SELECTION, OPPORTUNISM AND CONCEPTUAL CONTRADICTIONS IN THE MOUSTERIAN FROM THE CARPATHIAN CAVES (ROMANIA)

A NYERSANYAG KIVÁLASZTÁSA, OPPORTUNIZMUS ÉS FOGALMI ELLENTMONDÁSOK A KÁRPÁTOK BARLANGJAINAK (ROMÁNIA) MOUSTIERI KULTÚRÁJÁBAN

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Abstract

Between the settlements dating from the Middle Palaeolithic in Romania, a special place is held by the Mousterian from the Carpathian caves which provided lithic industries made of a great diversity of local rocks: flint, chaille, chert, jasper, radiolarite, quartz, quartzite, quartzolite, andesite, basalt, diorite etc. So far, all the specialized studies highlight the use of rocks other than flint, chaille or chert as a form of substitution of the high-quality raw materials missing in a certain area. As the use of certain types of rocks provides particular technological and typological features to the material culture from the Carpathian caves, we shall attempt to understand to what extent the Mousterian dwellers of the Carpathian caves chose, for debitage, certain categories of rocks with different mechanical properties and petrographic characteristics. The types of rocks analysed in this article come from the following Mousterian settlements: Bordul Mare Cave from Ohaba Ponor, Curată Cave from Nandru, Cioarei Cave from Boroşteni and Muierii Cave from Baia de Fier. Besides the prevalent use of local rocks, which denotes opportunistic behaviour and particular adaptability in relation to resources existing around the settlements, we find there are differences in selecting the types of raw material.

Kivonat

A romániai középső paleolitikus lelőhelyek között fontos helyet foglalnak el a Kárpátok barlangjainak moustiéri rétegei, amelyek leletei olyan helyi kőzetekből készültek, mint a tűzkő, kova, szarukő, jáspis, kvarc, kvarcit, kvarcolit, andezit, bazalt, diorit, stb. Az eddigi tanulmányok szerint a különböző, gyengébb minőségű kova- és szarukő fajták felhasználását az tette szükségessé, hogy az adott régióból hiányoztak a jó minőségű nyersanyagok forrásai. Mivel a különböző kőzetek felhasználása különböző eszköztípusok és technológiai jellegzetességek felhasználását teszi lehetővé, a cél annak megértése, hogy az itt élő emberek miért választották az egyes eltérő mechanikai és kőzettani jellemzőkkel rendelkező kőzeteket. Az elemzett kőzettípusok: a Bordul Mare-barlang (Ohaba Ponor – Ohábaponor, Hunyad megye), a Curată-barlang (Nandru – Nándor, Hunyad megye), a Cioarei-barlang (Boroşteni – Gorj megye) és a Muierii barlang (Baia de Fier – Gorj megye) moustiéri lelőhelyeiről származnak. Az eredmények arra utalnak, középső paleolitikus közösségek, opportunista viselkedést és alkalmazkodóképességet mutatva, túlnyomó részben a közeli nyersanyagforrásokat használták. Ugyanakkor, bizonyos különbségek is kimutathatóak a nyersanyag választás esetében.

KEYWORDS: MIDDLE PALAEOLITHIC, CARPATHIAN CAVES, RAW MATERIAL, PETROGRAPHIC ANALYSES, MICROSCOPIC ANALYSES

KULCSSZAVAK: KÖZÉPSŐ PALEOLITIKUM, BARLANGOK, NYERSANYAG, KŐZETTANI ELEMZÉSEK, MIKROSZKÓPOS ELEMZÉSEK

Introduction

Among the settlements of Romania in which Mousterian cultural layers have been defined, a special place is held by the Mousterian from the Carpathian caves which provided lithic industries made of a great diversity of local rocks: flint, chaille, chert, jasper, radiolarite, quartz, quartzite, quartzolite, andesite, basalt, diorite etc.

Generally, man's most favourite rocks in Prehistory to produce the tools are of the sedimentary siliceous type: flint, chaille, chert, jasper, radiolarite. Romanian geologists call them quite frequently silicolites. Among the jaspers, there are two varieties, more commonly encountered in the Palaeolithic, named lydienne and phtanite. Moreover, Romanian geologists include menilites in this category (Papiu 1960).

