DOI: 10.17746/1563-0110.2017.45.1.003-014

A.P. Derevianko[1], M.V. Shunkov[1], L. Bulatović[2], K.K. Pavlenok[1, 3], V.A. Ulyanov[1, 4], M.B. Kozlikin[1], and A.V. Kandyba[1]

[1]Institute of Archaeology and Ethnography, Siberian Branch, Russian Academy of Sciences, Pr. Akademika Lavrentieva 17, Novosibirsk, 630090, Russia
E-mail: derev@archaeology.nsc.ru; shunkov@archaeology.nsc.ru; pavlenok-k@yandex.ru; vladul@front.ru; kmb777@yandex.ru; arhkandyba@gmail.com
[2]Public Institution "Museums and Galleries", Mark Milanova 4, 32000, Podgorica, Montenegro
E-mail: hajhel@t-com.me
[3]Novosibirsk State University, Pirogova 2, Novosibirsk, 630090, Russia
[4]Lomonosov Moscow State University, Leninskie Gory, Moscow, 119991, Russia

New Findings on the Middle Paleolithic of the Eastern Adriatic: The Earliest Settlement at Bioče, Montenegro*

Excavations of undisturbed Pleistocene deposits at the Bioče rock shelter layers 4 and 3 by the joint Russian-Montenegrin expedition yielded the first evidence of Middle Paleolithic occupation. Primary reduction techniques are described, and a typology of the lithic industry is proposed. The techniques were quite simple, including parallel, multidirectional, and centripetal flaking suggestive of the Levallois tradition. Flakes were mostly small, short, and robust, with a straight profile. Most tools are single or double side-scrapers. Atypical end-scrapers, spurred and notched-denticulate tools, and flakes with irregular retouch are few. The closest technological and typological parallels are with Crvena Stijena layers XXII–XVIII, correlating with MIS 5c-b. This industry is based on Levallois and radial/discoid cores; elongated blanks are few. The most frequent tools are side-scrapers and backed knives. Finds from Bioče span a long period of occupation and testify to cultural evolution, suggesting, for the first time, that this site may be a key to understanding the cultural processes taking place during the Middle Paleolithic of the region.

Keywords: *Eastern Adriatic, Pleistocene, Middle Paleolithic, Bioče rock shelter, stratigraphy, lithic industry, chronology.*

Introduction

The Balkan Region, occupying a strategic location in the transition area between Europe and the Near East, plays a major role in the study of the Middle Paleolithic of the European continent. It has water boundaries in the west, south, and east (the Adriatic, Ionian and Black Seas), while the location of its northern boundary varies according to which factors (geographic or territorial and administrative) are taken into consideration. The studies published in recent years draw this boundary along the Drava, Sava, and Danube rivers (Reed, Kryštufek, Warren, 2004; Dogandžić, McPherron,

*Supported by the Russian Science Foundation (Project No. 14-50-00036).

Mihailović, 2014). The Balkans are characterized by a considerable physiographic diversity. The peninsula is dominated by dissected landscapes confined mainly to the valleys of large rivers and foothills. Being the most resource-rich, such landscapes were of the greatest interest to Paleolithic populations (Stepanchuk, Sapozhnikov, 2010). According to recent studies, the Balkans could have been a unique refugium for vegetable, animal and, therefore, human communities in the global cooling periods during the Pleistocene (Dogandžić, McPherron, Mihailović, 2014). This territory, then, with its resource-rich landscapes and refugium conditions, was probably used by humans and animals as a migration corridor, and is one of the most promising areas for obtaining new data on the Stone Age in Eurasia.

The Balkan Region can be conventionally divided into three main zones, varying in paleoecological characteristics: the coasts of the Adriatic and Ionian Seas; mountain ranges (the Dinar highlands, the Dalmatian Mountains, the Carpathians, the Rhodopes, and Pindus); and lowlands in the north that pertain to the common paleoecological zone with plains of the Lower Danube and the Black Sea (Furlan, 1977). Such Paleolithic sites as Bacho Kiro, Temnata, and Kozarnika (Bulgaria), Asprochaliko, Klissoura (Greece), Krapina, Vindija (Croatia) were discovered here. For a wide variety of reasons, including political ones, the coastal zone of the Balkans cannot be considered thoroughly studied in terms of Stone Age archaeology. After full-scale excavations of the Crvena Stijena site (Montenegro) in 1950–1970, this zone did not attract the attention of a wide range of researchers for a long time; therefore the issues of the Paleolithic in this region have not been fully included in the Central European problematics (Crvena Stijena, 1975). However, the landscape and climatic conditions facilitated the formation of peculiar manifestations of material culture here that are narrowly localized geographically. The coastal zone is separated from the internal areas of the peninsula by the Dalmatian mountain group and the Dinar highlands, which were natural barriers hampering the cultural contacts of the earliest population (Karavanić, 2007). In these conditions, the inhabitants of the coastal zone elaborated specific adaptation strategies reflected in their material culture. This determines the importance of this Balkan area for studying the Middle Paleolithic cultures of southeastern Europe and the Eurasian continent as a whole.

All Middle Paleolithic sites of the Eastern Adriatic contain material remains of the labors of Neanderthals. The disappearance of the Neanderthal population in the region, as shown by materials from the Crvena Stijena site (Morley, Woodward, 2011), may be likely related to the Campanian Ignimbrite eruption (about 40 ka BP). The earliest evidence of the presence of anatomically modern humans in the area under consideration is the Aurignacian site of Sandalja II in Istria (Croatia), for which site dates close to 32 ka BP are the oldest (Karavanić, Smith, 2013). Thus, according to the published anthropological data, the gap between the episodes of presence of Neanderthals and modern humans in the region is more than 5000 years. None the less, no transitional complexes have been found in the long coastal area from the Klissoura-1 site on the Peloponnesian peninsula in southern Greece to the Fumane site in northern Italy (Mihailović, Mihailović, Lopičić, 2011; Dogandžić, McPherron, Mihailović, 2014); and none of the known Middle Paleolithic industries has features suggesting local formation of the Upper Paleolithic traditions.

