuments of long duration of the early prehistory in the southeast Europe. Because of that, this site despite all limitations offers an ideal possibility for investigation of the long–lasting tendencies in the cultural development in the wider area of the north and east Mediterranean. Of course, because of the complexity of the topic but also due to the lack of material we do not intend to offer in this work the answers to all questions. We just tried to point out the existing problems and possible directions for their resolving.

ENVIRONMENTAL SETTING

Crvena stijena is situated on the left bank of the Trebišnjica river, near the village Petrovići in the southwestern Montenegro (Fig. 3). It is a large rock shelter located approximately 50 m above the river and at over 700 meters above sea level. The width of the rock shelter entrance at the ground level is just 26 meters, the greatest depth is around 15 meters and the height is around 15 meters. The entrance is facing south and is in the daylight during most of the day. Broad river valley and the entire area as far as the Leotar Mt. could be seen from the plateau in front of the rock shelter. On the other hand, we could only guess what the visibility of the cave in the Pleistocene was. The rock shelter was created in the red–colored limestones, which are visible even from rather great distance; at greater depth its size was probably much larger. At the depth of 20 meters the height of the entrance could have been over 30 meters, width over 30 meters and depth over 25 meters. When the accessibility is concerned the situation was somewhat different. The cave could be easily reached from the east along the limestone cliff, while the approach from the river is much more difficult because of the sloping of the terrain (Figs. 4, 5).

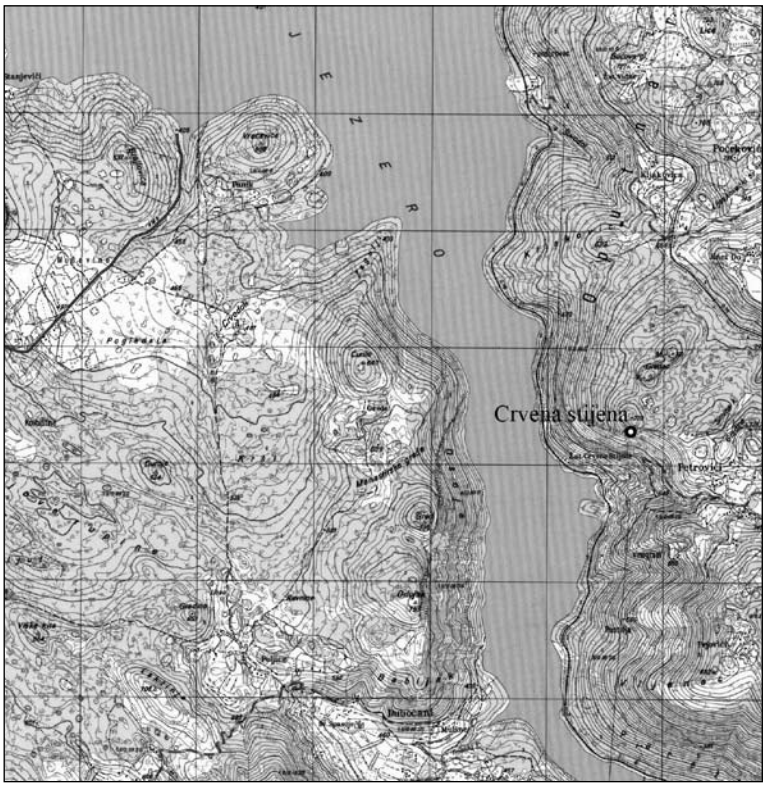

Fig. 3 Location of Crvena stijena (1:25000)

With the exception of the Trebišnjica valley, which is deeply cut into the limestone ground there are no prominent altitude differences in the surrounding relief. The rock shelter is situated at the western border of the High–karst plateau, which together with coastal mountains separates the hinterland from the coast (Fig. 6). The altitude of the plateau is 800–900 m and it is made of the dolomite and limestone originating from the Triass, Iura and Cretaceous period (Бешић

1980; Радојичић 1991a) and their average thickness reaches 4230 m. From the geographic point of view this plateau includes Katunski krš, Krivošije, Grahovo region, Rudine and Banjani. It is a typical karst area where almost all karst formations and phenomena occur. The length of the plateau is about 90 km and its width is about 40 km (Радојичић 1991a, 134). It had been created in the Oligocene and Miocene by disintegration of the limestone substratum. Despite large amount of rainfall there are no surface waterways in the area as all the water flows by the underground canals.

Although "angry karst" zone probably did not offer ideal conditions for settling in many periods, this could not be said for the Trebišnjica valley and lowland Herzegovina. The paleoecological investigations (Miracle, Sturdy 1991; Miracle 1995) and evidence concerning the economy of the Palaeolithic communities (Малез 1975), suggest that this area was abounding in resources in certain periods. From the geographic point of view the Trebišnjica valley gravitates toward the lowland Herzegovina and via that zone toward the coastal region. The distance from the Trebišnjica spring (flooded by the accumulation of the Bilećko lake) to the sea coast is less

Fig. 4 Crvena stijena – view of the site (photo by Jamie Clark, used with permission)

than 30 km as the crow flies. Also, the eastern part of the lowland Herzegovina is also connected with Podgorica–Skadar valley by the Zeta river valley via the lowland of central Montenegro. In this area have been recorded many Palaeolithic sites: Badanj near Stolac (Whallon 1989; 1999), Ružina pećina in Gatačko polje, as well as Bioče and Vruća pećina not far from Podgorica (Ђуричић 1997; Đuričić 2006).

Fig. 5 Crvena stijena – view from the rock–shelter toward the flooded Trebišnjica river valley

The Mediterranean climate dominates only in the narrow coastal region while the hinterland is characterized by the submediterranean climate. To this zone except the region of Rudine and Banjani also belongs the lowland of central Montenegro, i.e. Podgorica–Skadar valley, Bijelopavlićka plain and Nikšićko polje (Радојичић 1991b, 211–213). In the high mountain zone to the north of this area occurs sub–alpine climate with very cold winters (average January temperature is under 0ºC), while northeastern parts of Montenegro are characterized by altered temperate continental climate. The amount of rainfall is largest in the coastal mountainous regions, particularly in Krivošije (where average annual amount of rainfall is 2300–2500 mm); it abruptly decreases towards the northeast (1100–2100 mm around Durmitor, Sinjajevina, Komovi and Prokletije) while in the coastal region varies between 1926 mm (Kumbor) and 1440–1446 mm (Bar–Ulcinj). Generally speaking, the modified Mediterranean pluviometric regime with two rainy periods (late autumn, March) and two dry periods (late summer, February) prevails in Montenegro. The north winds prevail in winter and the south winds prevail during summer (Vujević 1956, 404).

On the High karst plateau, on the lime and dolomite substratum, had been created the red soil and buavica (black, dusty acid soil created on the limestone), which is characteristic of higher mountain zones (Katunski krš, regions of Piva, Durmitor and Sinjajevina). On this soil developed the Herzegovina–Montenegro–Macedonian type of vegetation. Above the zone of beech and pine, the zone of Bosnian pine (*Pinetum Heldreichii*) occurs on the cretaceous soil and zone of Mace-

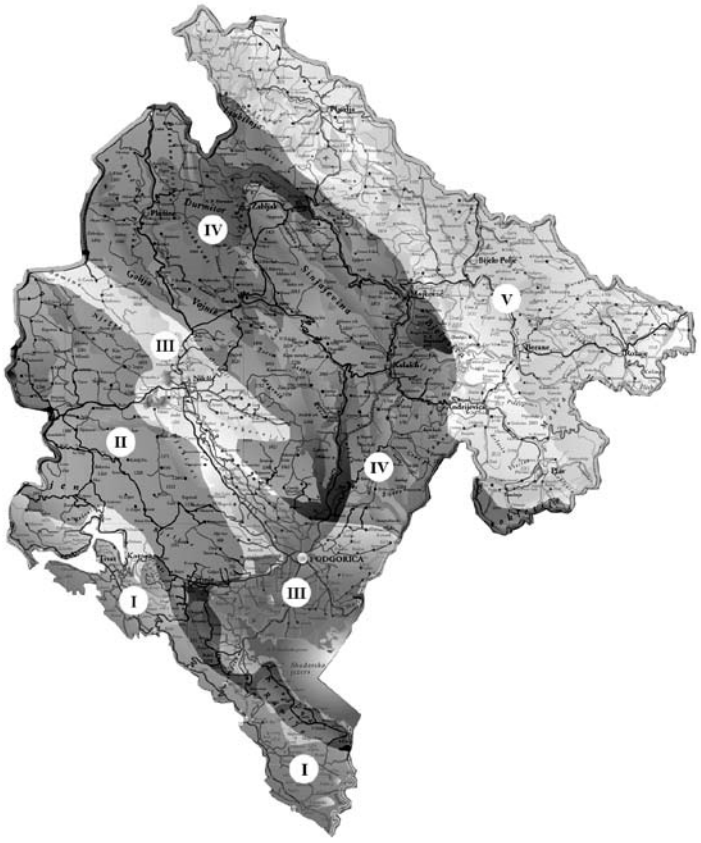

Fig. 6 The main relief areas of Montenegro: I Coastal zone, II High karst plateau, III Lowland of central Montenegro, IV The area of high mountains and tablelands, V The area of north–east Montenegro (modified from Радојичић 1991a)

donian pine (*Pinetum Peucis*) on the siliceous soil. The pine shrub forests (*Pinetum mughi*) transform with higher altitude into the mountain barren land. This type of vegetation comes in touch with the Mediterranean zone in this area. In this zone above the area of evergreen vegetation (forests of black oak and maquis) occurs first the narrow zone of deciduous oaks and above it also the zone of xerophilous coniferous forests. This type of vegetation is mostly registered also in the immediate vicinity of Crvena stijena, including the Trebišnjica valley as well. It is assumed that the Late Glacial Herzegovinan lowlands carried steppe or lightly wooded steppe communities and that forest vegetation was developed only in the beginning of the Holocene (Miracle, Sturdy 1991).

LOCATION, RESEARCH AND STRATIGRAPHY OF THE SITE

Crvena stijena was discovered in 1954 in the course of site surveying conducted by A. Benac, D. Sergejevski and J. Ivović. The test–trench excavations had been also carried out at the site in the same year. These excavations revealed that Crvena stijena is the multi–layered prehistoric site. The investigations continued in 1955 and 1956 under the directorship of A. Benac (National Museum of Bosnia and Herzegovina in Sarajevo) and after that director of excavations until 1958 was M. Brodar (Institute of Archaeology, Slovenian Academy of Sciences and Arts in Ljubljana). The Upper Palaeolithic, Mesolithic, Neolithic and Eneolithic layers of the site had been investigated in this period (Benac 1957; Benac, Brodar 1957; Brodar 1957a; 1958).

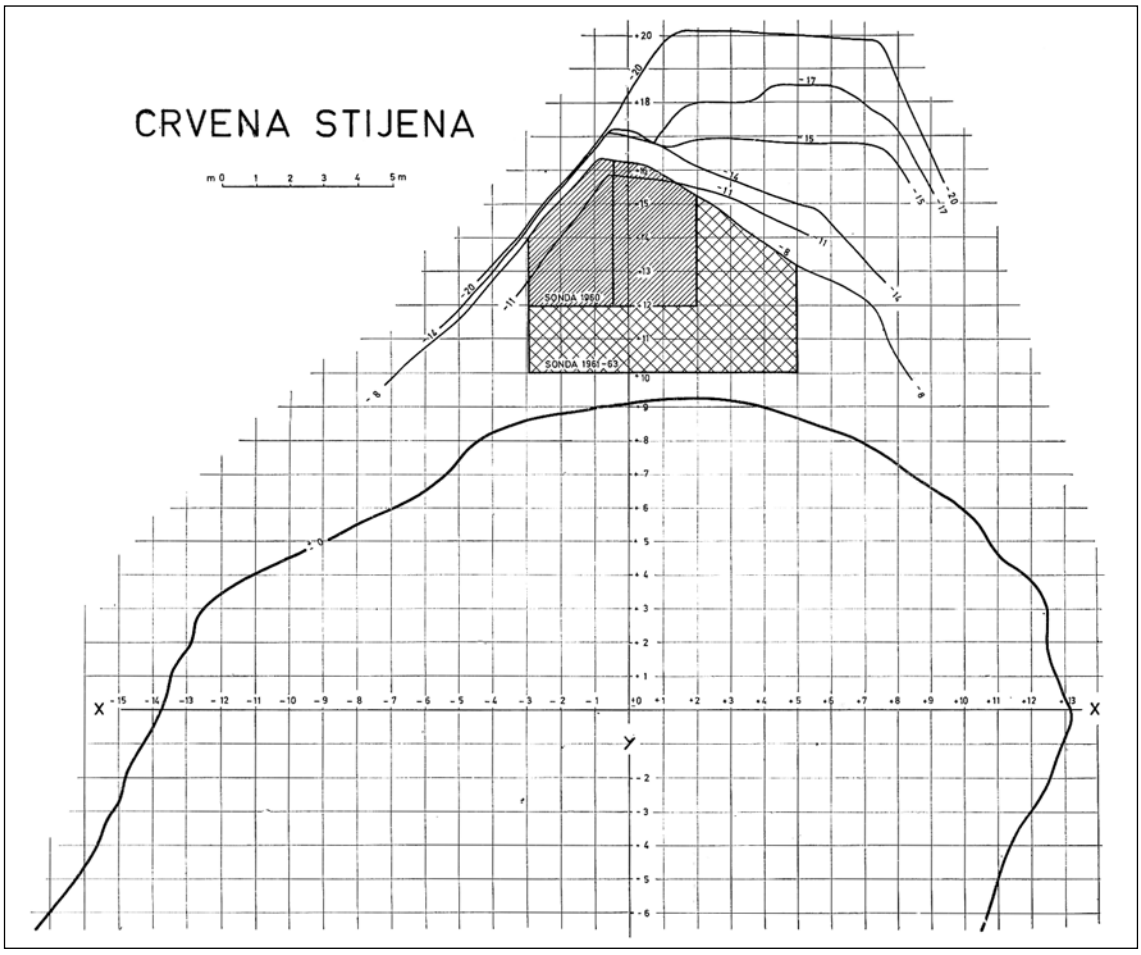

Fig. 7 Crvena stijena – ground plan (after Баслер 1975)

In order to extend the excavation area the rocks in the floor of layer X had been blown by the explosive in 1959. As a result of these works almost all Upper Palaeolithic and Mesolithic horizons had been removed from the secluded section of the rock shelter. The investigations of the Middle Palaeolithic layers continued between 1960 and 1963 under the directorship of Dj. Basler from National Museum of Bosnia and Herzegovina in Sarajevo (Баслер 1975).

The attempts were made from the very beginning to provide the interdisciplinary character of investigations. The analysis of the fauna was performed by I. Rakovec and M. Malez (Rakovec 1958; Малез 1975), the analysis of the macrobotanical remains was performed by A. Šercelj, the analysis of raw materials was entrusted to J. Pamić (Памић 1975),while the sediments were investigated by K. Brunnacker (Brunnacker 1975).

The excavations at Crvena stijena were in the beginning of the test–trench character. First the trenches A (in 1954), B and C (in 1955) were explored and later also trenches D, E, F and G (in 1956). By successive exploring and joining of the trenches the investigations gradually became the systematic excavations encompassing at one moment the entire area within the rock shelter (around 150 square meters) – from the place where the rock fragments appeared at the entrance to its interior wall (Figs. 7, 8). The interior wall of the rock shelter deepened more and more as the investigations continued. The method of gradual expansion of the excavated area (the 'combined method' according to the authors) could not have been always applied first of all because of crumbling of the sediments, i.e. collapsing of the profiles from which excavations started. The excavated area gradually

Fig. 8 Crvena stijena – view of the eastern part of the rock shelter (photo by Jamie Clark, used with permission)

narrowed during excavations and at the bottom of the cultural layer X it encompassed just 20 square meters.

The excavation of the Upper Palaeolithic and the Mesolithic horizons had been carried out in arbitrary layers, the thickness of which probably did not exceed 10 cm – as it was also the case when the Middle Palaeolithic layers had been excavated (Баслер 1975, 11). Namely, although the documentation from the excavations is no longer housed in the Regional Museum and Center for Culture – Nikšić, it could be concluded, on the basis of the data on paper bags with finds, that most of the cultural layers had been removed in more than five and sometimes even in almost twenty arbitrary layers. Small number of bags has also the information about the mixing of sediments. It could be assumed, according to this, that stratified material was separated from the material from uncertain stratigraphic location.

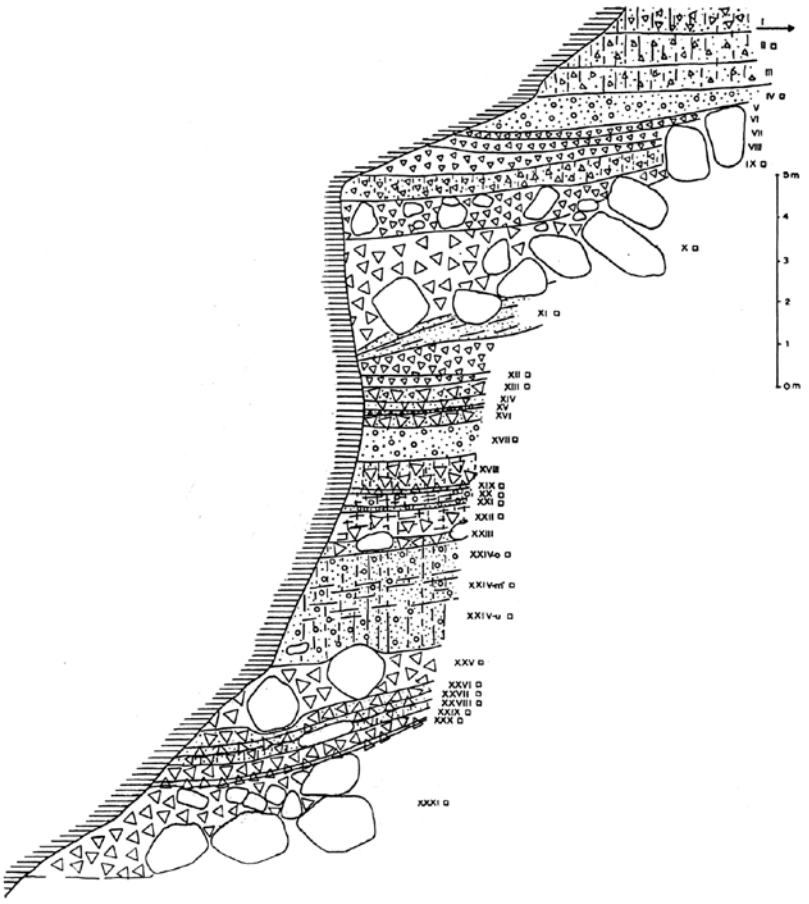

Fig. 9 Crvena stijena – eastern profile (after Brunnacker 1975)

In the course of site surveying in the immediate vicinity of Crvena stijena few flint artifacts had been obtained from the local residents (Brodar 1957b). The test trenching was carried out at the sites Repište and Potrkalje in 1955. It has been concluded that all finds come from the humus layer overlaying the layer of sterile clay, which lies on top of the virgin rock. The pottery fragments have not been found. Because of the heterogeneity of the assemblage and the fact that culturally and chronologically relevant tool types have not been found, M. Brodar did not propose definite identification of the cultural provenance and the date of the finds.

The[1] stratigraphy of the Upper Palaeolithic and the Mesolithic horizons at Crvena stijena has been defined already in 1958 (Benac, Brodar 1958, 45–47; Баслер 1975, 29; Brunnacker 1975) (Fig. 9).

- Layer X – fine and medium large eboulis with considerable admixture of brown and red clay. In lower layers the eboulis becomes larger and more rounded and the clay concentration is getting higher. An average thickness of the layer is around 2.5 m. In its floor appear large rocks around

[1] At the beginning of excavations (1955) layers V-VII were marked as layers Va-Vc (Benac-Brodar 1958, 45), while layers (stratums) Vd, VI and VII probably corresponds to the layers VIII, IX and X.

1 meter in diameter. Four archaeological horizons – Xd – Xa have been distinguished within this layer. The horizons yielded relatively small amount of archaeological finds and most of them have been recorded in horizon Xa. The remains of fauna are scarce but also very diverse (auroch or bison, ibex, wild boar, red deer, marmot, hare etc.). The analysis of the macrobotanical remains indicated the presence of pine: *Pinus sp.* in horizons Xc and Xb, the unknown pine species in horizon Xb and the species *Fraxinus ornus* in horizon Xb.

- Layer IX – layer of small eboulis of light gray–brown color without admixture of clay but with lenses of soot. Near the top of the layer appear rather large stone blocks. The layer contains large quantity of flint artifacts. Among the faunal remains have been identified the marmot, red deer, Alpine hare, lynx, auroch or bison, ibex, roe deer and wild boar. The charcoal remains belong to the unknown species of pine and simple pine (*Pinus sp.*).
- Layer VIII – layer of black color with small eboulis. It contains a lot of soot. The flint artifacts are present in large quantity. There is smaller amount of faunal remains than it has been encountered in the lower layers. The bones of red deer, lynx, auroch or bison, ibex, roe deer and wild boar have been found. The analysis of charcoal revealed that it was from the simple pine (*Pinus sp.*).
- Layer VII – layer of small light yellow non–blunted rubble without admixture of other sediments. Its thickness is relatively small and it contains small number of the chipped stone artifacts. Small fire place with charcoal of pine (*Pinus sp.*) has been encountered near the rock. Most of the bones were those of red deer but also the remains of marmot have been recorded.
- Layer VI – thin layer of eboulis with dark gray sediment. Its thickness is not uniform. Large quantity of shells of the terrestrial snail (*Helix pomatia L.*) was found at some locations. Only the remains of red deer and wild boar have been encountered. The number of chipped stone artifacts is larger than in the previous layer.
- Layer V – layer of light yellow sediment with the non–blunted rubble. The layer is thin (an average thickness is 10–15 cm) but it contains large quantity of archaeological finds and animal bones: red deer, wild boar, Alpine hare. The investigated area was 40 square meters.
- Layer IV – layer of grayish sediment with the eboulis. It consists of three horizons: IVb2, IVb1 and IVa. Large number of fireplaces was found in two lower horizons. The large quantity of snail shells was encountered in horizon IVb1. Also, large amount of flint artifacts, tools made of bone and horn and animal bones (red deer, wild boar, chamois, doe, hare etc.) have been found in all three horizons.

Chronology

As we already mentioned, one of the main problems in the study of Palaeolithic and Mesolithic horizons at Crvena stijena is the fact that chronology of the site has not been precisely established. Just one absolute date 40770 ± 900 BP for layer XII has been obtained during earlier excavations (Баслер 1975, 90). Because of that almost all attempts to determine the age of the Pleistocene layers had to rely on the interpretation of sedimentological and faunal analyses as well as on the

analysis of the archaeological material. These interpretations, however, did not coincide. Thus, for instance, I Rakovec attributed to the Pleistocene (Würm II) only the fauna from layer X, while he ascribed the fauna from the upper layers (starting with layer IX) to the postglacial (Rakovec 1958, 72). The problem with the faunal analyses at that time as it is the case today is in the fact that fauna from different biomes and having diverse degree of susceptibility to the climatic changes appear in the Upper Palaeolithic layers. In that regard it was often very difficult to determine whether some faunal association dates from the stadial or the interstadial.

The cold–loving steppic fauna was most frequent in layer X at Crvena stijena (Rakovec 1958; Малез 1975). The remains of the Alpine hare (*Lepus timidus*), snow vole (*Microtus nivalis*), Alpine marmot (*Marmota marmota*) and other rodents adapted to the cold climate (*Arvicola scherman exitus*) and the steppic (*Microtus arvalis*) and less frequently the forest environment (*Apodemus flavicolis*) have been found in that layer. Similar situation has been confirmed also in layer IX where the cold–loving Pleistocene fauna was represented by the Alpine wolf (*Cuon alpinus*), Alpine marmot (*Marmota marmota*), Alpine hare (*Lepus timidus*), ibex (*Capra ibex*) and whooper swan (*Cygnus cygnus*). The change ensued in layer VIII and it is discernible in the absence of the cold–loving species and the occurrence of the remains of the bovides (*Bos/Bison*), cervides (*Cervus sp.*), wild boar (*Sus scrofa*) and roe deer that are typical representatives of the forest fauna. In contrast to this, the faunal remains from the layers VII–V are insufficient for drawing any conclusions. Thus, in layer VII are present just the remains of marmot and cervides, in layer VI the cervides and in layer V the European and Alpine hare (*Lepus timidus varronis, Lepus europaeus*), badger (*Meles meles*), wild boar and red deer. In the fauna structure from layer IV have been identified only the forest, warm–loving Holocene species: European hare, fox (*Vulpes crucigera*), badger (*Meles meles*), wild cat (*Felis silvestris*), wild boar, red deer, roe deer and wild cattle.

ANALYSIS OF THE CHIPPED STONE ARTIFACTS

Raw materials

The mineral raw materials used for production of the artifacts at Palaeolithic and Mesolithic sites in Montenegro have not been investigated by the same method and at a uniform scale. The most completely have been studied the raw materials from Odmut analyzed by M. Pawlikowski (Kozłowski *et al.* 1994, 11–16). The petrographic analyses of the raw materials have been performed using the polarized microscope and geochemical analyses using the method of atomic absorption. The petrographic analyses were also performed on the raw materials from Crvena stijena (Памић 1975, 205–209). However, this analysis included just some kinds of raw material and the results of the analyses were quite summarily published. It has been established that the cherts of grayish color with compact texture and conchoidal fracture were prevailing. The texture of samples is homogeneous and structure is cryptocrystalline but the signs of recrystallizational transformations have been discerned in many samples. Considerable number of samples contained the fossil remains of the radiolarians. The mineral contents of the matrix mostly consists of opal and fine quartz grains, while the fossil remains are mainly made of the floss chalcedony. The raw materials were ascribed to the group of cherts according to their petrographic characteristics. It has been concluded that black dolomite chert appears in layer X and gray organogenic radiolarian chert appears in layer V. Considering the small incidence of the authentic cortex on the artifacts it has been suggested that the material was mostly obtained from the primary deposits, i.e. from the Lower Jurassic series distributed in the eastern Herzegovina and western Montenegro – in the vicinity of Trebinje and Petrovići (Памић 1975).

On the basis of the macroscopic analysis, which we were able to perform, the raw materials appearing in the Upper Palaeolithic and the Mesolithic layers at Crvena stijena could be classified into few basic categories:

a) Chalcedony, translucent, of homogeneous structure and of high quality. It occurs in gray, greenish, brown, beige, orange and reddish variety.
b) Translucent good quality flint similar to chalcedony. It occurs in beige, gray and bluish color. It is characterized by the waxy luster and is of the exceptional quality.
c) Jasper of homogeneous structure, without admixtures, of good quality – suitable for knapping. It occurs in gray, green, red and brown color. On many specimens two colors were encountered (e.g. red and green) indicating that the raw material comes from the same deposit.

d) Matte flint of homogeneous structure and irregular fracture. It occurs most often in beige and gray color.
e) Chert of heterogeneous structure, of beige–brown or gray color. It is of low quality, i.e. it is not suitable for knapping.
f) Other kinds of mostly high quality flint occur in some layers. These are, for instance, black dolomite chert identified in layers X–VIII, light beige (almost white) flint of homogeneous structure – recorded only in layer X and beige, yellowish and greenish flint, translucent with white spots resembling the flint from the pre–Balkan platform. It occurs only in horizon IVb1.

Layer		X (199)	IX (853)	VIII (1085)	VII (360)	VI (625)	V (2418)	IVb2 (759)	IVb1 (840)	IVa (516)
C	n.	15	101	149	48	63	128	70	203	108
	%	7.5	11.8	13.7	13.3	10.1	5.3	9.2	24.2	20.9
T	n.	48	91	95	63	79	137	24	217	130
	%	24.1	10.7	8.7	17.5	12.6	5.7	3.2	25.8	25.2
J	n.	58	168	163	53	73	206	74	53	34
	%	29.1	19.7	15.0	14.7	11.7	8.5	9.7	6.3	6.6
M	n.	0	3	49	12	37	170	48	27	34
	%	0.0	0.3	4.5	3.3	5.9	7.0	6.3	3.2	6.6
R	n.	21	360	456	164	272	1340	355	262	118
	%	11.0	42.2	42.0	45.5	43.5	55.4	46.8	31.2	22.9
O	n.	29	6	5	0	1	0	1	3	3
	%	14.6	0.7	0.5	0.0	0.2	0.0	0.1	0.3	0.6
I	n.	28	124	168	20	100	437	187	75	82
	%	14.1	14.5	15.5	5.5	16.0	18.1	24.6	8.9	15.9

Table 1 – Structure of raw materials used in artifact manufacture: C – chalcedony, T – translucent flint, J – jasper, M – matte flint, R – beige–brown and gray chert, O – other kinds of high quality flint, I – indeterminate and burnt (without flakes less than 15 mm long and small undeterminable blade and flake fragments)

The analysis of distribution of certain kinds of raw materials (Table 1) revealed that the low quality gray or brown chert, usually exceeding 40%, largely prevails in most layers, while the rate of occurrence of all other kinds is considerably smaller. Still, the differences in the structure of raw materials used for production of artifacts in certain phases have been noticed.

Layer X is characterized by small quantity of chalcedony (it is present in smaller quantity only in layer V) and the low quality of chert. On the other hand, the good quality translucent flint, jasper and other raw materials (including dolomite chert and white/beige good quality flint) are present in a maximum quantity.

In the layers IX–VI the incidence of chalcedony is larger, the rate of occurrence of translucent flint is slightly smaller and incidence of jasper is considerably smaller (the quantity of jasper decreases discontinuously through all layers). The rate of occurrence of the matte flint and particularly of low quality chert is higher. The black flint appears in the layers IX and VIII in the insignificant quantity.

The layers V and IVb2 are characterized by considerable decrease in the quantity of chalcedony and translucent flint and by maximum incidence of low quality chert, while the situation is quite the opposite in horizons IVb1 and IVa2: participation of the first two kinds is greater while the quantity of low quality chert is decreasing. Also, the participation of jasper in these horizons drops to its minimum.

Products of knapping

The general structure of the chipped stone artifacts from the Upper Palaeolithic and Mesolithic layers of Crvena stijena is characterized by high incidence of chunks (generally between 5% and 10%) as well as relatively small incidence of blades (not exceeding 23.6%), rejuvenation flakes (4% at the most) and tools (generally under 16%).

Layer		X (199)	IX (853)	VIII (1085)	VII (360)	VI (625)	V (2418)	IVb2 (759)	IVb1 (840)	IVa (516)
A	n.	11	37	57	13	26	124	21	60	30
	%	5.5	4.3	5.2	3.6	4.2	5.1	2.8	7.1	5.8
B	n.	8	19	22	6	5	7	10	1	1
	%	4.0	2.2	2.0	1.7	0.8	0.3	1.3	0.1	0.2
C	n.	9	80	97	18	31	83	68	42	10
	%	4.5	9.4	8.9	5.0	5.0	3.4	8.9	5.0	1.9
D	n.	75	499	618	231	442	1801	543	416	269
	%	37.7	58.5	56.9	64.2	70.7	74.5	71.5	49.5	52.1
E	n.	32	98	119	57	61	158	81	198	106
	%	16.1	11.5	11.0	15.8	9.8	6.5	10.7	23.6	20.5
F	n.	63	117	170	33	59	245	36	123	100
	%	31.6	13.7	15.7	9.2	9.4	10.1	4.7	14.6	19.4
G	n.	1	3	2	2	1	0	0	0	0.0
	%	0.5	0.3	0.2	0.5	0.2	0.0	0.0	0.0	

Table 2 – General structure of the chipped stone assemblages: A – cores. B – rejuvenation blades and flakes, C – chunks, D – flakes, E – blades, F – retouched tools, G – products of the secondary tools modification (without flakes less than 15 mm long and small undeterminable blade and flake fragments)

When the rate of occurrence of basic categories of the artifacts is concerned (Table 2), the following tendencies and groups could be discerned:

- The assemblage from layer X is distinguished by relatively high incidence of blades (16.1%) and rejuvenation flakes (4%), exceptionally high incidence of retouched tools (31%) and distinctly smallest quantity of flakes (37.7%).
- In layers IX and VIII the incidence of blades and retouched tools decreases and is roughly uniform (11% and 13%–16%), while quantity of large chunks reaches its maximum (around 9%).
- In layer VII the incidence of blades increases to 15.8%. The incidence of chunks and tools decreases while the incidence of flakes increases.

- Layers VI and V are characterized by relatively uniform structure: the quantity of rejuvenation flakes decreases to less than 1%, blades less than 10% and quantity of flakes exceeds 70%.
- Horizon IVb2 is characterized by the similar structure (the incidence of tools is only 4.7% and chunks even 8.9%). The only difference is in the fact that quantity of blades is increasing once again (10.7%).
- In horizons IVb1 and IVa the structure of artifacts is almost identical: the incidence of cores is surprisingly high (over 5%), quantity of rejuvenation blades and flakes is negligible (0.1% and 0.2%) and decrease in the quantity of flakes (for approximately 20%) is proportional to the increase in the quantity of blades and tools (for approximately 10%).
- One of the most conspicuous tendencies is the increase in the flakes/blades index up to the layer V and then its abrupt decrease in horizons IVb1 and IVa (Table 3).

Layer	X	IX	VIII	VII	VI	V	IVb2	IVb1	IVa
F/B	2.34	5.09	5.19	4.05	7.24	11.39	6.70	2.10	2.53

Table 3 – Flakes/blades index

The structure of all assemblages of the artifacts is typical of the dwelling places and not of the workshops or the workshop sites. This is first of all indicated by high incidence of the retouched tools. Also, high incidence of tools in layer X suggests the short–time stay. On the other hand, the tendency of decrease in the quantity of tools and increase in the products of knapping that could be followed up to the horizon IVb2 coincides with the increased workshop activity in this habitation horizons. It culminates in horizon IVb2. The frequency of cores is stable and the workshop character is only confirmed by the proportion of tools and blades/flakes.