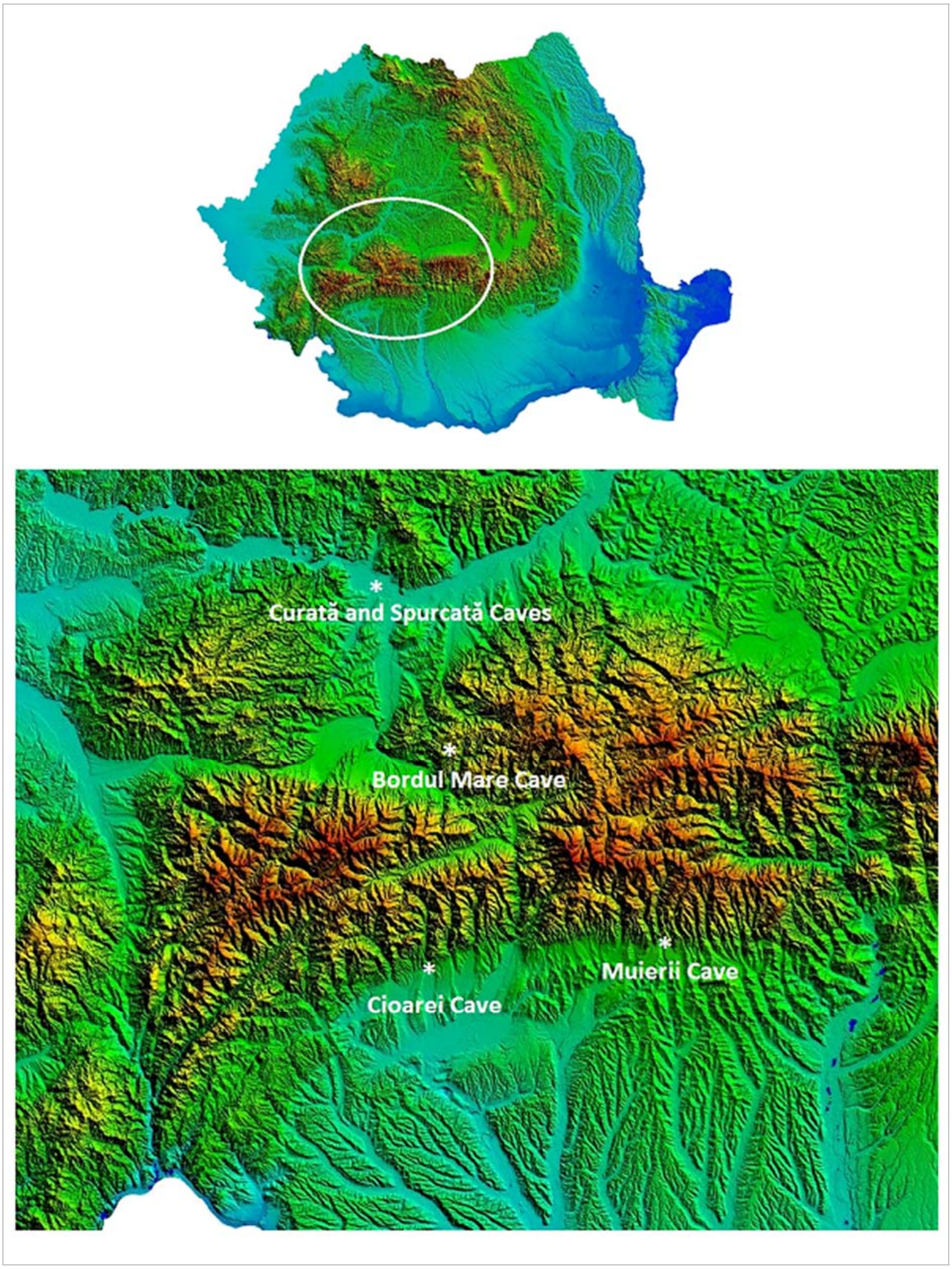

Fig. 1.: Geographic location of the researched caves

1. ábra: A vizsgált barlangok földrajzi elhelyezkedése

In addition to metamorphic rocks of the quartzite type, the Neanderthal man from the Carpathian caves, mainly the Cioarei-Boroşteni Cave, also used several types of igneous rocks. Among the igneous plutonic rocks, we can mention the use of quartzolites, granitoids and different types of granites, granodiorites, syenites, monzonites or diorites. Quartzolites are rocks with massively compact texture, an often equigranular structure, which are composed of 90% quartz along which other various minerals may appear. Granites are plutonic rocks made of quartz, alkali feldspars, plagioclases and few mafic minerals. They have holocrystalline structure and massive, sometimes varved, texture. Granodiorites are rocks formed mainly of quartz, plagioclase and alkali feldspar, with massive texture. At macroscopic level, granites and granodiorites differ from other rocks in the abundant presence of quartz. Syenites are plutonic rocks in which felsic minerals are almost exclusively represented by alkali feldspars and plagioclases. Monzonites are plutonic rocks in which felsic minerals are preponderantly represented by alkali feldspars and plagioclases in relatively equal proportions. Diorites are phaneritic rocks comprised of plagioclases (andesine and oligoclase) and mafic minerals. They are echigranular and present a low to high granulation, gray colour (the typical "salt and pepper" aspect) (Mareş et al. 1989).

Of the volcanic igneous rocks, rhyolites, basalts and andesites were used. Rhyolites are volcanic rocks composed mainly of quartz, alkali feldspar and plagioclase. They have porphyric or microporphyric structure. Basalts are aphanitic rocks made of mafic minerals and plagioclase. They are dark-coloured rocks, black or gray-black. When chloritized, basalts have a greenish colour, and when oxidized, they are reddish brown. They present various textures: fluidal, vesicular, amygdaloidal etc. Andesites are porphyric rocks composed mainly of plagioclase and mafic minerals. They have variable colours, generally gray, reddish brown or black (Mareş et al. 1989).

As the use of certain types of rocks provides particular technological and typological features to the material culture from the Carpathian caves, we shall attempt to understand to what extent the Mousterian dwellers of the Carpathian caves chose, for debitage, certain categories of rocks with different mechanical properties and petrographic characteristics. The types of rocks analysed in this article come from the following Mousterian settlements: Bordul Mare Cave from Ohaba Ponor, Curată Cave from Nandru, Cioarei Cave from Boroşteni and Muierii Cave from Baia de Fier (**Fig. 1.