In the last decade, the intensity of the studies in the region has markedly increased, owing especially to the research conducted by Russian archaeologists in Montenegro (Derevianko, Bulatović, Tsybankov et al., 2010; Derevianko, Bulatović, Baković, Tsybankov et al., 2011; Derevianko, Bulatović, Baković, Agadžanjan et al., 2012; Derevianko, Bulatović, Pavlenok et al., 2014; Derevianko, Pavlenok, Kandyba et al., 2014; Derevianko, Pavlenok, Kandyba, 2015; Derevianko, Bulatović, Ulyanov et al., 2015). The Russian-Montenegrin expedition paid particular attention to studying the Bioče settlement, which may be rightly classified as one of the most informative objects of the region (Derevianko, Pavlenok, Kandyba, 2014; Derevianko, Pavlenok, Kandyba et al., 2014). This site, where occasional excavations have been carried out from time to time, has been known since 1980s (Đuričić, 2006). During the most recent phase of studies, in the lowest unit of the deposits (layers 3 and 4), which was earlier considered to be sterile, artifacts we discovered; and a totally new view has been formed of the stratigraphic situation at the site and the dynamics of the changes in the material complexes.

Bioče rock shelter: location, history of research

The Bioče village, to which the site owes its name, is located in a small valley, surrounded by mountains, at the confluence of the Morača and Mala Reka rivers (Fig. 1). The rock shelter itself is located along the left shoulder of the Morača valley at the foot of a limestone massif, at an elevation of about 40 m above the modern river's edge (Fig. 2) (Derevianko, Bulatović, Tsybankov et al., 2010).

The first exploratory trench at the site was excavated in 1986, following which the site was periodically studied until 1997. As a result of these works, a 4-meter deep series of deposits was opened over an area of 18 m^2; however, the base of the bedrock was not reached.

The sequence of Pleistocene deposits was divided into three series (I–III) by L. Đuričić (2006), who was the first researcher of this site. Series I, with a noticeable humus proportion, contained ash and coal interlayers. The bulk of the archaeological and osteological materials was found in these deposits. Series II consisted of clay and sand layers, with numerous partings of calcareous rock. Series III included archaeologically sterile clay layers. Earlier, the entire lithic industry of the site was recognized to be of one type, and to correspond to the characteristics of the regional micro-Mousterian facies of the Middle Paleolithic, which existed during MIS 3. The industry is dominated by Levallois flaking technique products, on which mainly small side-scrapers, Mousterian points, rocklets, and atypical end-scrapers were manufactured. Đuričić assigned the Bioče industry to the Levallois-Mousterian facies.

During the first year of work, when the walls of the old trench were cleaned, the Russian-Montenegrin expedition managed to establish that a considerable proportion of the site's deposits had been severely disturbed by combat actions during World War II (Derevianko, Bulatović, Tsybankov et al., 2010). A new excavation unit at the site was set up deep under the rock shelter, where undisturbed cultural deposits were discovered. They were unearthed through the entire sequence to the bedrock's base.

Fig. 1. Location of the Bioče rock shelter.

Fig. 2. Bioče rock shelter. General view.

Stratigraphic and cultural sequence

As a result of the work carried out in 2010–2015, four main lithological units were distinguished in the site section, which was more than 5 m thick (Fig. 3) (Derevianko et al., 2015).

Four additional units (1.1–1.4) were traced in layer 1. They are represented by medium