Somewhat more complete picture could be obtained if the general structure is considered within the categories of raw materials (Table 4). It is quite expectable that blades and tools are more frequent in the structure of artifacts made of good quality raw materials and the flakes in the structure of artifacts made of low quality raw materials. Nevertheless, at least three tendencies could be noticed here as well (Fig. 10):

Layer X	C	T	J	M	R	O	I	Total n. and %
A	0	2	5	0	1	3	0	11 5.5
B	0	3	2	0	2	1	0	8 4.0
C	0	2	4	0	2	0	1	9 4.5
D	7	14	16	0	12	6	20	75 37.7
E	6	6	7	0	2	6	5	32 16.1
F	2	21	23	0	2	13	2	63 31.6
G	0	0	1	0	0	0	0	1 0.5

(continued)

Total	n.	15	48	58	0	21	29	28	199
	%	7.5	24.1	29.1	0.0	10.5	14.6	14.1	

a)

Layer IX	C	T	J	M	R	O	I	Total n. and %
A	3	6	9	0	13	0	6	37 4.3
B	3	1	5	0	10	0	0	19 2.2
C	0	1	11	0	49	0	19	80 9.4
D	51	40	80	3	239	2	84	499 58.5
E	22	13	20	0	34	1	8	98 11.5
F	21	29	42	0	15	3	7	117 13.7
G	1	1	1	0	0	0	0	3 0.3
Total n.	101	91	168	3	360	6	124	853
%	11.8	10.7	19.7	0.3	42.2	0.7	14.5	

b)

Layer VIII	C	T	J	M	R	O	I	Total n. and %
A	11	6	14	1	24	0	1	57 5.2
B	4	1	8	2	6	0	1	22 2.0
C	4	2	3	2	66	0	20	97 8.9
D	67	31	76	26	292	2	124	618 56.9
E	33	11	14	16	34	0	11	119 11.0
F	28	44	48	2	34	3	11	170 15.7
G	2	0	0	0	0	0	0	2 0.2
Total n.	149	95	163	49	456	5	168	1085
%	13.7	8.7	15.0	4.5	42.0	0.5	15.5	

c)

Layer VII	C	T	J	M	R	O	I	Total n. and %
A	4	3	2	0	4	0	0	13 3.6
B	1	0	3	0	2	0	0	6 1.7
C	2	3	3	0	8	0	2	18 5.0

(continued)

D		26	26	24	7	133	0	15	231 64.2
E		8	22	10	3	12	0	2	57 15.8
F		5	9	11	2	5	0	1	33 9.2
G		2	0	0	0	0	0	0	2 0.5
Total	n.	48	63	53	12	164	0	20	360
	%	13.3	17.5	14.7	3.3	45.5	0.0	5.5	

d)

Layer VI		C	T	J	M	R	O	I	Total n. and %
A		2	3	6	3	11	1	0	26 4.2
B		0	2	1	0	2	0	0	5 0.8
C		3	0	0	1	21	0	6	31 5.0
D		35	40	42	17	219	0	89	442 70.7
E		13	19	7	8	11	0	3	61 9.8
F		10	14	17	8	8	0	2	59 9.4
G		0	1	0	0	0	0	0	1 0.2
Total	n.	63	79	73	37	272	1	100	625
	%	10.1	12.6	11.7	5.9	43.5	0.2	16.0	

e)

Layer V		C	T	J	M	R	O	I	Total n. and %
A		14	11	28	8	56	0	7	124 5.1
B		1	2	0	0	3	0	1	7 0.3
C		1	0	3	4	60	0	15	83 3.4
D		64	61	94	105	1084	0	393	1801 74.5
E		22	16	25	23	65	0	7	158 6.5
F		26	47	56	30	72	0	14	245 10.1
G		0	0	0	0	0	0	0	0
Total	n.	128	137	206	170	1340	0	437	2418
	%	5.3	5.7	8.5	7.0	55.4	0.0	18.1	

f)

Horizon IVb2	C	T	J	M	R	O	I	Total n. and %
A	0	1	7	0	13	0	0	21 2.8
B	3	0	0	3	3	0	1	10 1.3
C	3	0	2	2	43	0	18	68 8.9
D	42	13	40	31	273	1	143	543 71.5
E	13	8	15	10	18	0	17	81 10.7
F	9	2	10	2	5	0	8	36 4.7
G	0	0	0	0	0	0	0	0
Total n. %	70 9.2	24 3.2	74 9.7	48 6.3	355 46.8	1 0.1	187 24.6	759

g)

Horizon IVb1	C	T	J	M	R	O	I	Total n. and %
A	19	18	12	1	8	0	2	60 7.1
B	0	0	0	0	1	0	0	1 0.1
C	5	4	3	0	24	0	6	42 5.0
D	65	55	19	13	213	0	51	416 49.5
E	77	84	8	6	12	0	11	198 23.6
F	37	56	11	7	4	3	5	123 14.6
G	0	0	0	0	0	0	0	0 0.0
Total n. %	203 24.2	217 25.8	53 6.3	27 3.2	262 31.2	3 0.3	75 8.9	840

h)

Horizon IVa	C	T	J	M	R	O	I	Total n. and %
A	10	12	4	3	1	0	0	30 5.8
B	0	0	1	0	0	0	0	1 0.2
C	0	1	1	0	4	0	4	10 1.9
D	22	39	16	26	97	1	68	269 52.1
E	47	42	4	1	5	0	7	106 20.5
F	29	36	8	4	11	2	10	100 19.4

(continued)

G	0	0	0	0	0	0	0	0 0.0
Total n. %	108 20.9	130 25.2	34 6.6	34 6.6	118 22.9	3 0.6	82 15.9	516

i)

Table 4 (a–i) – Structure of raw–materials (C–I) and general structure of chipped stone assemblages (A–G) in layers X–IV

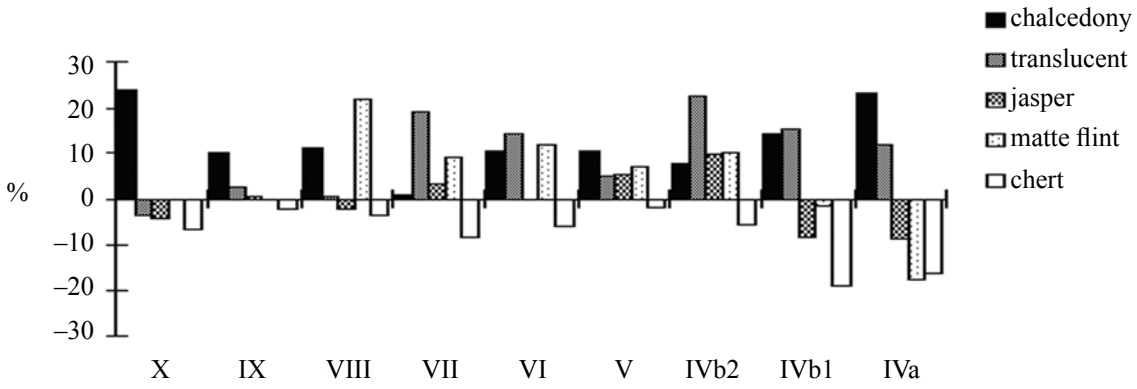

Fig. 10a – Difference in the incidence of blades in comparison to the incidence in general structure

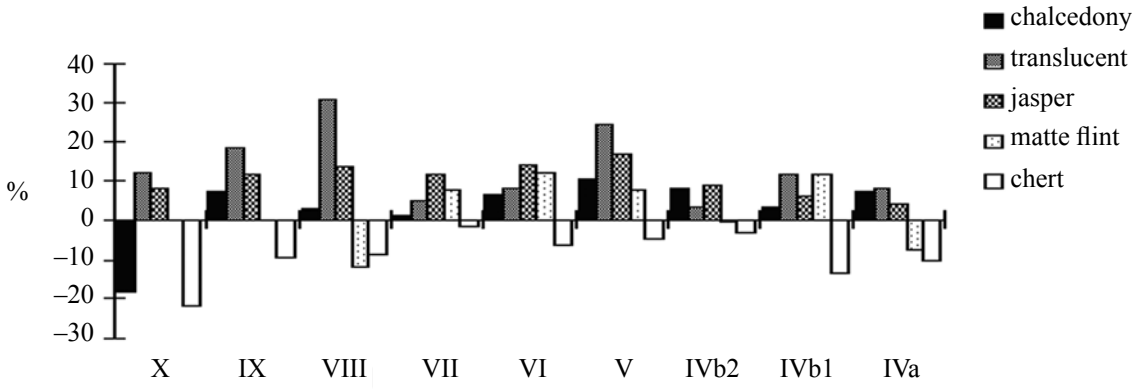

Fig. 10b – Difference in the incidence of tools in comparison to the incidence in general structure

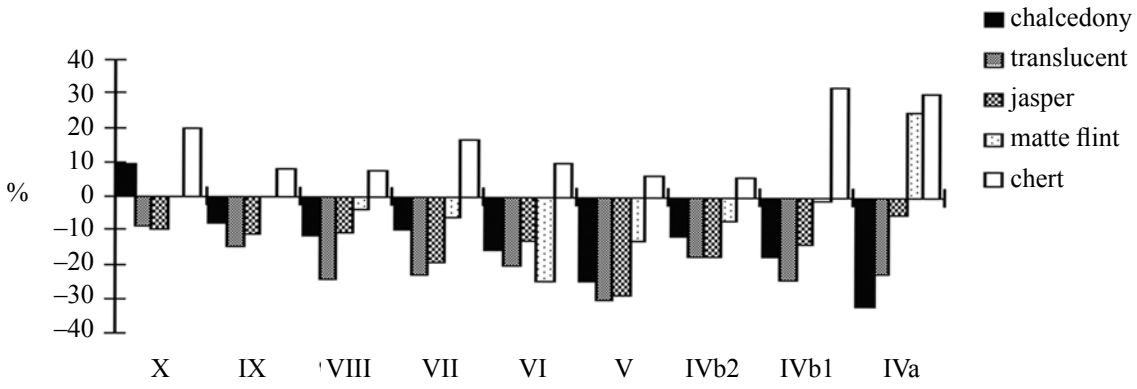

Fig. 10c – Difference in the incidence of flakes in comparison to the incidence in general structure

- Down to layer VIII the trend of decrease in the selective use of chalcedony in blade production could be noticed (Fig. 9a), then quite the opposite trend of increase in the selective use of good quality raw materials for tool production is conspicuous (Fig. 9b) and finally trend of decrease in good quality raw materials in flake production that is in layer VIII over –20% in relation to the general structure.
- In layer VII an abrupt decrease in selectivity of the good quality raw materials occurs in the tool production that later on gradually increases up to the layer V (Fig. 9b). The situation is quite the opposite when the selective use of good quality raw materials for blade production is concerned (Fig. 9a).
- In horizons IVb2 – IVa could be noticed considerable rise in the selective use of chalcedony and translucent flint in the blade production (considerably more than the complete tools – see Figs. 9a, 9b), while matte flint and chert reach the absolute maximum when the selective striking of flakes of these raw materials is concerned (Fig. 9c).

Cores

The cores appear in many types and variants (Table 5, Pl. I–IV). According to the number and mutual position of striking platforms and flaking surfaces they are classified as: pre–cores, single–platform cores, double–platform cores, cores with changed orientation, bipolar cores, irregular and discoid cores and core fragments.

Layer		X (11)	IX (37)	VIII (57)	VII (13)	VI (26)	V (124)	IVb2 (21)	IVb1 (60)	IVa (30)
A	n.	0	5	5	1	3	14	2	5	1
	%		13.5	8.8	7.7	11.5	11.3	9.5	8.3	3.3
B	n.	4	16	22	5	13	38	9	32	11
	%	36.4	43.2	38.6	38.5	50.0	30.6	42.8	53.3	36.7
C	n.	1	2	2	1	0	2	0	1	0
	%	9.1	5.4	3.5	7.7	0.0	1.6	0.0	1.7	0.0
D	n.	1	1	7	1	0	2	1	1	4
	%	9.1	2.7	12.3	7.7	0.0	1.6	4.8	1.7	13.3
E	n.	3	6	6	3	5	36	4	8	5
	%	27.3	16.2	10.5	23.1	19.2	29.0	19.0	13.3	16.7
F	n.	1	5	6	1	4	23	5	4	4
	%	9.1	13.5	10.5	7.7	15.4	18.5	23.8	6.7	13.3
G	n.	1	2	9	1	1	9	0	9	5
	%	9.1	5.4	15.8	7.7	3.8	7.2	0.0	15.0	16.7

Table 5 – General structure of the cores categories: A – pre–cores, B – single–platform cores, C – double–platform cores, D – cores with changed orientation, E – bipolar cores, F – irregular cores, G – core fragments

As it could be seen in table 5 the pre–cores are most numerous in layers VI and V (Pl. III/1, 2, 7, 8) but they are also well represented in other layers (except layer X and horizon IVa). Among the cores sensu stricto by far the most numerous are the single–platform cores and then follow bipolar cores and in somewhat smaller quantity also irregular and discoid cores for flakes.

It has been established on the basis of the detailed analysis of the cores (annex 6) that layer X is characterized by small cores for blades (Pl. I/2, 3). All other types including bipolar cores (Pl.I/4) and cores with changed orientation were also encountered.

Layer IX is characterized by considerable frequency of the pre–cores. The most numerous are the amorphous pre–cores shaped without concept and discarded in an early phase of preparation but there are also the pre–cores with laterotransversal (Pl. I/10) and bifacial preparation.

In layer VIII could be noticed the highest incidence of cores with changed orientation. Four of these specimens are in fact double single–platform cores where second flaking surface is either on the back side or on the lateral side considering the original flaking surface. However, there are also very small cores (3 specimens) with traces of knapping on the back side (at an angle of 90° to the core face) but it could not be established with certainty whether they result from rejuvenation or exploitation of cores (Pl. II/3, 5, 8).

Layers VII–V are characterized by higher incidence of bipolar (Pl. III/6, 12) and irregular cores along with abrupt decrease of the single–platform cores. It is, however, indicative, that among them also appear the cores for microbladelets (Pl. II/9; Pl. III/4, 11), which have not been otherwise encountered in large quantity in these layers. Similar situation has been confirmed also in horizon IVb2 (Pl. IV/1–3) but there the incidence of single–platform cores is slightly higher. The quantity of irregular cores reaches its maximum in this horizon.

The horizons IVb1 and IVa are characterized by the cores for symmetrical bladelets and microbladelets (Pl. IV/5–10, 12–16). Most often these cores have not been specially prepared. They are often fragmented and they were generally exploited to the maximum. Regarding this it should be said that the cores with changed orientation are very frequent in the horizon IVa (Pl. IV/13, 14, 16).

Blades

The blades have been analyzed taking into account their morphometric characteristics, characteristics of the dorsal side and the characteristic of the striking platform.

Layer	X (32)	IX (98)	VIII (119)	VII (57)	VI (61)	V (158)	IVb2 (81)	IVb1 (198)	IVa (106)
n.	8	43	72	27	30	51	41	97	42
%	25.0	43.9	60.5	47.4	49.2	32.3	50.6	49.0	39.6

Table 6 – Occurrence of complete blades

When the state of preservation is concerned it could be noticed that quantity of complete blades differs significantly from layer to layer without any conspicuous trend (Table 6).

Layer	X (8)	IX (43)	VIII (72)	VII (27)	VI (30)	V (51)	IVb2 (41)	IVb1 (97)	IVa (42)
S n	1	1	0	0	1	0	0	1	0
%	12.5	2.3			3.3		0.0	1.0	0.0

(continued)

M	n	6	20	50	18	19	38	32	58	25
	%	75.0	46.5	69.4	66.7	63.3	74.5	78.0	59.8	59.5
VM	n	1	22	22	9	10	13	9	38	17
	%	12.5	51.2	30.5	33.3	33.3	25.5	21.9	39.2	40.5

Table 7 – Morphometrical categories of unretouched blades (complete specimens): S – > 5 cm, M – 2.6–5 cm, VM – up to 2.5 cm

The sample from Crvena stijena is not reliable enough for drawing the dependable conclusions about morphometry of the finds (Table 7). Namely, the sediment had not been sifted during excavations so it is quite understandable that almost in any layer (the only exception being layer VIII) very small blades do not prevail. We could only notice that their quantity in horizons IVb2–IVa continuously increases and before that it continuously decreases.

Horizon		IVb2 (41)	IVb1 (97)	IVa (42)
S–US	n.	0	1	0
	%	0.0	1.0	0.0
M–VUS	n.	0	4	0
	%	0.0	4.1	0.0
M–US	n.	13	39	10
	%	31.7	40.2	23.8
M–S	n.	19	15	15
	%	46.3	15.5	35.7
VM–US	n.	1	13	3
	%	2.4	13.4	7.1
VM–S	n.	8	25	14
	%	19.5	25.8	33.3

Table 8 – Morphometrical structure of unretouched blades (complete specimens) from layer IV: VUS – very narrow blades with elongation index – length/width (Ie) greater than 6, US – narrow blades (Ie = 3.1–6), S – broad blades (Ie = 2.1–3)

It is also rather conspicuous that elongation of the blades increases in horizons of layer IV (table 8). Thus, in horizon IVb1, for example, the total amount of elongated specimens (with elongation index over 3) is 58.8% (in contrast to 34.1% in horizon IVb2 and 30.9% in horizon IVa). Even more so, 40.2% of all specimens are small narrow blades, i.e. the blades between 2.6 and 5 cm long. The actual incidence of narrow blades is probably even greater as large number of symmetrical narrow blades is fragmented (and these specimens were not included in the analysis).

Layer		X (8)	IX (42)	VIII (72)	VII (27)	VI (30)	V (51)	IVb2 (41)	IVb1 (97)	IVa (43)
1	n	5	19	35	16	18	32	13	64	24
	%	62.5	45.2	48.6	59.2	60.0	62.7	31.7	66.0	55.8
1K	n	2	8	10	4	5	9	7	23	10
	%	25.0	19.0	13.9	14.8	16.7	17.6	17.1	23.7	23.2
2	n	0	1	6	0	1	0	2	1	0
	%	0.0	2.4	8.3	0.0	3.3	0.0	4.9	1.0	0.0

(continued)

2K	n	0	1	1	0	0	0	2	0	0
	%	0.0	2.4	1.4	0.0	0.0	0.0	4.9	0.0	0.0
IO	n	0	1	0	0	0	0	0	0	0
	%	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IOK	n	0	0	0	0	0	0	0	0	0
	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	n	1	5	12	3	4	6	8	4	3
	%	12.5	11.9	16.7	11.1	13.3	11.8	19.5	4.1	7.0
3K	n	0	4	3	4	0	1	3	1	4
	%	0.0	9.5	4.2	14.8	0.0	2.0	7.3	1.0	9.3
K	n	0	3	5	0	2	3	6	4	2
	%	0.0	7.1	6.9	0.0	6.7	5.9	14.6	4.1	4.6

Table 9 – Dorsal surface of unretouched blades (complete specimens). Types of dorsal surface: 1 – parallel scars in one direction, 1K – parallel scars in one direction and cortex, 2 – parallel scars in two directions, 2K – parallel scars in two directions and cortex, IO – parallel scars in opposite direction, IOK – parallel scars in opposite direction and cortex, 3 – multidirectional scars, 3K – multidirectional scars and cortex, K – cortical specimens (with more then 50% of cortex on dorsal surface)

When the rate of occurrence of the basic types of dorsal side is concerned it should be said that their quantity approximately match the quantity of the basic core types – at least because the blades and flakes struck from the single–platform cores and with parallel scars in one direction considerably prevail (Table 9). Yet, it should be taken into account that certain number of such blades was undoubtedly struck from the cores with changed orientation and with many striking platforms.

Layer	X (8)	IX (42)	VIII (72)	VII (27)	VI (30)	V (51)	IVb2 (41)	IVb1 (97)	IVa (43)
PAR	87.5	71.4	72.2	74.1	80.0	80.4	58.5	90.7	80.0
RAZ	12.5	35.7	20.8	25.9	13.3	13.7	26.8	5.1	16.3
KOR	0.0	7.1	6.9	0.0	6.7	5.9	14.6	4.1	4.6
K–K	25.0	38.1	26.4	29.6	23.3	25.5	43.9	28.9	37.2

Table 10 – Proportional incidence of blades and bladelets with parallel (PAR) and multidirectional (RAZ) scars and cortical specimens (KOR); K–K – total percentage of specimens with traces of cortex

Regarding the rate of occurrence of specimens with parallel scars (table 12) layer X and particularly horizons IVb1 and IVa could be distinguished. On the other hand their quantity is rather small in horizon IVb2 while the specimens with multidirectional scars or cortex are exceptionally well represented. Also the total rate of occurrence of the specimens with cortex is even 43.9% in this horizon (Table 10).

Layer	X (16)	IX (70)	VIII (92)	VII (37)	VI (42)	V (86)	IVb2 (51)	IVb1 (147)	IVa (65)
1 n.	12	31	48	15	26	42	27	64	16
%	75.0	44.3	52.2	40.5	61.9	48.8	52.9	43.5	24.6
2 n.	0	1	2	1	2	1	2	5	2
%	0.0	1.4	2.2	2.7	4.8	1.2	3.9	3.4	3.1
3 n.	0	1	0	0	0	4	0	42	29
%	0.0	1.4	0.0	0.0	0.0	4.6	0.0	28.6	44.6

(continued)

4	n.	1	10	11	10	4	9	5	18	6
	%	6.2	14.3	11.9	27.0	9.5	10.5	9.8	12.2	9.2
5	n.	0	4	2	0	2	6	2	3	3
	%	0.0	5.7	2.2	0.0	4.8	7.0	3.9	2.0	4.6
6	n.	1	9	5	5	2	8	7	3	1
	%	6.2	12.8	5.4	13.5	4.8	9.3	13.7	2.0	1.5
7	n.	2	14	24	6	6	16	8	12	8
	%	12.5	20.0	26.1	16.2	14.3	18.6	15.7	8.2	12.3

Table 11 – Platforms on unretouched flakes (complete specimens and proximal fragments): plain (1), dihedral (2), faceted (3), edge (4), punctiform (5), cortical (6), undeterminable and damaged (7)

When the striking platform is concerned (Table 11) it could be noticed that incidence of many categories considerably varies. Something that could be indicative is the abrupt increase in quantity of the blades with faceted platform in horizons IVb1 and IVa. Also when the dorsal side is concerned, the specimens with cortical platform are most frequent in horizon IVb2.

Flakes

Layer	X (75)	IX (499)	VIII (618)	VII (231)	VI (442)	V (1801)	IVb2 (543)	IVb1 (416)	IVa (269)
n.	36	134	197	69	97	241	143	95	30
%	48.0	26.8	31.9	29.9	21.9	13.4	26.3	22.8	11.1

Table 12 – Occurrence of complete flakes

The state of preservation of flakes in the Upper Palaeolithic and the Mesolithic layers at Crvena stijena is remarkably poor particularly in the layers V and IVa (Table 12). The fragmentariness is considerably higher than it is the case with the blades.

	Layer X (36)	IX (134)	VIII (197)	VII (69)	VI (97)	V (241)	IVb2 (143)	IVb1 (95)	IVa (30)
S n	2	0	1	1	0	1	0	0	0
%	5.5	0.0	0.5	1.4	0.0	0.4	0.0	0.0	0.0
M n	11	43	93	23	52	92	66	31	10
%	30.5	32.1	47.2	33.3	53.6	38.1	46.1	32.6	33.3
VM n	23	91	103	45	45	148	77	64	20
%	63.9	67.9	52.3	65.2	46.3	61.4	53.8	67.4	66.7

Table 13 – Morphometrical categories of unretouched flakes (complete specimens): S – > 5 cm, M – 2.6–5 cm, VM – up to 2.5 cm

The proportional incidence of basic morphometric categories of flakes is stable in most layers (table 13). The only exceptions are layers VIII, VI and IVb2 where the frequency of very small specimens is slightly lower and those over 2.5 cm slightly higher.

Horizon		IVb2 (143)	IVb1 (95)	IVa (30)
MLO	n.	38	18	8
	%	26.6	18.9	26.7
MO	n.	17	7	1
	%	11.9	7.4	3.3
MKO	n.	11	6	1
	%	7.7	6.3	3.3
VMLO	n.	20	11	4
	%	14.0	11.6	13.3
VMO	n.	33	21	9
	%	23.1	22.1	30.0
VMKO	n.	24	32	7
	%	16.8	33.7	23.3

Table 14 – Morphometrical structure of unretouched flakes (complete specimens) from layer IV: LO – laminar flakes, with elongation index – length/width (Ie) 1.6–2, O –medium elongated flakes (Ii = 1.1–1.5), KO – short flakes (Ii < 1)

In the category of small flakes in all horizons of layer IV the elongated (laminar) specimens are prevailing and within the category of very small flakes their frequency is lowest (Table 14).

Layer		X (36)	IX (134)	VIII (197)	VII (69)	VI (97)	V (241)	IVb2 (143)	IVb1 (95)	IVa (30)
1	n	6	33	79	23	33	87	48	24	8
	%	16.7	24.6	40.1	33.3	34.0	36.1	33.6	25.3	26.7
1K	n	8	15	13	8	8	14	22	10	2
	%	22.2	11.2	6.6	11.6	8.2	5.8	15.4	10.5	6.7
2	n	0	6	3	0	1	0	1	1	0
	%	0.0	4.5	1.5	0.0	1.0	0.0	0.7	1.0	0.0
2K	n	0	0	0	0	0	0	1	2	0
	%	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.1	0.0
IO	n	0	0	2	0	0	0	2	0	0
	%	0.0	0.0	1.0	0.0	0.0	0.0	1.4	0.0	0.0
IOK	n	0	1	0	0	0	0	0	0	1
	%	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	3.3
3	n	6	50	66	23	38	98	52	40	15
	%	16.7	37.3	33.5	33.3	39.2	40.7	36.4	42.1	50.0
3K	n	11	15	16	13	6	22	7	11	1
	%	30.5	11.2	8.1	18.8	6.2	9.1	4.9	11.6	3.3
K	n	5	14	18	2	11	20	10	7	3
	%	13.9	10.4	9.1	2.9	11.3	8.3	7.0	7.4	10.0

Table 15 – Dorsal surface of unretouched flakes (complete specimens). Types of dorsal surface: 1 – parallel scars in one direction, 1K – parallel scars in one direction and cortex, 2 – parallel scars in two directions, 2K – parallel scars in two directions and cortex, IO – parallel scars in opposite direction, IOK – parallel scars in opposite direction and cortex, 3 – multidirectional scars, 3K – multidirectional scars and cortex, K – cortical specimens (with more then 50% of cortex on dorsal surface)

	Layer X (36)	IX (134)	VIII (197)	VII (69)	VI (97)	V (241)	IVb2 (143)	IVb1 (95)	IVa (30)

(continued)

PAR	38.9	41.0	49.2	44.9	43.3	41.9	51.7	38.9	33.3
RAZ	47.2	48.5	41.6	52.2	45.4	49.8	41.2	53.7	53.3
KOR	13.9	10.4	9.1	2.9	11.3	8.3	7.0	7.4	10.0
K–K	66.7	33.6	23.8	33.3	25.8	23.2	28.0	31.6	23.3

Table 16 – Proportional incidence of flakes with parallel (PAR) and multidirectional (RAZ) scars and cortical specimens (KOR); K–K – total percentage of specimens with traces of cortex

When the dorsal side of flakes is concerned (Tables 15, 16) we could follow the tendencies of increase in quantity of flakes with multidirectional scars in horizons IVb1 and IVa and the decrease in quantity of flakes with cortex (K–K) from layer X to layer VII.

Layer		X (45)	IX (168)	VIII (245)	VII (85)	VI (131)	V (325)	IVb2 (181)	IVb1 (130)	IVa (50)
1	n.	28	96	152	52	90	187	99	79	30
	%	62.2	57.1	62.0	61.2	68.7	57.5	54.7	60.8	60.0
2	n.	3	16	15	5	11	25	11	5	4
	%	6.7	9.5	6.1	5.9	8.4	7.7	6.1	3.8	8.0
3	n.	1	2	7	1	3	21	1	4	0
	%	2.2	2.9	2.8	1.2	2.3	6.5	0.5	3.1	0.0
4	n.	3	9	13	4	4	5	8	3	0
	%	6.7	5.3	5.3	4.7	3.0	1.5	4.4	2.3	0.0
5	n.	0	3	6	2	0	6	2	2	2
	%	0.0	1.8	2.4	2.3	0.0	1.8	1.1	1.5	4.0
6	n.	5	17	24	12	15	40	44	26	11
	%	11.1	10.1	9.8	14.1	11.4	12.3	24.3	20.0	22.2
7	n.	5	25	28	9	8	41	16	11	3
	%	11.1	14.9	11.4	10.6	6.1	12.6	8.8	8.5	6.0

Table 17 – Platforms on unretouched flakes (complete specimens and proximal fragments): plain (1), dihedral (2), faceted (3), edge (4), punctiform (5), cortical (6), undeterminable and damaged (7)

When the striking platform is concerned (table 17) the proportional frequency of the basic types is almost identical in all layers. We could only notice the tendency of abrupt increase in quantity of cortical platforms in layer IV that was by all appearances the result of rather poor core preparation. That is also confirmed by almost complete absence of the rejuvenation flakes in horizons IVb1 and IVa.

Retouched tools

	Layer		X (64)	IX (116)	VIII (168)	VII (33)	VI (59)	V (245)	IVb2 (37)	IVb1 (120)	IVa (100)
Burins		n	10	6	18	0	2	7	2	8	6
		%	15.6	5.2	10.7	0.0	3.4	2.8	5.4	6.7	6.0

(continued)

Endscrapers	n	11	38	25	6	9	72	9	33	26
	%	17.2	32.7	14.9	18.2	15.2	29.4	24.3	27.5	26.0
Retouched blades	n	8	9	6	5	2	18	1	5	2
	%	12.5	7.7	3.6	15.2	3.4	7.3	2.7	4.2	2.0
Sidescrapers	n	3	9	13	2	7	12	3	3	5
	%	4.7	7.7	7.7	6.1	11.9	4.9	8.1	2.5	5.0
Retouched flakes	n	2	3	15	1	10	50	2	4	14
	%	3.1	2.6	8.9	3.0	16.9	20.4	5.4	3.3	14.0
Raclettes	n	3	3	4	1	0	5	1	1	1
	%	4.7	2.6	2.4	3.0	0.0	2.0	2.7	0.8	1.0
Perforators	n	5	9	12	5	4	7	0	6	3
	%	7.8	7.7	7.1	15.2	6.8	2.8	0.0	5.0	3.0
Denticulated tools	n	2	6	9	4	6	26	3	6	4
	%	3.1	5.2	5.3	12.1	10.2	10.6	8.1	5.0	4.0
Notched tools	n	8	11	17	5	11	19	9	26	17
	%	12.5	9.5	10.1	15.2	18.6	7.7	24.3	21.7	17.0
Splintered pieces	n	0	6	5	0	3	11	4	3	4
	%	0.0	5.2	3.0	0.0	5.1	4.5	10.8	2.5	4.0
Truncations	n	5	6	3	1	2	11	3	19	15
	%	7.8	5.2	1.8	3.0	3.4	4.5	8.1	15.8	15.0
Backed points and blades/bladelets	n	3	6	21	0	0	0	0	0	0
	%	4.7	5.2	12.5	0.0	0.0	0.0	0.0	0.0	0.0
Backed tools fragments	n	2	0	4	2	0	0	0	0	0
	%	3.1	0.0	2.4	6.1	0.0	0.0	0.0	0.0	0.0
Backed truncations	n	0	2	4	1	1	0	0	0	0
	%	0.0	1.7	2.4	3.0	1.7	0.0	0.0	0.0	0.0
Segments	n	0	1	3	0	0	0	0	0	0
	%	0.0	0.9	1.8	0.0	0.0	0.0	0.0	0.0	0.0
Triangles	n	0	0	4	0	0	0	0	0	0
	%	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
Trapezes	n	0	0	0	0	0	0	0	4	1
	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	1.0
Atypical geometrics	n	0	1	1	0	0	0	0	1	0
	%	0.0	0.9	0.6	0.0	0.0	0.0	0.0	0.8	0.0
Combined tools	n	1	0	0	0	1	2	0	0	1
	%	1.6	0.0	0.0	0.0	1.7	0.8	0.0	0.0	1.0
Tools fragments	n	1	0	4	0	1	5	0	1	1
	%	1.6	0.0	2.4	0.0	1.7	2.0	0.0	0.8	1.0

endscrapers/burins	1.0	6.3	1.4	6:0	4.5	10.3	4.5	4.1	4.3
endscr+bur/"substratum"	0.8	1.1	0.9	0.3	0.4	1.0	0.6	1.0	1.1
backed tools (%)	7.8	6.9	18.4	9.0	1.7	0.0	0.0	0.0	0.0
geometrics (%)	0.0	0.9	4.8	0.0	0.0	0.0	0.0	4.2	1.0
straight backed/arched points and bladelets	4:0	3:2	5:16	0:1	0:0	0:0	0:0	0:0	0:0
endscr. long/short (n.)	3:7	2:36	4:21	0:6	1:8	8:64	0:9	5:28	0:26
simple burins (n.)	5	0	7	0	0	4	0	4	1
burins on snap (n.)	3	3	5	0	1	1	2	1	2
burins on truncation and on retouched edge (n.)	1	2	0	0	0	1	0	3	2
dihedral burins (n.)	1	0	4	0	0	1	0	0	1
combined burins	0	1	2	0	0	0	0	0	0

Table 18 – General structure of the retouched tool categories and main indices

The endscrapers prevail in all assemblages except in layer X where they equal in number the burins (Table 18). The burins are present in considerable quantity only in layers X and VIII (over 10%) while their quantity is considerably smaller in other layers. Also the endscrapers/burins index is around 1 only in layers X and VIII.

The endscrapers are continually present in high proportion. The incidence of retouched blades is relatively high only in layers X and VII, of the retouched flakes in layer V (to some extent also in layer VI and horizon IVa) and of the perforators only in layer VII. The rate of occurrence of denticulated tools is high in layers VII–V while the notched tools are most frequent in layers X, VII, VI and particularly in horizons IVb2–IVa. The splintered pieces are most frequent in horizon IVb2.

The truncations are somewhat more frequent in layers X and IX and exceptionally abundant in horizons IVb1 and IVa but they never outnumber the backed tools at least when the Pleistocene layers are concerned. The backed tools (generally speaking) appear only in layers X–VII and reach their peak in layer VIII. Similar situation is also with the geometric tools, which appear only in layers IX, VIII and IV. However, the authentic geometric artifacts (segments and triangles) have been found only in layer VIII while layer IV (first of all the horizon IVb1) is characterized by the trapezes. The truncations and backed tools were encountered in layers IX–VI.

Considering that the retouched tools are the decisive indicator for cultural and relative–chronological determination of the industries we are going to present their typological characteristics in detail.

Layer X

In horizon Xd have been recorded: dihedral burin on thick flake with inverse, semi–steeply retouched notch (Pl. V/1), endscraper on symmetrical, fragmented, discontinuously retouched blade (Pl. V/2), endscraper on small flake with lateral notch and one macrolithic endscraper on massive, thick flake (Pl. V/5). There have also been found three blades partially retouched by semi–steep marginal retouch (Pl. V/3), one raclette – i.e. one flake with latero–transversal, continuous steep–semi–steep retouch, one flake with denticulated retouch and one tool fragment with semi–steep retouch.

In horizon Xc three burins have been recorded: burin on a snap of the long laterally semi–steeply retouched blade (Pl. V/6), angle (oblique) burin on flake (Pl. V/7) and burin on retouched blade truncation (Pl. V/ 8). In addition have also been found: one massive, irregular blade retouched by semi–steep retouch (Pl. V/9), one sidescraper attributed to that category (and not to the endscrapers) because of somewhat shallower retouch (Pl. V/10), two flakes with inverse notch, one denticulated point (Pl. V/13), two perforators with arched tip on blades (Pl. V/11, 12) and two tools, which could be joined together and which initially were one implement – (Pl. V/14). Also, three straight backed bladelets have been encountered in this horizon. These are one point with oblique semi–steeply retouched truncation used as tip while the edge is almost to the top retouched by semi–steep (in the middle) to steep (in lower section) marginal retouch (Pl, V/17) and two fragmented backed tools – bladelet with marginal semi–steep retouch (Pl. V/16) and bladelet

retouched bilaterally – by steep direct retouch on one edge and semi–steep fine marginal partial retouch on the other edge (Pl. V/15).

Only six retouched artifacts have been recorded in horizon Xb: angle burin on flake with retouched notch (Pl. VI/1), lateral burin on a snap of the blade with a notch (Pl. VI/2), pointed endscraper on flake with broad, semi–steeply retouched notch (Pl.VI/4), blade with inversely retouched notch, flake with directly, deeply semi–steeply retouched notch (Pl. VI/5) and one symmetrical perforator on a narrow bladelet (Pl. VI/3).

In horizon Xa have been recorded: one lateral burin on flake (Pl. VI/6), two endscrapers on broad blades bilaterally retouched by semi–steep retouch (Pl. VI/7, 9), one nosed endscraper on flake (Pl. VI/8), two atypical endscrapers on massive flakes, four retouched blades, one with bilateral, semi–steep retouch (Pl. VI/10), one with lateral shallow retouch and two with partial semi–steep retouch on one edge – in one instance in combination with inverse, fine marginal retouch on other edge. There were also found one point on asymmetrical blade with semi–steep retouch (Pl. VI/11), one convex sidescraper on very small flake (Pl. VI/17), two blades and two flakes with laterally retouched notch, two retouched flakes, two raclettes with semi–steep–steep retouch (Pl. VI/18) and as much as five truncations: three blades (two with straight and one with oblique truncation – Pl. VI/ 12, 13) and two flakes (with slightly oblique truncation). There was also recorded one steeply retouched point with irregular straight back retouched by steep and deep retouch (Pl. VI/14).

In the bags with finds from 1956 that are marked as 1956, trench D–C (canal at the bottom), D or E, with descriptions of sediments and with traces of reddish sediment on the artifacts have been found few more retouched tools: three burins on thick flakes – single–blow transversal, shallow multi–facetted (Pl. VI/15) and carinated (Pl. VI/19) also one endscraper on flake (Pl. VI/16), two perforators on irregular flakes (Pl. VI/20, 21) and one atypical steeply retouched artifact (Pl. VI/22).

Layer IX

Burins – 6 specimens

In this group have been encountered two lateral burins on a blade snap and one on a snap of the flake (Pl. VII/1), one double burin (lateral in combination with shallow – ventral) on blade, lateral burin on flake truncation (Pl. VII/2) and double–sided (Para–Noailles) burin on double steeply retouched truncation (Pl. VII/3).

Endscrapers – 38 specimens

Just two endscrapers on blades, one arched on symmetrical unretouched blade (Pl. VII/4) and other, double on laterally semi–steeply retouched blade (Pl. VII/5) have been recorded while all other endscrapers were made on flakes. The endscrapers on flakes could be distinguished as:

- asymmetrical arched endscrapers on massive flakes – over 2.5 cm in size – 2 specimens (Pl. VII/7),

- arched and asymmetrically arched endscrapers on laminar flakes – 4 specimens,
- fan–shaped endscrapers on flakes over 2.5 cm in size – 1 specimen,
- short, continuously retouched endscrapers with splintered retouch on ventral side (Pl. VII/8) – 3 specimens (among them is also one of microlithic size – 15 mm long – Pl. VII/9),
- short endscrapers less than 2.5 cm long – 12 specimens (Pl. VII/6, 10–15),
- circular and asymmetrically circular endscrapers on flakes less than 2.5 cm in size (Pl. VII/18, 19),
- asymmetrically circular, continuously retouched double arched–concave endscrapers (Pl. VII/16, 17),
- endscrapers on splintered pieces – among them was one double endscraper (Pl. VII/20–24),
- nosed endscrapers on small flakes – 1 specimen (Pl. VII/27),
- carinated arched endscrapers on very small flakes – 3 specimens (Pl. VII/25, 26),
- fragments of slightly asymmetrical arched endscrapers for which it could not be determined whether they are on blades or flakes.

In any case it should be emphasized that of all the endscrapers (38 specimens) only 5.3% are the endscrapers on blades, that splintered retouch in one direction or bipolar was encountered on even eight specimens (21.0%) and that there are nine specimens (23.7%) made on thick flakes (the thickness exceeds half of its width).

Retouched blades – 9 specimens

Among the retouched blades have been encountered two fragments and one complete blade with semi–steep retouch (Pl. VIII/1), three fragments with semi–steep, marginal retouch (Pl. VIII/2, 3) while two fragments and one complete specimen have shallow and marginal retouch.

Sidescrapers – 9 specimens

One tool fragment has deep invasive almost facial retouch while ventral side of the flake is retouched by shallow, surface retouch (Pl. VIII/4). One bilaterally retouched sidescraper with pointed tip (Pl. VIII/5) has also been found. Among the sidescrapers have also been identified two more sidescrapers with straight retouched edge (Pl. VIII/6), sidescraper with partially retouched straight edge, two convex (Pl. VIII/7) and one concave sidescraper as well as one bilaterally retouched sidescraper with irregularly straight edges converging towards the tool base (Pl. VIII/9).

Notched tools – 11 specimens

The notched tools are represented by four specimens made on blades: three with lateral, shallow and marginally retouched notch (Pl. VIII/10) and one with transversal steeply retouched notch. There were seven notched tools made on flakes; four of them are lateral ones with semi–steep, deep retouch (Pl. VIII/11) while three are transversal and partially cover the edge of flake. Two were obtained by semi–steep marginal and one by semi–steep and deep retouch.

Denticulated tools – 6 specimens

There were recorded: denticulated endscraper on thick elongated flake, denticulated narrow blade (Pl. VIII/12), asymmetrical very small denticulated blade, one massive denticulated flake and two very small denticulated flakes (Pl. VIII/8).

Retouched flakes – 3 specimens

Three flakes have been found – one slightly less than 5 cm in size and two very small – retouched by shallow–semi–steep, marginal retouch.

Raclettes – 3 specimens

Three specimens have been recorded. These are the flake continuously retouched by semi–steep–steep retouch (Pl. VIII/14), flake with lateral and partial semi–steep–steep lamellar retouch and flake retouched transversally by semi–steep deep retouch (Pl. VIII/13). The retouched edge of the last mentioned specimen has slightly pointed medial part.

Splintered pieces – 6 specimens

Six flakes with transversally or longitudinally oriented bipolar scars on ventral side have been found (Pl. VIII/15, 16). Particularly interesting is the convex sidescraper with bipolar damages on ventral side that resembles the knife of the Kostenki type (Pl. VIII/17).

Perforators – 9 specimens

Five perforators on blades and four on flakes have been encountered. All perforators belong to the category of borers (i.e. tip was obtained by lateral or bilateral direct retouch). When borers on blades are concerned on just one specimen the tip was modified on both edges while all others resemble the tool with very slanting truncation (Pl. VIII/ 18–20). However, they differ from that tool type because their point is in the tool axis as the opposite blade edge is curved toward the point. One borer of this type has been also recorded on the flake. There were also identified two more borers on flakes with bilaterally distinguished point (Pl. VIII/21) as well as one fragmented borer on flake.

Truncations – 6 specimens

There were found two blades with oblique truncation (Pl. VIII/22, 23), blade with oblique convex truncation, very small flake with oblique concave truncation (Pl. VIII/24), very small flake with typical oblique steeply retouched truncation (Pl. VIII/25) and the blade with double (straight partial combined with irregular – shouldered) truncation.

Backed blades, bladelets and points – 6 specimens

Among backed points have been identified: rather large point with straight back, which is curved near the tip and which at the opposite edge, on proximal end, has a notch creating the shouldered protrusion (Pl. VIII/26), one atypical arched point with slight protrusion at one edge modified by inverse semi–steep continuous retouch (Pl. VIII/27), one short very small point modified on the

proximal end of a blade and with irregular arched back and tip in the tool axis (Pl. VIII/28) and fragment of the point with tip in the tool axis and slightly concave back (Pl. VIII/29). There have also been found two fragmented bladelets with irregular straight back (Pl. VIII/ 30, 31).

Backed truncations – 2 specimens

Backed truncations are really atypical and are on the verge of identification as this tool type. We identified one straight backed bladelet with shouldered truncation (Pl. VIII/32) and one backed truncation that resembles very much the triangle – but the opposite edge is not straight (Pl. VIII/33).