**). The reason for selecting these settlements was influenced by two significant aspects: the existence of a sufficient number of lithic industries and recent restudy of lithic ensembles which have provided an accurate assessment of the proportion of raw material used (Cârciumaru 2000, Cârciumaru et al. 2000, 2002a, 2002b, Doboş et al. 2010, Niţu 2012). Furthermore, Mousterian layers in these settlements are, chronologically speaking, fairly close to each other (Cârciumaru 1973, 1980, 1999, Niţu 2012), which allowed us to eliminate several risks inherent in comparisons along extremely large chronological levels and, at the same time, favoured the individualisation of several assumptions regarding communities which are close in terms of time and their occurrence.

Physico-geographical potential

For a better integration of lithic ensembles from the Carpathian caves considered in this study, we have deemed it useful to make a short presentation of the physico-geographical potential of the areas where the caves are located and of the geochronology of Mousterian layers in these particular caves.

Throughout the Haţeg-Orăştie Depression, drained by the hydrographic basin of the Strei river and a part of the Mureş, there are some of the most important caves inhabited by the Neanderthal man: Bordul Mare Cave from Ohaba Ponor, Curată and Spurcată caves from Nandru (**Fig. 2/1, 2**).

Bordul Mare Cave, Pui commune, Hunedoara County, is located at the foot of the Şureanu Mountains (also known, in geological literature, as the Sebeş Mountains), at an absolute altitude of 693 m. Having the code number 2063/7, the cave has a south-west oriented entrance which gives into a wide and spectacular panorama of the Haţeg Depression (**Fig. 2/1.**).

According to recent micropalaeontological determinations and the observations made on the lamellibranches and gastropods discovered by us during archaeological excavations, the limestone in which Bordul Mare Cave was carved can be assigned to the Upper Cretaceous and not to the Jurassic, as previously thought. The Upper Cretaceous often includes conglomerates caught between layers of limestone, which, once released by erosion, lie upon the limestones underlying these layers (Gherasi et al. 1968, Mureşan et al. 1980). Thus we can explain the numerous and various quartz and quartzite pebbles, alongside other types of rocks, of different sizes, which can be encountered on the limestone slopes near the Bordul Mare Cave, rock that were extensively used by the dwellers of the cave during the Mousterian. Furthermore, we have discovered an extremely revealing situation on the Fântâna Socilor Plateau, close to Bordul Mare Cave, where, among pebbles of various rocks, including quartzite, we have found such rocks as flint and chert (Cârciumaru et al. 2011; Niţu, 2012).