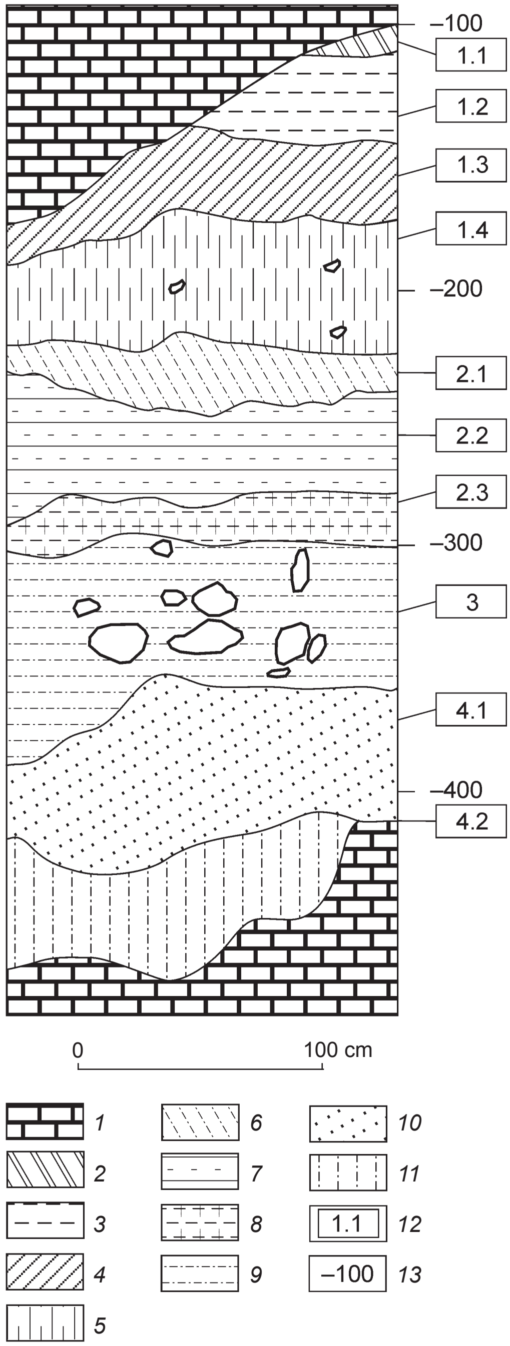

Fig. 3. Structure of the section of Pleistocene deposits at Bioče. *1* – limestone bedrock; *2* – medium-textured sandy and crushed stony loam, having an intense brown color with a reddish shade; *3* – brownish-black light loam, rich in humus; *4* – rubble-crushed stony thickness with light-loamy filler, having a dark brown color with a reddish shade; *5* – light loam, rich in humus, having an intense brownish-black color; *6* – fine rubble-crushed stony horizon of erosion pavement with sandy-loam filler of porous type; *7* – uneven-grained, gray-colored and gray-brown sandy loams and sands; *8* – gray-colored, fine-grained sandy loams enriched by fine rubble-crushed stony material at the top; *9* – reddish-brown heavy loam, saturated with highly-fractured grit and rubble in the upper part; *10* – reddish-brown heavy loams; *11* – packed plastic reddish-brown heavy loams with inclusions of grit and fine rubble; *12* – layer number; *13* – benchmark.

and light loams of different shades (from reddish to brown), which are saturated with humus and rock debris to different extents. According to the results of preliminary radiocarbon dating of bone and coal samples from layers 1.2 and 1.4, the accumulation of these deposits took place from 40 to 32 ka BP (Derevianko, Pavlenok, Kandyba, 2014).

The major part of the archaeological material (about 90 % of the total number of finds at the site) was discovered in layer 1. Among the cores, radial ones for producing small flakes are most abundant. Orthogonal shapes are typologically close to them. Unifacial single-platform cores are dominated by longitudinal pieces, including isolated cores with volumetric fronts. Simple shapes of end-cores with trial spalls are encountered. A distinctive feature of the material complex from layer 1 is the "microlithism" of the toolkit: only few items have a maximum size exceeding 5 cm. Taking into account this feature, the assemblage of Bioče can be referred to as "micro-Mousterian". The predominant category of tools includes side-scrapers—most frequently, single longitudinal ones. Atypical end-scrapers represent another major category. Among the knives, which are third most numerous, single-edged longitudinal items are common. Pointed and combination tools are few.

Layer 2 is divided into three parts (2.1–2.3). Its filling consists mainly of gray-colored sandy loams and uneven-grained sands in the upper and middle part of the layer, while the lower part is composed of light loams.

Products of the radial reduction technique are widely represented in the layer industry. At the same time, all forms typical of the layer 1 industry are present, and also pieces reflecting development of other stone working techniques, such as mass-produced average-sized blades, and also elongated points and carefully retouched side-scrapers and knives, which are manufactured on the basis of these.

Layers 3, 4.1, and 4.2, which form the lower part of the section, obviously, correspond to series III of the sequence of Pleistocene deposits according to the observations of Đuričić (2006). Deposits in this part of the section are represented by heavy reddish-brown loams, with various degrees of saturation with detrital material.

The stratigraphy of the site deposits reflects a prolonged process of sedimentation. Ancient intra-cave deposits (layer 4.2) formed as a result of chemical erosion of the limestone bedrock lie at the section base, obviously. This process could have proceeded even before the opening of the karst cavern. The angular displacement between the dip and strike of the layer 4.2 textures and the overburden deposits suggests the break in sedimentation that preceded the accumulation of layer 4.1. The presence of aleurite lenses in layer 4.1 points to the formation of sediments under conditions of a low-flow water reservoir with a relatively stable hydrological regime. In terms of its origins, layer 3 is sediment of layer 4.1 that experienced intense mechanical destruction in a dry or poorly moistened ground condition, accompanied by a substantial input of detrital material under subaerial conditions. Such a drastic change of setting is probably related to the opening of the karst cavern. From this point on, landscape and climatic changes started playing a leading part in the dynamics of the formation of loose deposits.

The arrangement of the archaeological materials in the deposits is indicative of the almost permanent presence of humans in the niche during the formation of the cultural layers of the two upper units, which precluded the accumulation of sterile sediments. As a result of successive accumulation of the remains of numerous visits (layers 1 and 2), stratigraphically monotonous cultural gigantic layers were formed. Rare stone items, which do not form pronounced occurrence horizons, are recorded in a "suspended" state in layers 3 and 4.1. Meanwhile, the materials of layer 4.1 are localized solely in its near-superface part.

Analysis of the entire body of data allows the conclusion to be drawn that the loamy fill of layer 3 is similar in its content to the substance of layer 4.1, though different from the latter in its crumbly structure, lack of lens-stratified texture, and in the saturation with detrital material received from the shelter walls. Formation of layer 4.1 proceeded predominantly in a low- or moderate-flow subaqueous setting, typical of closed karst caverns, which was replaced by subaerial conditions characteristic of dry (open, blown) caverns. Most probably, after intra-cave sediments had dried out (the beginning of layer 3 formation), the space under the Bioče rock shelter became comfortable for visits and habitation by Paleolithic humans. In light of this, the artifacts from layer 4.1 should be considered as received from layer 3 as a result of trampling.

Archaeological materials from layers 3 and 4.1

The lithic industry from layer 3 totals 310 items (Table 1). Almost one third of the collection consists of production waste in the form of chips and scales. Taking into account small flakes that were not used to manufacture tools, waste accounts for 68 % of the collection.