Geometric tools – 2 specimens

Of the geometric artifacts have been encountered one segment (Pl. VIII/34) and one atypical steeply retouched microlith (Pl.VIII/35).

Layer VIII

Burins – 18 specimens

Among simple burins have been encountered two transversal double–blow burins – one on a blade with semi–steep retouch (Pl. IX/1) and other on flake, single–blow angle – oblique burins on broad flakes (2 specimens), double angle – oblique on blade and two shallow burins (both specimens have two scars each – one on distal end of the flake and the other on distal end of the denticulated blade).

In the category of burins on truncations have been classified lateral single–blow burins (3 specimens – one on blade and two on flakes – Pl. IX/2), lateral multiple burin on blade with a notch and lateral double–blow burin on a snap of the thick flake.

To the category of dihedral burins could be attributed: dihedral burins of central type (2 specimens – one on blade and one on thick flake – Pl. IX/3,4), multiple burin on flake fragment (Pl. IX/5) and dihedral asymmetrical burin on thick flake.

There were also found two combined, double–sided burins on endscrapers made on thick flakes (shallow, lateral on the retouch + transversal or lateral plain at the opposite end).

Endscrapers – 25 specimens

There were recorded just four endscrapers on blades and 21 specimens on flakes. Among endscrapers on blades were identified: one arched endscraper on unretouched, fragmented blade (Pl. IX/6), one atypical arched endscraper inversely retouched on the blade with inverse shallow– surface retouch (Pl. IX/11) and one endscraper with straight and oblique working edge on one partially retouched blade. Among the endscrapers on flakes the following variants have been distinguished:

- endscrapers over 25 mm in size (massive) – 4 specimens; one is fan–shaped, arched (Pl. IX/7); one was made on broad flake while two specimens have irregular working edge,

- endscrapers on unretouched flakes up to 25 mm long – 8 specimens (Pl. IX/8–10, 14): six specimens are arched, two are atypical nosed pieces (Pl. IX/13), on two specimens is conspicuous splintered retouch (rejuvenation) on ventral side starting from the retouched edge,
- endscrapers on retouched flakes up to 25 mm long – 3 specimens: one is on shallow and marginally retouched flake, one is irregular, on a flake with semi–steep retouch (Pl. IX/12) and one is fan–shaped, laterotransversal and made on proximal end of steeply retouched flake (Pl. IX/16),
- endscrapers on flake up to 15 mm long – 3 specimens: one is laterotransversal (Pl. IX/15), one is fan–shaped (Pl. IX/17) and one is of thumbnail type – of hypermicrolithic size (Pl. IX/18),
- fragment of arched endscraper on flake – 1 specimen.

Two endscrapers were also made on cores:
- endscraper with straight and slightly oblique working edge made on elongated core for the bladelets,
- arched endscraper on the core with changed orientation.

In addition there was also found one double arched endscraper made on narrow blade.

Retouched blades – 6 specimens

Within this tool category have been distinguished the following types:
- blades with shallow marginal retouch – 1 specimen,
- blades with shallow deep retouch – 2 specimens (Pl. IX/19),
- blades with semi–steep retouch – partial – 1 specimen,
- blades bilaterally retouched by semi–steep retouch – 2 specimens (Pl. IX/20).

Sidescrapers – 12 specimens

Among laterally retouched sidescrapers were identified:
- convex sidescrapers – 3 specimens; one fragmented larger piece (Pl. IX/24) and two smaller ones, slightly convex, on elongated flakes,
- concave sidescrapers – 1 specimen (Pl. IX/21)
- transversal sidescrapers – 3 specimens – one transversal piece with semi–steep stepped retouch and two laterotransversal, partially retouched on one edge and on distal end.

Bilaterally retouched sidescrapers also include: one bilateral sidescraper on flake with parallel edges and as much as four sidescrapers on flakes with converging edges. Depending on the segment of the tool preserved they are biconvex (1 specimen), biconcave (2 specimens – Pl. IX/23) and convex–straight (2 specimens – Pl. IX/27, 28).

Facially retouched tools – 1 specimen

One facially retouched microlithic leaf–like point has been found in this layer (Pl.IX/25).

Notched tools – 17 specimens

Ten specimens on blades have been recorded. The notches are of different depth and retouched in various ways – usually by shallow but also by steep (1 piece) and semi–steep retouch (3 pieces – Pl. IX/29). In one instance the retouch continues along the entire edge of the blade (Pl. IX/30).

Seven pieces of this tool type were made on flakes. Three shallow notches were modified by steep–semi–steep retouch, two notches are deep – with shallow retouch (Pl. IX/26) and two are inverse and modified by steep and deep retouch.

Denticulated tools – 9 specimens

There were found two denticulated endscrapers on flakes (Pl. IX/33), including also one carinated piece (Pl. IX/32), four denticulated blades (Pl. IX/31) and three denticulated flakes. The retouch is usually continuous and shallow or semi–steep except on one flake where it is discontinuous.

Retouched flakes – 15 specimens

These flakes are partially or totally retouched by shallow, marginal or deep retouch. All discovered specimens were modified by direct retouch.

Raclettes – 4 specimens

There were identified one lateral raclette (Pl. X/1), one laterotransversal, one transversal – arched (Pl. X/2) and transversal – slightly pointed raclette (Pl. X/3). One specimen has splintered retouch on the ventral side.

Flakes with splintered retouch – 2 specimens

There are two flakes, which are laterally, partially and inversely retouched by shallow, surface retouch.

Splintered pieces – 3 specimens

These are the flakes with bipolar oriented scars on ventral side. One specimen also has scars on dorsal side (Pl. X/4).

Perforators – 12 specimens

There were recorded nine specimens on blades and three on flakes. When the perforators on blades are concerned we could distinguish perforators with laterally retouched point and perforators with bilaterally retouched point. To the first group are attributed two directly retouched and one inversely retouched borer as well as one borer on backed bladelet (Pl. X/5). Regarding the borers with bilaterally steeply retouched point, the point is usually not in the tool axis and in two instances is prominently curved (Pl. X/6). Among the perforators on flakes we identified one steeply retouched borer of Becs type (Pl. X/7) and two borers on asymmetrical flakes.

Truncations – 3 specimens

There were recorded one blade with straight steeply retouched truncation (Pl. X/9) and a distal blade fragment with truncation modified by inverse, steep retouch (Pl. X/10). There was also found one bladelet with oblique, partially damaged truncation.

Backed truncations – 4 specimens

This is rather heterogeneous category of tools that includes one asymmetrical blade with slightly oblique semi–steeply retouched truncation and slightly convex back (Pl. X/11), one backed bladelet with straight truncation (Pl. X/12), one atypical arched backed bladelet with narrow straight truncation (Pl. X/13) as well as one straight backed bladelet with oblique, partially steeply retouched truncation (Pl. X/14).

Backed points – 19 specimens

They appear in many variants including the following:

- slightly arched (2 pieces) and distinctly arched (2 pieces) points over 25 mm in size (Pl. X/15–18, 26),
- arched and slightly arched elongated points less than 25 mm in size (5 pieces – Pl. X/19–22, 25);
- distinctly arched and short points, less than 25 mm in size (3 pieces – Pl. X/23, 24),
- points with straight and asymmetrical back, with tip in tool axis, up to 25 mm long (2 pieces – Pl. X/27),
- fragments of backed points – two with straight (slightly arched) back (Pl. X/28) and three with arched back one of which has bilaterally retouched point and resembles the perforator or steeply retouched truncation.

Backed bladelets – 2 pieces

Two specimens have been recorded in this category: one fragment of straight backed bladelet (Pl. X/29) and one arched backed bladelet that resembles the segment (Pl. X/30).

Geometric tools – segments – 3 piece

Only one authentic segment – with regular, steeply retouched arched back and straight unretouched edge has been recorded (Pl. X/33). Another two specimens are on the verge of classification among backed points as both their ends are in tool axis while the opposite – unretouched edge is not straight but irregular (Pl. X/31, 32).

Geometric tools – triangles – 4 specimens

There were found two asymmetrical – elongated pieces (one of them fragmented – Pl. X/34, 35) and two symmetrical isosceles triangles one of which is not completely finished (Pl. X/36, 37).

Atypical backed tool – 1 specimen

This is one flake with straight steeply retouched back (Pl. X/40).

Fragments of backed tools – 4 specimens

We have identified: one proximal fragment of bladelet with straight or slightly arched back (Pl. X/39), two medial fragments of bladelet with straight back (one has characteristic – oblique truncation at one end – Pl. X/38) and one fragment of bladelet with slightly arched back.

Tool fragments – 3 specimens

This group includes two fragments of tools with semi–steep retouch and one tool fragment with shallow and deep retouch.

Products of secondary modification – 1 specimen

This is a burin spall of first order struck from the distal end of a blade.

Layer VII

Endscrapers – 6 specimens

There were encountered two distinctly arched (slightly pointed) endscrapers on thick flakes (one of them is laterally modified by stepped retouch) (Pl. XI/1, 2), two short endscrapers on very small flakes (Pl. XI/3, 4) and two double biconcave endscrapers (Pl. XI/5, 6).

Retouched blades – 5 specimens

Three blades with semi–steep retouch (one of them bilaterally retouched) have been encountered (Pl. XI/7) as well as one lateral and one bilateral semi–steeply retouched blade.

Sidescrapers and points – 2 specimens

There were recorded one fragment of atypical sidescraper (flake with partial semi–steep retouch) and one point with laterally retouched tip (Pl. XI/8).

Notched tools – 5 specimens

There have been encountered two blades with shallow notch modified by shallow marginal retouch (Pl. XI/9), one blade with deep notch retouched by semi–steep marginal retouch and one flake with deep shallow retouched notch. One blade with the notch retouched by deep semi–steep retouch has been found in the material coming from horizon Vc.

Denticulated tools – 4 specimens

This group includes denticulated sidescraper with deep semi–steep denticulated retouch (Pl. XI/10), one flake with shallow, marginal denticulated retouch (Pl. XI/20) and one flake with two unconnected semi–steeply retouched notches (Pl. XI/21). One denticulated carinated endscraper was identified in the material from horizon Vc.

Retouched flakes – 1 specimen

There is one flake fragment with inverse semi–steep retouch.

Raclettes – 1 specimen

There is one flake with continuous semi–steep–steep deep retouch on the edge and on the proximal end (Pl. XI/11).

Perforators – 5 specimens

Among the perforators on blades have been distinguished: one asymmetrical borer on blade with bilaterally retouched point similar to those from the previous layer (Pl. XI/14) and two double borers on bladelets with two very oblique truncations creating point on both ends (Pl. XI/12,13). The borers on flakes are represented by asymmetrical laterally retouched borer on rejuvenation flake with semi–steep retouch (Pl. XI/22) and bilaterally retouched borer on flake with semi–steep retouch (Pl.XI/23).

Truncations – 1 specimen

One flake with oblique truncation that resembles a borer has been encountered (Pl. XI/15).

Backed truncations – 1 specimen

One atypical specimen with straight semi–steeply retouched truncation has been found. The flake is laterally retouched by partial, steep and deep retouch (Pl. XI/16).

Fragments of backed tools – 2 specimens

We have recorded one bladelet with partially retouched arched back (Pl. XI/18) and one medial fragment of a bladelet with asymmetrical (sinusoid) steeply retouched back (Pl. XI/17).

Products of secondary modification

This is the proximal fragment of bladelet that has partial marginal retouch on truncation and from which starts shallow inverse burin facet (Pl. XI/19). The artifact resembles the products obtained by the micro–burin technique.

Layer VI

Burins – 2 specimens

Both specimens come from the bags with provisional mark of layer VI (Vb). There is one simple lateral burin (Pl. XII/1) and one double lateral burin on a blade snap (Pl. XII/2).

Endscrapers – 9 specimens

There have been found:

- one arched endscraper on unretouched blade (Pl. XII/3),

- five short endscrapers on very small flakes (up to 25 mm long) – among them is one lateral arched specimen and one pointed specimen (Pl. XII/2),
- one circular carinated endscraper (Pl. XII/9),
- one pointed carinated endscraper on very thick flake (Pl. XII/10),
- one double arched carinated endscraper (one working edge is inversely retouched) (Pl. XII/11).

Retouched blades – 2 specimens

There was encountered one proximal blade fragment with partial steep retouch (Pl. XII/12) as well as one bladelet with partial semi–steep marginal retouch on proximal end.

Sidescrapers – 7 specimens

This group consists of one straight, inversely retouched sidescraper, two small convex sidescrapers (Pl. XIII/13), two fragments of larger convex sidescrapers as well as two transversal sidescrapers (Pl. XII/14).

Notched tools – 11 specimens

There have been found three bladelets with shallow semi–steeply retouched notches (Pl. XII/15, 16) as well as one bladelet with two bilateral shallow notches. The retouched notches on flakes are considerably more numerous (7 pieces) and they could be shallow – short or elongated or deep (Pl. XII/17). The elongated shallow notches (4 pieces) are modified by semi–steep retouch.

Denticulated tools – 6 specimens

The following types have been identified within this category: one denticulated blade, two carinated denticulated endscrapers on very small flakes (Pl. XII/18), one flake modified by transversal, discontinuous denticulated retouch, one massive, partially denticulated flake (Pl. XII/19) as well as very small flake with partial, alternating denticulated retouch.

Retouched flakes – 10 specimens

They appear in the large range of varieties and do not represent homogeneous typological category (Pl. XII/24, 25). The retouch is generally partial and shallow or semi–steep.

Splintered pieces – 3 specimens

There are two flakes with bipolarly oriented, short scars on ventral side and one flake with shallow – surface retouch on the distal end of ventral side (Pl. XII/26).

Perforators – 4 specimens

There were found two perforators on flakes with bilaterally semi–steeply retouched point (Pl.XII/22,23) and two specimens (one on blade and one on flake) with the retouch extending on one or both edges (Pl. XII/20, 21).

Truncations – 2 specimens

There are one blade and one laminar flake with oblique, steeply retouched truncation (Pl. XII/27, 28).

Backed truncations – 1 specimen

There was recorded just one atypical bladelet with steeply retouched straight truncation and steeply–semi–steeply alternately retouched asymmetrical (sinusoid) edge (Pl. XII/29)

Combined tools – 1 specimen

It is a massive flake with endscraper formed on one end and burin on a snap on the other end.

Tool fragments – 1 specimen

One fragment of a tool with semi–steep retouch has been found.

Products of secondary modification

There is one elongated flake of the burin of first order (Pl.XII/30).

Layer V

Burins – 6 specimens

We have recorded three simple angle burins: single–blow burin on retouched flake (Pl. XIII/1), double–blow, shallow burin on a flake with semi–steep inverse retouch (Pl. XIII/2) and bi-lateral (single–blow + double–blow) angle burin on blade (Pl. XIII/3). There were also encountered one double–blow lateral burin on a snap of retouched blade (Pl. XIII/4), double–blow transversal burin, which starts from the retouched edge of a flake (Pl. XIII/5) and one dihedral (single–blow + double–blow) burin on a thick flake.

Endscrapers – 72 specimens

They represent the most frequent class of tools. They could be classified into many types and variants:

Endscrapers on blades:

- arched endscrapers on regular unretouched (2 pieces – Pl. XIII/1,2) and retouched (1 piece) blades,
- arched endscrapers on irregular unretouched blades (2 pieces – Pl. XIII/8),
- arched endscrapers on irregular retouched blades (2 pieces) – lateral retouch is semi–steep – in one instance bilateral and direct and in the other unilateral and inverse,
- pointed endscrapers on blades with retouched notch (1 piece – Pl. XIII/9).

Endscrapers on flakes:
- arched endscrapers on massive unretouched flakes 2.5 –5 cm long (10 pieces – Pl. XIII/10–12, 16),
- arched endscrapers on massive retouched flakes 2.5–5 cm long (7 pieces – Pl. XIII/13,17),
- arched – carinated endscraper on massive thick flakes 2.5–5 cm long (1 piece – it is probably fragmented double endscraper),
- nosed endscraper on massive flakes 2.5 cm long (1 piece – Pl. XIII/14),
- circular – carinated endscrapers on massive thick flakes (1 piece – Pl. XIII/18),
- arched and pointed endscrapers on very small (up to 2.5 cm long) unretouched flakes (23 pieces – Pl. XIII/20, 21, 23–25, 27, 32),
- arched endscrapers on very small retouched flakes (9 pieces – Pl. XIII/19, 22, 28),
- nosed endscrapers on very small flakes (2 pieces – Pl. XIII/26/29),
- circular endscrapers on very small flakes (5 pieces – Pl. XIII/30, 31, 33),
- arched–carinated endscraper on very small flakes (1 piece),
- double arched endscrapers (4 pieces) and double arched – nosed specimen (1 piece) on very small flakes.

Retouched blades – 18 specimens

There were found four blades with shallow, mostly discontinuous retouch and nine blades with semi–steep, deep or marginal retouch (Pl. XIV/1, 2). In addition, there were recorded four bladelet with semi–steep marginal retouch (2 partially and 2 completely – Pl. XIV/3, 4), and one bilaterally partially semi–steeply retouched blade.

Sidescrapers– 12 specimens

There have been identified: sidescrapers with straight and slightly concave working edge (2 pieces – Pl.XIV/5), partially retouched sidescrapers (2 pieces – Pl.XIV/6), convex sidescrapers on small flakes (4 pieces – two of them are carinated and one was made on a splintered piece – Pl. XIV/7), convex laterotransversal sidescrapers on small flakes (1 piece – Pl. XIV/9), convex laterotransversal sidescrapers on very small flakes (2 pieces – Pl. XIV/8) and facially retouched biconvex sidescrapers (1 piece – Pl. XIV/10).

Notched pieces – 19 specimens

Among this type of tools were identified:
- blades of medium size with lateral notch (2 pieces – Pl. XIV/11,12),
- blades with shallow, semi–steeply retouched notch (2 pieces),
- blades with double, bilateral asymmetrical semi–steeply retouched notches (5 pieces – Pl. XIV/14),
- flakes with single, shallow or semi–steeply retouched notch (6 pieces – Pl. XIV/13),
- flakes with double notches – near the top of pointed flake (2 pieces), near the base (1 pieces) and asymmetrically oriented (1 piece).

Denticulated tools – 26 specimens

Following variants have been encountered:

- denticulated points on laminar flakes (2 pieces),
- denticulated blades and bladelets (4 pieces – Pl. XIV/16),
- endscrapers modified by coarse denticulated retouch – massive lateral (1 piece); on small thick flakes (5 pieces – Pl. XIV/15),
- sidescrapers retouched by coarse denticulated retouch (4 pieces – Pl. XIV/17,18),
- fragments of tools with coarse denticulated retouch (2 pieces),
- flakes with continuous semi–steep denticulated retouch (3 pieces),
- flakes with discontinuous denticulated retouch (5 pieces).

Retouched flakes – 50 specimens

They are typologically undifferentiated category. They are modified mostly by shallow marginal retouch and less frequently by semi–steep partial retouch (Pl. XIV/18). Certain number of so–called 'worked flakes from layer V' also belongs to this group.

Splintered pieces – 11 specimens

These are flakes, which have bipolar oriented scars on ventral side (9 pieces – Pl. XIV/20,21, 27, 28).

Raclettes – 5 specimens

There were found three convex lateral raclettes, one laterotransversal raclette (Pl. XIV/22) and also one pointed raclette (Pl. XIV/29).

Perforators – 7 specimens

All specimens are identified as borers and have bilaterally retouched point. They are classified as: asymmetrical borers on blades with the retouch from the tool point extends to one of the edges (3 pieces – Pl. XIV/23), symmetrical borers on short flakes and with the point out of the flaking axis and modified by semi–steep retouch (3 pieces – Pl. XIV/30) and lateral asymmetrical inversely retouched borers (1 piece).

Truncations – 11 specimens

They are represented by:

- blades and laminar flakes with straight truncation (2 pieces – Pl. XIV/24,25),
- retouched blades with straight truncation on proximal end (2 pieces),
- blades with oblique truncation (4 pieces),
- blades with concave – straight or oblique truncation (2 pieces),
- blades with shouldered truncation.

The retouch on all specimens is semi–steep–steep.

Combined tools – 2 specimens

In both instances it is a combination of endscraper and transversal multiple burin on proximal end (on one tool the burin facets start from the snap and on the other from the retouched edge).

Tool fragments – 5 specimens

There have been found two fragments of steeply retouched tools (Pl.XIV/31) and three fragments of tools with semi–steep retouch.

Horizon IVb2

Burins – 2 specimens

Two burins on a flake snap have been recorded – one single–blow and one double–blow (Pl. XV/1, 2).

Endscrapers – 9 specimens

There were encountered two arched endscrapers on very small unretouched flakes (Pl. XV/3), two lateral arched endscrapers (Pl. XV/4,5), one concave endscraper on splintered piece (Pl. XV/7) and as much as four endscrapers on small and very small thick flakes – three of them are arched and one nosed (Pl. XV/6, 8, 9).

Retouched blades – 1 specimen

Just one fragment of laterally shallow retouched blade has been found (Pl. XV/10).

Sidescrapers – 3 specimens

There were one straight sidescraper on rather large flake (over 5 cm long) (Pl. XV/11), fragment of straight sidescraper on flake and one concave–straight laterotransversal sidescraper.

Notched tools – 9 specimens

This tool type is very frequent. We identified two blades with lateral shallow notches modified by semi–steep marginal retouch (Pl. XV/12), one asymmetrical blade with double bilateral semi–steeply retouched notch (Pl. XV/13) and one symmetrical bladelet with a notch on one edge and denticulated retouch on the other but it is not certain that this piece comes from this horizon as this tool type does not appears until the upper horizon. The opposite notches were encountered also on flakes – one lamellar piece and one fragmented (Pl. XV/16). On the flakes are confirmed single – transversally oriented notches (1 piece) as well as double laterotransversal shallow notches (1 piece).

Denticulated tools – 3 specimens

There were recorded one roughly denticulated endscraper (Pl. XV/22), one denticulated sidescraper (Pl. XV/18) and laminar flake with shallow denticulated notch (Pl. XV/14).

Retouched flakes – 2 specimens

There have been found just two flakes with partial, shallow and deep retouched (Pl. XV/15).

Splintered pieces – 4 specimens

All specimens are characterized by bipolar damages on ventral side (Pl. XV/19).

Raclettes – 1 specimen

This is one laterally, semi–steeply retouched flake (Pl. XV/20).

Truncations – 3 specimens

There have been found one symmetrical blade and one flake (broken blade?) with straight steeply retouched truncation (Pl. XV/23, 24) as well as one blade with oblique truncation (Pl. XV/25).

Horizon IVb1

Burins – 8 specimens

In this category of tools we identified:

- simple single–blow lateral burins on bladelets (3 pieces – Pl.XVI/1, 2),
- simple single–blow transversal burin on blade (1 piece),
- simple single–blow lateral burin on a bladelet snap (1 piece – Pl. XVI/3),
- single–blow lateral burins on a blade truncation (2 pieces – Pl. XVI/4),
- multiple lateral burin on the retouch of carinated endscraper (1 piece).

Endscrapers – 33 specimens

They appear in many clearly distinguishable variants.

Endscrapers on blades:

- arched endscrapers on unretouched, symmetrical blades and bladelets (3 pieces – Pl. XVI/5, 6),
- arched endscrapers on retouched blades and bladelets (2 pieces – Pl. XVI/7),

Endscrapers on flakes (all are less than 2.5 cm in size):

- arched endscrapers on unretouched flakes (4 pieces – Pl. XVI/8, 9, 11, 12),
- fan–shaped endscrapers on unretouched flakes (2 pieces – Pl. XVI/10, 11),
- hypermicrolithic thumbnail, short endscrapers (up to 1.5 cm long) on unretouched flakes (Pl. XVI/13, 14),
- arched endscrapers on laterally (5 pieces) and bilaterally (1 piece) retouched flakes with semi–steep retouch and irregular edges (Pl. XVI/15, 16–19),

- fan–shaped endscrapers on semi–steeply retouched flakes (1 piece – Pl. XVI/20),
- pointed endscrapers on unretouched short flakes up to 2.5 cm long (2 pieces – Pl. XVI/21),
- pointed endscrapers on flakes with semi–steep retouch (1 piece),
- nosed endscrapers on unretouched flakes (3 pieces – Pl. XVI/22),
- atypical shouldered endscrapers on unretouched (1 piece) and retouched (1 piece) flakes,
- double endscrapers (arched–straight) on unretouched (1 piece) and retouched (2 pieces – Pl. XVI/23) flakes,
- double endscrapers (arched–shouldered) on continuously bilaterally retouched flakes (1 piece – Pl. XVI/24).

Retouched blades and bladelets – 5 specimens

There have been found one proximal fragment of the broad blade retouched by semi–steep deep retouch as well as four bladelets retouched partially by shallow–semi–steep retouch (Pl. XVI/25, 26). One of the bladelets is bilaterally modified – by direct retouch on one edge and the inverse retouch on the other.

Sidescrapers – 3 specimens

There were recorded one rather large transversal sidescraper (Pl. XVI/27), one slightly convex sidescraper on very small flake (Pl. XVI/28) and one fragment of the sidescraper.

Notched tools – 26 specimens

Among narrow bladelets with single retouched notch could be distinguished: bladelets with shallow retouched notch (8 pieces – Pl. XVI/29, 30, 31), bladelets with deep retouched notch (8 pieces – Pl. XVI/32, 33) and bladelets with deep denticulated notch (1 piece). Among the bladelets with double retouched notches (3 pieces – Pl. XVI/34–36) was identified also one specimen with double denticulated notches (Pl. XVI/34). There was also found one fragment of the bladelet with a single notch.

The notches on flakes have been recorded on five specimens. They are generally laterally oriented and modified by semi–steep retouch.

Denticulated tools – 6 specimens

There were found: one broad blade over 5 cm in size, laterally retouched by semi–steep denticulated retouch (Pl. XVI/39, two narrow denticulated bladelets (Pl. XVI/40), two flakes with discontinuous denticulated retouch (they have actually two notches each) and one flake with lateral coarse denticulated retouch (Pl. XVI/41).

Retouched flakes – 4 specimens

The flakes are modified by shallow (2 pieces), semi–steep (1 piece) or by steep partial retouch (1 piece).

Splintered pieces – 3 specimens

All specimens have bipolar facets on ventral side

Raclettes – 1 specimen

This is laterally steeply retouched flake. The retouched edge is of convex shape.

Perforators – 6 specimens

There were identified: bilaterally retouched borer on a fragment of massive flake, bilaterally retouched borer on very narrow bladelet (Pl. XVI/37), double (?) borer with points modified by two steeply retouched notches (Pl. XVI/38), drill on blade (Pl. XVI/42) and two drills with elongated points on flakes (Pl. XVI/52).

Truncations – 19 specimens

They appear in many variants:

- unretouched blades and bladelets with straight steeply retouched truncation (5 pieces – Pl. XVI/53, 54),
- unretouched blades and bladelets with oblique steeply retouched truncation (3 pieces),
- unretouched blades and bladelets with double steeply retouched truncation (3 pieces – Pl.XVI/45, 48),
- blades and bladelets with straight (3 pieces) or shouldered (1 piece) truncation and lateral notch (Pl. XVI/43),
- bladelets (2 pieces) and laminar flakes (1 piece) with straight truncation and bilateral symmetrical notches (Pl. XVI/44),
- bladelets with double truncation and lateral notch (1 piece – Pl. XVI/51).

Geometric tools – trapezes – 4 specimens

There have been found two elongated symmetrical trapezes (one of them is on irregular blade) with oblique truncations (Pl. XVI/49, 50) as well as two short asymmetrical trapezes, which have slightly less oblique truncation on one end and very oblique – straight or concave truncation on the other (Pl. XVI/46, 47).

Geometric tools – atypical – 1 specimen

This is one microlith with two truncations (straight and slightly convex) that could hardly be identified as trapeze let alone as the tool with truncation because of its size and small degree of elongation.

Tool fragments – 1 specimen

This is one typologically indistinguishable fragment of the tool with semi–steep retouch.

Horizon IVa

Burins – 6 specimens

There have been recorded: simple transversal burin on blade, lateral burin on a narrow blade snap (Pl. XVII/1), two double–blow burins on a flake snap – one is of lateral type and the other is angular (Pl. XVII/2), and also double–blow lateral burin on retouched flake edge (Pl. XVII/3) and dihedral burin on blade (Pl. XVII/4).

Endscrapers – 26 specimens

They appear in the following variants:

- arched endscrapers on blades (1 piece – Pl. XVII/5),
- arched endscrapers on irregular unretouched flakes over 2.5 cm in size (1 piece – Pl. XVII/6),
- arched endscrapers on irregular flakes over 2.5 cm in size that have the scars of splintered (shallow–surface) retouch on ventral side (2 pieces),
- arched, short and thumbnail endscrapers on unretouched flakes less than 2.5 cm in size (7 pieces – Pl. XVII/8, 9, 13, 14),
- concave endscrapers on unretouched flakes less than 2.5 cm in size (1 piece – Pl.XVII/10),
- arched endscrapers on laterally (semi–steeply) retouched flakes over 2.5 cm in size (3 pieces – on one specimen the working edge has alternating retouch – Pl. XVII/11),
- arched and laterotransversal endscrapers on retouched flakes less than 2.5 cm in size (4 pieces – Pl. XVII/7, 14),
- shouldered endscrapers on flakes (1 piece – Pl.XVII/12),
- nosed endscrapers on flakes (2 pieces – Pl. XVII/18),
- double endscrapers (3 pieces – Pl. XVII/19),
- fragments of arched endscrapers (1 piece).

Retouched blades – 2 specimens

There are one bladelet modified by semi–steep retouch and one proximal fragment of bilaterally, shallow and marginally retouched blade (Pl. XVII/15).

Sidescrapers – 5 specimens

They were made on small and very small flakes. There have been identified: one convex (Pl. XVII/16), two slightly convex, one straight and one biconvex fragmented sidescraper (Pl. XVII/17).

Notched tools – 17 specimens

Among notched tools on blades and bladelets have been recorded: one blade and seven bladelets with shallow notch (Pl. XVII/20, 21, 23, 42), one bladelet with bilateral symmetrical deep notches (Pl. XVII/22) and one bladelet with bilateral steeply retouched asymmetrically arranged

notches. The notched tools on flakes are represented by laminar flake of rather large size modified by denticulated, shallow and long retouched notch, three flakes with semi–steeply retouched notches, two retouched flakes with inversely semi–steeply retouched notches on proximal end and one fragment of pointed flake modified by bilateral, symmetrical, semi–steeply retouched notches near the tip.

Denticulated tools – 4 specimens

There were found: one blade with shallow notch retouched by coarse denticulated retouch, one blade with two joined notches creating denticulated retouch (Pl. XVII/27), one partially semi–steeply retouched rejuvenation flake and one macrolithic semi–steeply retouched denticulated flake (Pl. XVII/34).

Retouched flakes – 14 specimens

There have been recorded eight semi–steeply retouched flakes and six shallow retouched ones. The retouch is generally partial or discontinuous.

Splintered pieces – 4 specimens

On all specimens are conspicuous bipolar damages on ventral side of the flake.

Raclettes – 1 specimen

This is a flake retouched laterally by steep– semi–steep alternating retouch.

Perforators – 3 specimens

There have been identified: one borer on flake with undifferentiated point, laterally retouched by semi–steep and deep retouch, one borer with the point modified by steep and deep retouch (Pl. XVII/24) and one distal fragment of perforator on bilaterally steeply retouched blade with irregular edges. The last mentioned specimen has also inversely oriented damages on the point indicating possibly that it was used as drill.

Truncations – 15 specimens

There were encountered one blade and two bladelets with straight steeply retouched truncation (Pl. XVII/25, 29, 30), two blades and three bladelets with oblique steeply retouched truncation (Pl. XVII/28, 33) and one blade with oblique truncation and lateral inversely retouched notch (Pl. XVII/35). Double tools with truncation are very frequent. These are narrow bladelets with double steeply retouched truncations (2 pieces – Pl. XVII/31, 32), blade segments with asymmetrical (1 piece) or concave truncations (1 piece – Pl. XVII/36) and blades with double steeply retouched straight truncation and inversely or directly retouched notch on one of the edges (Pl. XVII/41).

Geometric tools – trapezes – 1 specimen

It is one really atypical specimen, which could be possibly identified as double tool with truncation. It is made on the segment of broad blade and truncations are slightly oblique (Pl. XVII/40).

Combined tools – 1 specimen

It is the combination of borer with bilaterally steeply retouched point and tool with straight steeply retouched truncation (Pl. XVII/38). This tool is attributed to the group of microliths.

Tool fragments – 1 specimen

This is one medial fragment of steeply retouched blade (Pl. XVII/39).

UPPER PALAEOLITHIC AND MESOLITHIC OF CRVENA STIJENA WITHIN THE REGIONAL CONTEXT

Parallels between Crvena stijena and other Upper Palaeolithic and Mesolithic sites in Montenegro

In the time when the investigations at Crvena stijena just started they rather indicated the potential for future investigations than they provided comprehensive insight in the early prehistory of the southwestern Balkans. However, the situation concerning the investigated Palaeolithic and Mesolithic sites in Montenegro changed soon afterwards. The excavations in the Odmut cave in the northern Montenegro have been conducted in the beginning of the 1970s (Srejović 1974; Kozłowski *et al.* 1994) and in the beginning of the 1980s investigations of many rich and multi–layered Palaeolithic and Mesolithic sites in this area have also started. The systematic archaeological excavations have been carried out at the sites Mališina stijena and Medena stijena in the Ćehotina canyon (Радовановић 1986; Srejović 1989; Mihailović 1996), at Trebački krš in the Lim valley (Đuričić 1996), at Bioče in the Morača canyon (Đuričić 2006) and in Vruća pećina near Podgorica (Ђуричић 1997). The preliminary results of these investigations along with already known data have confirmed that Palaeolithic and Mesolithic sites in the mountainous region of Montenegro are not at all the rare phenomenon. The Middle Palaeolithic has been encountered at Bioče, Crvena stijena and Mališina stijena, the Upper Palaeolithic at Crvena stijena, Mališina stijena, Medena stijena and Trebački krš and the Mesolithic period has been recorded at Crvena stijena, Odmut, Medena stijena, Trebački krš and Vruća pećina.

Mališina stijena is the spacious rock–shelter (35 x 15 m) on the left bank of the Ćehotina River. It is situated around 7 m above the present–day water level, at around 800 meters above sea level and its entrance is facing north. In the lower layers (3b16–3b13) it contains the Middle Palaeolithic industry dated in the period before 38000 BP (Радовановић 1986; Hedges *et al.* 1990). The finds from Late Upper Palaeolithic with the straight backed bladelets and the endscrapers and burins on blades and flakes have been discovered in layers 3b2–3b1 (Fig. 11: 1–16), while in layer 2 have been also found the backed bladelets (some of them arched), endscrapers on short blades and shouldered blades (Fig. 11: 17–33). The layer 3b1 is dated in 13780 ± 140 BP. In the layers with the Upper Palaeolithic finds have been encountered numerous hearths and clearly differentiated activity zones.

Medena stijena is situated around 1 km upstream of Mališina stijena in the more easily approached section of the Ćehotina canyon. It is located on the right river bank and facing south. The dimensions of the rock–shelter are 30 x 8 m (Srejović 1989; Mihailović 1996). The artifacts, which could be related to the early phase of Late Upper Palaeolithic including straight backed bladelets, retouched blades and massive endscrapers and burins have been found in the layers X–IX (Fig. 11: 1–5), while in layer VIII have also been found backed points of considerable size and large

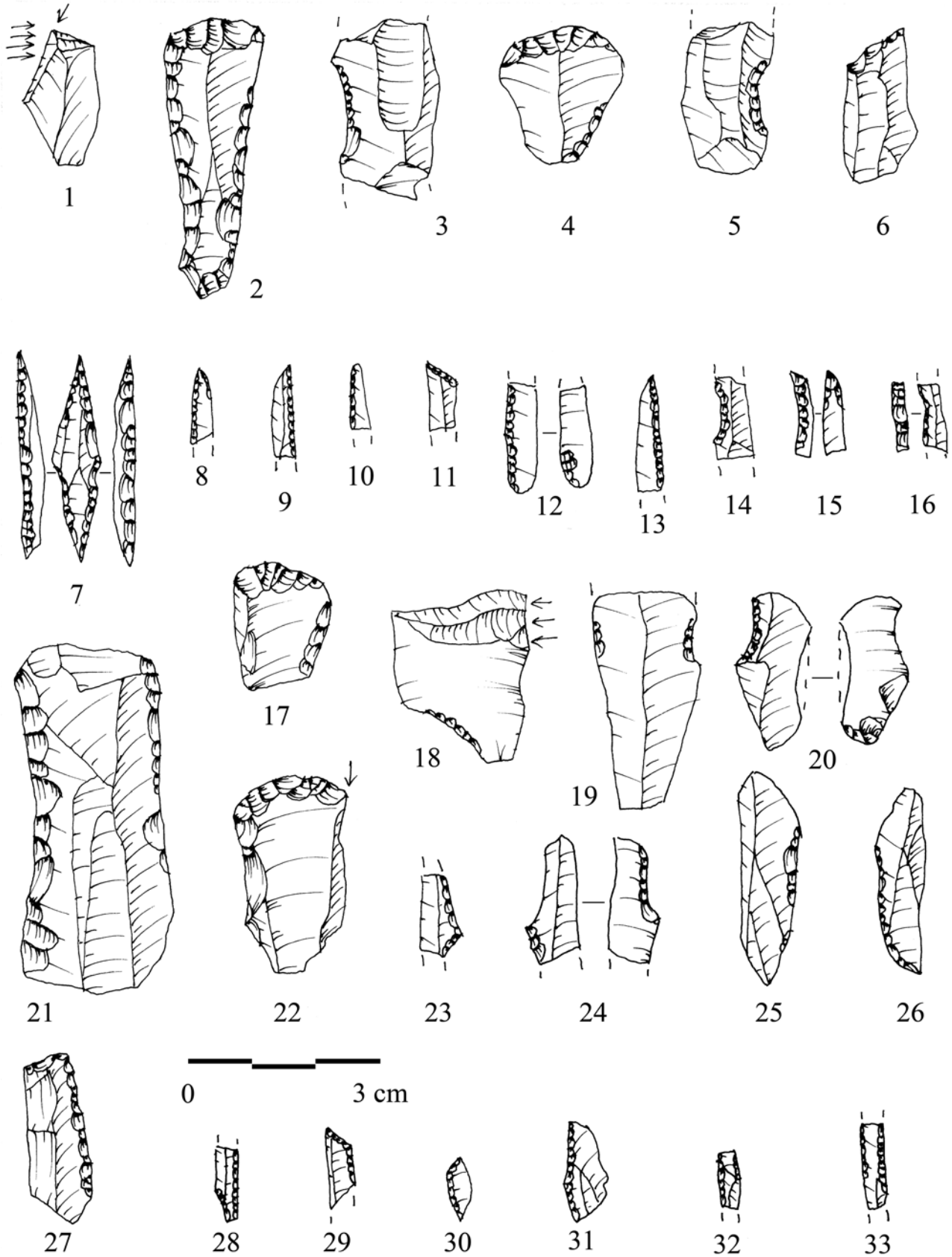

Fig. 11 Mališina stijena: retouched tools from layers 3b1 (1–16) and 2 (21–33)
(redrawn from Радовановић 1986)

quantity of nosed endscrapers on flakes (Fig. 12: 6–11). The rich industry including thumbnail and circular endscrapers, arched backed bladelets, backed truncations and geometric artifacts has been encountered in layers VII–V (Fig. 12: 12–23). The finds from layer IV are ascribed to dated in the Mesolithic period. The prevailing artifacts are endscrapers on irregular flakes, retouched flakes, denticulated and notched pieces and splintered tools and there were also found the trapezes as geometric microliths (Fig. 12: 24–30). When the faunal remains are concerned only the remains of horses have been found in layer X and the bones of red deer, bison, ibex and chamois were recorded in layers VII–V. Faunal remains from disturbed layer IV could have not been reliably distinguished from the remains dating from the later prehistory. Many shells of the Helix pomatia snails, which were found in the lower section of the Holocene sequence, come probably from this layer (Dimitrijević 1996).