Fig. 2.: Bordul Mare Cave (1); Curată and Spurcată caves from Nandru (2); Limestone spur in which the Cioarei Cave is carved and panorama of Subcarpathian depression opening above the cave (3); Entrance to the Muierii Cave and the Galbenu river Gorge (4).

2. ábra: Bordul Mare-barlang (1); Curată- és Spurcată-barlang, Nándor mellett (2); Mészkőszirt a Cioarei-barlanggal és a Kárpátok előterének panorámájával (3); A Muierii-barlang bejárata és a Galbenu folyó áttörése (4)

The particularity of the Haţeg Depression is given by the mountain massifs which border it to the south (Retezat and Ţarcu Mountains), west-northwest (Poiana Ruscă Mountains), and east-northeast (Şureanu Mountains). At the same time, the depression occupies a special place within the orographic ensemble of southwest Transylvania, with direct connections to surrounding mountain units, provided by the rivers descending from the heights, and to the more distant regions by the couloir of the Strei river as far as its flowing into the Mureş and further, to the entire Basin of Transylvania and the Hungarian Plain (Alföld). The Haţeg-Orăştie Depression is truly an area of morphological, hydrographic convergence and, hence, of convergence of communication means with very large geographic units with natural potential (Badea et al. 1987a, 1987b).

The Curată (code 2277/1) and Spurcată (cod 2277/2) caves are located along the Petac river, a tributary of the Cerna, which expands its hydrograhic basin over a length of 65 km and an area of 740 sq km in the Poiana Ruscă Mountains (**Fig. 2/2.**).

The Poiana Ruscă Mountains, flanking the Haţeg-Orăştie Depression to the west, are an intermediary relief level between the depression area and the high areas of the Southern Carpathians (Kräutner 1984).

Petrographically, the Poiana Ruscă Mountains stand out through the presence of metamorphic rocks such as mica-schists, amphibolites, gneisses, crystalline rocks (including quartzites) and limestones which locally (in the areas of Hunedoara-Runcu-Luncani or Nandru) reach 3,000 m in thickness. Igneous rocks such as granodiorites and andesites are also present.

Alongside the valley of the Strei, the Cerna forms a parallel couloir linking the depression with the valley of the Mureş river. This proves that Palaeolithic communities had a clear opportunity to penetrate, by its tributaries, deep into the mountainous plateaux and, moreover, it provided easy access to the wide valley of the Mureş river which represented, for the bunches of hunters, a real gate towards the east and the west, once they came out of the depression.

Two other caves, located south of the Southern Carpathians, revealed important Mousterian dwellings: the Cioarei Cave and the Muierii Cave.

The Cioarei Cave (code 2116/1) is situated along the Bistricioara river, a tributary of the Bistriţa, in the vicinity of the Boroşteni village, commune of Peştişani, Gorj County, carved in a limestone spur of Barremian-Aptian age, which descends from Piatra Boroşteni in the Vâlcan Mountains (Cârciumaru 2000, Cârciumaru et al. 2000, Cârciumaru et al. 2002a, 2002b). The cave has a strategic location, at the contact of the southern rim of the mountain with the first depression groove specific to the Subcarpathians of Oltenia, which allows a wide panorama opening in front of the entrance to the cave (**Fig. 2/3.**).

The valley of the Bistricioara, which penetrates deep into the Vâlcan Mountains, crosses the granitoid and granitic geological layers of the Şuşiţa and Tismana type (Bercia et al. 1968), as well as the Lainici-Păiuş series composed of quartzites, psamitic gneisses, sericite-chlorite schists, cornean, crystalline limestones with silicates, granogneisses, granitoid paragneisses, dynamically metamorphosed rocks, etc. (Pauliuc 1937, Ghica-Budeşti 1940). Among the granites of the Şuşiţa and Suseni types, fully developed along the southern rim of the Vâlcan Mountains, quartz, granites and diorites stand out. The valley of the Bistricioara also presents quartzites from the Tulişa layers. Given the analyses conducted on the lithic material at the Cioarei Cave, we believe that geologists have wrongly defined the quartzite in this area; the rock they refer to is actually quartzolite. This confusion is due to the macroscopic similarities between the two rock types.

The Muierii Cave (code 2051/1) was carved in the Tithonic limestones which form the Garba crest in the southwest of the Parâng Mountains. The entrance opens to the southwest, along the gorges formed by the valley of the Galbenu brook. The cave is located upstream of Baia de Fier, Gorj County, where the Galbenu brook exits the gorge in the Subcarpathian depression (**Fig. 2/4.**).