Core-shaped items comprise 16 pieces, including 3 core-shaped fragments and a completely exhausted core. Typologically definable cores (13 items) represent several reduction strategies (Table 2), among which the prevailing one can barely be distinguished.

Three cores are single-platform and unifacial. The platforms of two items were prepared by several deep transverse spalls. Average-sized oval flakes were detached from them (Fig. 4, *14*, *18*). Several large flakes were detached from the third item without preliminary preparation of the core (Fig. 4, *23*). Reduction of the longitudinal core to produce elongated spalls was performed from one asymmetrically convex platform along two adjacent sides (Fig. 4, *24*). A longitudinal alternative core has two opposite wide fronts with negative scars from shortened detachments, of average and small size, that were spalled in reversed directions (Fig. 4, *17*). A bidirectional core shows negatives of counter-oriented small detachments on adjacent surfaces (Fig. 4, *12*).

Two artifacts are assigned to the category of orthogonal. The detachment of blanks was performed along one (Fig. 4, *13*) or two adjacent (Fig. 4, *19*) fronts after reorientation of the core, the latter being due to the formation of defects on the main front.

The only Levallois core in the collection was made on a small pebble (Fig. 4, *16*). A large spall removing the major portion of the front was detached from a smooth striking-platform. Negative scars of small shaping centripetal detachments are preserved along the perimeter.

Spalls for shaping the striking-platform occupy 3/4 of the blank perimeter on one radial core, and 1/2 of the blank perimeter on the second core. The fronts of both items are covered by negatives of small centripetal detachments. A similar centripetal method of flaking blanks is represented by a bifacial discoid core (Fig. 4, *20*).

A set of technical spalls (see Table 1) consists mainly of the decortication products (primary and secondary spalls of different size). Average-sized flakes prevail. Three artifacts are defined as longitudinal marginal spalls.

The category of blank spalls is dominated by average-sized flakes (3–5 cm) represented by 41 pieces (see Table 1). Characteristic of this category is a smooth striking-platform. Among the flakes, there is a series of tools with roughly faceted striking-platforms suggestive of the Levallois technique. Implements with

Table 1. **Main categories of stone tools from layers 3 and 4.1 at Bioče**

Products of primary reduction	Layer 3		Layer 4.1	
	pcs.	%	pcs.	%
Core-shaped items	16	5.2	4	11.8
Including:				
cores	13	4.2	3	8.8
core-shaped fragments	3	1.0	1	2.9
Primary spalls	6	1.9	1	2.9
Including:				
large	1	0.3	0	0.0
medium	5	1.6	1	2.9
Secondary spalls	12	3.9	3	8.8
Including:				
large	1	0.3	1	2.9
medium	8	2.6	2	5.9
small	3	1.0	0	0.0
Flakes	163	52.6	13	38.2
Including:				
large	5	1.6	0	0.0
medium	41	13.2	2	5.9
small	117	37.7	11	32.4
Technical spalls	4	1.3	0	0.0
Including:				
longitudinally marginal	3	1.0	0	0.0
indeterminate	1	0.3	0	0.0
Chips	73	23.5	3	8.8
Scales	21	6.8	8	23.5
Complete blades	4	1.3	0	0.0
Split pebbles	10	3.2	2	5.9
Split boulder	1	0.3	0	0.0
Total	310	100.0	34	100.0

Table 2. **Cores from layers 3 and 4.1 at Bioče**

Core type	Layer 3		Layer 4.1	
	pcs.	%	pcs.	%
Longitudinal	2	13	1	25
Transverse	1	6	–	–
Longitudinal adjacent	1	6	–	–
Bidirectional adjacent	1	6	–	–
Longitudinal alternative	1	6	–	–
Multidirectional	1	6	2	50
" bifacial	1	6	–	–
Levallois for production of flakes	1	6	–	–
Radial	2	13	–	–
Discoid	1	6	–	–
Exhausted	1	6	–	–
Core-shaped fragment	3	19	1	25
Total	16	100	4	100