Trebački krš is a shallow rock–shelter (30 x 6.5 m), facing south, on the left bank of the Lim river. It has three layers (II, Ib and Ia) where short and thumbnail endscrapers, bladelets with straight and arched back and few mostly atypical microliths have been found (Đuričić 1996) (Fig. 13). It has been assumed on the basis of the sediment characteristics and the results of pollen and faunal analyses that industry from layer II dates from the end of the Upper Pleistocene and finds from layers Ia and Ib date from the Early Holocene period. The remains of red deer and ibex were found in layer II, while bones of red deer, wild boar and chamois were found in the upper horizons (Dimitrijević 1999). The pollen analyses indicate open steppic vegetation in the time of accumulation of layer II and the evolution of forest vegetation in the later period (Николић 1992).

The Odmut cave is situated at the confluence of the Vrbnica and the Piva river at 558 meters above sea level. The cave entrance is 20 m wide, 11 meters deep and facing southeast. The cave yielded remains from diverse prehistoric periods (Srejović 1974; Марковић 1985). The stone industry from the Late Mesolithic period including trapezes, short endscrapers, retouched bladelets with one or two notches and many retouched flakes (Fig. 14) has been encountered in the layers XD, Ia and Ib (Kozłowski *et al.* 1994). Fifty–four harpoons, one pebble with traces of ochre and bone with engraved geometric motif have been found in layer I. This layer was C14 dated between 6400–5490 cal BC. According to the analyses of S. Bökönyi the bones of ibex are largely prevailing among the faunal remains and the bones of fish and birds have also been found (Srejović 1974; Mihailović 1998).

The finds from the above mentioned caves have been discussed in many works. I. Radovanović related the industry from the Upper Palaeolithic layers at Mališina stijena to the early – Gravettian or Epigravettian industries in the southeast Europe (Радовановић 1986), D. Srejović and D. Mihailović attributed the finds from layers X–V from Medena stijena to somewhat later phase of Epigravettian (Srejović 1989; Mihailović 1996), Lj. Đuričić also attributed the industry from Trebački krš to the Epigravettian period (Đuričić 1996) while the Mesolithic industry from Odmut was dated to the Late Mesolithic (Kozłowski *et al.* 1994). The finds from Vruća pećina (Fig. 15) for which we have just preliminary information so far, also date most probably from the Late Mesolithic (Ђуричић 1997), while technologically impoverished industry with trapezes from layer IV of Mališina stijena is also ascribed to that period (Mihailović 1996).

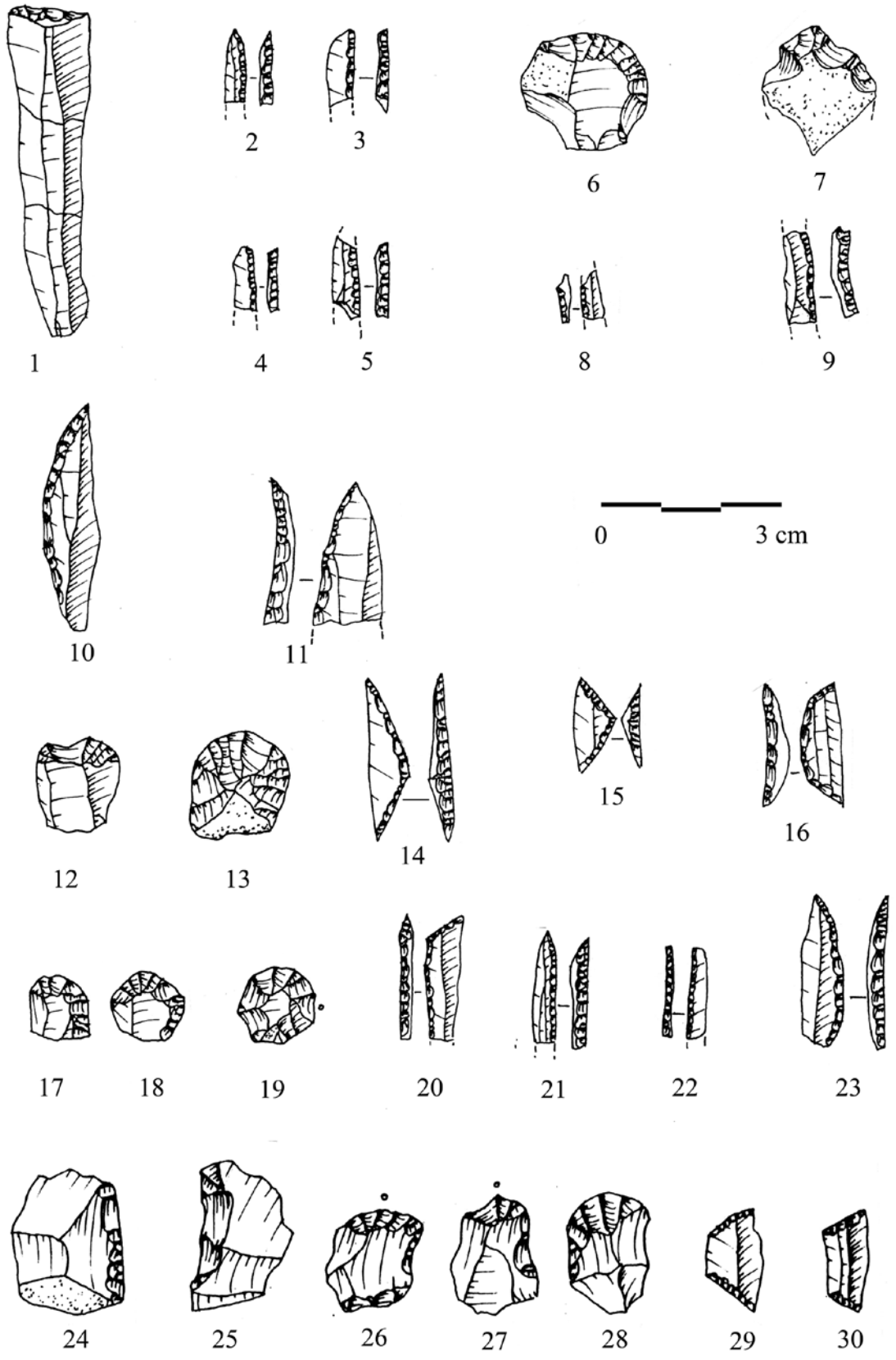

Fig. 12 Medena stijena: retouched tools from layers X (2–5), IX (1), VIII (6–11), VI (12–16), V (17–23) and IV (24–30)

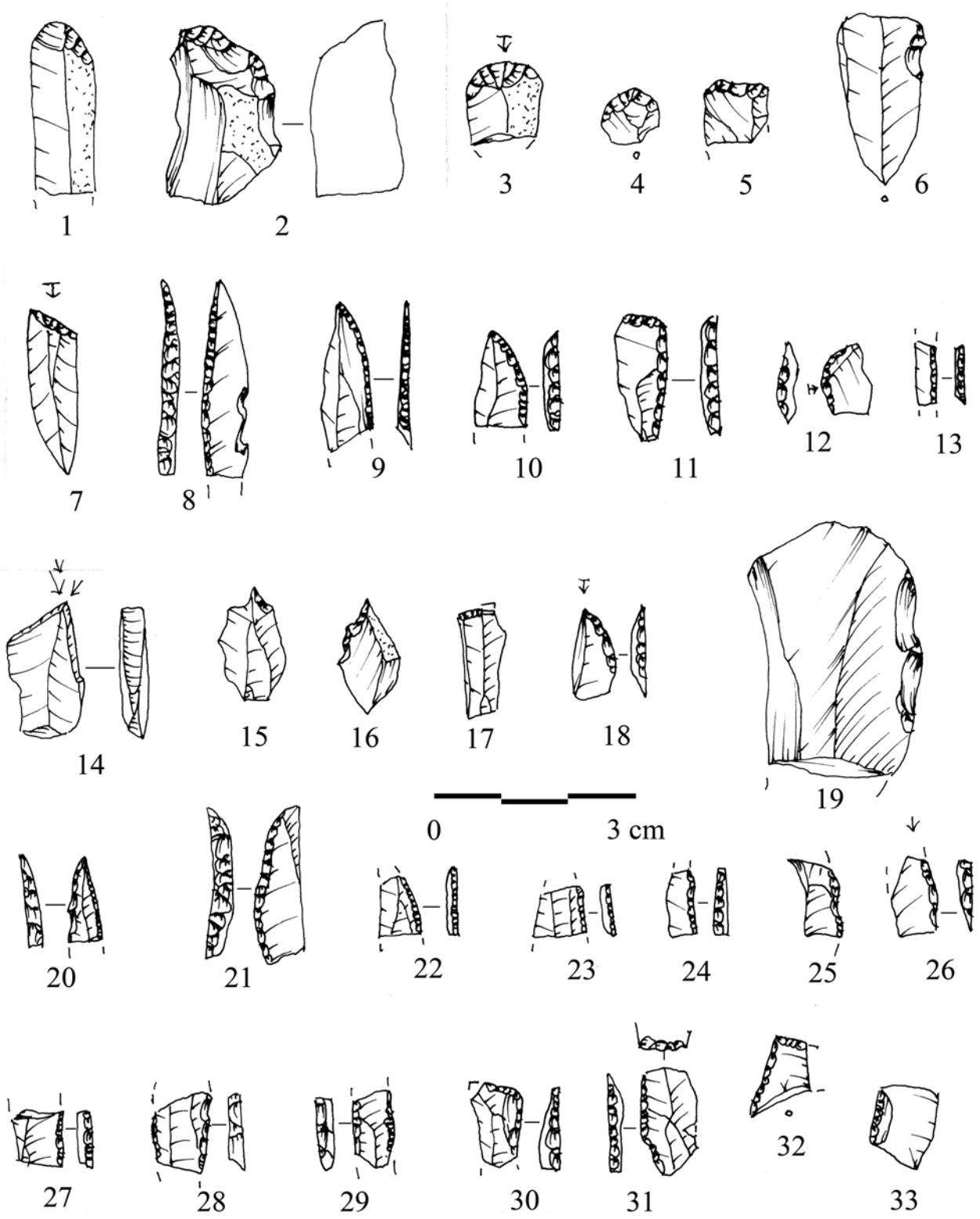

Fig. 13 Trebački krš: retouched tools from layers II (1–13) and Ia (14–33) (after Mihailović 1998)

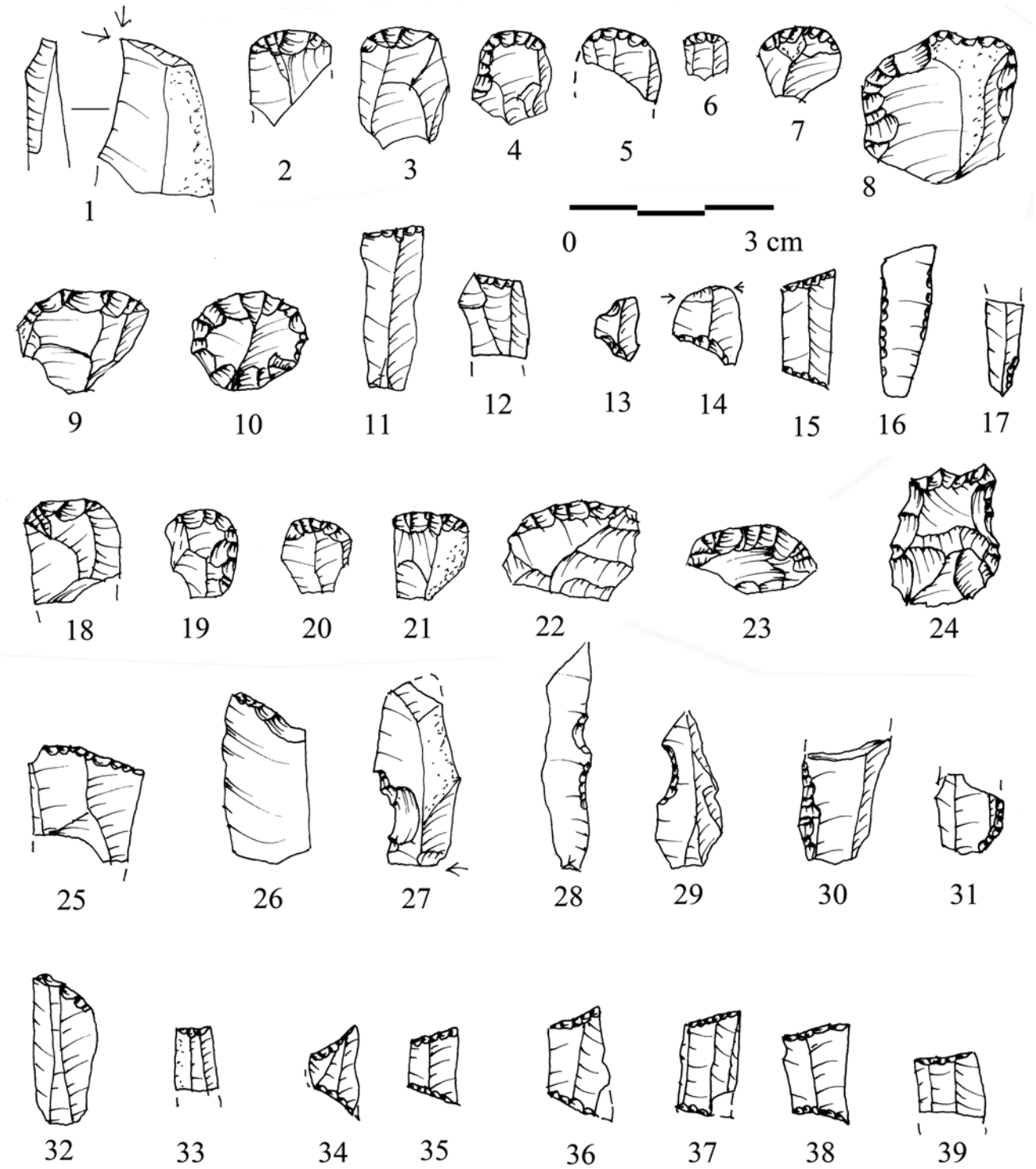

Fig. 14 Odmut: retouched tools from layers XD (1–17) and Ib (18–39) (redrawn from Kozłowski *et al.* 1994)

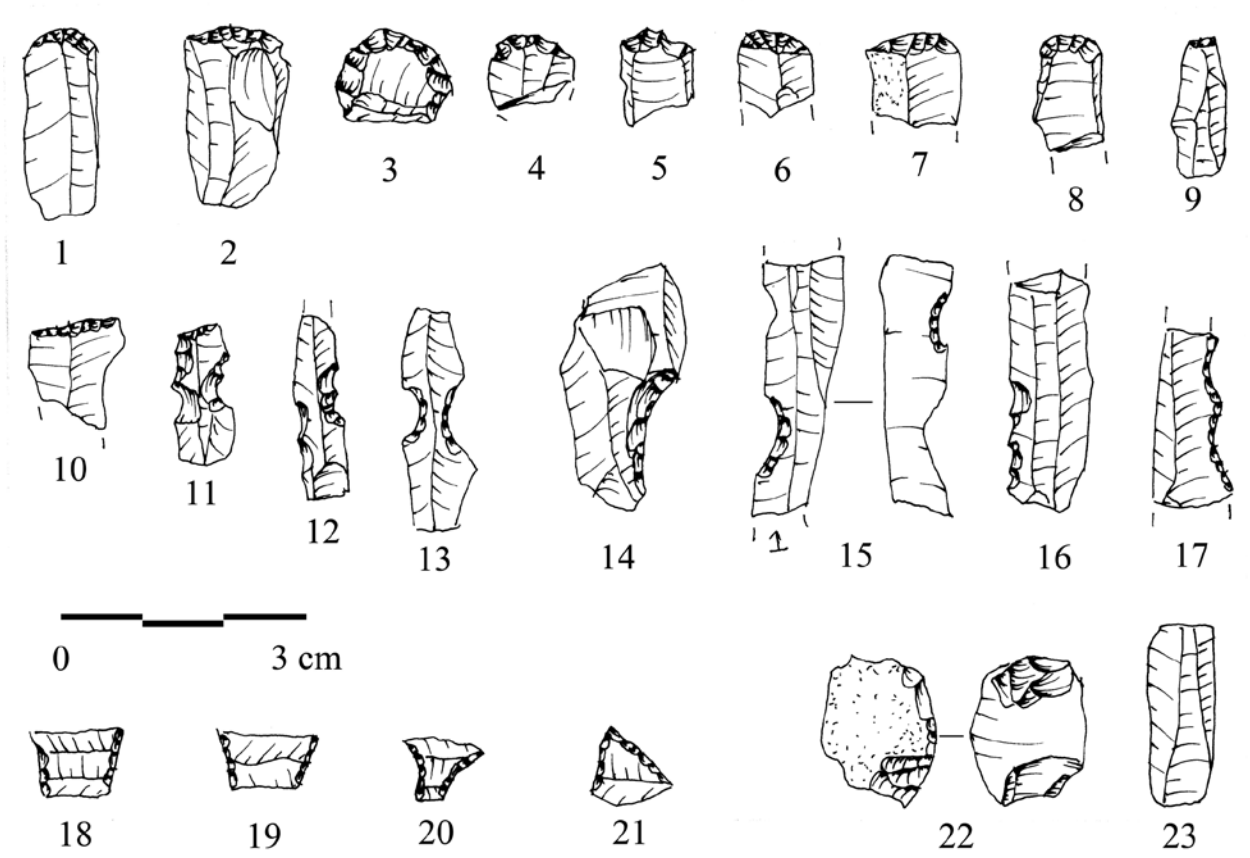

Fig. 15 Vruća pećina: retouched artifacts from Mesolithic layer (redrawn from Ђуричић 1997)

Industries with straight backed bladelets, without geometric tools

The industry from layer X at Crvena stijena has the closest parallels with the finds from layers X and IX at Medena stijena. Relatively small number of artifacts (between 130 and 260 specimens) has been found at both sites and the structure of raw materials and structure of basic categories indicates short stay of human groups in the settlement. The assemblages of artifacts from these layers are characterized by somewhat higher incidence of good quality raw materials: chalcedony, translucent flint and high quality jasper and there are also artifacts, which were probably brought from other locations. This is, for instance, the case with tools and blades made of good quality red jasper from the lower layers of Medena stijena and with artifacts made of white flint from layer X at Crvena stijena. Nevertheless, it seems that most of the raw materials were obtained from small or medium distance considering the dwelling place.

In layer X at Crvena stijena have been recorded in comparison with other assemblages by far the highest percentage of tools (31.6%), high percentage of blades (16.1%) and rejuvenation flakes (4%) but also the smallest percentage of flakes (37.7%). The incidence of tools in layers X and IX at Medena stijena (Mihailović 1996) is considerably smaller (15.8%) and frequency of blades (26.2%) and cores (11.9%) is higher. The workshop character of industry is somewhat more

prominent at Medena stijena as it is confirmed by the products of knapping. However, it is clear that settling of Medena stijena (as well as Crvena stijena) was not focused exclusively on the artifacts production in this phase.

The simple cores for bladelets prevail at both sites but at Crvena stijena were identified also the bipolar cores. The microlithic component in both industries is less prominent than in other assemblages. The laminar index is high among the retouched as well as among the unretouched artifacts and the incidence of blades more than 5 cm long is exceeding 10%. Very small blades (up to 2.5 cm) are recorded in the smallest quantity just in layer X at Medena stijena and layer X at Crvena stijena. The cortex appears at Medena stijena on the flakes but not on the blades (it has been noticed on just one specimen), so it could be assumed that blades were struck only after decortification of the cores. Similar situation has been encountered also at Crvena stijena. The highest incidence of flakes with multidirectional scars and cortex (30.5%) has been identified in layer X at this site, while when the blades are concerned the cortex has been ascertained on two out of eight specimens. At Medena stijena, in contrast to Crvena stijena, faceting before striking the blades had been practiced; platform of this type has been confirmed on 10.7% of specimens.

The greatest resemblance between the assemblage from layer X at Crvena stijena and the assemblages from the lower layers at Medena stijena has been noticed in the structure and style of tool manufacture. At both sites do appear bladelets and points with straight back while geometric tools are absent. The endscrapers prevail over other tool categories (15%–21%), burins and retouched blades are well represented (10%–16%) and notched tools are rather numerous (8%–21%) as well as the truncations (8%–15%). Also, at Crvena stijena as well as at Medena stijena do appear the endscrapers and burins on massive flakes, tools made on narrow and long blades (endscrapers, burins, retouched blades, truncations) as well as the blades bilaterally modified by deep and semi–steep retouch. These industries correspond to the material from layer 3b1 at Mališina stijena that is still not completely published. There also appear the straight backed points and massive endscrapers and burins while the arched backed bladelets and geometric tools have not been found (Радовановић 1986).

Industries with arched backed bladelets and geometric tools

The industries with arched backed bladelets and with geometric tools are confirmed in layers IX and VIII at Crvena stijena, VIII–V at Medena stijena and in layer II at Trebački krš (Đuričić 1996; Mihailović 1996; 1998). At Crvena stijena as well as at Medena stijena could be noticed similar tendencies in the style of tool manufacture, in knapping technology and in the method of raw materials procurement. The number of finds in the assemblages increases in the course of time and reaches its maximum in the upper Pleistocene layers: at Crvena stijena in layer VIII (1196) and at Medena stijena in layer VI (2686). The quantity of artifacts, structure of the raw materials, structure of the main categories of artifacts and structure of tools indicate the decline in the mobility of community and longer and/or more frequent stay in the settlements.

The changes in the structure of raw materials are gradual. Almost continuous decrease in the rate of occurrence of artifacts of jasper and translucent flint along with the increase in quantity of low quality matte flint and gray–beige chert could be noticed from layer X at Crvena stijena. At Medena stijena, however, the incidence of chalcedony discontinuously decreases from layer IX (16.7%) until the layer V (9.1%) and index indicting ratio between high quality and low quality jasper decreases from 2.2–2.5 in layers X–VIII to 0.7–1.3 in layers VII–V.

The knapping process at Medena stijena and also at Crvena stijena was, judging by the cores, at least partially directed towards production of microbladelets and backed tools. All knapping phases have been performed in the settlements including preparation of cores and decortification, rejuvenation in the process of exploitation and tool production. The platform faceting had not been practiced to the great extent. Still, it should be emphasized that exploitation of cores was not based on the rejuvenation techniques but on the change of striking direction. The cores with traces of knapping of back or lateral side at an angle of 90° or 180° have been found both at Medena and at Crvena stijena. It is not improbable that some cores, particularly those at Crvena stijena have been transformed into flat bipolar cores in the final phase of knapping.

Despite intensive workshop activity the structure of assemblages of the artifacts and faunal remains suggests that different activities had been performed in the dwelling places. This is confirmed, among other things, by the zones of activities recorded at Medena stijena (Mihailović 2004b). When the general structure of the assemblages at all sites in Montenegro is concerned the cores are represented by about 5%, chunks generally represent 5% to 8% and tools 15–20%. The diachronic and regional differences could be noticed only when the quantity of blades is concerned. They are most frequent at Medena stijena and Trebački krš and slightly less frequent at Crvena stijena. In any case, the blades of larger size are lacking both at Crvena and at Medena stijena while the lamellar component becomes more important. For example, the microbladelets (up to 2.5 cm long) are represented by over 50% in the morphometric structure of blades at Medena stijena and Trebački krš.

The analysis of tools offered best results when the diachronic trends, regional differentiation of industries and differences between the sites are concerned. In layer IX at Crvena stijena and in layer VIII at Medena stijena there are still present the elements from the earlier phase: retouched blades and notched tools are abundant, the incidence of truncations is high and at both sites are still present carinated endscrapers, burins and blades with deep and semi–steep retouch. The characteristic of Crvena stijena in this phase are the endscrapers on splintered pieces and of Medena stijena the nosed endscrapers while backed points of rather large size made on blades appear at both sites. The microlithic and circular endscrapers appear in these layers for the first time and there have been recorded (in very small quantity) also the geometric artifacts and atypical backed truncations. Typical flat arched backed bladelets have not been recorded.

In the layers VII–V at Medena stijena, layer VIII at Crvena stijena, layer 2 at Mališina stijena and layer II at Trebački krš have been found typical bladelets with arched back, backed truncations, geometric tools (segments and triangles) as well as short, thumbnail and circular endscrapers on flakes. The microlithic character of the industry is very prominent. The triangles, backed truncations and arched backed points and bladelets appear for the first time in considerable quantity at Crvena and Medena stijena and they are somewhat more frequent at Crvena than at Medena stijena.

On the other hand, the industry characterized by high degree of standardization and hipermicrolithization of endscrapers and backed tools has been recorded only in layer V at Medena stijena. Namely, even 44.5% of all endscrapers on flakes were made on flakes less than 15 mm in size and also the backed points and bladelets just 3 mm wide were recorded. In this layer at Medena stijena have also been recorded the occurrence of massive denticulated tools.

Industries with smaller incidence of backed tools and without geometric tools

The industries of Crvena stijena VII–V and Trebački krš Ia–Ib that are characterized by considerably smaller quantity of elements from the previous phase follow the microlithic, geometric and lamellar industries of Crvena stijena VIII, Medena stijena V and Trebački krš II (Đuričić 1996; Mihailović 1996; 1998). Particularly conspicuous is almost total absence of geometric tools – segments and triangles. In contrast to Mališina and Medena stijena that lost their function as dwelling places in this period, the settling of Crvena stijena is still intensive. The continuity exists also at Trebački krš while Odmut and Vruća pećina were inhabited only in the later phase of the Holocene.

The decrease in quantity of good quality raw materials has been recorded not only at Crvena stijena but also at other sites. The incidence of chalcedony and translucent flint decreases to 5% each and total quantity of low quality raw materials reaches 76.2%. Similarly the incidence of chalcedony at Trebački krš* decreases from 45.3% in layer II to just 17.4% in layer Ia, while the quantity of chert rises from 7.4 % to 25.7%. The bipolar and irregular cores are very frequent in this phase at both sites, while the incidence of single–platform cores decreases; percentage of flakes rises (the flakes/blades index at Trebački krš rises from 1.12 in layer II to 2.30 in layer Ia) while number of blades decreases; incidence of cortical specimens is greater and selection of good quality raw materials for production of blades and tools is less prominent.

The similarities between Crvena stijena and Trebački krš are even more prominent when the repertoire of tools is concerned. The arched backed bladelets and atypical backed truncations are still present in layer VII at Crvena stijena and layers Ib and Ia at Trebački krš. On both sites the burins are rather scarce, endscrapers and retouched flakes appear in somewhat smaller proportion (not exceeding 21% and 5% respectively) and perforators and retouched blades are relatively well represented (10%–17%). The asymmetrical tools on flakes are very frequent in layers VII and VI at Crvena stijena while the incidence of backed tools abruptly decreases. Lower rate of occurrence of the backed tools at Crvena stijena could be the consequence of the fact that sediment had not been sifted during excavations.

Industries with trapezes

The trapezes were not mentioned in the first reports about the investigations at Crvena stijena. Nevertheless, this tool type has been confirmed during the revisional study of the material in the

* Thanks to Lj. Đuričić we have had the opportunity to conduct our own analysis of the material from Trebački krš (Mihailović 1998).

assemblages from horizons IVb1 and IVa. Regarding the rate of occurrence of the trapezes but also of many other elements, the assemblages from horizons IVb1–IVa at Crvena stijena are very similar to the finds from the Mesolithic layers at Odmut ((Kozłowski *et al.* 1994; Mihailović 1998; 1999). We are going to comment here not only on the industry from layers XD, Ia and Ib from Odmut but also on the industry from Vruća pećina (Ђуричић 1997) that has not yet been published in detail.

At Crvena stijena, the good quality raw materials appear again in the industries from horizons IVb1–IVa. The rate of occurrence of chalcedony and translucent flint in these horizons is over 50% in total and good quality raw materials were used for knapping also at Odmut and in Vruća pećina. On the other hand, the low quality raw materials still predominate in horizon IVb2 at Crvena stijena and similar situation is with the assemblage from layer IV at Medena stijena where total quantity of low quality raw materials even reaches 69.9%. It is possible to offer many explanations for this phenomenon and we shall discuss that later. It is important, however, to emphasize that main reason for the use of good quality raw materials at most of the sites is in the introduction of lamellar technology and tools made on the bladelets.

The cores of chalcedony and translucent flint from Crvena stijena were not specially prepared as it is confirmed by the presence of bladelets with parallel scars and cortex on the side as well as with the cortical platform. Due to the advanced flaking technique (maybe even by pressure) along with frequent faceting of the platform, the elongated symmetrical bladelets with parallel edges of triangular and trapezoid section had been obtained. Small number of rejuvenation blades indicates that lateral preparation was infrequently applied and the cores were exploited to the maximum (like in Late Upper Palaeolithic) by changing the direction of knapping. Similar tendency was confirmed also at Odmut (Kozłowski *et al.* 1994). The incidence of specimens with asymmetrical transversal section decreases abruptly in layer Ib at this site, while the incidence of blades with parallel edges, symmetrical section (particularly trapeze–like) and faceted platform is considerably increasing.

The industries from Crvena stijena and Odmut are characterized in this phase by presence of the bladelets with single or double notches (at Crvena stijena they vary between 17% and 24.3%) and of various tools made on blades and bladelets (truncations, endscrapers, various types of combined tools). The rate of occurrence of endscrapers (25%–30%) and truncations (8%–15%) is relatively high. The tools on flakes, particularly endscrapers are still present in high quantity at Odmut as well as in horizon IVb2 at Crvena stijena, while backed tools have been encountered in larger quantity only in layer Ia at Odmut (6.7%). The trapezes at Odmut are somewhat more frequent than at Crvena stijena and they also appear in greater number of variants. In contrast to Crvena stijena and Odmut the industry from layer IV at Medena stijena has less prominent laminar character and it is characterized by high incidence of endscrapers (25.9%) and retouched flakes (23.3%).Other types of tools are considerably less frequent and endscrapers are of irregular shape with working edge oriented laterally or on proximal end of a flake. In this industry the trapezes are of medium elongation and have oblique retouched edges.

As it could be seen, similar trends have been encountered at most Upper Palaeolithic and Mesolithic sites in Montenegro. However, there have been also recorded many inconsistencies, so the impression is that in many cases the differences between the sites from the same phase are more prominent than the differences between the industries from the same site. The mineral resources had been exploited in the similar way in almost all phases and within restricted area, the only excep-

tion being Crvena stijena (and to some extent Medena stijena) in the early phases of settling in the Upper Palaeolithic. The bipolar technology and many elements in the style of tool production (end-scrapers on splintered pieces, short bladelets with arched back) are characteristic of Crvena stijena, the standardization and geometrization is characteristic of Medena stijena and use of high quality raw materials and lamellar character characterizes the industry of Trebački krš. These differences might have been the consequence of the differences in the excavation method (and way of gathering finds), the quality of available raw materials, extent and character of habitation (i.e. the function of dwelling places) and cultural tradition. We shall discuss possible reasons for the technological variability within space and time later in the text.

The Middle to Upper Palaeolithic Transition

The transition from the Middle to the Upper Palaeolithic at Crvena stijena could be discussed from the aspect of: a) late Middle Palaeolithic industries from layers XIV–XII, b) volcanic eruption, resulting in formation of layer XI and c) industry from layer X. Unfortunately, the necessary material, which should provide the basis for the discussion is not sufficiently documented and studied. The industry from layers XII–XIV has not been studied in detail, the project of investigation of tephra in the southeast Europe has just started, while it is still impossible to establish the chronology and cultural provenance of the industry from layer X with certainty. Therefore, when the investigations of these processes are concerned we could discuss the importance of Crvena stijena only hypothetically.

Middle Palaeolithic basis

It is not easy to draw a borderline between early and late Middle Palaeolithic at Crvena stijena. According to the Basler's observations and the sedimentological investigations the complete series of Middle Palaeolithic layers was accumulated between MIS6 and MIS3 and most of the layers date from MIS5a–5d. The layer XIII with the finds attributed to the Denticulate Mousterian has been recently generally dated to MIS 4 on the basis of the sediments analysis (Morley 2007). If this proves to be true that would be a kind of surprise because most of the industries of this type have been dated to MIS 3 (Mellars 1996; Thiébaut 2006). It seems, however, that sedimentological observations correspond to the data obtained by the analysis of the faunal remains. In other words, despite the fact that remains of the species, which are not particularly relevant from the climatic point of view (red deer, ibex, bovides) appear in layer XIII, there were also encountered the remains of elk (Alces alces) and willow grouse (Lagopus lagopus), i.e. the species adapted to the cold climate (Малез 1975). These species are lacking in layer XII, which contains the 'late Mousterian' industry (Баслер 1975). This layer is dated in 40777± 900 BP and besides the chipped stone artifacts it contained also the remains of cave bear, wild boar, red deer, bison, wild cattle, ibex and chamois (Малез 1975).

The investigations of the Middle Palaeolithic layers at Crvena stijena have been carried out by M. Brodar (in 1956 and 1958) and Đ. Basler (between 1960 and 1963) and both of them were rather reserved in regard of the cultural determination of the finds. Brodar gathered quite abundant Middle Palaeolithic industry (around 3600 artifacts) in layers XII–XVIII and attributed it to the micro–Mousterian (Benac, Brodar 1958, 56–57; Brodar 1962, 17–19). Basler, as it seems, found smaller amount of artifacts during his excavations and published them in the monograph on Crvena stijena (Баслер 1975). According to his data 116 artifacts have been found in layer XIII and in all other layers of the upper section of the sequence there was less than hundred artifacts per layer. He attributed the assemblages from layers XVII–XIV to the Mousterian, from layer XIII to the Denticulate Mousterian and from layers XII and XI to the late Mousterian. S. Ivanova attempted in the end of 1970s to calculate Bordes' indexes using Basler's data and to comprehend the industry from

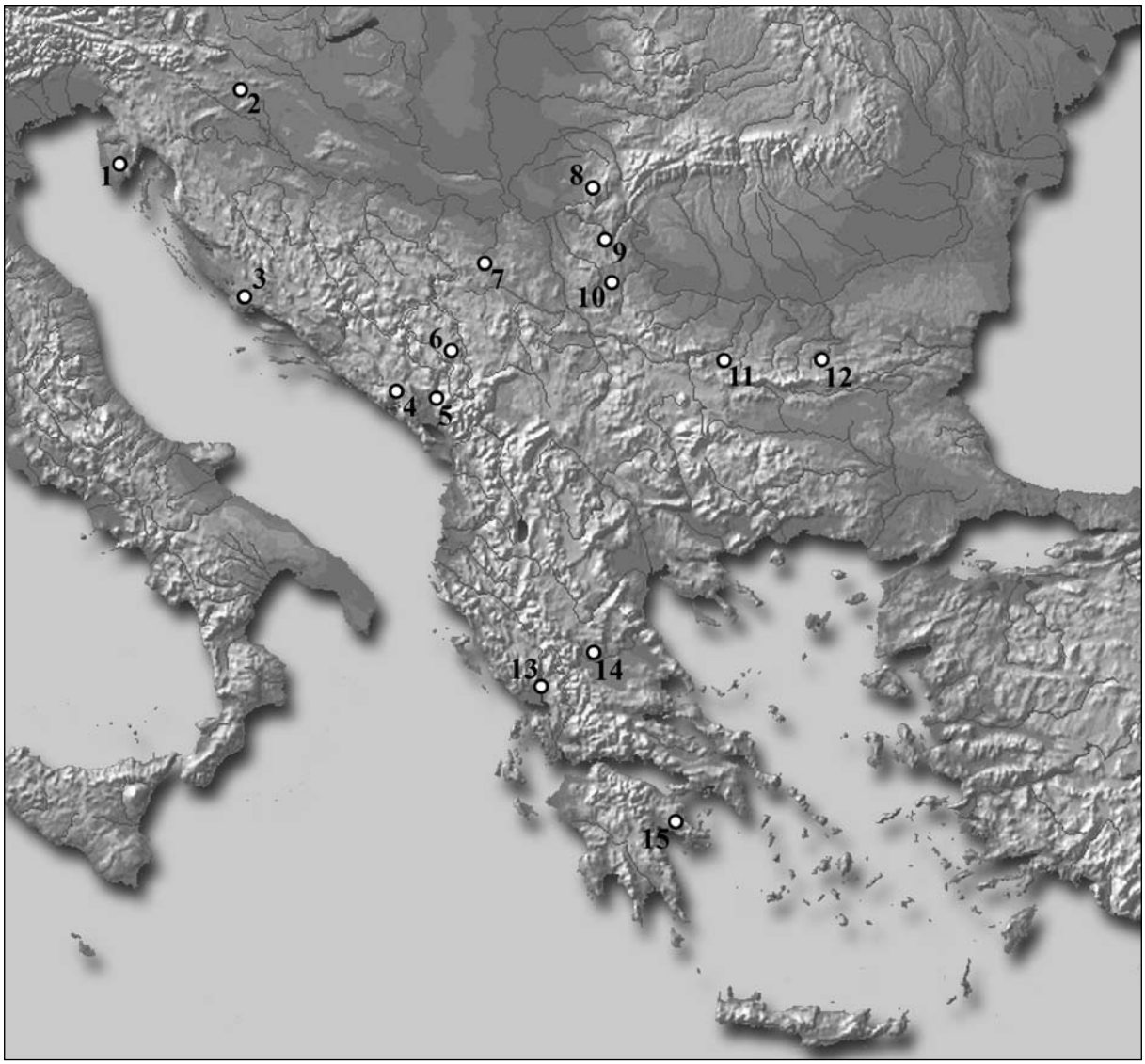

Fig. 16 Middle and Early Upper Palaeolithic sites in the Balkans, mentioned in the text: Šandalja II (1), Vindija (2), Mujina pećina (3), Crvena stijena (4), Bioče (5), Mališina stijena (6), Šalitrena pećina (7), Peştera cu Oase (8), Cave near Trajan's tablet (9), Baranica (10), Temnata (11), Bacho Kiro (12), Asprochaliko (13), Theopetra (14), Klisoura (15)

Crvena stijena within wider regional context (Ivanova 1979). She defined it as the distinct facies of the Typical Mousterian (Pinios – Crvena stijena a) that is characterized by high rate of occurrence of the sidescrapers and the Mousterian points (perhaps because of the material selection) and low incidence of the Charentian elements and almost complete absence of the Levallois artifacts. We could agree, in essence, with most of these notions except the last one. In any case, the situation will become clearer only after the material is revised and published in detail.