Galbenu valley crosses geological layers attributed to the Palaeozoic magmatites composed of granites, granitoids, granodiorites and gneiss facies. The series of Tulişa, in the area crossed by the Galbenu valley, appears to consist mainly of crystalline schists, while the quartzites are not present, as in the region crossed by the Bistricioara valley, where the Cioarei cave from Boroşteni is located (Bercia et al. 1968). However, its use during the Mousterian in the Muierii Cave remains an undeniable fact, which implies the existence of other areas of origin, near the cave.

Geochronology of Mousterian layers

Bordul Mare Cave

Bordul Mare cave revealed four Mousterian layers (Roska 1924, 1925a, 1925b, 1930, 1933, 1943, Nicolăescu-Plopşor et al. 1955, 1957a). We shall not insist on numbering the layers over the course of time for this has been dealt with in a recently published article (Cârciumaru & Niţu 2008). Chronologically speaking, absolute dating exists only for upper layers, i.e. layer III, the richest Mousterian layer of the cave, and layer IV. For layer III, there are several samples of C-14 dating establishing the evolution boundaries between 45.500 + 3.500 /-2.400 (GrN 14.626) and 39.200 + 4.500 /-2.900 (GrN 11.618), while for layer IV there is only one dating, namely 28.780 ± 290 B.P. (GrN 14.627). Sedimentation of layer III was completed in the glacial stage between the interstadial complex of Nandru (the Nandru 2 phase - Brörup) and the interstadial complex of Ohaba (Ohaba B climatic oscillation - Arcy-Kesselt). The climate was dry and cold and the landscape was dominated by a cold steppe, grass pollen reaching almost 95% (Cârciumaru 1973, 1980). A substantial list of macromammal species confirms the cold climate of this period: *Ursus spelaeus*, *Equus caballus fossilis*, *Cervus elaphus fossilis*, *Megaceros giganteus*, *Rhinoceros tichorhinus*, *Rhinoceros antiquitatis*, *Bos (primigenius)*, *Bison priscus*, *Rangifer tarandus fossilis*, *Elephas primigenius*, *Saiga tatarica*, *Capra sewertzovi*, etc. (Roska 1925a, 1925b, 1930, Gaál 1928, 1943, Nicolăescu-Plopşor et al. 1955, 1957a). As regards Layer IV, palynological studies have revealed the existence of a wet temperate climate characteristic of the Ohaba interstadial complex (Arcy-Stillfried B, Arcy-Kesselt) (Cârciumaru 1973, 1980). The large mammal fauna is consistent with this climate, with species such as: *Ursus spelaeus, Equus caballus fossilis, Ovis (argaloides), Rangifer tarandus fossilis, Cervus elaphus fossilis, Canis lupus, Canis vulpes fossilis* (Roska 1925a, 1925b, 1930, Gaál 1928, 1943, Nicolăescu-Plopşor et al. 1955, 1957a).

For other older layers, dating was based on pollen analyses, so that Mousterian II was estimated to be prior to the age of 60.000 B.P. (Cârciumaru 1973, 1980). In fact, we may consider this estimation as valid considering that for Mousterian layers III and IV the assumptions formulated by M. Cârciumaru (1973) were later confirmed by C-14 dating. Although layer I did not reveal any palinological spectrum, given the environment characteristics during the sedimentation of the deposit which overlaps this cultural layer, one may state that it is contemporary with a glacial stage. The large mammal fauna suggests this assumption, being represented by the following species: *Elephas primigenius, Rhinoceros antiquitatis, Equus caballus fossilis, Hyaena spelaea, Ursus spelaeus, Canis lupus, Canis vulpes fossilis, Capra. sp.* (Roska 1925a, 1925b, 1930, Gaál 1928, 1943, Nicolăescu-Plopşor et al. 1955, 1957a). Layer II was deposited in a landscape dominated by pine, alongside spruce, juniper, willow, birch and then fir and deciduous trees dominating the late glacial stage that had preceded the Nandru interstadial (Nandru 1-Amersfoort) (Cârciumaru 1973, 1980). The large mammal fauna was dominated by *Ursus spelaeus, Equus caballus fossilis, Canis lupus, Canis vulpes fossilis* (Roska 1925a, 1925b, 1930, Gaál 1928, 1943, Nicolăescu-Plopşor et al. 1955, 1957a).