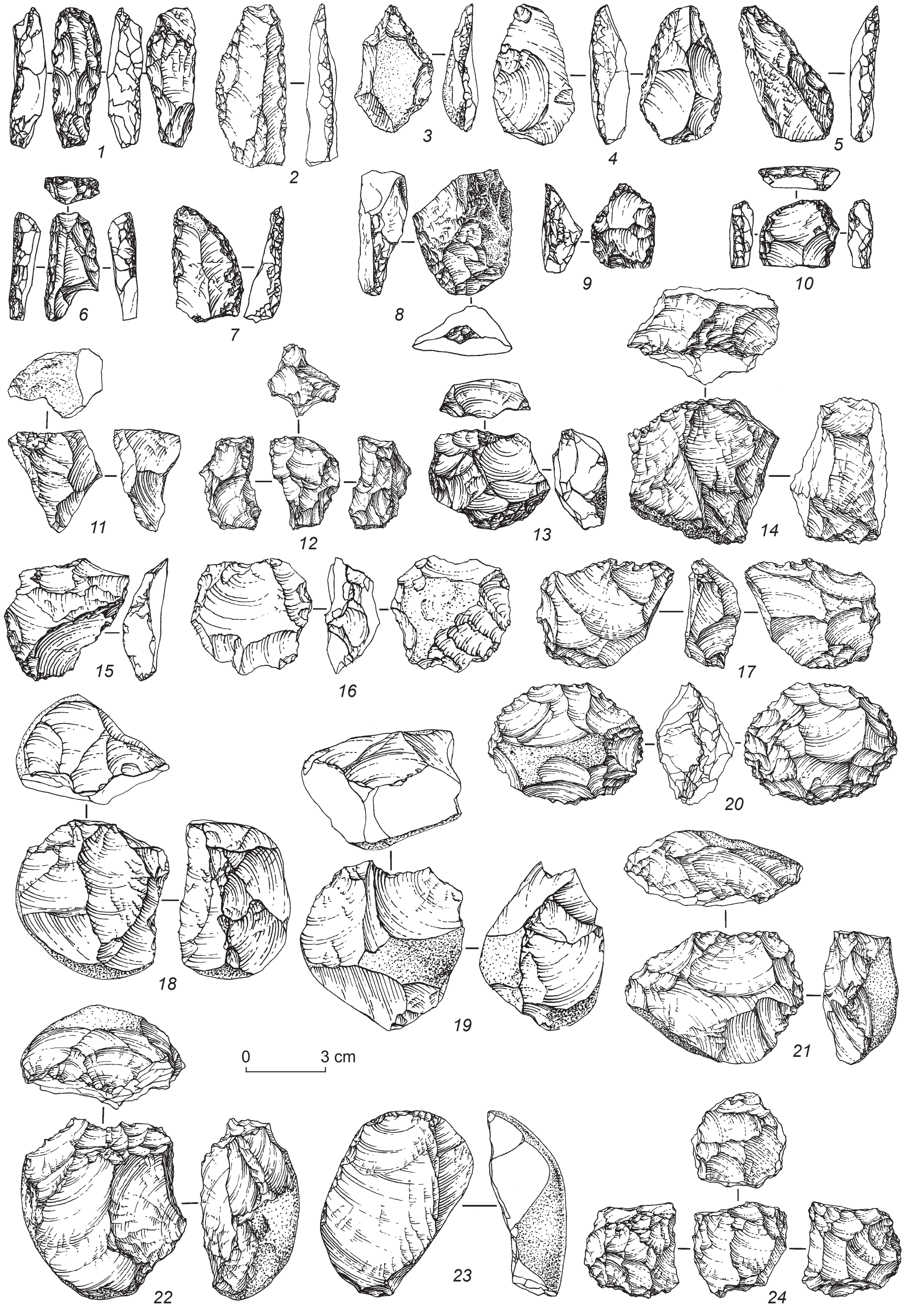

Fig. 4. Lithic industry from layers 3 and 4.1 at Bioče.

dihedral platforms, which occur (although infrequently) in flakes and blades, are morphologically close to them. Obviously, rare spalls with linear/point-like platforms should be considered accidental. Pieces with natural platforms are associated only with decortication spalls.

Faceting of spalls generally corresponds to the methods of reduction that are represented by accompanying cores. One third of the items have longitudinal faceting. Spalls with multidirectional faceting are half of this. Detachments with smooth, radial or convergent faceting are less representative. Bidirectional faceting is recorded on one blade.

Half of the toolkit is composed of side-scrapers of various types (Table 3). Single-edged side-scrapers are made on flakes in a longitudinal manner (Fig. 4, *8*, *15*). They differ in the degree of the edge's convexity, in the presence or absence of a back, and one specimen is distinguished by an arrangement of its facets. Retouch in the majority of items is dorsal, abrupt, marginal, medium- or fine-faceted. One side-scraper can be assigned to the category of bifacial, longitudinal, and convex. An area of natural surface performs the function of a back. The edge is prepared by fine, continuous, abrupt, marginal, bifacial retouch.

Characteristic of double side-scrapers are convex edges (Fig. 4, *1*, *6*). Two tools are treated by dorsal abrupt and vertical scalar, invasive, large-faceted retouch, owing to which the items have acquired oval elongated shapes, and a resemblance to limaces. One of the tools shows traces of a series of small flattening spalls from a longitudinal edge to the ventral surface. A longitudinal straight dorsal side-scraper is shaped on a blade. The edges are treated by stepped vertical medium- and fine-faceted invasive retouch. The collection includes a longitudinal straight-convex side-scraper made on a blade as well (Fig. 4, *2*). It has dorsal abrupt retouch, marginal on one edge, and invasive scalar on the other.

Two side-scrapers are treated by dorsal abrupt marginal scalar retouch along 3/4 of their perimeters. A longitudinal edge of one implement has a negative scar from a large spall of ventral thinning-out (Fig. 4, *4*).

A longitudinal straight dorsal knife with a natural back is made on a small robust flake. The working edge is pointed by semi-abrupt medium-modified, large-faceted, invasive retouch.

Atypical end-scrapers (2 pieces) are made on flakes (Fig. 4, *9*, *10*). The edges, straight in one case and convex in the other, are prepared by dorsal, vertical, strongly-modified, medium- and fine-faceted marginal retouch.

Spurred tools total 3 items. The working member is located on the distal edge (Fig. 4, *3*) or at the corner between the distal and longitudinal edges of the blank. The spur is separated by means of deep dorsal (2 pieces) or ventral notches.

Table 3. **Tools from layers 3 and 4.1 at Bioče**

Tool type	Layer 3		Layer 4.1	
	pcs.	%	pcs.	%
Side-scraper, single longitudinal straight	1	5	–	–
" with a natural back	1	5	–	–
Side-scraper, single longitudinal convex	1	5	–	–
" with a natural back	–	–	1	33
" with bifacial retouch	1	5	–	–
Double side-scraper, longitudinal straight	1	5	–	–
" convex	2	10	1	33
" straight-convex	1	5	–	–
Side-scraper with retouch along 3/4 of its perimeter	2	10	–	–
Longitudinal straight knife with a natural back	1	5	–	–
Atypical end-scraper	2	10	–	–
Spurred tool	3	14	–	–
Notched-denticulate tool	1	5	–	–
Retouched fragment	1	5	–	–
Retouched flake	2	10	1	33
Tool fragment	1	5	–	–
Total	21	100	3	100

The working edge of a notched-denticulate tool on the middle marginal spall is represented by a series of shallow notches separated by slightly protruding dents.