The industries similar to the one from Crvena stijena have been encountered also at other sites on the east Adriatic coast and in the south of the Balkans (Fig. 16). The rich industry with sidescrapers of diverse type, Mousterian points and Levallois artifacts has been recorded in the upper layers at Bioče (Đuričić 2006). The industry is of the microlithic character and many tools (particularly raclettes) were made on flakes smaller than 2 cm in size. Above the 'basal Mousterian' at Asprochaliko was also encountered the so–called micro–Mousterian where the sidescrapers prevail at least when the tools are concerned (Higgs and Vita Finzi 1966; Bailey *et al.* 1983a).The industry with small–sized artifacts, lower or higher incidence of the Levallois artifacts and many sidescrapers has been encountered in Klisoura in the Peloponnesus (Sitlivy *et al.* 2008), Theopetra in Thessaly (Panagopoulou 1999) and in Mujina pećina near Trogir (Karavanić and Bilich–Kamenjarin 1997; Karavanić 2007). Most of the authors think that microlithic character of the industries results from the use of mostly low quality local raw materials. Still, it should be mentioned that this phenomenon could have been related to the character of settling of human groups in the dwelling places. Rather large quantity of artifacts (most at Bioče and Klisoura) has been recorded at most sites where the so–called micro–Mousterian has been encountered, while the heterogeneity of the remains suggests that shelters had been used as base camps.

The rate of occurrence of the artifacts within the Bordes' typological groups (I–IV) and the index value is difficult to estimate because of the absence of the quantitative data. The Levalloisian component is present in all industries and is the most frequent in the middle segment of the Middle Palaeolithic sequence at Klisoura (Sitlivy *et al.* 2008). Judging by the published data, the Levallois artifacts are most numerous in layers XVII and XVIII at Crvena stijena although they are confirmed also in the upper section of the sequence. The Pontinian, technologically close to the Charentian has been confirmed only at Crvena stijena (in layers XXII, XXI, XVIII) and the Charentian elements have been recorded also in other layers. In regards to this, it should be mentioned that J. K. Kozłowski, after examining material from Crvena stijena and other Middle Palaeolithic sites in the Balkans, ascribed the Charentoid character to the entire Mousterian of the Balkans (Kozłowski 1992). There are, however, also the authors who think that this phenomenon should be associated with the frequent rejuvenation and reshapening of tools (Pangopolou 1999). The Denticulate Mousterian to which the industry from layer XIII has been ascribed is not confirmed at other sites in the region (except, possibly in Mujina pećina), while the Upper Palaeolithic artifacts are not present in substantial quantity anywhere. A couple of tools on retouched blades and elongated flakes as well as one carinated endscraper were encountered in layer XII at Crvena stijena (Mihailović 1998). Few carinated endscrapers and burins were found in layers 3b13–3b16 at Mališina stijena (Радовановић 1986), while an increase in the incidence of the Upper Palaeolithic elements was recorded in the upper layers of the sequence at Klisoura (Sitlivy 2008). Similar situa-

tion has been recorded also in the Apennine peninsula. It is interesting that layers with the Middle Palaeolithic finds at Klisoura and at the sites in Italy (Mussi 2002) are followed by the layers with the initial Upper Palaeolithic (industry related to Uluzzian) and layers with the Aurignacian artifacts (Koumouzelis *et al.* 2001).

The Middle Palaeolithic of Crvena stijena is characterized by the elaborate style in tool production. The industry from lower layers (XXVII–XXIV) was once related to the industry Karain E in Anatolia and the Mousterian of Zagros type because of its Charentoid character, presence of the Levallois technology and occurrence of distinct tools (Kozłowski 1992; 2002). The Levallois technology of recurrent type together with the discoid technique of the core knapping appears in this type of Mousterian. The rate of occurrence of the sidescrapers as well as the retouched Levallois and Mousterian points is high; the base of sidescrapers is often tapered by the ventral retouch and there are also the Kostenki truncations and the points made on bilaterally retouched blades. Just because of this, the hypothesis was proposed on the basis of the similarities in the material culture that during the Early Glacial and perhaps even earlier (during MIS6) the eastward expansion of Neanderthals took place (Kozłowski 1992; 2002). It has been assumed that the Neanderthal communities were driven in the glacial periods as far as the Near and Middle East along a corridor opened at that time: across the Balkans and Anatolia. There are, however, also the authors who believe that it is more probable that Neanderthals inhabited this area during some of the warm phases, particularly during MIS5e (Hublin 2002).

The continuous and intensive settling at Crvena stijena in the Last Interglacial and Early Glacial is confirmed by over 1 meter thick soot deposits, numerous artifacts and animal bones. At that time the Balkans was the refugium for plants and animals and probably for the humans as well. The favorable living conditions existed particularly in the west of peninsula as the humidity was higher in that area in the glacial periods (Tzedakis, Bennett 1996). Anyhow, according to many authors, the Balkans represented in the Pleistocene the hotspot of biodiversity and the area where the relict forms of organisms survived for a very long period of time (Griffits *et al.* 2004; Weiss, Ferrand 2007). The survival and variability of species was among other things also possible because the Balkan Peninsula (in contrast to the west Europe) was geographically open to the south, toward Asia Minor and Middle East, in all periods. Therefore, the populations inhabiting the region could have escaped the negative influence of climatic changes following the shifting of ecological zones and climatic belts from the northwest to the southeast and vice versa. It could be assumed, against that background, that social, cultural and population interferences were most prominent at the borders of the ecological zones in the areas, which have been permanently inhabited during the Pleistocene period.

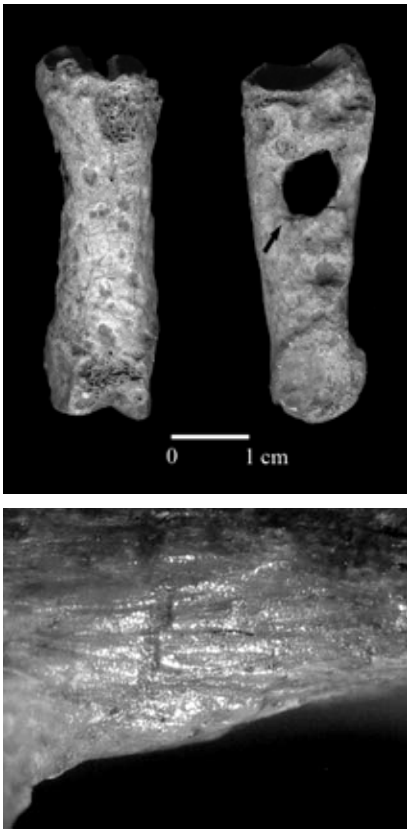

Fig. 17 Perforated phalanx (*Capra ibex*) from layer XII of Crvena stijena

Despite the fact that the coastal region was an important communication route, the Upper Palaeolithic elements in the Middle Palaeolithic and "transitional" industries have been encountered so far only in the eastern Balkans, in the industries from Bacho Kiro and Temnata (Kozłowski 1982; Ginter *et al.* 2000), while in the south they have been encountered in the insignificant quantity and within the scope usual for the Middle Palaeolithic. Similar situation was also encountered when other evidence is concerned. The only reliable proofs of the graphic expression in the Middle Palaeolithic have been perhaps confirmed in the eastern Balkans, in Bacho Kiro and Temnata (Marshack 1982; Crémades 2000). In contrast to this, there is still no reliable confirmations that perforation on the caprine phalanx, which was found in layer XII at Crvena stijena (Fig. 17), is the result of human activity (Basler 1975b; Mihailović 2004a), and similar situation is also with the pebble of limestone from Bioče. On this pebble, found in the upper stratigraphic complex, have been noticed (engraved?) radial lines and rectangular motifs (Đuričić 2006). The pebble has been found in the upper stratigraphic complex, which probably dates from the Upper Pleistocene. If the anthropogenic character of the engraving is confirmed then it could be the additional proof that different species of the hominids fostered similar graphic expression in Europe and in Africa at the beginning of Upper Pleistocene (d'Errico *et al.* 2003).

Y5 tephra and period of transition

Crvena stijena is one of the first sites in the southeast Europe where thick layer of volcanic ash has been recorded (Brunnacker 1975). The layer XI has been recently identified as Y5 tephra, or Campanian–Ignimbrite, dated to 41–39 ka (Morley 2007; Giaccio *et al.* 2008; Baković *et al.* 2009). The layer of tephra is thickest at the rear part of the rock shelter where it is cca 20 cm thick. The distribution of the layer is discontinuous at the ground level, while at the rock shelter entrance it was recorded just in traces. It was accumulated around large rocks at the bottom of layer X that probably collapsed at approximately same time. In many parts of the rock shelter and particularly at the entrance tephra is mixed with the sediment of layers X and XII. Therefore, it is small wonder that it contained the Middle Palaeolithic artifacts. We think that only the remains of birds could be ascribed with somewhat more certainty to layer XI as they have been found in considerable quantity just at this level (Малез 1975).

It is quite clear that the eruption before 40 ka and later eruptions (before 33.5 ka and before 29 ka), Heinrich event 4 and general climatic instability in the second half of MIS3 could have had a considerable impact on cultural and population movements at the transition from the Middle to the Upper Palaeolithic (Zilhao 2006; Giaccio *et al.* 2008; Higham *et al.* 2009). After the eruption before 40 ka the volcanic ash covered the greater part of central and south Italy and probably also the littoral region of the east Adriatic coast. Besides at Crvena stijena, the Y5 tephra has been confirmed in the Balkans also in Temnata as well as in the Franchthi cave (Morley 2007). In the east Europe it reached as far as Kostenki where it covered the layers with artifacts from the early Upper Palaeolithic as it is also the case with some sites in Italy (Castelcivita, Serino), (Fedele *et al.* 2002; Mussi 2002; Giaccio *et al.* 2008). Considering that the east Adriatic coast is not too far from the place of

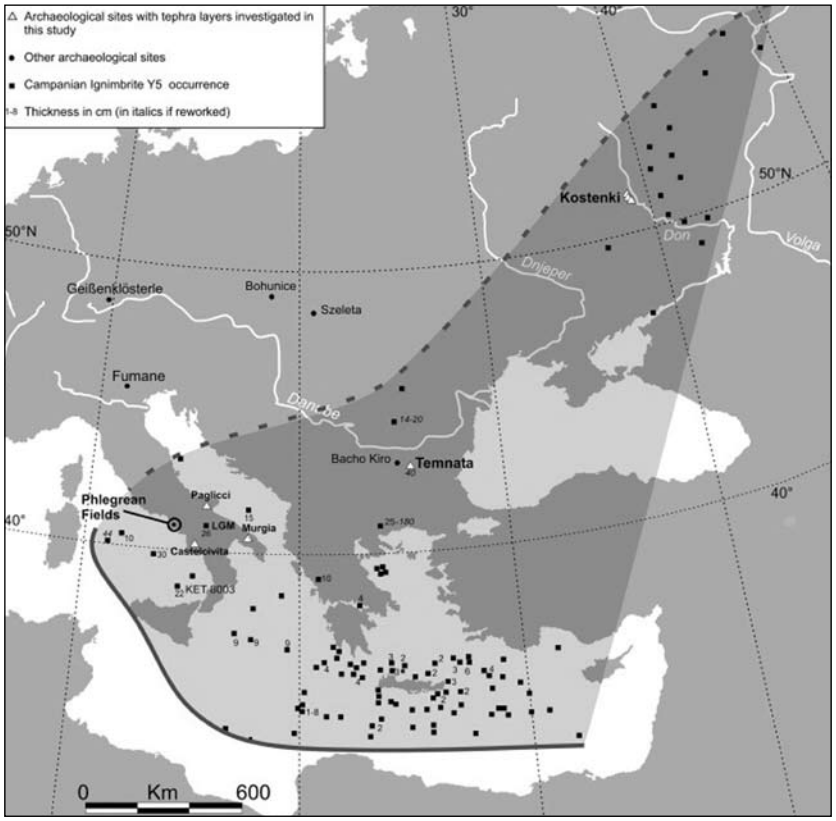

Fig. 18 Areal distribution of the Y5 tephra (after Giaccio *et al.* 2008)

eruption (Fig. 18) it could not be ruled out that in this area as well as in the Apennine Peninsula the ash covered flint deposits, that degradation of vegetation and fauna had happened and perhaps it also resulted in temporary depopulation of the entire region (Mussi 2002). There are authors who think that this event caused the demographic crisis within wider geographic area (Zilhao 2006).

The Middle Palaeolithic in the Adriatic–Ionian region came to an end before around 40 ka but the Upper Palaeolithic sites older than 34 ka have not been confirmed so far in the entire coastal region, with the exception of the industry similar to the Uluzzian at Klisoura (Kouzoumelis *et al.* 2001). What could have been the reason and why is the transition from the Middle to the Upper Palaeolithic characterized by almost monotonous succession of the Mousterian and the Aurignacian? When other parts of the Balkans, and even larger part of Europe, are concerned, lacking of the chronological overlapping of the Middle and Upper Palaeolithic within smaller regions indicates that not only ecological but also social competition, i.e. distinctive territoriality existed between the bearers of Middle and Upper Palaeolithic (Mihailović 2004a). There is also a possibility that the Balkans had been settled either from the north, from central Europe or from the east, from the Danube basin (Conard, Bolus 2003) and that coastal direction did not play important role in these processes. But, if the east Adriatic coast was the last to bear the brunt of colonization, the question could be asked why the Middle Palaeolithic communities ceased to settle in this area, even more so because the coastal area provided favorable living conditions (Finlayson 2008).

The more recent investigations revealed that the Aurignacian sites are grouped within the broad belt along the Danube–Sava corridor and that they actually do not exist in the central parts

of the Balkans. Also, the absolute dates indicate that main natural communications (first of all the Danube basin) played a considerable part but also that Upper Palaeolithic spread diffusely from the east to the west of the Balkans like a front covering the large territory from the south to the north. The dropping of dates obtained for the earliest occurrence of the Upper Palaeolithic and modern man could be followed from Temnata and Bacho Kiro in the east of the Balkans (40 ka) via Baranica (Михаиловић *et al.* 1997), Cave above Tabula Traiana in eastern Serbia (Борић, Јевтић 2008) and Peştera cu Oase (Trinkaus 2005) in the southwestern Romania (dated in 35–36 ka) to Šalitrena pećina in western Serbia (32 ka) (B. Mihailović, personal communication). Similar tendency is conspicuous in the dates obtained for the end of Middle Palaeolithic and it is known that in the westernmost parts of the Balkans (Vindija) the Neanderthals survived until 33–32 ka (Higham *et al.* 2006).

However, when the south Balkans and the coastal region are concerned there are at least two elements, which suggest the pattern of change similar to the one confirmed in the Lower Danube basin. Here as well as in the east of the Balkans the Middle Palaeolithic terminated more than 40 ka ago (Crvena stijena, Mujina pećina) while early Upper Palaeolithic at least when the south of the Balkans is concerned (Klisoura) started very early, at approximately same time. Therefore, when the transition from the Middle to the Upper Palaeolithic is concerned we are disposed to assumption that absence of the sites dating from the period between 39 ka and 34 ka is rather the consequence of insufficient investigations than the result of the demographic crisis, which happened, as it is assumed, in the central part of the Apennine Peninsula (Mussi 2002). We also believe, as Basler once also suggested (Баслер 1975), that consequences of the Campanian–Ignimbrite eruption had only limited and temporary effect even in the coastal zone (which was the most exposed) and that they could not be the main reason for cultural and population changes that took place in this period.

Layer X and the problem of Aurignacian

In layer X was discovered the laminar Upper Palaeolithic industry, which did not include the Middle Palaeolithic elements with the exception of one retouched point in horizon Xa. Brodar related this industry to the Aurignacian in the broadest sense (Benac–Brodar 1958, 59), Basler accepted this explanation with some reserves (Баслер 1975, 90–93) and then many works appeared in the end of 1980s (Радовановић 1986; Montet–White 1996; Mihailović 1999) where the industry from this layer was attributed to the earliest industries with backed tools. There were many reasons for that: a) in the industry from layer X there are no carinated and nosed endscrapers; b) blades from horizon Xa (one retouched blade and two endscrapers on blades) do not have typical Aurignacian retouch; c) among the finds from horizon Xa were encountered typical backed bladelets of the type found in the upper layers; d) almost all discovered bladelets are long, narrow and regular while Dufour bladelets have not been found and e) there is a great resemblance between the industry from this layer and the industry from the lower layers at Medena stijena when the structure of the assemblage and the stylistic characteristics of the tools are concerned. Nevertheless, we could not exclude entirely the possibility that finds from this layer could belong to the Aurignacian. The industry from

layer X differs from the Epigravettian industries in layers IX and VIII regarding the structure of raw materials, while semi–steeply retouched bladelets and bladelets with pointed tip have been also recorded in many Aurignacian industries, particularly in the Proto–Aurignacian (Broglio 1996). In addition, more recent investigations at Klisoura (Kouzoumelis *et al.* 2001) and Šalitrena pećina (Mihailović, Mihailović 2009) revealed that numerous bladelets appear in the Aurignacian in the Balkans and among them also the specimens with steep and deep retouch have been encountered (although in small quantity).

It is obvious, for the mentioned reasons, that it is not possible to draw final conclusions about the industry from layer X at this moment, even more so because we could not rule out the possibility of mixing the finds from horizon Xa and the finds from the upper horizons. Whether the industry from layer X (which is preserved within very small area at the site) is at least chronologically close to the proto–Aurignacian will be confirmed, we hope, by the absolute dates. If, however, it turns out that the finds come from the later period it is open to question whether this problem could be solved. The more recent investigations have revealed that there are great difficulties when cultural and chronological distinguishing between Aurignacian and Gravettian in the Adriatic–Ionian region is concerned. In contrast to the north Balkans where the Aurignacian continued until before 27 ka (Bacho Kiro) and where the Gravettian appeared after 27 ka (Šalitrena pećina, Kozarnika, Temnata, Bacho Kiro) the situation is different in the coastal zone. The Aurignacian sites in that area are of relatively late date (Klisoura, Šandalja II) and the Aurignacian coincides chronologically with the Gravettian ((Kouzoumelis *et al.* 2001; Karavanić 2003; Kozłowski 2008). For example, the Gravettian at Asprochaliko dated in 27 ka is almost contemporary with the Aurignacian at Klisoura that lasted until before 18 ka. At Klisoura itself, the level with backed bladelets has been encountered between two Aurignacian horizons and the industry of the late Aurignacian has to a considerable extent the transitional (Aurignacian–Gravettian) character (Kozłowski 2008). The stylistic differences between these two techno–complexes suggest that their bearers were different while many shared elements indicate the possibility of cultural and technological transformation. This question is, in any case, too complex to be discussed here in detail.

Late Upper Palaeolithic

Early Phase

The industries from the early phase of the Late Upper Palaeolithic in Montenegro are just slightly better investigated than the industries from the preceding period (Fig. 19). Even more so, the assemblages of artifacts from only few sites in Montenegro could have been ascribed to this phase. One of these sites is Medena stijena where the industries from layers X and IX clearly distinguish from the industry from the upper layers. To this phase could be attributed also the finds from layer 3b1 at Mališina stijena dated to the half of the 14th millennium BP (Hedges *et al.* 1990) and possibly also the industry from layer X at Crvena stijena that we have already discussed. Almost all mentioned industries are characterized by small number of artifacts (the only exception is Mališina

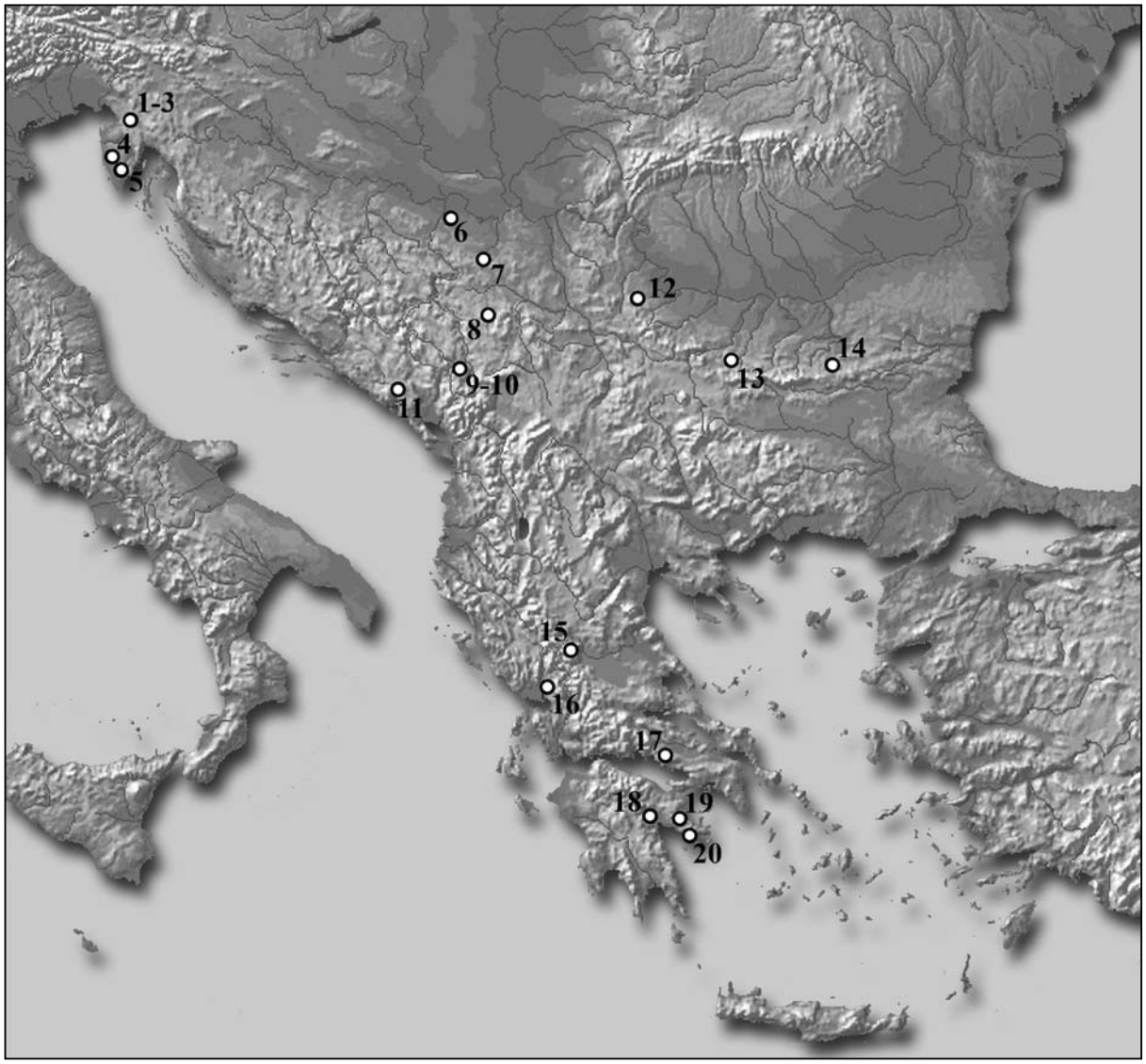

Fig. 19 Gravettian/Early Epigravettian sites in the Balkans, mentioned in the text: Ovča jama, Županov spodmol, Jama v lozi (1–3), Romualdova pećina (4), 5. Šandalja II (5), Kadar (6), Šalitrena pećina (7), Hadži Prodanova pećina (8), Mališina stijena, Medena stijena (9–10), Crvena stijena (11), Kozarnika (12), Temnata (13), Bacho Kiro (14), Kastritsa (15), Asprochaliko (16), Seidi (17), Kephalari (18), Klisoura (19), Franchthi (20)

stijena), the restricted repertoire of tools, the raw materials from distant deposits and the occurrence of blades and tools on blades. Only the bladelets and points with straight back have been encountered of the backed tools, while the geometric artifacts are lacking. In the broadest sense, these industries could be compared with the industries belonging to Gravettian and early Epigravettian as in the Balkans also in the Apennine peninsula.

Very little has been known about the Gravettian in the Balkans until only couple of decades ago. Most of the sites in the western Balkans have not been published in detail, the industries from the southern Balkans have been generally treated just as industries with backed points, it turned out that finds from Kadar in Bosnia date from the Epigravettian period (Montet–White *et al.* 1986) while the Gravettian in Bulgaria was until the end of 1980s known only from the site Bacho Kiro

(Kozłowski 1982). The essential shift happened, however, just after the investigations in Bulgaria. The extensive Gravettian–Epigravettian sequence has been documented in the Temnata cave (Kozłowski *et al.* 1992; 1994), rich Gravettian layer has been investigated in the Kozarnika cave (Tsanova 2003) and Gravettian has also been confirmed in western Serbia, in Šalitrena pećina near Mionica (Mihailović, B. 2008). More recent investigations have revealed that the Gravettian sites (likewise the Aurignacian sites) cluster in the Sava–Danube corridor and that central European elements characteristic of the Pavlovian and the Willendorfian appear at many of these sites. The middle Danube component is most prominent in Šalitrena pećina and is also prominent in the industries from Temnata and Kozarnika (Kozłowski 1999; 2008).

The evolution of the backed tools industries could be followed in Šalitrena pećina and in Temnata even after the Gravettian phase. The layer 4 in Šalitrena pećina where has been encountered rich Gravettian industry with burins, endscrapers and pointed blades, the Gravettian points and micro–points with retouched base and double truncations similar to rectangles is followed by the industry from layer 3 with considerably reduced repertoire of tools (Mihailović, Mihailović 2007; Mihailović, B. 2008). In Temnata, however, above the Gravettian layer appear the Epigravettian horizons, which contain the industry with many elements of continuity considering the preceding phase (Sirakov *et al.* 1994). Particularly characteristic of these layers are bilaterally retouched micro–points with tapered base. The early Epigravettian in the central Balkans appears, except in these caves, also in Kadar in Bosnia (Montet–White *et al.* 1986), probably in Hadži Prodanova pećina in western Serbia (Михаиловић, Михаиловић 2006) and at few more sites, which have not yet been published in detail (Malez 1979).

The early industries with backed tools in the south Balkans have been classified into three phases (Kozłowski, Otte 1997, 24–25). To the first phase, which corresponds to the period between 28 ka and 25 ka are attributed the industry from layer 9 at Asprochaliko dated in 26100± 900 BP and the finds from layer D at the site Kephalari. To the second phase, i.e. the period between 25 ka and 21 ka are attributed the industries from the lithic phase II at Franchthi cave and stratum 7 at Kastritsa and to the third phase, i.e. the period between 21 ka and 15/16 ka, the finds from stratum 5 at Kastritsa, layers D1–D2 at Kephalari and the artifacts from the Seidi cave (Higgs, Vita–Finzi 1966; Perlès 1983; 1987; 1999; Hahn 1984; Adam 1989; Kozłowski 1996). The stadial horizons in the north Adriatic and the west Balkans have been documented at the sites in Slovenia and Croatia: in Ovčja Jama and Jama v lozi (Brodar 1986; Osole 1979) and in layer C of Šandalja II (Malez 1979; Montet White, Kozłowski 1983), while the horizons from the stadial Lascaux, i.e. Philippi have been ascertained in layer C of Romualdova pećina, in layer 2/A–B at Županov spodmol (dated in 16780± 150 BP) and in layer IIb at Kadar (Montet White, Kozłowski 1983; Montet–White *et al.*1986). In the Apennine peninsula the industries from the sites Paglicci (layers 21–22), Cala (layer Beta II–I), Mochi (layer D) and Calanca (layers 6–4) correspond to the undifferentiated Gravettian (Palma di Cesnola, Bietti 1983) and the industries from layers 18 and 17 at Paglicci and from many other sites where the leaf–like and shouldered points have been encountered are ascribed to the early Gravettian (Palma di Cesnola, Bietti 1983; Mussi 2002).

There are still not enough elements, which could make possible distinguishing the industries of the early phase of Epigravettian in the Adriatic–Ionian region in the same way as it has been

done with the industries from the sites in Italy (Bartolomei *et al.* 1979; Bietti 1997; Mussi 2002). Yet, common elements in evolution of the backed tools industries in these two regions do exist: the Gravettian in the Apennine Peninsula as well as in the Balkans is followed by the Epigravettian industries with small amount of finds (Paglicci is the exception), limited repertoire of tools and the shouldered points. The differences are discernible in the fact that in the Balkans the burins are less numerous and shouldered points less frequent (in Montenegro just one atypical specimen has been found in layer IX at Crvena stijena) and leaf–like points are entirely lacking.

The question arises what factors had the impact on similarities and diversities in the material culture between different parts of the Balkans as well as between the east Adriatic coast and the Apennine Peninsula. Although the glaciation of the Alps and the Dinarides during the maximum of the Last Glacial could have substantially impeded the communication between the coastal area and the hinterland (Mussi 2002; Mihailović, Mihailović 2007) there are elements, which suggest cultural proximity of the industries from both sides of the Adriatic. It has been noticed that elements of the Mediterranean Epigravettian appear in the Epigravettian of the Sava basin (Kadar) and the Danube basin (Temnata) along with the central European and local (Balkan) component and vice versa, meaning that shouldered points appear in Italy and in the Balkans later than in central Europe (where they were present already from 25 ka) and that they last until before 14 ka (Kozłowski 1999; 2008). It is logical to assume that occurrence of similar elements in the material culture was decisively influenced by population movements during the Last Glacial Maximum. However, it should be taken into account that this could have also happened because of other reasons: mobility of the communities (and consequently possibility to establish cultural contacts) was greater, the way of life was similar and shouldered points (as tips for the long–range projectiles) could have survived in the south Europe as long as there were possibilities for hunting large animals in the steppe environment.

It is assumed that the Balkans was during the Last Glacial Maximum the refugial area (Ginter *et al.* 1994) despite the fact that very few sites from that period have been discovered in Italy as well as in the Balkans. This perhaps should not be surprising considering that investigations have been so far generally directed toward investigation of the cave habitations in the hinterland. Taking into account that certain parts of Europe (Iberian Peninsula, Franco–Cantabrian region, Great Russian plain) were densely populated during this period, some authors think that also in south Europe the aggregation of the resources (and population) took place in nowadays flooded north Adriatic plain (Miracle 2007). Here, we must lay emphasis on two moments. First, even if there was a swamp in the lowermost zones of the plain (Mussi 2002), this was certainly not the case with at that time considerably wider coastal zone (Miracle 2007). Second, if the north part of the eastern Balkans offered favorable living conditions it could be assumed that similar conditions also existed in the secluded areas (ravines and river valleys) in the peninsula interior. Otherwise, the settling at that time was probably logistically organized and the economy was based on hunting for the bovides, equides, cervides and caprines. The hilly and mountainous region was settled occasionally in the warm seasons and climatic phases and at some sites like Klithi and Kastritsa there is evidence for the intensive hunting of ibexes and red deers (Bailey *et al.* 1983a; 1983b; Gamble 1997).

Middle Phase

The industries from layer IX at Crvena stijena and layer VIII at Medena stijena have, in a sense, the transitional character. There appear the elements of earlier and later phase and they are particularly characterized by the frequency of large–sized points. It should be emphasized when the phenomena indicating later phase are concerned that arched backed points and artifacts typical of the ensuing period (microlithic endscrapers, truncations, geometric tools) have been encountered. Crvena stijena is characterized by the endscrapers made on splintered pieces, while Medena stijena is characterized by exceptionally high incidence of nosed endscrapers on flakes.

We have not found adequate analogies for the mentioned elements. The massive arched points and points with tip in the tool axis similar to those from Medena stijena have been found in Ovčja jama in Slovenia but they are dated in the early phase of Epigravettian – radiometrically in 19540± 500 BP (Brodar, Osole 1979, 146–147; Osole 1979, 181–186). It could be assumed on the basis of the quantity of endscrapers on flakes and sporadic appearance of the geometric microliths that these industries are related both culturally and chronologically to the industries from layers, which definitely date from the Late Glacial. Nevertheless, it is difficult to estimate their date at this moment. Considering that the cold climate species – Alpine wolf (*Cuon alpinus*), Alpine marmot (*Marmota marmota*), Alpine hare (*Lepus timidus*), ibex (*Carpa ibex*) and whooper swan (*Cygnus cygnus*) still appear in layer IX at Crvena stijena and that in layer VIII at Medena stijena the steppic fauna (*Bison priscus*) was recorded it is not impossible that they date from an even earlier period.

Late Phase

Most of the industries from the sites in Montenegro (Crvena stijena VIII, Medena stijena VII–V, Trebački krš II, perhaps also Mališina stijena – layer 2) date from the late phase. All of them could be ascribed to the final Epigravettian, which appears in the south and southeast Europe from Bølling–Allerød interstadial to the beginning of the Holocene (Fig. 20). The industries are of the microlithic character and they are characterized by the arched backed bladelets, backed truncations, geometric artifacts and circular and thumb–nail endscrapers. The occurrence of the mentioned elements is related to the process of Azilianization (or Romanelization), which by the end of Late Glacial encompass diverse techno–complexes in the area of European Mediterranean coast (Kozłowski, Kozłowski 1979).

Three stages in Azilianization of the Epigravettian cultures in Montenegro could be distinguished. In the initial stage, in the industries from layer VII at Medena stijena and probably layer 2 at Mališina stijena (south trench) the elements of Azilianization appear in traces and are manifested in smaller dimensions of endscrapers and small quantity of backed truncations, atypical geometric artifacts and segments. In the next stage the circular endscrapers occurred while variability and proportional incidence of short endscrapers on flakes, backed tools and geometric tools reach its peak (Medena stijena VI, Crvena stijena VIII). In the final stage the hipermicrolithization of endscrapers and backed tools took place and very narrow retouched bladelets did occur, the incidence of geometric tools decreases; the massive denticulated tools (Medena stijena V, Trebački krš II) and

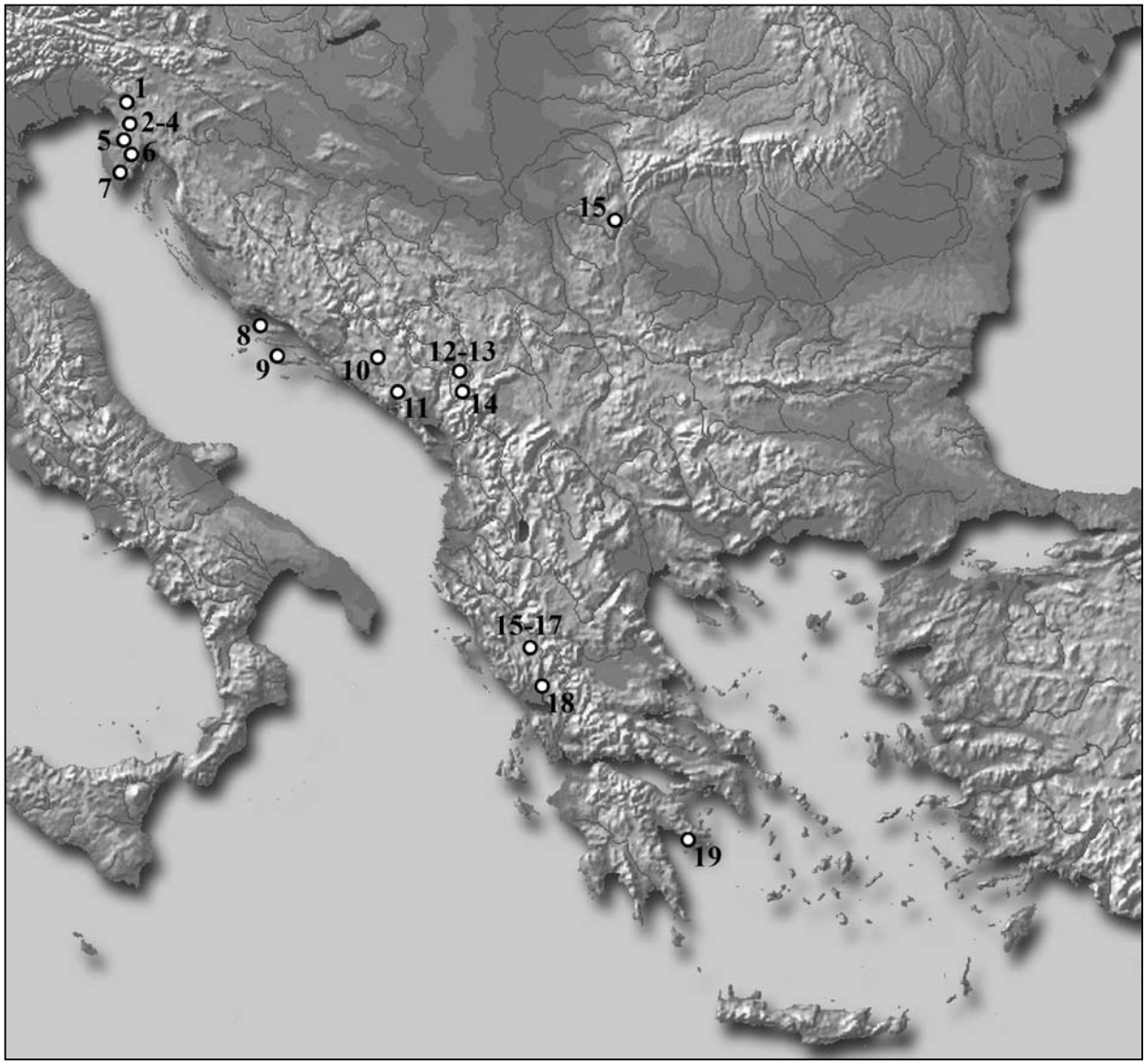

Fig. 20 Late Epigravettian sites in the Balkans, mentioned in the text: Matjaževe kamre (1), Ovčja jama, Županov spodmol, Jama v lozi (2–4), Nugljanska pećina (5), Vešanska pećina, Pupićina pećina (6), Šandalja II (7), Kopačina pećina (8), Vela spila (9), Badanj (10), Crvena stijena (11), Mališina stijena, Medena stijena (12–13), Trebački krš (14), Klithi, Megalakkos, Boila (15–17), Asprochaliko (18), Franchthi (19)

the elements resembling the process of Sauveterrianization appeared. This is the process, which characterizes the evolution of industries in the parts of west and central Europe in the beginning of the Holocene (Kozłowski, Kozłowski 1984). Still, the genuine bilaterally retouched Sauveterrian points have not been encountered at the sites in Montenegro.

Parallels with Badanj

The parallels between Crvena stijena and the contemporary sites could be drawn both at more limited and broader regional level. At more limited level the parallels could be drawn with

Badanj and other sites in Montenegro. On the broader plan they could be established between the north and the south Balkans as well as between the sites along the coast and in the Apennine peninsula.

The Epigravettian site Badanj near Stolac is only around forty kilometers far from Crvena stijena (Whallon 1999). The absolute dates obtained for this site (Heges *et al.* 1990, 214) reveal that the lower horizons, dated in the end of 14th millennium BP, are somewhat later than expected (Montet White, Kozłowski 1983, Tabl. I). The straight backed bladelets significantly prevail in this phase in relation to those with arched back, the incidence of endscrapers on flakes is low and geometric artifacts (segments and triangles) are not frequent. Not only the date but the actual presence of these tool types indicates that the industry from the lower layers at Badanj could correspond to the first stage in the process of Azilianization of the Epigravettian industries in this area.