Curată Cave

Two Mousterian layers were identified in the Curată Cave, numbered from bottom to top Mousterian I and Mousterian II (Nicolăescu-Plopşor et al. 1957b; Nicolăescu-Plopşor & Păunescu 1959). Unfortunately, as presented by Al. Păunescu (2001), the samples of dating of the two Mousterian layers are completely absurd, in the sense that data obtained for the older layer are younger than those corresponding to the upper layer. We believe that this strange inversion of dating is due to the alteration of numbering layers from one excavation campaign to another. Seven samples of dating were performed, with values ranging between >36.300 B.P. (GrN 24.223); 29.940 + 420/ - 400 B.P. (GrN 13.249) and > 45.000 B.P. (GrN 23.407). If we take into account the palaeoclimatic frame, the succession is as follows: the older Mousterian layer deposited in the interstadial complex of Nandru (Amersfoort-Hengelo), while the second Mousterian layer is placed between the glacial stage, preceding the Ohaba interstadial complex (Arcy-Stillfried B, Arcy-Kesselt), and the end of this interstadial complex (Cârciumaru 1973, 1980).

Cioarei Cave

Cioarei Cave is the Mousterian settlement that has been dealt with in the majority of the interdisciplinary studies, so that the geochronology of cultural layers can be assessed with much more arguments than in other cases. Mousterian lithic industries were identified in layers A-J, but high densities of materials were recorded in layers E, F, G, H and J (Cârciumaru 2000, Cârciumaru et al. 2000, Cârciumaru et al. 2002 a, 2002b).

One may say that the cave started to be systematically inhabited with the sedimentation of layer E, although lithic tools were recovered from subadjacent layers as well. Geo-chronologically speaking, layer E deposited, at least in its upper part, in the late stage of the warm period of Boroşteni (probably contemporary with the Eem interglacial period – Riss-Würm), in a forest landscape which dominated the surroundings of the cave and which was characterised by various tree species, among which hazel and hornbeam prevailed (frequent taxa especially during the last interglacial period) (Cârciumaru 1977), while, among the animals identified by M. Patou-Mathis (2000-2001) one can mention Carnivores (477): *Ursus spelaeus* (470), lynx (1), wolf (3), common fox (3); Herbivores (52): *Rhinoceros mercki* (3) (a fossil pointing to the last interglacial period), bison (4), stag (18), buck (1), mouflon (1), boar (2), Lagomorphs (2), Indeterminable (21).

For layer E, a few samples of C-14 dating have been obtained, hardly exceeding 50,000 years, which corresponds to the detection limit of the method, giving the impression that they come in contradiction with palinological estimations and those resulted from the study of fossil mammals. Here are the existing datings: GrN – 15.046: 50.900 + 4.400 / - 2.800 B.P.; GrN – 15.047: > 47.000 B.P. (charcoal); GrN 15.048: 51.900 + 5.300 / - 3.200 B.P. (unburned bones).

With different frequencies, the Cioarei Cave seems to have been dwelt quasi-permanently until the end of layer H, which represents, in fact, the most intense stage of inhabitancy of the cave. Layer H is deposited in a period in which stages of environmental improvement alternate with others of slight climatic recession, specific to the Nandru A climatic oscillation (Amersfoort-Brörup), of which Nandru 2 stage (contemporary with Brörup interstadial) is less represented, following some slight processes of disturbance. Mammal fauna associations, present in this part of the deposit, reveal the succession of sequences of cold climate with *Chionomys nivalis, Crocuta spelaea, Cervus* *elaphus, Equus sp., Capra ibex*, Bovid, with others of climatic improvement such as *Hystrix vinogradovi, Vulpes vulpes, Ursus arctos, Sus scrofa, Cervus elaphus* (Terzea, 1987; Patou-Mathis, 2000-2001).

Two samples of C-14 dating indicate, for layer H, the following ages: GrN – 15.054: 48.000 + 1.800/ -1.500 B.P.; OxA – 3.840-41: 48.500 ± 3.900 B.P.

After a certain period of time, during which layer I is deposited, when the cave is practically uninhabited, the Neanderthal man returns during the stage of the sedimentation of layer J, completed in the Nandru 3 phase (possibly palinologically contemporary with Odderade interstadial), C-14 dated: GrN 15.053: 48.900 + 2.100/ -1.700 B.P.; GrN 13.001: 43.000 + 1.300/ -1.100, which would rather imply contemporaneousness with the Moershoofd (Cârciumaru 2000).