The collection comprises flakes with episodic dorsal and ventral retouch, a piece with irregular retouch, and a fragment of a tool.

In layer 4.1, 30 artifacts have been found, a half of which was represented mainly by small flakes. One third of the collection consists of fragments and scales. Four core-like shapes (three cores and a fragment), four decortication spalls, and two average flakes may be classified as informative items.

Two multidirectional (Fig. 4, *21*, *22*) and one longitudinal (Fig. 4, *11*) cores reflect strategies of the industry of layer 3. The characteristics of platforms and spall faceting are also in exact accordance with those in materials of the overlying layer, which confirms the expediency of interpreting items from layers 3 and 4.1 within a single assemblage.

The toolkit consists of 3 items. A single, longitudinal, convex side-scraper with a natural back is made on a longitudinally marginal blade. The working edge of the tool is shaped by dorsal, stepped, abrupt, strongly-modified, medium- and fine-faceted invasive retouch (Fig. 4, *5*). A double, longitudinal, convex side-scraper on the middle leaf-shaped flake is treated by dorsal, abrupt, marginal, different-sized retouch (Fig. 4, *7*). The last item is an average-sized spall with small portions of ventral retouch.

Brief description of Middle Paleolithic assemblages of Montenegro

Seven Paleolithic localities are known in the territory of Montenegro; however, Middle Paleolithic materials were recorded at only three of them: Crvena Stijena, Mališina Stijena, and Bioče. The major source of information on that epoch is provided by collections from the site of Crvena Stijena (Crvena Stijena, 1975; Baković et al., 2008), located not far from the boundary between Montenegro and Bosnia and Herzegovina. The thickness of loose deposits at the site is more than 20 m. In different years, researchers have distinguished 30 cultural layers comprising archaeological material from the Lower Paleolithic (pre-Mousterian) to the Bronze Age. 20 layers, with a total thickness of more than 10 m, were assigned to the Middle Paleolithic.

The materials from layers XXXI–XXV of Crvena Stijena allow us to relate the beginning of the Middle Paleolithic in this region to MIS 6, or an earlier period (Mihailović, 2014). Throughout the duration of MIS 6 (186–128 ka BP), a cold and dry climate was typical of the Balkans (Tzedakis, Hooghiemstra, Palike, 2006). Forest vegetation was preserved only in small refugiums with sufficiently humid climates and without extreme temperature fluctuations. Archaeological collections of the site suggest that roughly shaped cores made by means of the Levallois or centripetal flaking technique were used in primary reduction. The toolkit is dominated by side-scrapers; denticulate and notched implements are also widely represented. Other categories of tools are less representative. According to D. Mihailović (2014), during this prehistoric period, the Balkans were, obviously, merely a transit corridor connecting Central and Northwestern Europe with Southwest Asia.

Interglacial epoch MIS 5e (128–118 ka BP) was the warmest period for the last 450 thousand years (Abrantes et al., 2012). Evergreen forests with pistachios *Pistacia* and holm oaks *Quércus ílex* grew in Southeastern Europe at that time, as well as elm-trees *Ulmus* and hornbeams *Carpinus*. In the sequence of the Crvena Stijena deposits, layer XXIV, nearly 3 m thick, which consists of several ash horizons saturated with bones and artifacts, pertains to this period (Crvena Stijena, 1975). Primary reduction was dominated by the Levallois technique. The tools were predominantly side-scrapers made on Levallois blanks and *éclat débordant* spalls, as well as retouched spalls (Mihailović, 2014).

The gradual cooling that started approximately 118 ka BP caused alternation of cool (MIS 5d, 5b) and warm (MIS 5c, 5a) climatic phases. A favorable climate of warm phases close to that of MIS 5e facilitated active distribution of Neanderthal populations in the region. During cold phases, when the role of pine-birch and herbal vegetable communities increased (Tzedakis, Bennett, 2005), a demographic decline, obviously, took place.

The archaeological collection of layer XXIII of Crvena Stijena (MIS 5d stage) is very unimpressive.

The materials from layers XXII–XX, which are indicative of the use of Levallois and radial/discoid cores, pertain to the MIS 5c stage. Here, few elongated blanks are present among the spalls. The toolkit is represented mainly by side-scrapers. These are dominated by transverse varieties, some of which are treated by Quina retouch. Among other types of tools, Mousterian points and backed knives should be mentioned. Several atypical end-scrapers occur in layer XXI (Mihailović, 2014).

Layer XIX yielded only rare uninformative artifacts.

The materials of layer XVIII are related to stage MIS 5b. The characteristics of this lithic industry are very close to those of industries from layers XXII–XX; however, according to M. Brodar (1962), notched-denticulate implements are numerous in the toolkit.

Scarce materials from layer XVII pertain to stage MIS 5a. Primary reduction is characterized by a Levallois core, a combination core, and a bidirectional core. The toolkit is for the first time dominated by denticulate shapes rather than by side-scrapers. Tools of other types are few and, among these, narrow blades and points with abrupt retouch along the longitudinal edge are noteworthy.

The subsequent stage MIS 4 (75–58 ka BP) was distinguished by strong cooling that was accompanied by a dominance of steppe vegetation in Central and Southern Europe. The evidence of human activities in the Crvena Stijena deposits of this period (layer XVI) is minimal (Crvena Stijena, 1975; Morley, Woodward, 2011), as it is throughout the entire territory of the Balkans (Mihailović, 2014).