The greatest changes in the upper layers at Badanj are noticed in considerably higher incidence of endscrapers (particularly circular and thumbnail ones), in considerably smaller total quantity of the retouched blades and flakes, in the decrease of the index representing ratio between the straight and arched backed bladelets and in slightly greater incidence of the geometric tools. These tendencies generally coincide with the tendencies documented in the industries from the Epigravettian sites in Montenegro. However, very big differences could also be noticed in the structure and typology of tools. These differences, when Badanj is concerned, are discernible in almost complete absence of burins and considerably higher incidence of endscrapers (particularly in the later period) as well as in conspicuously lower incidence of many tool categories: sidescrapers, denticulated and notched tools, perforators, truncations and even geometric tools (at least in comparison with Medena stijena). Also, massive arched backed points appear in both phases at Badanj as well as bilaterally retouched backed bladelets, which have not been encountered at the sites in Montenegro.

It should be added to all mentioned above that the question arises whether the latest layers at Badanj (2a, 2b) date from the Pleistocene or the Holocene. They are, like also at Crvena stijena, of different sedimentological composition (of grayish color) and contain large quantity of shells of terrestrial snail (Miracle 1995; Whallon 1999). The remains of typical Holocene fauna were encountered in these layers, while the remains of cold climate species are lacking (Miracle 1995). It is apparent for these reasons that more precise chronological determination of layers 2a and 2b is not possible without new absolute dates.

Parallels with the sites in the neighboring regions

In the recent years have started the investigations of the Konispol cave in the south Albania but only preliminary results have been published so far (Elwood *et al.* 1996; Korkuti 1997; Harrold *et al.* 1999). The cave yielded the Upper Palaeolithic horizon (26700± 180 BP) whose cultural provenance is not possible to determine at the moment and also the Mesolithic layer with the industry similar to the one ascertained in layer D at the site Sidari in Corfu (Sordinas 1970; 2003). The Mesolithic industry is dated in the period from 6703 to 6174 cal BC. The closest parallels could be

still established with the sites in Greece and first of all with Franchthi cave, which despite being the remotest yielded the horizons, which bear witness to the frequent settling in the period from the 23–22nd millennium BP to the emergence of the Neolithic (Perlès 1987; 1990;). However, for the comprehension of the Palaeolithic and the Mesolithic in Montenegro very important are also the sites in the canyon of the Voidomatis River in the mountain zone of Epirus – Klithi, Boila and Megalakkos (Bailey 1997; Kotjabopolou *et al.* 1997; Sinclair 1997) but also the previously known sites like Kastritsa and Asprochaliko (Higgs, Vita–Finzi 1966; Higgs *et al.* 1967; Bailey *et al.* 1983a; 1983b).

The early phases of industries with backed tools in Epirus are represented by the industries from layer 9 at Asprochaliko and stratum 7 at Kastritsa and we already commented on them. However, we did not know much about the Final Palaeolithic until recently except that the microlithic industry with thumbnail endscrapers and geometric tools appear in the upper layers (1–5) at Asprochaliko. In more recent times these industries have been studied in detail especially from the aspect of the raw materials and the products of knapping technology (Adam 1989; 1997).

The microburin technique, which is totally lacking in all phases at Asprochaliko, appears in strata 5–3 at Kastritsa. There were also encountered the shouldered and bifacial points, as well as the products of the microburin technique and small quantity of geometric tools (Perlès 1983, Adam 1989). The endscrapers–points (similar to those from the sites in the western Balkans) and somewhat larger retouched blades of the type found in Montenegro only in the horizons dated to the earlier phase of the Epigravettian appear in stratum 5. The shouldered points have been confirmed in strata 5, 3 and 1 and massive arched points in stratum 3 (Adam 1997, 491–494). It should be added that shouldered points have been recorded also in the Epigravettian layers of the Seidi cave in Beothia but their chronological position could not be precisely established.

Klithi yielded many horizons dated between 16th and 10th millennia BP. There have been gathered rich chipped stone industry containing the straight backed bladelets, bilaterally retouched bladelets and distinctly manufactured truncations ('fracture transversale Klithienne' or F.T.K.after C. Roubet – see Roubet 1997) and endscrapers on flakes. There is no information about the rate of occurrence of the arched backed bladelets or the geometric tools. The bone tools, particularly awls, resemble the tools found at Crvena stijena but the difference being also rather large number of needles found at Klithi (Adam, Kotjabopoulou 1997).

Another two sites in the Voidomatis River valley also offer rather important evidence. Megalakkos is situated in the immediate vicinity of Klithi and yielded faunal remains and chipped stone artifacts dating from the 16th millennium BP (Sinclaire 1997). The rock–shelter Boila is also situated on the bank of the Voidomatis River but at the very entrance to the Vikos canyon. The cultural layers of the rock–shelter have been radiometrically dated in the period from the 14th to the 11th millennium BP (Kotjabopoulou *et al.* 1997). They yielded laterally and bilaterally retouched backed bladelets and points and many products indicating use of the microburin technique. The industry from Boila is in many elements similar to the industry from stratum 1 at Kastritsa. The authors do not rule out that there is also the Epipalaeolithic, i.e. the Mesolithic layer at the site (*Ibid*.)

The small quantity of triangles as well as the backed truncations also appear at Franchthi from the lithic phase III (which is not dated) and IV (dated in 12540 ± 180 BP) as well as at the beginning of the late phase of Epigravettian in Montenegro (Perlès 1987, 134 sq.). However, the

products obtained by the microburin technique also appear in the lithic phase IV at Franchthi in contrast to the sites in Montenegro. In phase VI (dated between 10880 ± 160 BP and 10260 ± 110 BP) microlithization and variability of steeply retouched and geometric tools reached its peak. The denticulated tools are very frequent in these phases, there are still the products of microburin technique and they are also characterized by bilaterally retouched backed bladelets. It is interesting that short endscrapers are infrequent in both phases and that massive endscrapers on flakes made of low quality raw materials are prevailing. There is also small number of artifacts made of obsidian from Milos that could have been transported only by the seaways. The upper layers 1–5 of Asprochaliko probably also date from this period (Higgs, Vita Finzi 1966; Perlès 1983).

In contrast to the sites in Greece where backed tools prevail almost as a rule, it is not the case at the sites in central and north Dalmatia, except in Nugljanska pećina and Vešanska pećina (Montet–White, Kozłowski 1983; Komšo, Pellegatti 2007). It seems that they are at least in that regard much closer to the sites in Montenegro. In Kopačina pećina in Brač are confirmed one Final Palaeolithic and one Early Holocene horizon (Montet White, Kozłowski 1983; Čečuk 1996; Komšo 2006). The Pleistocene horizon contains many short endscrapers, burins, truncations, arched backed points, segments and splintered pieces. The Epigravettian industry with short endscrapers and arched points has also been encountered at Lopar in Rab (Malez 1974), while many Gravettian and Epigravettian horizons have been recorded in Šandalja II (Malez 1979, 257–259).

It is interesting, when Šandalja II is concerned, that retouched blades and points with shallow or semi–steep retouch prevail in almost all layers, from stratum ‘c’ (21740 ± 450 BP) up to the stratum ‘b’(10830 ± 50 BP) (Montet White, Kozłowski 1983, 382). The only exception is the lower level of stratum ‘b’ (12320 ± 160 BP) with as much as 42.5% endscrapers (in contrast to 34.0% retouched blades and points). Otherwise, the evolution of industry at this site basically corresponds to the evolution of the Epigravettian in Montenegro. The bladelets and points with straight back (22.8%) together with shouldered points (7.0%) appear in the lowest horizon – stratum ‘c’. The segments start from the lower level of stratum ‘b’ (one specimen) and reach 3.7% in the middle level and 5.9% in the upper level. The steeply retouched truncations are, like at Medena stijena, the most frequent in the latest Pleistocene layer (they appear only in upper level of stratum ‘b’ – 6.9%). Anyhow, the microlithic short endscrapers on flakes distinctively prevail over other variants in all levels of stratum ‘b’.

The Epigravettian evolution at the sites in the Slovenian karst (Županov spodmol A/B, Jama v lozi, Ovčja jama 3) is similar to that at Šandalja and other Istrian sites: Vešanska, Nugljanska and Pupićina pećina (Brodar, Osole 1979; Osole 1979; Brodar 1986; Montet White, Kozłowski 1983; Komšo, Pellegatti 2007). They are characterized, among other things, by burin frequencies equal to or exceeding those of endscrapers. Likewise at Šandalja, the retouched blades and points are very frequent at Županov spodmol, Matjaževe kamre and Ovčja jama. Shouldered points were recorded at Šandalja II, Županov spodmol, Jama v lozi and Ovčja jama (Montet White, Kozłowski 1983).

Finally, we will not discuss extensively the sites in the Apennine peninsula regardless of the fact that they were used for a long time as the sole reference point for defining cultural manifestations in the Upper Palaeolithic and the Mesolithic in Montenegro. The evolution of the Final Epigravettian in this area coincides to the great extent with Final Epigravettian in Montenegro and

it could be particularly well observed at the sites in northern Italy (Bisi *et al.* 1983) as at the sites in the natural shelters (Tagliente 16–4, Battaglia, Fiorentini) also at the high Alpine sites in the open area (Piancavallo, Andalo etc.). Considerable resemblances could be noticed also when the sites in southern Italy are concerned (Paglicci 9–2, Taurisano 5–1, Ugento, Romanelli E–C) (Bartolomei *et al.* 1979), and the increase in incidence of splintered pieces at some sites including Taurisano, Cipoliane C and Romanelli (Bietti 1990, 129) speaks in favor of the assumptions about cultural proximity between the Adriatic–Ionian facies in the Apennine peninsula and the Epigravettian industries on the east Adriatic coast (Whallon 1999; 2007). Also, as well as in Montenegro, there is evidence in south Italy that Epigravettian in the form of so–called Epiromanellian extends in the Holocene (Cavallo BII–I, Cipoliane 2–1, Uluzzo – Bietti 1990, 131).

Factors of technological changes in the Late Upper Palaeolithic

As it could be concluded from the above explanations the technological changes, which could be perceived at Crvena stijena correspond with the general tendencies of evolution of the Late Upper Palaeolithic in the southeast Europe and the north Mediterranean as far as the Antalya region in Asia Minor. The cultural regionalization could be observed within this entire area, and it could be discerned, at least when Montenegro is concerned, in the fact that Crvena stijena and the Adriatic zone are characterized by the lower incidence of geometric artifacts and central Balkan region is characterized by the lower incidence of splintered pieces and Azilian elements (arched backed points, circular endscrapers etc.). Nevertheless, the Late Upper Palaeolithic in this region was not characterized only by technological innovations but also by changes in the way of life of the hunter–gatherer communities. The characteristics of that period are recolonization of the hilly and mountainous region, decrease in the mobility of communities and increase in intensity of settling the natural shelters. The economy is not based any more on hunting for the big animals nor is it of the specialized character. It is characterized by expanding of the resource basis, i.e. by hunting for two or three animal species in the closest vicinity of the settlement.

The most frequent in layers IX and VIII at Crvena stijena are the remains of red deer and wild boar, the bovides are less frequent and the ibex is represented by just one identified remain in each layer (Rakovec 1958; Малез 1975). There were also recorded the remains of roe deer in layer VIII. The situation is similar at other sites in Montenegro. The remains of bovides, ibex and chamois were encountered in layer 3 and the remains of roe deer and red deer in layer 2 at Mališina stijena (Dimitrijević 2004). At nearby Medena stijena the bison appears only in layer VIII, red deer and ibex were recorded in layer VI and most numerous finds in layer V are the bones of ibex. The ibex and the chamois are the only species of the hunting fauna in layer II at Trebački krš (Dimitrijević 1999). Despite large quantity of artifacts and many mostly fragmented long bones only small number of specimens could have been identified at Mališina and Medena stijena, (Dimitrijević 1996; Bogićević, Dimitrijeveć 2004) indicating that parts of the animals hunted in different biomes had been brought to the rock–shelters. In that regard these dwelling places could be rather characterized as base than as temporary, i.e. transit camps.

Very similar situation has been also encountered at other Final Palaeolithic sites in the Balkans. As we already mentioned the sites where the remains of only one species prevail date generally from the earlier period, while two or three species are equally represented at most sites from the end of the Pleistocene. Thus, caprines and cervides prevail at Asprochaliko and at Badanj (like at Medena stijena) while caprines and wild boar prevail at Cuina Turcului (Bolomey 1970; 1973; Bailey *et al.* 1983; Miracle 1995). This is confirmed in a certain way by the remains from Mališina stijena where the remains of many species of birds and fish have been discovered (Bogićević, Dimitrijević 2004), while the evidence for gathering mollusks is recorded in Istria and in the south of the Balkans (Miracle 2003; Lubell 2004). Nevertheless, it should be emphasized that there are no elements of the broad spectrum economy (Miracle 1995) at any of these sites except possibly in Franchthi cave (Perlès 1999). There is evidence, not so convincing as in some other parts of Europe (e.g. in Iberian Peninsula), that intensification of hunting for ibexes also took place in the Balkans by the end of the Pleistocene (Medena stijena V, Trebački krš II, Cuina Turcului II).

The natural shelters were frequently inhabited in this period during many successive seasons in the long period of time, but maintaining at the same time more or less the same function. This is particularly conspicuous at Medena stijena where the zones of activity in layers VI and V are almost totally overlapping (Mihailović 2004b). We are convinced that reasons for this situation should not be looked for only in the environmental conditions and the morphology of settlements. There are enough elements to assume that hunter–gatherer communities in this period did not have the passive attitude toward the environment and the opportunistic approach in providing resources but that they, by all appearances, practiced the organized settlement pattern where every dwelling place had its distinct role. Despite the difficulties concerning the reconstruction of the settlement pattern it is evident that multiple specialization and diversification in many aspects of human activity including technology, economy and even settling took place in this period. The optimization of hunting strategy and technological system through the operationalization of activities and standardization of the knapping products created an illusion about economizing with the resources (or it was perhaps the purpose of this hole strategy).

It is quite possible that re–occupation of hilly–mountainous zone and establishing of organized settlement pattern could have happened because, among other things, of the rise of sea level, restriction of living space and increase in population density in the coastal region (Miracle 2007). They could have been also influenced (significantly if not decisively) by the quantity, seasonality and distribution of the resources in relatively deprived postglacial environment (if compared to the Holocene). However, it could be assumed and with reason that the territoriality was more prominent and the mobility was less intense in this period in comparison with Last Glacial Maximum and that high level of cultural and social integration had been achieved. The organized settlement pattern and the way of obtaining the resources along with prominent territoriality certainly had the root in tradition as well as in distinct degree of social and cultural integration (Mihailović 1999; 2007a). This is confirmed by the cultural regionalization, which was recorded not only in the western parts of the Mediterranean basin but also in the Adriatic zone (Mussi 2002; Whallon 2007).

Yet, something else should be emphasized here. Howsoever it could be assumed that intensification and diversification in obtaining the resources had not been based on cultural contacts

(in contrast to the period of transition to agriculture), it is hard to imagine that the occurrence of distinct elements in technology and style of tool production in different regions happened independently, without any external influences. The resolution and directions of distribution of the intercultural trends are still impossible to comprehend in details. It is, however, conspicuous that the Mesolithic elements appear earlier in the southeast Europe than in the west of the continent and that is the reason why C. Perlès pointed to the Mesolithization of the economic activities, which have been documented at Franchthi (Perlès 1999). However, the Mesolithic elements in the Final Palaeolithic of the southeast Europe did not occur only in the economy. We have already mentioned earlier that in layer V at Medena stijena appear (not quite typical) Sauveterrian elements, which are discernible in the hypermicrolithic character of industry, the appearance of various types of triangles and massive denticulated tools (Mihailović 1996). The investigations in Greece have confirmed that such elements are sporadically present at some other sites: at Franchthi, at the transition between the lithic phases VI and VII, in the lower Mesolithic layers at Klisoura (Koumouzelis *et al.* 2003) and in unit IV in the rock shelter Boila in south Epirus (Kotjabopoulou *et al.* 1997). It is, therefore, obvious that there is no distinct difference between the Final Palaeolithic and the Early Holocene industries in this area. All this should be taken into account when considering cultural and chronological position of the industry from layers VII–V at Crvena stijena.

Epipalaeolithic and Mesolithic

Crvena stijena VII–V and the problem of the Early Mesolithic in the Balkans

As we have already emphasized it is not possible to determine with certainty the date of the layers VII–V and it is not certain that it would be possible even in the future. These layers are not preserved at the site, the faunal remains are lacking and it is a big question whether the bone tools contain enough collagen for the dating. On the basis of the sediments composition and the fauna structure the industry from these layers was once attributed to the Pleistocene (Баслер 1975; Brunnacker 1975), while sometime later mostly on the basis of the character of the industry it was attributed to the Holocene period (Montet–White, Kozłowski 1983). The finds from the lowermost undisturbed Holocene layer, which according to color and composition probably corresponds to the lower level of layer IV have been dated after more recent investigations in 7700–8190 cal BC (Beta–211505) (Baković *et al.* 2008). On the basis of this evidence it could be assumed that layers VII–V are earlier than this date but it is not clear how much earlier.

The Early Mesolithic of the east Adriatic coast is very insufficiently investigated in contrast to the Final Palaeolithic (Fig. 21). From this period probably date horizons Ia and Ib at Trebački krš (Đuričić 1996), as well as the finds from Kopačina pećina (Čečuk 1996; Komšo 2006), Vela spila (Čečuk, Radić 2005) and Pupićina pećina (Miracle 2001) that are still not published in detail in contrast to the faunal remains. The site Zalog pri Verdu in Slovenia in the furthest northwestern area dates from the Early Mesolithic (Kavur 2006), while in the extreme south it has been encoun-

tered in the Franchthi cave (Perlès 1990), in Theopetra (Kyparissi–Apostolika 2003), in Klisoura (Koumouzelis *et al.* 2003) and in the Cave of Cyclope in the island Ioura in the Sporades (Sampson *et al.* 2003). Many Mesolithic sites in the Iron Gates including Padina, Vlasac and some other sites including perhaps also Cuina Turcului (layer II) also date from this period (Radovanović 1996).

The precise regional and chronological distinguishing of the Early Holocene industries in the Balkans is impossible for the time being, so the conclusions drawn by few authors about this period even couple of decades ago are still valid. As Kozłowski and Montet–White suggested (Montet–White, Kozłowski 1983) the Early Mesolithic industries in the northwest of the peninsula are more related to the Italian sequence and the Sauveterrian elements, characteristic of the Gulf of Trieste and sub–Alpine regions are somewhat more frequent in these industries. The Epigravettian

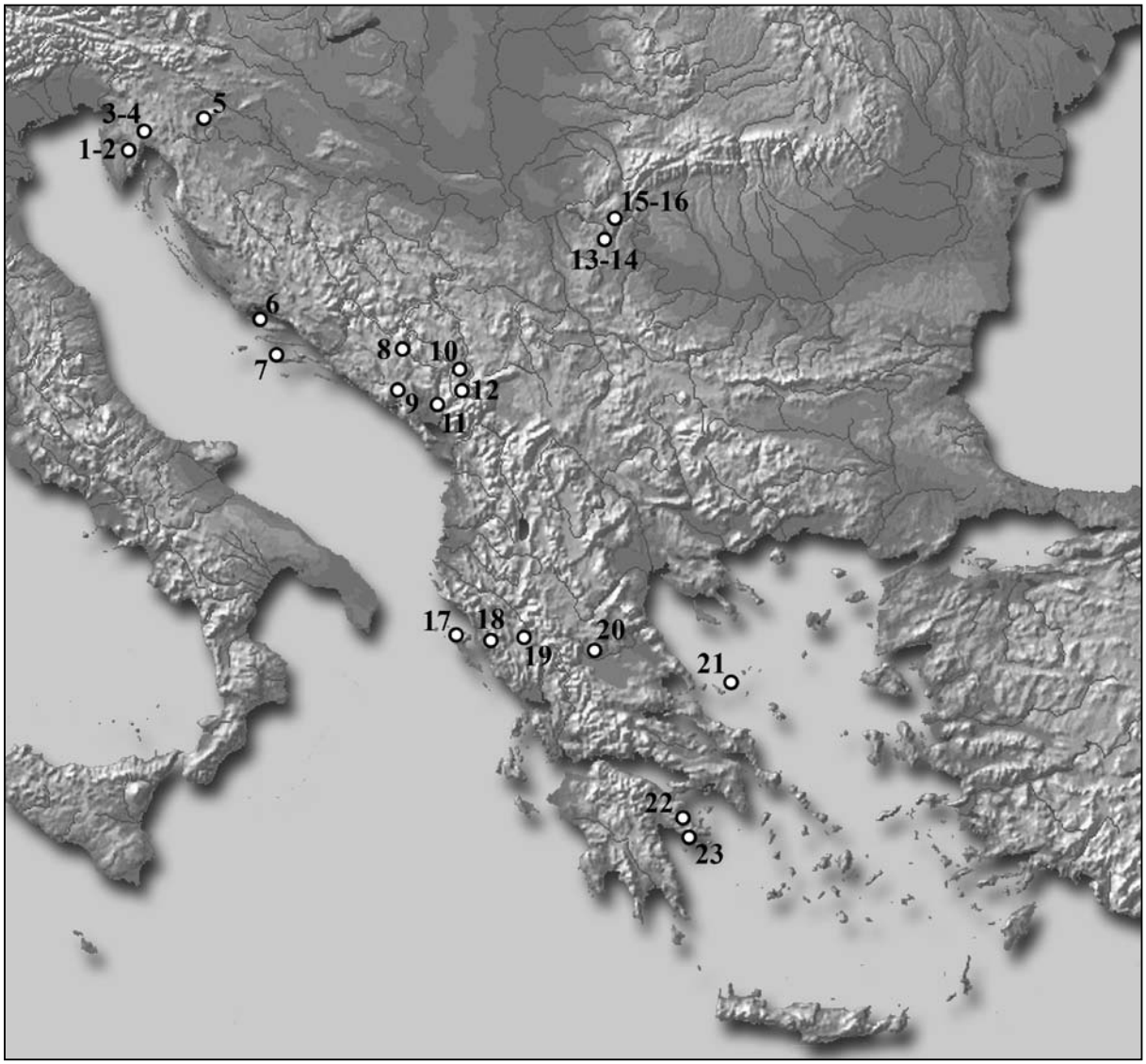

Fig. 21 Mesolithic sites in the Balkans, mentioned in the text: Lokve, Pupićina pećina (1–2), Viktorjev spodmol, Mala Triglavica (3–4), Zalog pri Verdu (5), Kopačina pećina (6), Vela spila (7), Odmut (8), Crvena stijena (9), Medena stijena (10), Vruća pećina (11), Trebački krš (12), Padina, Vlasac (13–14), Icoana, Razvrata (15–16), Sidari (17), Konispol (18), Boila (19), Theopetra (20), The Cave of Cyclope (21), Klisoura (22), Franchthi (23)

component is prominent in the central Adriatic area, in Montenegro and in Greece (particularly at Trebački krš, Boila and Klisoura) and that is the reason why the Epigravettian of this area was once attributed to the Holocene Epigravettian (so–called Epitardigravettian), close to the Epiromanellian in the Apennine Peninsula (Kozłowski, Kozłowski 1984). On the other hand, the steeply retouched tools are exceptionally scarce in the industries encountered in Franchthi (lithic phase VII), Theopetra and in the Cave of Cyclope. Similar situation has been confirmed also in the Iron Gates. As I. Radovanović noticed (Radovanović 1981) the final Epigravettian of Cuina Turcului is followed by Early Holocene industry from Padina with smaller incidence of steeply retouched tools as well as the industry from Vlasac where just a few backed bladelets have been encountered (Kozłowski, Kozłowski 1982). Vlasac is contemporary with other quartz industries of the Lower Gorge in the Iron Gates (Icoana, Razvrata and other sites) where steeply retouched tools are entirely lacking (Radovanović 1996).

It could be noticed that tendency of technological decline manifested in the increase of low quality raw materials, flakes and tools on flakes is parallel with disintegration of the Epigravettian techno–complex in the Balkans (Mihailović 2001). This phenomenon was originally noticed in lithic phase VII of the Franchthi cave but it remained rather unnoticed for quite a long time and related only to Greece (Perlès 2003) because of the tendency to study industries exclusively within national and even more restricted geographic borders (Iron Gates). The decline is manifested in Greece (at the sites Sidari and Franchthi – lithic phase VII) not so much when the raw materials are concerned but when the knapping technology and repertoire of tools are considered (Perlès 1990; 2003; Sordinas 1970; 2003). The rate of occurrence of 'pièces à retouche linéaire' at Franchthi increases from 11.2% in phase VI to even 64.5% in phase VII (Perlès 1990). The tools on flakes are abundant at Theopetra while the backed tools are almost entirely lacking – just a couple of thick backed bladelets have been found. Similar bladelets were recorded also in the Cave of Cyclope where like at Franchthi many tools on irregular flakes (endscrapers, retouched flakes, splintered pieces) have been found (Sampson *et al.* 2003). In contrast to this, the tools on massive and irregular flakes were not recorded in such high proportion in layer D at the site Sidari in Corfu (Sordinas 1970; 2003).

As we have already mentioned the decline in quality of the raw materials used for knapping was recorded in Montenegro at Trebački krš as well as at Crvena stijena and high proportion of low quality sorts of raw material was also encountered in horizon IVb2 at Crvena stijena and layer IV at Medena stijena. The incidence of blades reaches its minimum in layers VI and V at Crvena stijena while the rate of occurrence of tools on flakes of the Laplace's (1964) 'supstrate' category (sidescrapers, retouched flakes, denticulated and notched tools, raclettes) is considerably higher at Crvena stijena (layers VII–IVb2) as well as at Trebački krš in layers Ib and Ia than in the lower, Pleistocene layers. Identical tendencies have also been confirmed in the Mesolithic of the Iron Gates (Radovanović 1981; Mihailović 2001). The situation is similar even at the site Zalog pri Verdu in Slovenia dated around the mid 8th millennium cal BC where the retouched flakes, sidescrapers and endscrapers on irregular flakes reach high proportion while the steeply retouched tools are very infrequent (Kavur 2006).

It could be observed, on the basis of all this, that phenomenon of technological decline is not characteristic only of Greece, the Iron Gates or some other region but that it is one of the main

characteristics of the Early Mesolithic in the Balkans. Similar manifestations, though not in such measure, have been documented in the Mesolithic of Italy, Corsica and Spain (Perlès 2003), and even in the other parts of the west Europe. It is obvious, therefore, that absence of the characteristic microliths and the Mesolithic elements characteristic of central and west Europe could not be explained by the isolation of the Balkans but that it is, in fact, the technological model, which bears witness to the successful adaptation of the hunter–gatherer communities to the changed ecological environment in the Holocene. As many authors have emphasized the appearance of the expedient technology is in direct correlation with changes in extent and character of settling and with different activities in settlements and dwelling places. To put it more simply, the industries with higher incidence of transformation tools etc. should be associated to the base camps and residential activities and the industries with higher proportion of projectiles to the hunting stations. Within that context it could be expected in the future to find the sites in the Balkan interior with the industry similar to the one, which is documented at Boila and Trebački krš, perhaps even the sites with higher rate of occurrence of the Sauveterrian elements.

It is well–known that way of life and economy changed substantially in the Early Holocene that littoral areas had been settled and that diversification and intensification in the resources procurement had taken place. In all better investigated regions (Greece, Iron Gates, Slovenian karst) there is evidence that besides hunting for the forest fauna (red deer, roe deer and wild boar) there was also practiced hunting for the birds and small mammals as well as collecting of the mollusks and fishing (Miracle 2001). But, it must be emphasized that technological changes had not been influenced only by ecological and economic factors. Parallel with the gradual changes in the settlement pattern and economy the entire cultural system had changed but we know very little about that so far. The elements of identity are not conspicuous in the knapping technology any more and the innovations appear in other domains: in the production of bone tools, in the hunting technique, in the funerary practice. Despite the tendency of social seclusion, which will finally result in the emergence of the Lepenski Vir culture, the contacts with distant areas still exist.

So, how we should understand the industry from layers VII–V at Crvena stijena in that context. According to the structure of raw materials, products of knapping and the retouched tools (made on somewhat larger flakes) this industry corresponds much more with the Early Holocene industries than with any Final Palaeolithic industry in Montenegro. Nevertheless, if it turns out that these layers date from the Pleistocene it would not be surprising. We have seen that geometric artifacts are lacking in the industries from the east Adriatic coast, particularly those dating before the Younger Dryas, and that rate of occurrence of the low quality raw materials, flakes and tools on flakes is not negligible in those industries. Withal, there are indications that ecological (and consequently economic) changes in Greece took place somewhat earlier than in other parts of Europe, so we could not disregard the possibility that similar ecological conditions existed also in the area of the south Adriatic.

Disregarding the problems in studying layers VII–V it should be emphasized that also the industry from horizon IVb2 that probably corresponds to layer 4 at the cave entrance (recently dated in the end of 9th and the beginning of 8th millennium cal. BC) certainly belongs to the technologically impoverished Mesolithic. It has been established already some time ago that there are not

many elements from horizons IVb1 and IVa in horizon IVb2 and the very fact that many microlithic circular endscrapers have been found in the mixed surface layers (certainly not comprising layers VII–V) indicates that the Romanellian component in the industry from the lower level of layer IV is considerably more prominent than it had been assumed. When the raw materials and knapping products from horizon IVb2 are concerned the finds do not differ essentially from the artifacts from layers VII–V; the incidence of low quality raw materials, unretouched flakes and tools in the category of 'supstrates' is also high in this industry as well.

Crvena stijena IV and the problem of evolution of the local Castelnovian

When the Holocene layers at Crvena stijena have been investigated in the end of 1950s it was not possible to determine precisely the industry from layer IV. Benac immediately indicateed the Mesolithic character of the industry and the parallels with the Capsian (Benac, Brodar 1958), and later devoted his efforts to challenge the assumptions (widely popular at that time) that remains from layer IV could be related to the pre–ceramic Neolithic (Бенац 1975). Considering that pottery fragments and bones of the domesticated goat (Capra hircus) and cattle (Bos taurus brachiceros) have been recorded in the Mesolithic layer the problem of relationship between the Mesolithic and the Neolithic at Crvena stijena continued to draw attention of the scholars (Budja 2001). The question was the actual one also because the Neolithic elements have been confirmed at other sites in the Adriatic zone as well (Bietti 2001; Budja 2001). However, it turned out that discussion about the Neolithic elements in the material from layer IV is not based on the sound grounds: the investigations had been conducted many years ago, the finding circumstances are unknown, the faunal remains are not preserved and most of the documentation is missing.

The industry from layer IV has been attributed to the Castelnovian in the beginning of the 1980s but sometime later it has been identified as the Para–Castelnovian (Kozłowski, Kozłowski 1984; Kozłowski *et al.* 1994). It has been noticed that assemblages of the artifacts from Odmut and Crvena stijena do not have typical Castelnovian traits, characteristic of the industries in Slovenia and north Italy. The differences have been noticed not only in structure and typology of tools but also in the fact that the use of the microburin technique has not been ascertained at the sites in Montenegro (Kozłowski *et al.* 1994). Nevertheless, the investigations in Montenegro have revealed that industries with more or less prominent Castelnovian characteristics do appear within the broad zone from the Gulf of Trieste to the Podgorica basin, despite scarce evidence of the Late Mesolithic in Istria and north and central Dalmatia. In the late Mesolithic layer at Vela spila (7/4) dated in 7200 ± 30 BP quite a few chipped stone artifacts have been found (Komšo 2006; Čečuk, Radić 2005), while at the site Lokve in Istria has been recorded the industry, which included asymmetrical trapezes together with many bladelets and backed points (Komšo 2006). To the south of Crvena stijena the local Castelnovian has been recorded only in Vruća pećina (Ђуричић 1997). Besides the artifacts resembling those from Crvena stijena, few geometric microliths similar to those found in layer D at the site Sidari and in the lithic phases VIII and IX in the Franchthi cave have been also encountered at this site.

We have already pointed to the fact that industry from horizon IVb2 could rather be ascribed to the early than to late Mesolithic regardless of the fact that few artifacts, which resemble the finds from horizon IVb1 (few truncations and one blade with symmetrical notches), have been recorded within this industry. The new investigations in the entrance area of the cave (Baković *et al.* 2009) revealed that grayish dusty layer near the bottom of the Mesolithic sequence that according to the sediment traits corresponds more to the layer IV than to the complex of layers VII–V dates from the end of 9th – beginning of the 8th millennium cal BC. On the other hand, two absolute dates were obtained – 6510–6430 cal BC (Beta 211504) and 6500–6420 cal BC (Beta 211503) for layer 2 where symmetrical microbladelets characteristic of the horizon IVb1 have been found. Therefore, it could be assumed that rather long period of time passed between the accumulation of horizons IVb2 and IVb1 and that the earliest phase of the local Castelnovian at Crvena stijena should be associated just to the horizon IVb1.

The industry from horizon IVb1 is characterized by the lamellar technology and broad repertoire of tools on blades and bladelets. This industry contains the denticulated blades, blades with double notches, truncations, trapezes and combined tools. There were also encountered many tools on flakes particularly endscrapers and splintered pieces. Similar industry is confirmed in layers XD, Ia and Ib at Odmut and in Vruća pećina, while technologically impoverished Mesolithic with the trapezes has been encountered in layer IV at Medena stijena. The Castelnovian elements are most frequent at the sites in the immediate hinterland (Crvena stijena, Vruća pecina), while in the industries in the north of Montenegro they are less prominent (Odmut) or they are entirely lacking (Medena stijena). Because of that the assumption was suggested at one time that the Castelnovian influences spread gradually from the coast toward the mountainous hinterland (Mihailović 1999). It seems that the absolute dates also speak in favor of this: layer 2 at Crvena stijena is dated in the middle 7th millennium BC and the Mesolithic layers at Odmut (if we disregard confusions concerning few absolute dates) are dated in the transition from the 7th to the 6th millennium and in the first quarter of the 6th millennium cal BC (Kozłowski *et al.* 1994).

The local Castelnovian recorded in layer 2 in the rock–shelter entrance and in horizon IVb1 in its interior corresponds chronologically to the very beginnings of the Late Mesolithic in the neighboring areas. At the same time it should be emphasized that in the industry from Crvena stijena do not appear the transitional elements characteristic of the early phase of the Late Mesolithic of the north Adriatic and the sub–Alpine region. In contrast to the north Italy and Slovenia where gradual transition from the Sauveterrian to the Castelnovian could be observed (Romagnano III, Viktorjev spodmol, Mala Triglavica) and Istria (Lokve) where the backed bladelets also appear together with the Castelnovian elements (Broglio, Kozłowski 1984; Turk 2004; Komšo 2006), such phenomenon has not been recorded so far in the Late Mesolithic of Montenegro. Likewise in the Iron Gates and in contrast to the sites in the northwestern Balkans the bone projectiles have been encountered here: at Crvena stijena were found the projectiles with obliquely cut base and at Odmut have been found over 50 single flue harpoons with one or two barbs (Srejović 1974; Mihailović 1998). Thus, as matters stand now, there is a difference between: a) north Adriatic with the industries containing the products of the microburin technique and the backed tools, b) south Adriatic zone (sites in Montenegro) where these elements do not appear and c) Ionian– Aegean area with the sites where various types of uncharacteristic microliths are recorded (Sidari, Franchthi, the Cave of Cyclope).

Regardless of the mentioned differences it is evident that social and economic stabilization and establishing of the new technological standards took place in the Balkan Late Mesolithic (Mihailović 2007b). The lamellar technology and the microliths connected with this technology (including the trapezes) appear in all mentioned areas, while the procurement of the extra–local raw materials was the common characteristic. The evidence of the broad spectrum economy is no more the exception but the rule and settling once again was of the logistic character. Like in the Mesolithic of the northeastern Italy the intensification of the seasonal hunting for ibexes also ensued in the Late Mesolithic of Montenegro. This is best confirmed by the finds from Odmut where the remains of ibexes represent 67% of the fauna structure (Srejović 1974; Mihailović 1998). Judging by the remains of fauna from the site Spila near Perast this practice continued also in the Neolithic period (Марковић 1985).

The Neolithic elements in the southwest Balkans as well as in the Iron Gates are first manifested in the knapping technology. In the final Mesolithic phase at Odmut and Crvena stijena has been recorded the diminishing of the tools repertoire, an increase in the retouched blades and the appearance of the broad blade technology characteristic of the Neolithic in this very area. Therefore, we would not agree with the explanation that there are no elements of continuity between the Castelnovian and the earliest Neolithic industries, at least when the south Adriatic is in question (Biagi 2001). Obviously, in the southwest Balkans the gradual changes not only in knapping technology and production of tools of bone and antler but also in the economy and in the settlement pattern took place in this period. Therefore, it seems that there is ground for assumption that the Neolithic in this area arrived gradually by selective taking over of innovations and that relatively narrow costal zone was some kind of filter, which slowed down its expansion. All in all, the model of the Neolithic expansion in the east Adriatic region is entirely different from the model documented in the central regions of the Balkans. The only exception is the Iron Gates area where in similar circumstances (only on the micro plan) the Neolithic appeared gradually and with certain delay.

CONCLUSION

We hope to have managed to show in the above presentation the importance of Crvena stijena for the comprehension of changes in the Upper Palaeolithic and the Mesolithic in the Balkans. We included and analyzed in detail the complete material available to us, we discussed the problem of the appearance of early Upper Palaeolithic, general periodization of the Late Upper Palaeolithic industries has been presented and explanation of their evolution has been suggested. In addition, we raised the question of technological decline in the Early Holocene industries, the problem of distribution of the Castelnovian influences and microlamellar technology has been examined and special attention was paid to the settlement pattern and economy in the Late Upper Palaeolithic and the Mesolithic. Of course, many questions still remain open and we were compelled to revise some of the former opinions. Considering the lack of exact indicators we were of the opinion that instead of fruitless discussion about chronology and cultural provenance it was much more important to show to what extent the study of Crvena stijena could contribute to the understanding of the long–term tendencies in the cultural and technological development.

When the transition from the Middle to the Upper Palaeolithic is concerned it should be emphasized that Crvena stijena fits only partially in the model of transition confirmed in the north Balkans. The Middle Palaeolithic at Crvena stijena and at other sites in the coastal area lasts up to before around 40 ka that speaks in favor of the assumption that coastal area was one of the main communication routes and that transition took place rather early as it was also the case in the north and east of the peninsula. It is very strange, however, that the Upper Palaeolithic sites dating between 40 and 30 ka have not been confirmed with certainty in the Adriatic–Ionian zone, from the sub–Alpine region (Broion, Fumane) to the Peloponnesus (Klisoura) in contrast to the north Balkans where clear succession of Middle and Upper Palaeolithic could be discerned. It still remains to be seen whether such situation is the result of the insufficient investigation or the coastal zone and the central regions of the Balkans were out of the reach of the Upper Palaeolithic communities.

The absence of chronological overlapping of the Middle and Upper Palaeolithic in the restricted geographic areas could indicate the territorial (social and ecological) competition of their bearers and successive withdrawal of the Middle Palaeolithic communities toward the western Balkans. Still, this scenario could not explain the prolonged interruption in the settling of the coastal zone and it is the similar case with the alternative explanation based on the consequences of the volcanic activities and climatic changes. The eruption, which happened before 39–40 ka certainly left its mark and could have temporarily resulted in depopulation of the region but (having in mind the situation in the Apennine peninsula) it is remotely conceivable that such an event and climatic instability in the period between 40 and 30 ka could have had the long–lasting consequences.