Muierii Cave

The stratigraphic situation of the Muierii Cave from Baia de Fier is extremely complicated, especially since excavations were performed in several galleries and the entrance to the cave. According to the specialised literature, Mousterian lithic ensembles were discovered mainly in the Mousterian Gallery (two levels), but also in the main gallery and the mouth of the cave as well (Nicolăescu-Plopşor 1935-1936, Daicoviciu et al. 1953, Nicolăescu-Plopşor et al. 1957c). As regards dating, most was performed on Homo sapiens bones found in the Mousterian Gallery that do not appear to have a clear connection with the materials discovered. There is only one dating for the Mousterian level I in the Mousterian Gallery, namely 42.560 + 1.310/ – 1.120 B.P. (GrN-16.977). Several other samples of dating were performed during a recent probing which did not reveal Palaeolithic materials. Dating was correlated with the stratigraphy established by C. S. Nicolăescu-Plopşor in older excavations, the assumption being that, as far as 0.90 m in depth, samples can be correlated with an Aurignacian habitation, while those below this depth with the Mousterian habitation (Doboş et al. 2010). We consider that, so long as dating hasn't been carried out for real cultural layers, they cannot be associated with the archaeological findings of this cave, therefore we shall not insist on them.

Rocks used in the Mousterian of Carpathian caves

Bordul Mare Cave

According to the analysis of the entire lithic ensemble from Bordul Mare Cave (Niţu 2012), regardless of the archaeological level, quartzite occupies in this settlement 90% of the rocks used. Depending on its prevalence in the collection, it can be divided into several categories, according to macroscopic characteristics. The most frequently observed category is granular quartzite, with sugary texture, medium granulation, generally vitreous in fracture, whitish in colour, smooth cortex of the same tint as the core of the pebble (**Fig. 3/1.**). This is similar, in terms of granulation and texture, to two other categories:

- granular quartzite, sugary texture, medium granulation, whitish colour, yellowish or reddish intrusions, yellowish or yellowish-brown smooth cortex (**Fig. 3/2.**);

- granular quartzite, sugary texture, medium granulation, gray or blackish-gray colour, vitreous in fracture, smooth cortex of the same tint as the core of the pebble.

Actually, differentiating in terms of colour is relative since there are pebbles with medium granulation and sugary texture which comprise whitish, vitreous, gray, yellowish or reddish areas. Technologically, we may say that the variants above mentioned may be included in one category, namely granular quartzite with medium granulation and sugary texture, of various tints, with the specification that the whitish-vitreous is more common (**Fig. 3/1,2,3.**)

Alongside this type of quartzite, several categories, though minor, are also present, such as granular quartzite with sugary texture and high (**Fig. 3/4.**), medium to low (**Fig. 3/5.**) or low granulation (**Fig. 4/1.**), several types of compact quartzite with fine texture, opaque (**Fig. 4/2.**) or vitreous in fracture (**Fig. 4/3.**). Some type of quartzite can be included in the category of filonian quartz and others are very similar in aspect to sandstone (**Fig. 4/4.**).

As already mentioned, granular quartzite, with sugary texture and medium granulation is most frequently used to the detriment of quartzite with fine granulation and, obviously, with a more compact structure. This can be explained by the presence of a greater proportion of quartzite with medium granulation in areas close to the cave.

The technical characteristics of different types of quartzite present in the Bordul Mare Cave ensemble are closely related by texture and granulation. Naturally, debitage stigmata are generally hard to notice. Granular quartzite with sugary texture and medium granulation, which is predominant in the collection, has, usually, percussion stigmata typical of quartz, i.e. crushing at the impact point, what J. P. Bracco (1993, 1997) called *écrasement*, or convergent radial striae. The most frequently encountered debitage accidents are of the Siret type and hinged, very rarely plunging.