The situation changed drastically about 58 ka BP (MIS 3 stage), when forest vegetation spread as the climate was becoming warmer and more humid (Panagiotopoulos et al., 2014). The geochronological position of layers XV–XIII of Crvena Stijena is not quite clear; layer XII, with a ^{14}C-date of 40,777 ± 900 ka BP (Vogel, Waterbolk, 1972), most certainly belongs to MIS 3. During this period, the subsistence strategies of local inhabitants underwent dramatic changes: totally new techniques came into use in the practice of production. The cores made by the Levallois and radial techniques were reduced down to the limit. Layers XV, XIV and XII contain flattened cores with negatives from the detachment of blades. Simple longitudinal side-scrapers prevail among the tools, and atypical end-scrapers are especially abundant in layers XIV and XIII (Mihailović, 2014).

In general, the materials of Middle Paleolithic layers XXXI–XVII of Crvena Stijena are defined as Mousterian Charantian-like tools with traces of the Levallois technique (Excavation…, 1982). Cultural layers of the final stage of the Middle Paleolithic (XVI–XII) were assigned to the regional micro-Mousterian facies (Mihailović, 2014).

The site of Mališina Stijena in northern Montenegro has only been studied fragmentarily. The site is located in a vast rocky depression on the left bank of the Ćehotina River. During archaeological excavations of the site in 1980–1984 and 1986–1987, it was possible to identify layers of the middle and final stages of the Upper Paleolithic. The Middle Paleolithic layers (3b13–3b16 in the southern part of the site, and 9–14 in the western part) with a total thickness of 0.5 to 1.0 m, were studied within an area of about 6 m^2. Only the most general information on the type of lithic industry is available (Radovanović, 1986). The excavators point to the prevailing use of centripetal flaking in primary reduction, with minor incidence of the Levallois technique. Notched-denticulate items are most widely represented among the tools. Apparently, to determine the place of this site in the regional Paleolithic structure, additional studies are needed.

Preliminary chronology of materials of Bioče layers 3 and 4.1 within the context of the Middle Paleolithic in Montenegro

Materials of the lower unit of the Bioče site deposits are rare (especially compared to collections of the middle and top parts of the section); however they allow us to get an idea of the stone-working trend among first inhabitants of the site. Quite simple parallel, multidirectional, and centripetal flaking patterns were used for primary reduction based on pebble raw materials. There also is vivid evidence of the use of Levallois technique. Reduction was performed to produce small, sufficiently wide, and robust flakes with straight profiles. Single and double side-scrapers were the predominant category of the toolkit. Atypical end-scrapers, spurred and notched-denticulate tools, and flakes with irregular retouch are few. All categories of tools (including blade-based tools) are represented in the overlying layers, which can be explained by the preservation of the original specialization of the site.

The results of analysis of the dynamics of the Bioče industry (taking into account stratigraphic observations) give grounds for distinguishing several technocomplexes marking the episodes of the site's occupation by human communities practicing various stone-working techniques. According to key indicators, the industry of the lower part of Bioče section may belong to stages MIS 5c-b. The industries of this period, judging by the finds from layers XXII–XVIII of Crvena Stijena, are characterized by the use of Levallois and radial/discoid cores. Noteworthy is also the availability of a few elongated blanks among the spalls from these layers. Similarly to the industry from the lower units of deposits in Bioče, the toolkit of layers XXII–XVIII in Crvena Stijena includes side-scrapes and backed knives. Also, layer XXI contained several atypical end-scrapers. The possibility of such an age-assessment of the lower part of the Bioče section (in the absence of absolute dating results) is also raised by the presence of narrow blades and points with abrupt retouch along the longitudinal edge in a scanty collection of layer XVII of Crvena Stijena (stage MIS 5a). Such shapes determine the appearance of the industry of Bioče layer 2 overlying the cultural strata of the lower deposits. Thus, there are sufficient grounds to assign the material complex of the lower part of the Bioče section to the cultural tradition that became established in the Middle Paleolithic of the region during MIS 5 (Crvena Stijena, 1975; Baković et al., 2008; Mihailović, 2014).

The obtained results allow a conclusion to be drawn about the cultural and chronological variability of the Bioče assemblages, and suggest that this site is considerably older than previously thought. This last circumstance supplies a reason for using Bioče as a reference object in cultural and chronological reconstructions along with Crvena Stijena materials.

References

Abrantes F., Voelker A., Sierro F.J., Naughton F., Rodrigues T., Cacho I., Ariztegui D., Brayshaw D., Sicre M.-A., Batista L. 2012
Paleoclimate variability in the Mediterranean region. In *The Climate of the Mediterranean Region*. London: Elsevier, pp. 1–86.

Baković M., Mihailović B., Mihailović D., Morley M., Vusovic-Lucic Z., Whallon R., Woodward J. 2008
Crvena Stijena excavations 2004–2006, preliminary report. *Eurasian Prehistory*, vol. 6 (1/2): 3–31.

Brodar M. 1962
Crvena Stijena 1958 i 1959. *Glasnik Zemaljskog muzeja u Sarajevu*. N. S., vol. XVII: 15–20.

Derevianko A.P., Bulatović L., Baković M., Agadžanjan A.K., Vislobokova I.A., Pavlenok K.K., Kandyba A.V., Chekha A.M. 2012
Issledovaniye skalnogo navesa Bioche (Chernogoriya) v 2012 godu. In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii*, vol. XVIII. Novosibirsk: Izd. IAE SO RAN, pp. 46–50.