There is no doubt that precise identification of the industry from layer X would make the understanding of these processes much easier but unfortunately the diagnostic types of the Auri-

gnacian tools have not been recorded in that industry. The cultural and chronological determination of the industry is impeded also by the fact that as it turned out the Aurignacian in the coastal zone started later (except in Klisoura), that it lasted simultaneously with the earliest industries with backed points and that the Aurignacian character of the industry is often impossible to identify. It is quite possible that differences between the Aurignacian and the Gravettian (at least in this area) should not be considered only from the aspect of differences in the chronology of sites and the cultural identity of populations. As the climatic and ecological changes that took place in south Europe and east Mediterranean at the beginning of the Last Glacial Maximum were less prominent than in central Europe it is possible that in this area the economic activities, which characterized the preceding period were practiced during longer period of time and consequently the earlier technology might have also been used longer. In the similar way could be explained the less differentiated Gravettian and less prominent differences between Gravettian and Epigravettian in the east Mediterranean region.

When, however, it regards the period of the Last Glacial Maximum, which is still insufficiently clarified, in studying the factors, which might have influenced the variability of the industry we should certainly take into consideration also the changes in the settlement pattern. Contrary to the expectations that the Balkans was the refugial area in the given period, the exceptionally small number of sites with the limited and uniform repertoire of tools has been recorded so far in this region. This conclusion particularly relates to the area of western Balkans where, it is assumed, the air humidity was higher and where the conditions for survival of the forest vegetation were better. If the concentration of the resources (and human communities) really took place in the extended coastal area during the maximum of the last glacial as some authors think, then it could be assumed that partially glaciated and somewhat more distant area on the fringes of the mountainous zone was just at the border of distribution of the hunter–gatherer communities inhabiting the coastal zone and that it was inhabited only temporarily in the warm seasons and the climatic oscillations.

The finds from layers IX and VIII at Crvena stijena and the material from other sites in Montenegro confirm that an increase in intensity of settling the mountainous region took place in this area as well as in other parts of Europe in the Late Glacial. The incidence of visiting natural shelters increases, the mobility and territory decreases and settlements maintain identical or similar function in a rather long period of time. All this as well as some other indicators suggest the use of organized settlement pattern, economizing with the resources and multiple specializations in various domains of human activity. There are strong indications that this period was marked by social integration and distinctive cultural regionalization. The industries in the coastal zone differ from the industries in the peninsula interior and this tendency is to continue even later. In contrast to the coastal zone where the industries with tools on flakes, short arched points and splintered pieces appear in this as well as in the ensuing period, the lamellar component is more prominent and geometric tools better represented at the sites in the hinterland (particularly at Medena stijena). In layer V at Medena stijena that probably dates from the very end of the Pleistocene the hypermicrolithic industry (with elongated triangles and microlithic backed points), which greatly resembles the Sauveterrian industries in Slovenia and northern Italy has been recorded.

The technological changes in the Epipalaeolithic and the Mesolithic as late as the early Neolithic could be continuously followed in the southeast Europe only at Crvena stijena and in Franchthi cave. The date of layers VII–V has not been established yet but it is obvious that industry from these layers differs form the finds from layer VIII. These differences could not be explained as a result of the specialized activities because the structure of the assemblages from these layers does not differ substantially from the structure of the assemblages from layers IX and VIII and horizons IVb2–IVa. It could neither be related to the phenomena recorded in the final Pleistocene at Vela spila, Badanj and other Final Palaeolithic sites in the coastal zone because the geometric artifacts, backed bladelets and products, which could be related to the lamellar knapping technology are still present in considerable quantity at these sites. The industry from layers VII–V, however, corresponds perfectly with the Early Holocene industries in Montenegro, Greece and in the Iron Gates where the decline was encountered at all three technological levels: in the selection of raw materials used for knapping, in the knapping technology (lamellar technology disappears) and in almost complete absence of the geometric artifacts. We think that these phenomena should be associated with changes in the economy and the settlement pattern that took place at the beginning of the Holocene. They rather bear witness to successful adaptation of the human communities to the environmental changes than to their cultural and social isolation.

Judging by the more recent investigations of Crvena stijena the Early Holocene industries from this site have very prominent Epigravettian, i.e. Romanellian component. However, in contrast to the sites in the north Balkans, the backed tools do not appear in these industries, while the tools made of antler and the bone projectiles are very frequent. The local Castelnovian appears rather early, already in the middle of the 7th millennium cal BC and it is characterized by the profound changes in technology, economy and the way of life. As matters stand now Crvena stijena (together with Vruća pećina) represents the southernmost point of distribution of Castelnovian on the east Adriatic coast and place whence the Castelnovian influences spread into the hinterland. Having in mind the continuity with the Neolithic industries in the same area, it will be very important to determine in what way the Mesolithic communities adapted to the Neolithic way of life. It seems, for the time being, that innovations were not accepted as a package but that they were adopted gradually (firstly in the knapping technology).

As it could be seen, regardless of the fact that many data are lacking, Crvena stijena offers an extraordinary insight into cultural and technological changes in the Palaeolithic and the Mesolithic of the southwest Balkans. We tried in this work to explain technological changes not only from the aspect of cultural and population movements but also in the context of all–encompassing changes in the economy, the society and the settlement pattern of hunter–gatherer communities. We might say that Crvena stijena had been located at the spot where cultural influences from central Adriatic and south Adriatic–Ionian region were brought face to face and also filtered in a certain way. These two regions were separated by narrow coastal zone between the high mountains of the Boka Kotorska bay and the north fringes of the south Adriatic depression, which even in the time of the Last Glacial Maximum was close to the present–day coast. Because of that and also because of the orientation of the Trebišnjica river course the populations inhabiting Crvena stijena gravitated toward the area of central Adriatic and the rock–shelter itself was used for thousands of years as transitional camp site

or final destination for the communities, which inhabited the coastal zone (particularly in the warm periods when mountainous region offered favorable conditions for exploitation). For these reasons it is understandable why almost all industries from Crvena stijena are of the Mediterranean character. In some periods (Middle Palaeolithic and Early Mesolithic) cultural evolution coincided with the evolution documented in the eastern Balkans, in the Ionian and the Aegean zone, while in the periods characterized by cultural regionalization (end of Late Upper Palaeolithic, Late Mesolithic) this evolution was more related to the area of north and central Adriatic. In any case, Crvena stijena (as well as the rock–shelter Paglicci on the opposite coast of the Adriatic) bears witness to the long duration of the earliest prehistory of the Adriatic basin. Its place and role was determined not only by favorable climate conditions and good geographic position but also by the ecology of the region that provided optimal living conditions for the hunter–gatherer communities.

APPENDIX

Total counts and percentages of debitage and tools from other Upper Palaeolithic and Mesolithic sites in Montenegro

Category		MSX (164)	MSIX (96)	MSVIII (244)	MSVII (221)	MSVI (1575)	MSV (1242)	MSIV (735)	OXD* (753)	OIa* (498)	OIb* (845)	TKII (161)	TKIb (218)	TKIa (362)
C	n.	18	5	8	4	39	37	8				7	9	8
	%	11.0	5.2	3.3	1.8	2.5	3.0	1.1	6.5	11.8	10.2	4.3	4.1	2.2
B	n.	43	29	72	65	408	379	163				50	49	88
	%	26.2	30.2	29.5	29.4	25.9	30.5	22.2	7.0	9.4	11.9	31.0	22.5	24.3
F	n.	57	39	82	92	694	525	416				56	112	203
	%	34.7	40.6	33.6	41.6	44.1	42.3	66.6	67.7	59.6	64.6	34.8	51.4	56.1
Rj	n.	5	3	12	12	83	54	24				4	16	9
	%	3.0	3.1	4.9	5.4	5.3	4.3	3.3				2.5	7.3	2.5
Ch	n.	11	1	14	4	37	37	39				1	3	2
	%	6.7	1.0	5.7	1.8	2.3	3.0	6.3				0.6	1.4	0.5
T	n.	26	19	54	44	307	210	85				41	28	48
	%	15.8	19.8	22.1	19.9	19.5	16.9	11.6	8.9	8.6	8.0	25.5	12.8	13.2
SM	n.	4	0	2	0	7	0	0				2	1	4
	%	2.4	0.0	0.8	0.0	0.4	0.0	0.0				1.2	0.4	1.1

General structure of the assemblages from Medena stijena (after Mihailović 1996), Odmut (after Kozłowski *et al.* 1994) and Trebački krš (after Mihailović 1998): cores (C), blades (B), flakes (F), rejuvenation blades and flakes (Rj), chunks (Ch), retouched tools (T), products of the secondary tools modification (burin spalls etc.).

* including chips and small flake fragments

	XD		Ia		Ib	
	n.	%	n.	%	n.	%
Burins	2	2.9	2	4.4	0	0.0
Endscrapers	21	30.4	7	15.5	16	24.6
Retouched blades	8	11.6	8	17.8	12	18.5
Retouched flakes*	19	27.5	16	35.5	19	27.7
Perforators	2	2.9	2	4.4	1	1.5
Notched tools**	1	1.4	1	2.2	4	6.1
Splintered pieces	1	1.4	2	4.4	1	1.5
Truncations	11	15.9	1	2.2	5	7.7
Backed tools	1	1.4	3	6.7	1	1.5
Trapezes	3	4.3	3	6.7	6	9.2

Odmut: general structure of the retouched tool categories (after Kozłowski *et al.* 1994)

* including “irregular scrapers” (denticulated tools, notched tools on flakes, sidescrapers)
** without notched tools on flakes

		X (26)	IX (19)	VIII (54)	VII (44)	VI (307)	V (210)	IV (85)
Burins	n.	4	2	6	6	32	20	4
	%	15.4	10.5	11.1	13.6	10.4	9.5	4.7
Endscrapers	n.	5	4	9	13	68	39	22
	%	19.2	21.0	16.7	29.5	22.1	18.6	25.9
Retouched blades	n.	3	2	4	3	16	4	7
	%	11.5	10.5	7.4	6.8	5.2	1.9	8.2
Sidescrapers	n.	2	0	0	1	6	6	6
	%	7.7	0.0	0.0	2.3	1.9	2.8	7.0
Retouched flakes	n.	0	3	4	0	10	6	19
odbici	%	0.0	15.8	7.4	0.0	3.2	2.8	22.3
Raclettes	n.	1	0	0	2	7	4	0
	%	3.8	0.0	0.0	4.5	2.3	1.9	0.0
Perforators	n.	1	1	0	3	9	4	4
	%	3.8	5.3	0.0	6.8	2.9	1.9	4.7
Denticulated tools	n.	0	0	2	0	13	16	4
	%	0.0	0.0	3.7	0.0	4.2	7.6	4.7
Notched tools	n.	2	4	7	2	24	10	3
	%	7.7	21.0	13.0	4.5	7.8	4.8	3.5
Splintered pieces	n.	0	0	1	0	4	4	5
	%	0.0	0.0	1.8	0.0	1.3	1.9	5.9
Truncations	n.	4	2	6	3	8	9	3
	%	15.4	10.5	11.1	6.8	2.6	4.3	3.5
Backed points and	n.	3	0	10	2	28	35	0
bladelets	%	11.5	0.0	18.5	4.5	9.5	21.0	0.0
Fragments of backed tools	n.	1	0	2	3	31	23	0
	%	3.8	0.0	3.7	6.8	10.1	10.9	0.0
Backed truncations	n.	0	0	0	1	18	22	0
	%	0.0	0.0	0.0	2.3	5.9	10.5	0.0
Segments	n.	0	0	0	1	4	2	0
	%	0.0	0.0	0.0	2.3	1.3	0.9	0.0
Triangles	n.	0	0	0	0	13	4	0
	%	0.0	0.0	0.0	0.0	4.2	1.9	0.0
Trapezes	n.	0	0	0	0	0	0	3
	%	0.0	0.0	0.0	0.0	0.0	0.0	3.5
Atypical microliths	n.	0	0	2	1	8	2	0
	%	0.0	0.0	3.7	2.3	2.6	0.9	0.0
Combined tools	n.	0	0	0	0	2	0	0
	%	0.0	0.0	0.0	0.0	0.6	0.0	0.0
Fragments of tools	n.	0	1	1	3	6	0	5
	%	0.0	5.3	1.8	6.8	1.9	0.0	5.9

Medena stijena: general structure of the retouched tool categories (after Mihailović 1996).

	II (41)		Ib (28)		Ia (48)	
	n.	%	n.	%	n.	%
Burins	3	7.3	1	3.6	2	4.2
Endscrapers	8	19.5	5	17.8	5	10.4
Retouched blades	1	2.4	3	10.7	3	6.2
Sidescrapers	0	0.0	2	7.1	4	8.3
Retouched flakes	1	2.4	1	3.6	2	4.2
Raclettes	0	0.0	0	0.0	3	6.2
Perforators	3	7.3	1	3.6	6	12.5
Denticulated tools	0	0.0	4	14.3	1	2.1
Notched tools	6	14.6	2	7.1	3	6.2
Splintered pieces	2	4.9	1	3.6	0	0.0
Truncations	2	4.9	2	7.1	1	2.1
Backed points and bladelets	8	19.5	3	10.7	5	10.4
Fragments of backed tools	2	4.9	1	3.6	9	18.7
Backed truncations	3	7.3	1	3.6	2	4.2
Segments	0	0.0	1	3.6	0	0.0
Atypical microliths	1	2.4	0	0.0	2	4.2
Fragments of tools	1	2.4	0	0.0	0	0.0

Trebački krš: general structure of the retouched tool categories (after Mihailović 1998).

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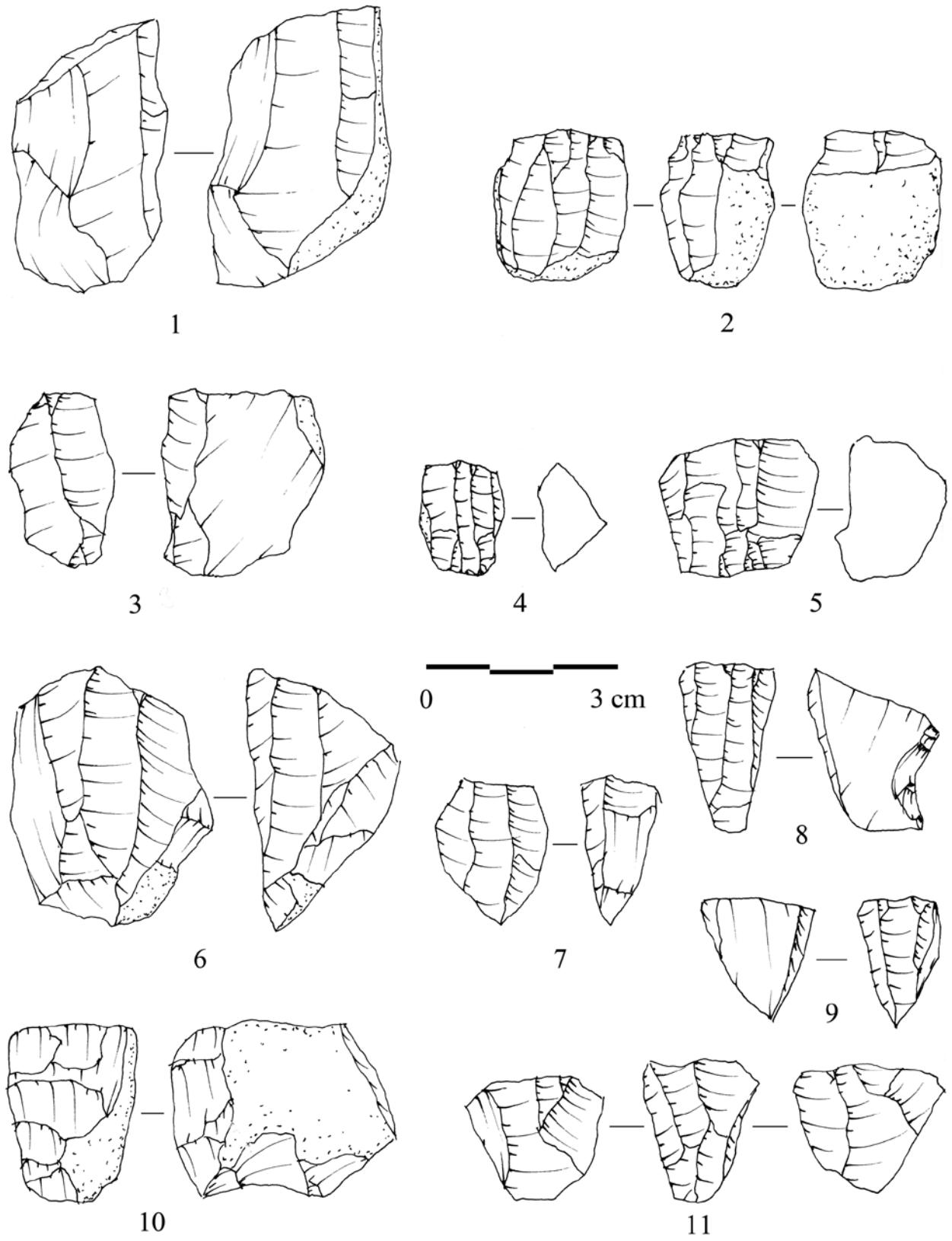
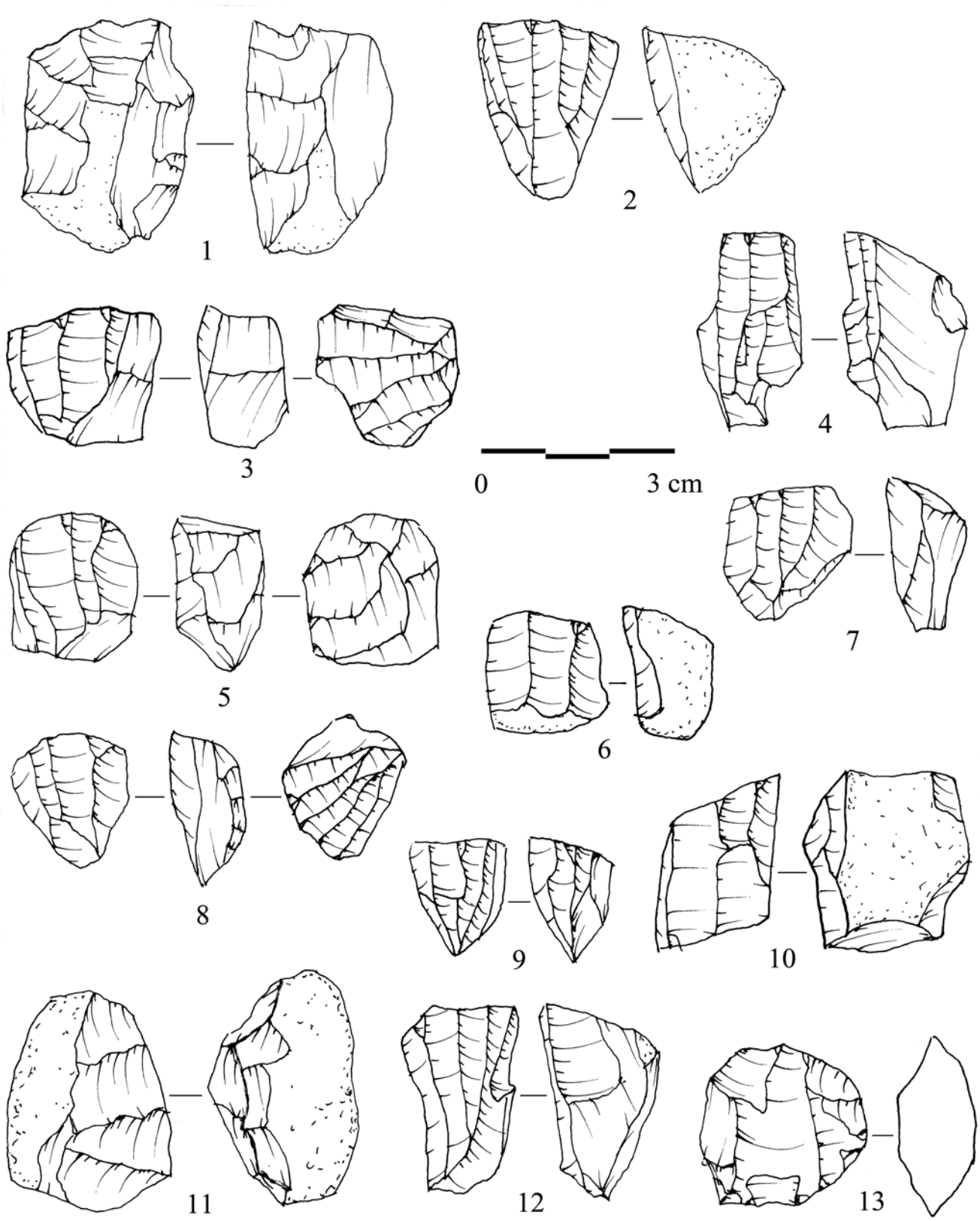
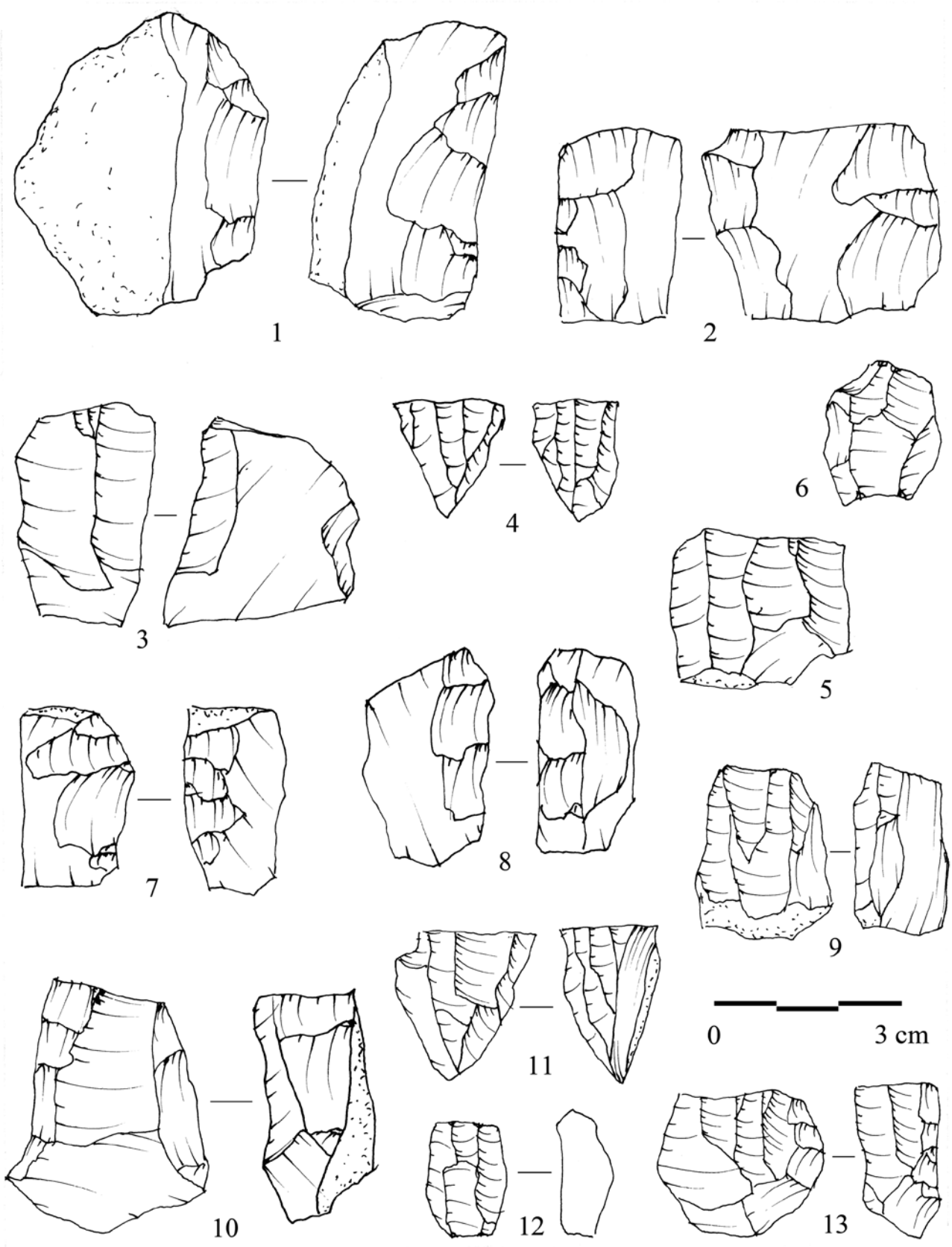
PLATES



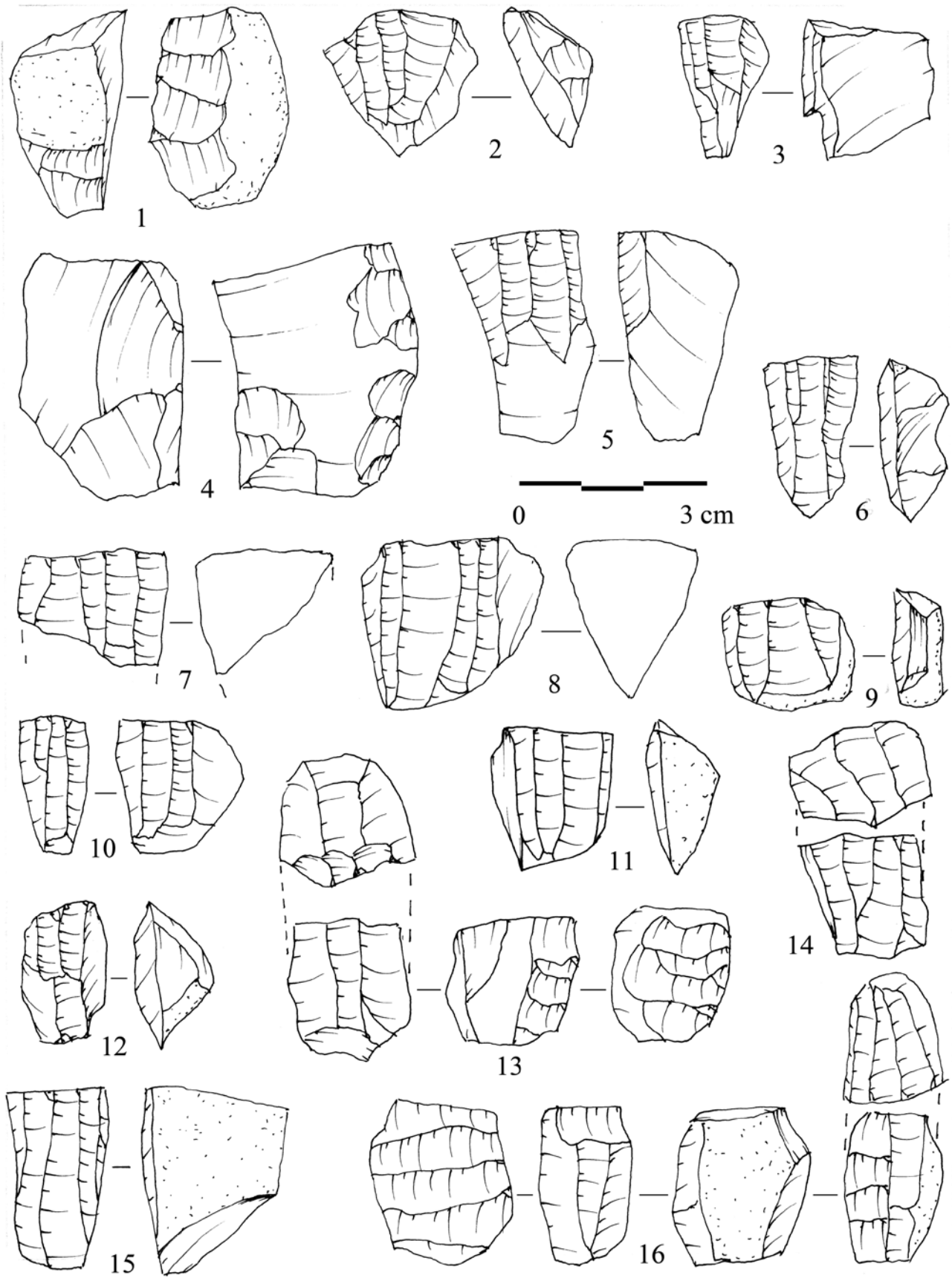
Pl. I: Cores in horizons Xd (1), Xb (2), Xa (4, 5), „stratum VII“ (3, 9) and layer IX (6–8, 10, 11)



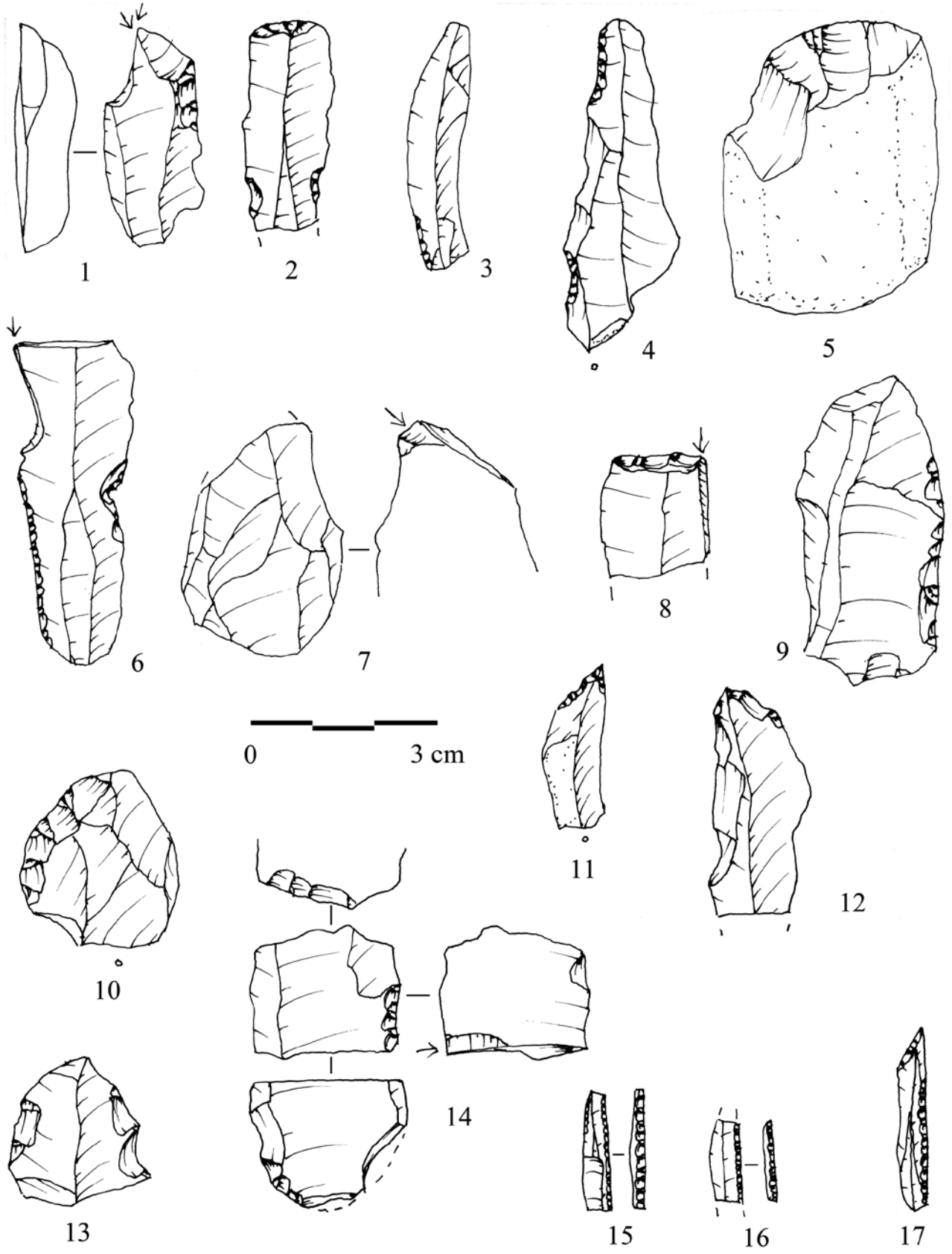
Pl. II: Cores in layers VIII (1–8, 10, 13) and VII (9, 11, 12)



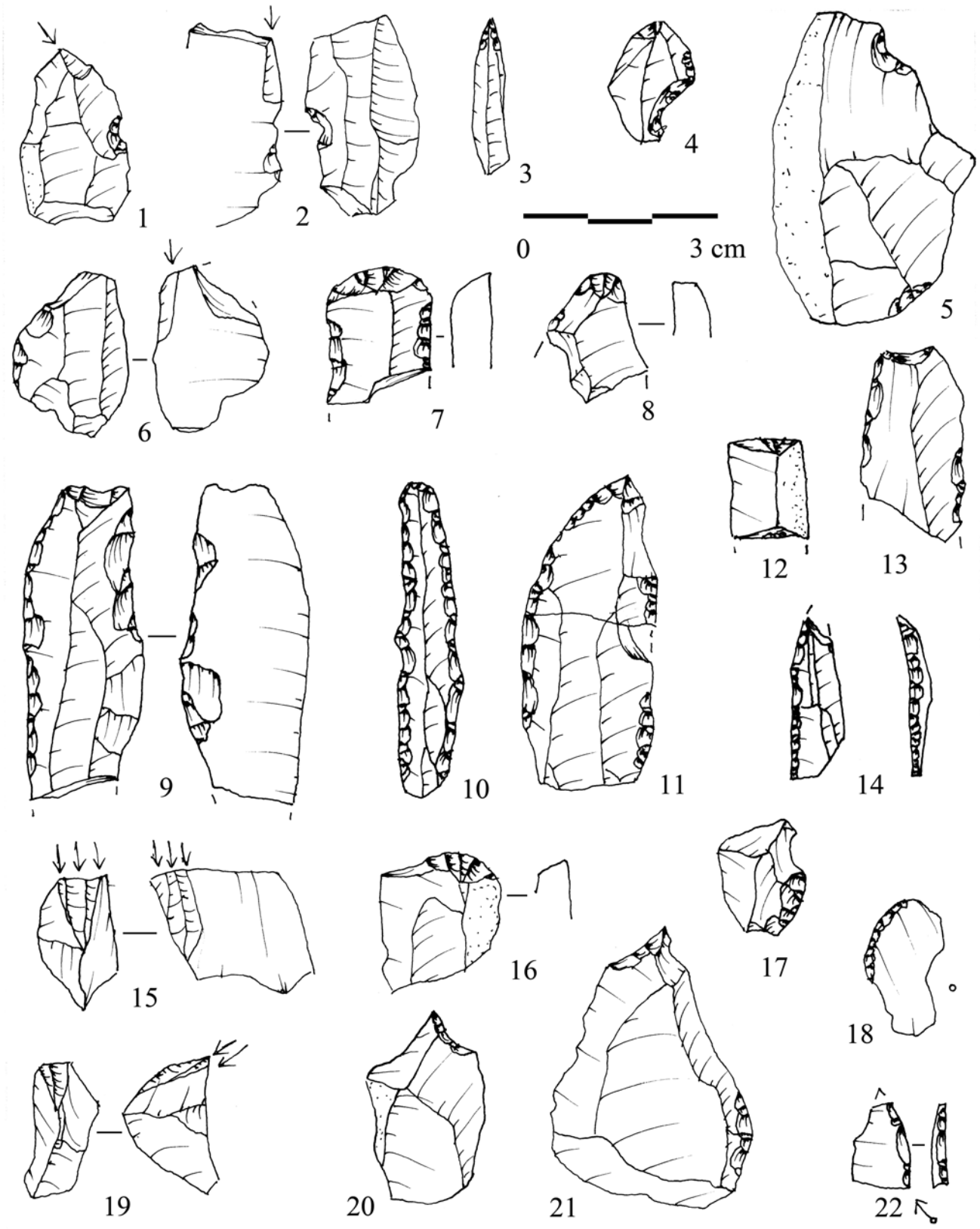
Pl. III: Cores in layers VI (1–6) and V (7–12)



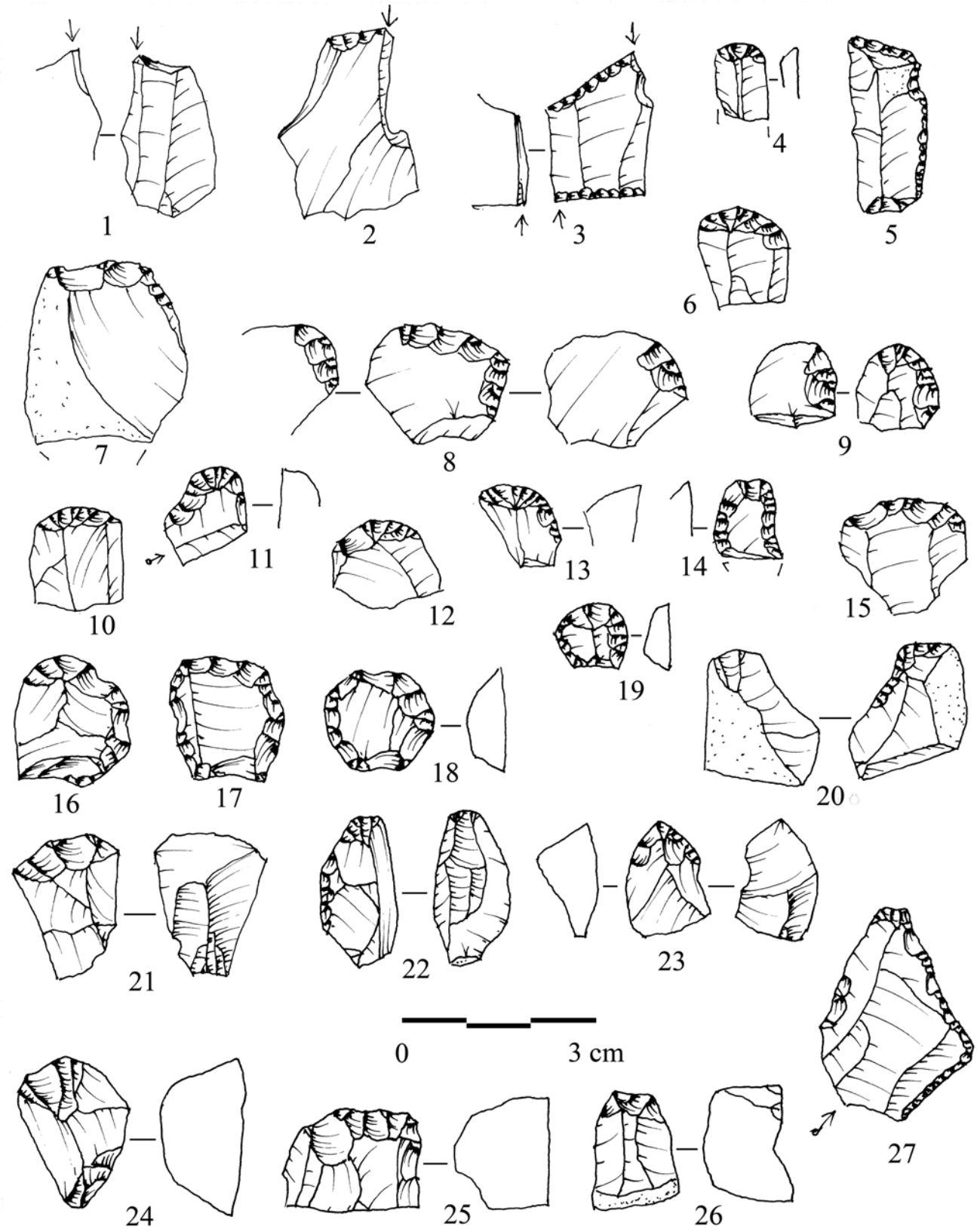
Pl. IV: Cores in horizons IVb2 (1–3), IVb1 (4–10, 12) and IVa (11, 13–16)