Derevianko A.P., Bulatović L., Baković M., Tsybankov A.A., Ulyanov V.A., Kandyba A.V. 2011
Issledovaniye skalnogo navesa Bioche (Chernogoriya) v 2011 godu. In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii*, vol. XVII. Novosibirsk: Izd. IAE SO RAN, pp. 34–40.

Derevianko A.P., Bulatović L., Pavlenok K.K., Kandyba A.V., Kozlikin M.B., Ćulović G., Chekha A.M. 2014
Kharakteristika materialnykh kompleksov stoyanki Bioche (po itogam rabot 2014 goda). In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii*, vol. XX. Novosibirsk: Izd. IAE SO RAN, pp. 27–31.

Derevianko A.P., Bulatović L., Tsybankov A.A., Ulyanov V.A., Kandyba A.V., Krivoshapkin A.I., Baković M. 2010
Issledovaniya skalnogo navesa Bioche (Chernogoriya) v 2010 godu. In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii*, vol. XVI. Novosibirsk: Izd. IAE SO RAN, pp. 52–57.

Derevianko A.P., Bulatović L., Ulyanov V.A., Pavlenok K.K., Kozlikin M.B., Kandyba A.V., Anoikin A.A., Ćulović G. 2015
Stratigrafiya otlozheniy skalnogo navesa Bioche (Chernogoriya). In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territorii*, vol. XXI. Novosibirsk: Izd. IAE SO RAN, pp. 49–52.

Derevianko A.P., Pavlenok K.K., Kandyba A.B. 2014
Finalnoye mustye Vostochnoi Adriatiki: Kamennaya industriya stoyanki Bioche. In *Trudy IV (XX) Vseros. arkheol. syezda v Kazani*, vol. I. Kazan: Otechestvo, pp. 56–58.

Derevianko A.P., Pavlenok K.K., Kandyba A.V., Kozlikin M.B., Chekha A.M. 2014
Mikromustye Balkanskogo poluostrova: K istorii izucheniya voprosa. *Vestnik Novosib. Gos. Univ*. Ser.: Istoriya, filologiya, vol. 13 (5). Iss.: Arkheologiya i etnografiya: 17–26.

Dogandžić T., McPherron S., Mihailović D. 2014
Middle and Upper Paleolithic in the Balkans: Continuities and discontinuities of human occupations. In *Palaeolithic and Mesolithic Research in the Central Balkans*. Belgrade: Serb. Archaeol. Soc., pp. 81–94.

Đuričić L. 2006
A contribution to research on Bioče Mousterian. *Journal of the Serbian Archaeological Society*, vol. 22: 179–196.

Excavation in the Bacho Kiro Cave – Final Report. 1982
Warsaw: Panstwowe wydawnictwo naukowe.

Furlan D. 1977
The climate of southeast Europe. In *Climates of Central and Southern Europe. World Survey of Climatology*. Amsterdam: Elsevier, pp. 185–235.

Karavanić I. 2007
Le Moustérien en Croatie. *L'Anthropologie*, vol. 111: 321–345.

Karavanić I., Smith F.H. 2013
Alternative interpretations of the Middle/Upper Paleolithic interface at Vindija Cave (Northwestern Croatia) in the context of Central Europe and the Adriatic. *Archaeology, Ethnology and Anthropology of Eurasia*, vol. 41 (4): 11–20.

Mihailović D. 2014
Palaeolithic in the Central Balkans: Cultural Changes and Population Movements. Belgrade: Serb. Archaeol. Soc.

Mihailović D., Mihailović B., Lopičić M. 2011
The Paleolithic of Northern Serbia. In *The Prehistory of Banat I: The Palaeolithic and Mesolithic*. Bucharest: The Publ. House of the Romanian Acad., pp. 77–101.

Morley M.W., Woodward J.C. 2011
The Campanian Ignimbrite (Y5) tephra at Crvena Stijena Rockshelter, Montenegro. *Quaternary Research*, No. 75 (3): 683–696.

Panagiotopoulos K., Böhm A., Leng M., Wagner B., Schäbitz F. 2014
Climate variability over the last 92 ka in SW Balkans from analysis of sediments from Lake Prespa. *Climate of the Past*, No. 10: 643–660.

Radovanović I. 1986
Novija istrazhivaњa paleolita i mezolita u Tsrnoj Gori. *Glasnik Srpskog arkheoloshkog drushtva*, No. 3: 63–76.

Reed J.M., Kryštufek B., Warren J. 2004
The physical geography of the Balkans and nomenclature of place names. In *Balkan Biodiversity: Pattern and Process in the European Hotspot*. Dodrecht: Springer Sci., pp. 9–22.

Stepanchuk V.N., Sapozhnikov I.V. 2010
Paleolit Balkan i Severnogo Prichernomorya: Vzaimodeistviye ili nezavisimoye sosushchestvovaniye? In *Terra cognoscibilis: Kulturnoye prostranstvo mezhdu Balkanami i Velikoi Stepyu v epokhu kamnya – bronzy*. Odessa: SMIL, pp. 11–39. (Materialy po arkheologii Severnogo Prichernomorya; iss. 11).

Tsrvena Stijena. 1975
Nikšić: Nauchno delo.

Tzedakis P., Bennett K. 2005
Interglacial vegetation succession: A view from southern Europe. *Quaternary Science Reviews*, No. 14: 967–982.

Tzedakis P., Hooghiemstra H., Palike H. 2006
The last 1.35 million years at Tenaghi Philippon: Revised chronostratigraphy and long-term vegetation trends. *Quaternary Science Reviews*, No. 25: 3416–3430.

Vogel J.C., Waterbolk H.T. 1972
Groningen radiocarbon dates X. *Radiocarbon*, No. 14: 6–110.

Received January 25, 2016.