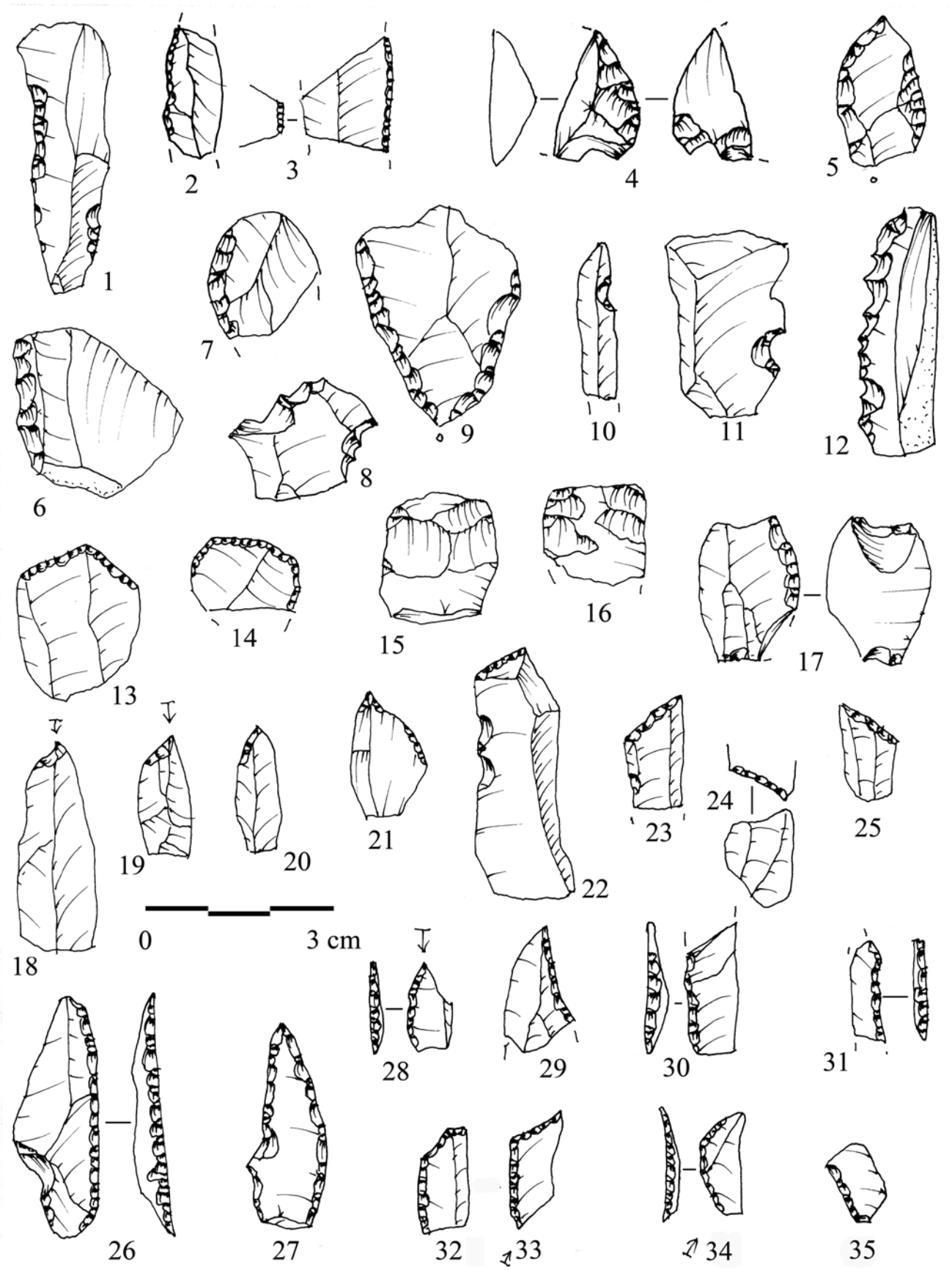
Pl. V: Retouched tools in horizons Xd (1–5) and Xc (6–17)



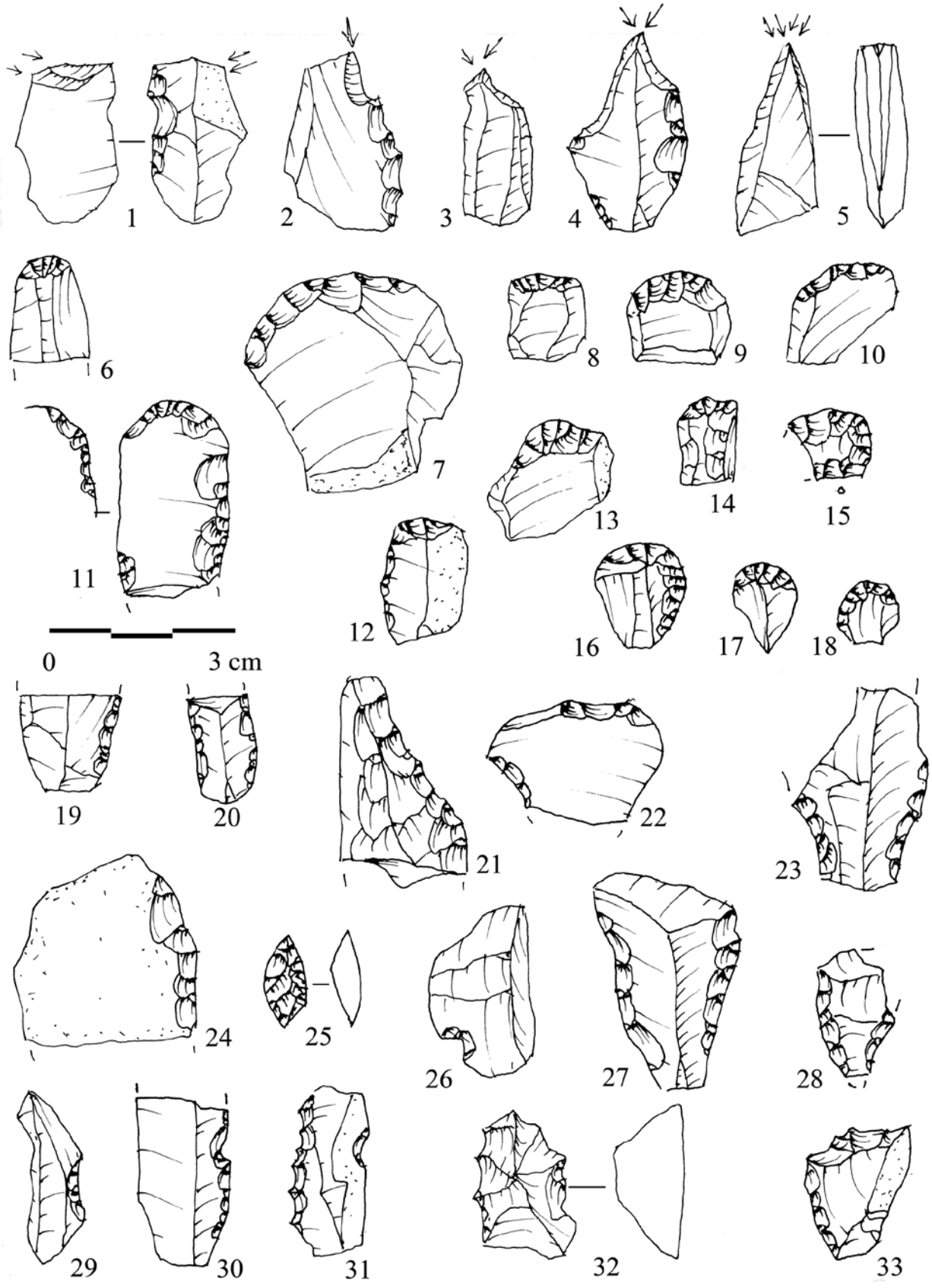
Pl. VI: Retouched tools in horizons Xb (1–5), Xa (6–14, 17, 18) and „stratum VII“ (15, 16, 19–22)



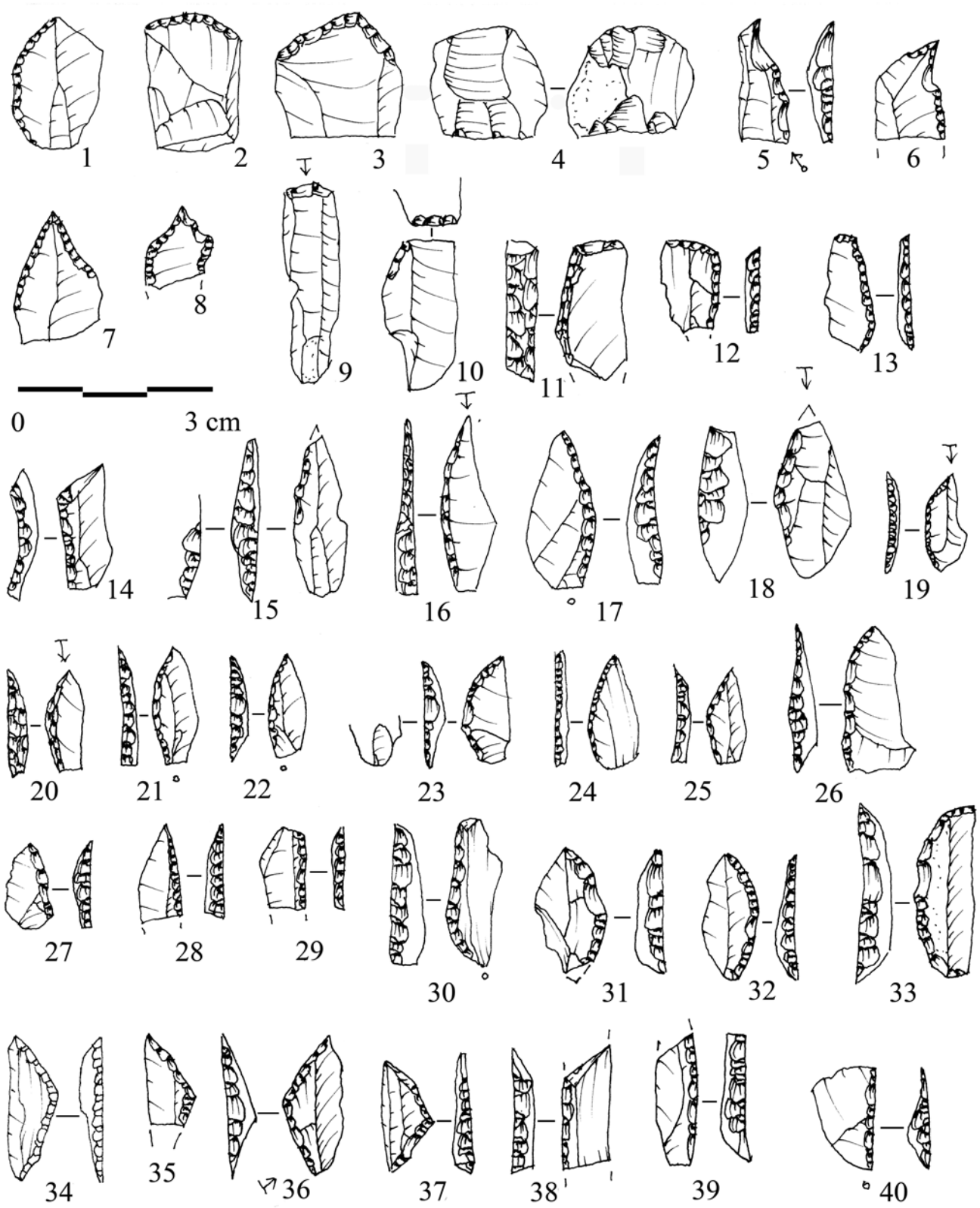
Pl. VII: Retouched tools in layer IX



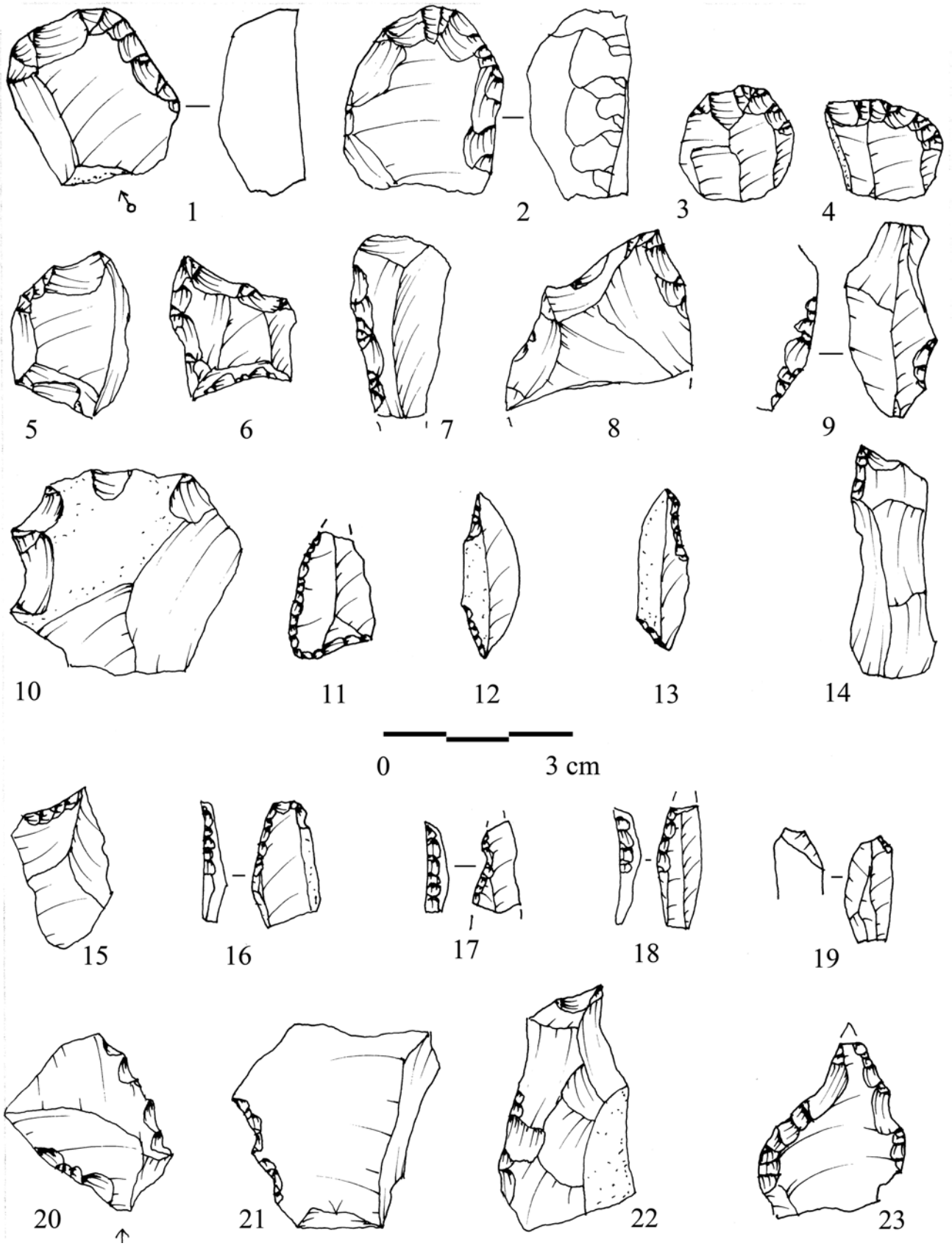
Pl. VIII: Retouched tools in layer IX



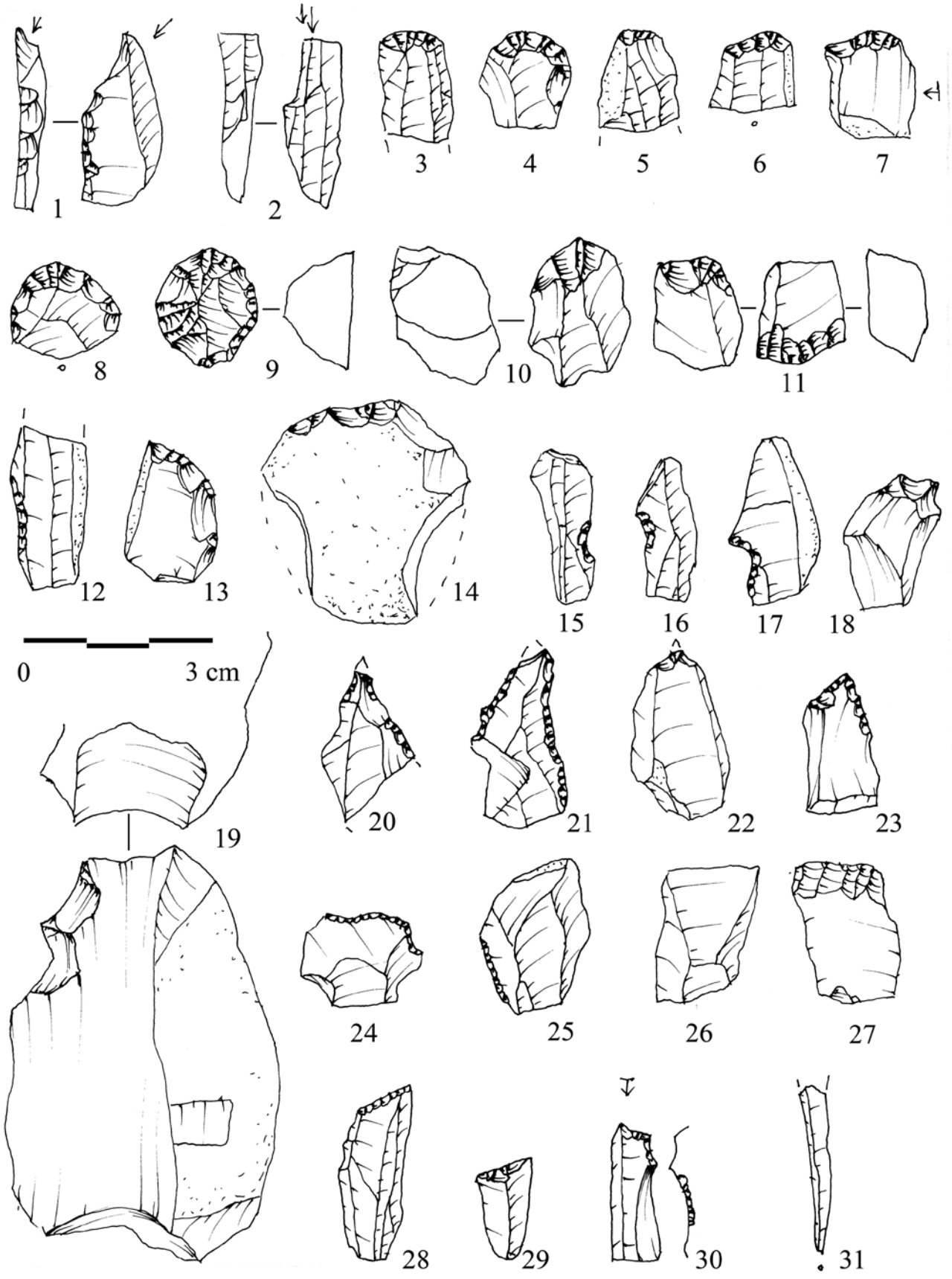
Pl. IX: Retouched tools in layer VIII



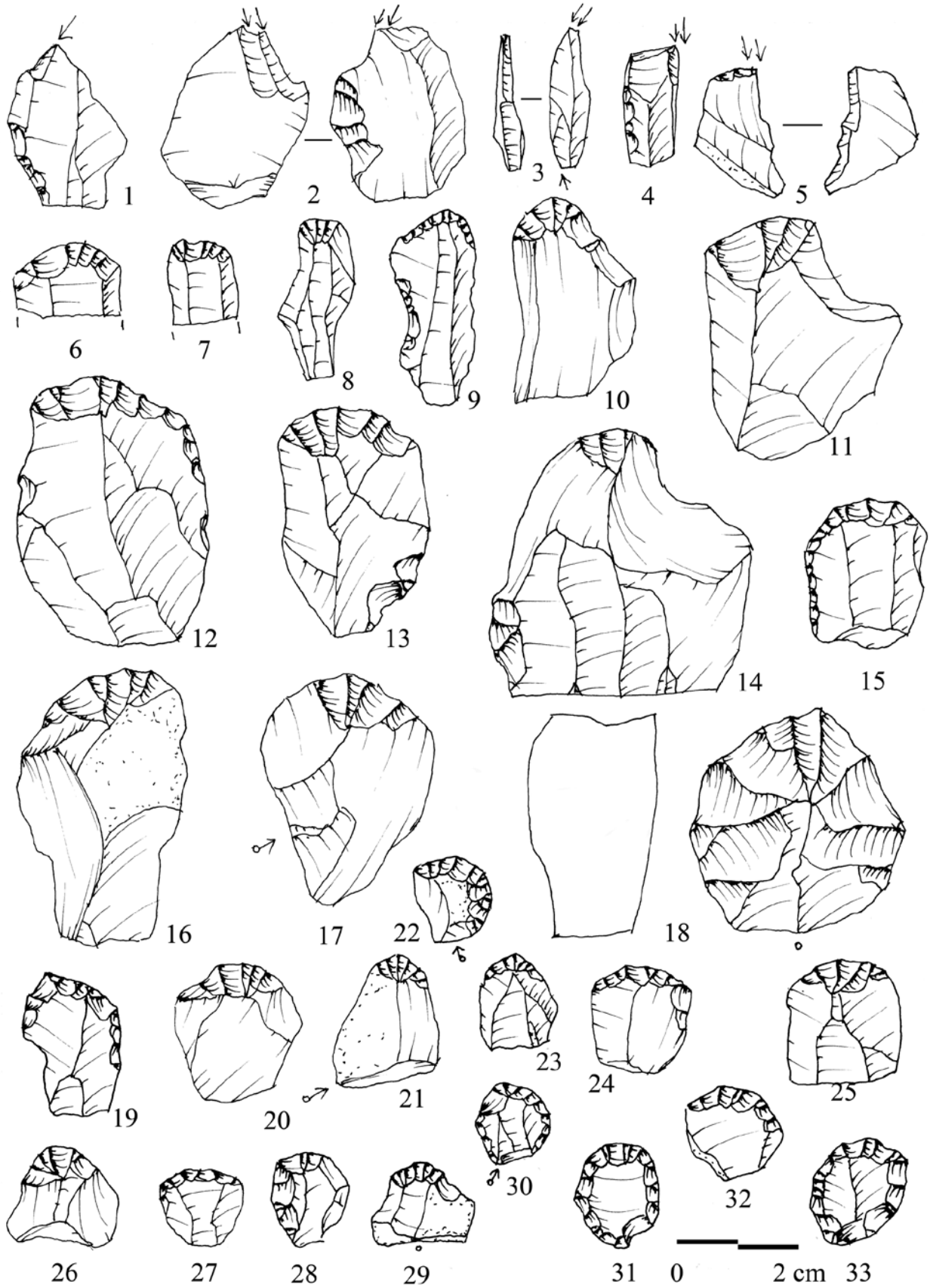
Pl. X: Retouched tools in layer VIII



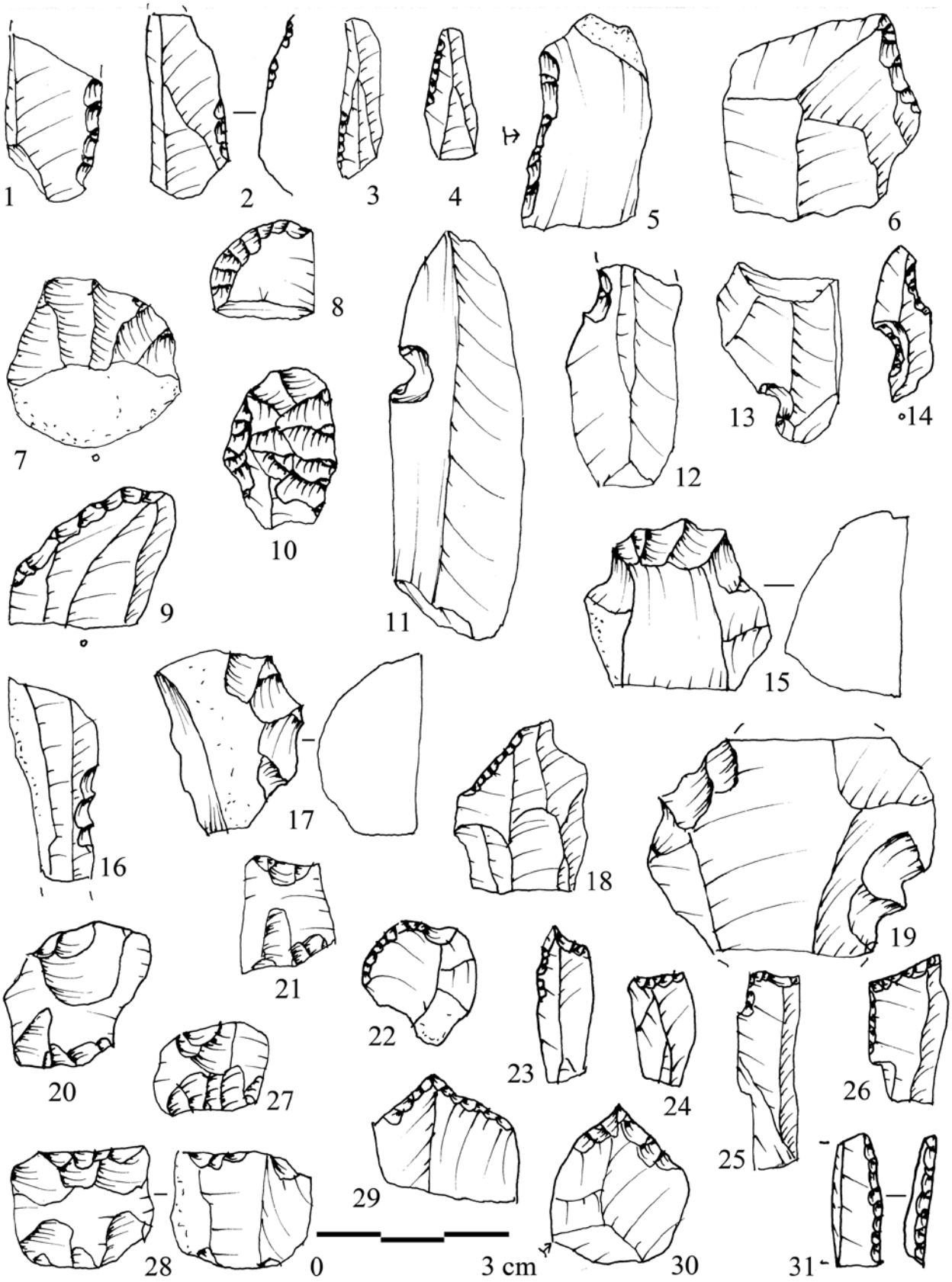
Pl. XI: Retouched tools in layer VII



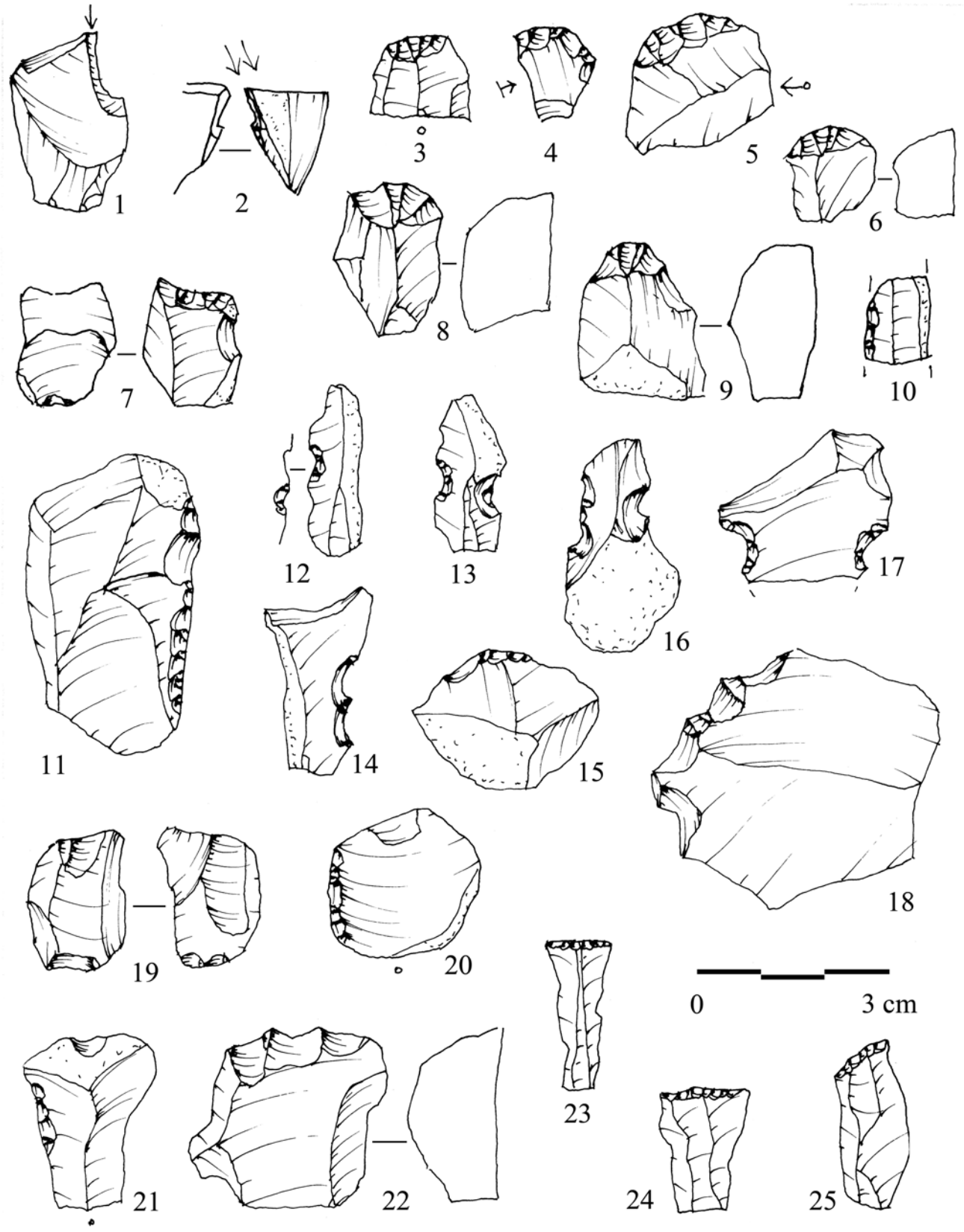
Pl. XII: Retouched tools in layer VI



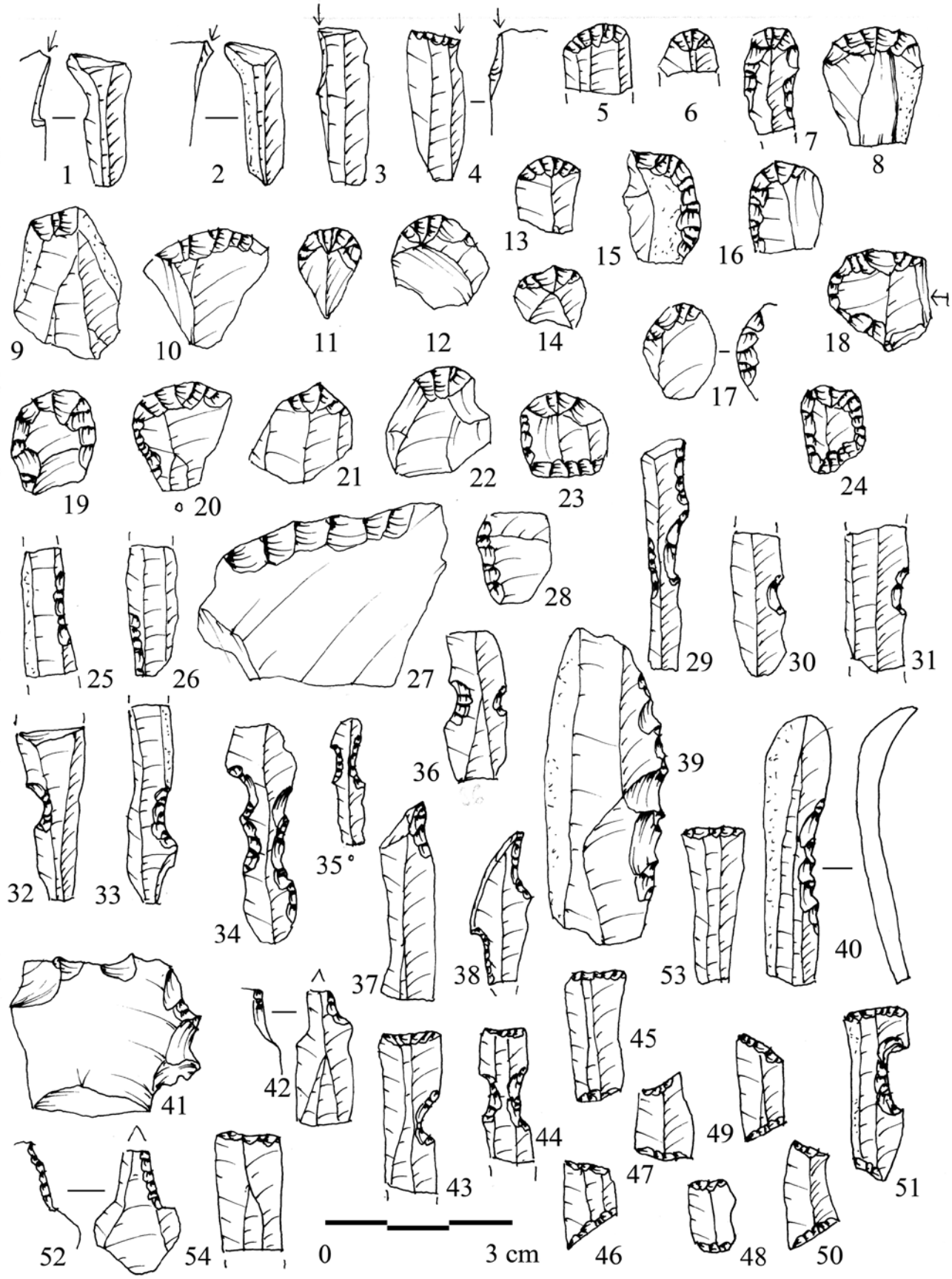
Pl. XIII: Retouched tools in layer V



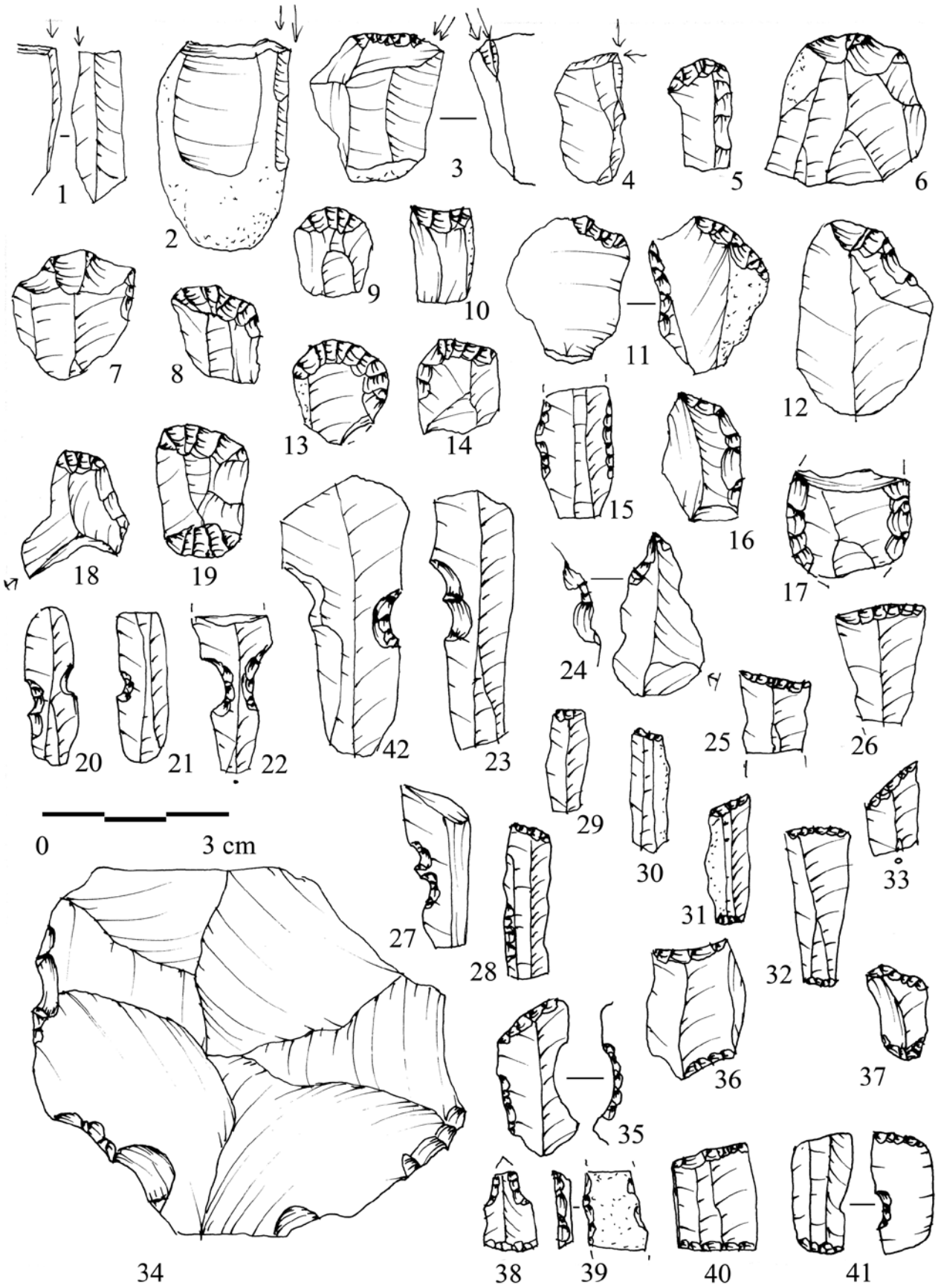
Pl. XIV: Retouched tools in layer V



Pl. XV: Retouched tools in horizon IVb2



Pl. XVI: Retouched tools in horizon IVb1



Pl. XVII: Retouched tools in horizon IVa

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