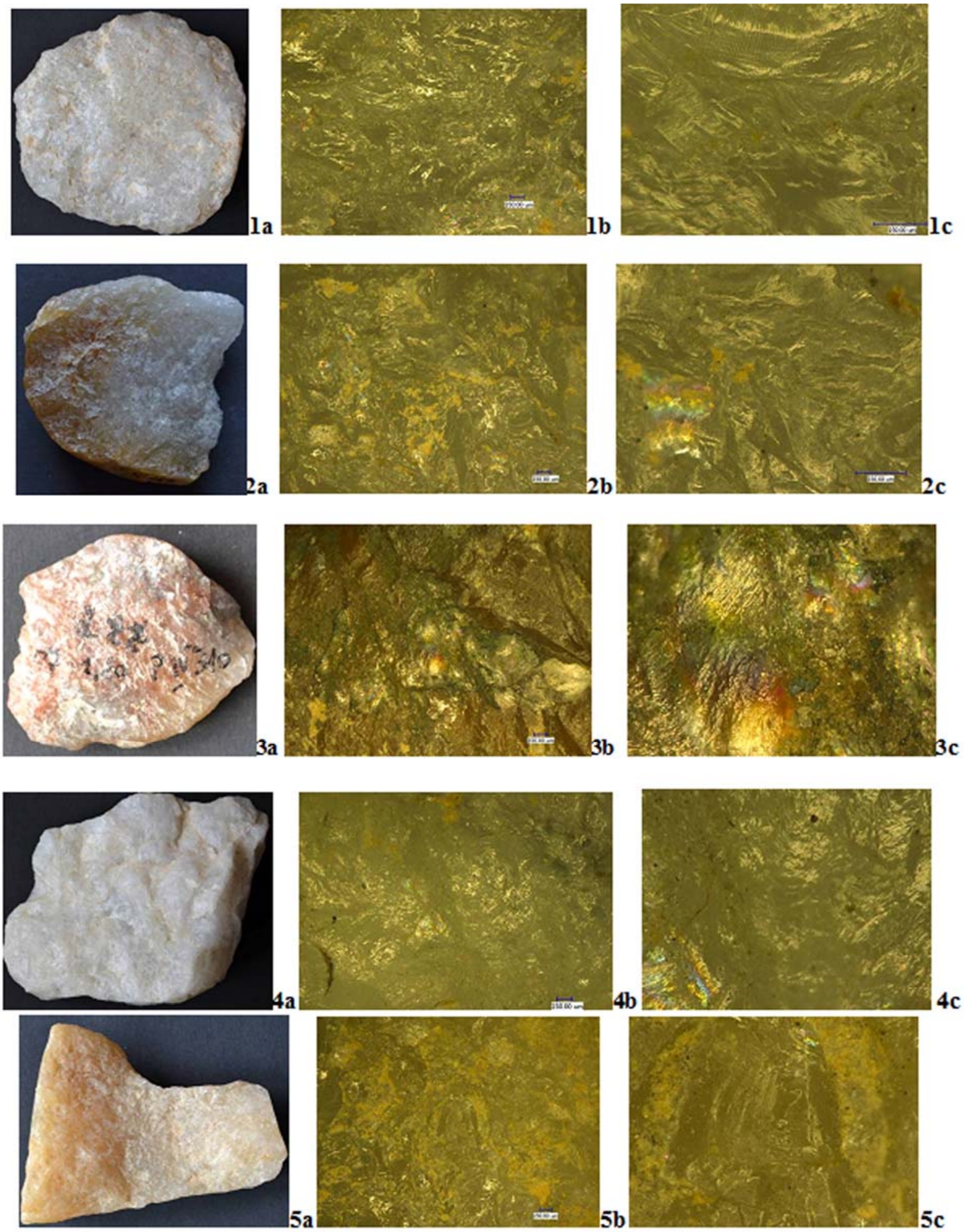

Fig. 3.: Bordul Mare Cave, Mousterian III layer - 1a, 2a, 5a quartzites very rich in quartz; 3a quartzite with various instances of mineralisation; 4a quartzite very rich in quartz minerals; 1 b, 1c, 2b, 2c, 3b, 3c, 4b, 4c, 5b, 5c images provided by the VHX 600 digital microscope (1b, 2b, 3b, 4b, 5b x 50; 1c, 2c, 3c, 4c, 5c x 200)

3. ábra: Bordul Mare-barlang, moustiéri III réteg – 1a, 2a, 4a kvarc szemcsékben gazdag kvarcit; 3a kvarcit különféle ásványokkal; 4a kvarc szemcsékben gazdag kvarcit; az 1 b, 1c, 2b, 2c, 3b, 3c, 4b, 4c, 5b, 5c képek VHX 600 digitális mikroszkóppal készültek (1b, 2b, 3b, 4b, 5b x 50; 1c, 2c, 3c, 4c, 5c x 200)

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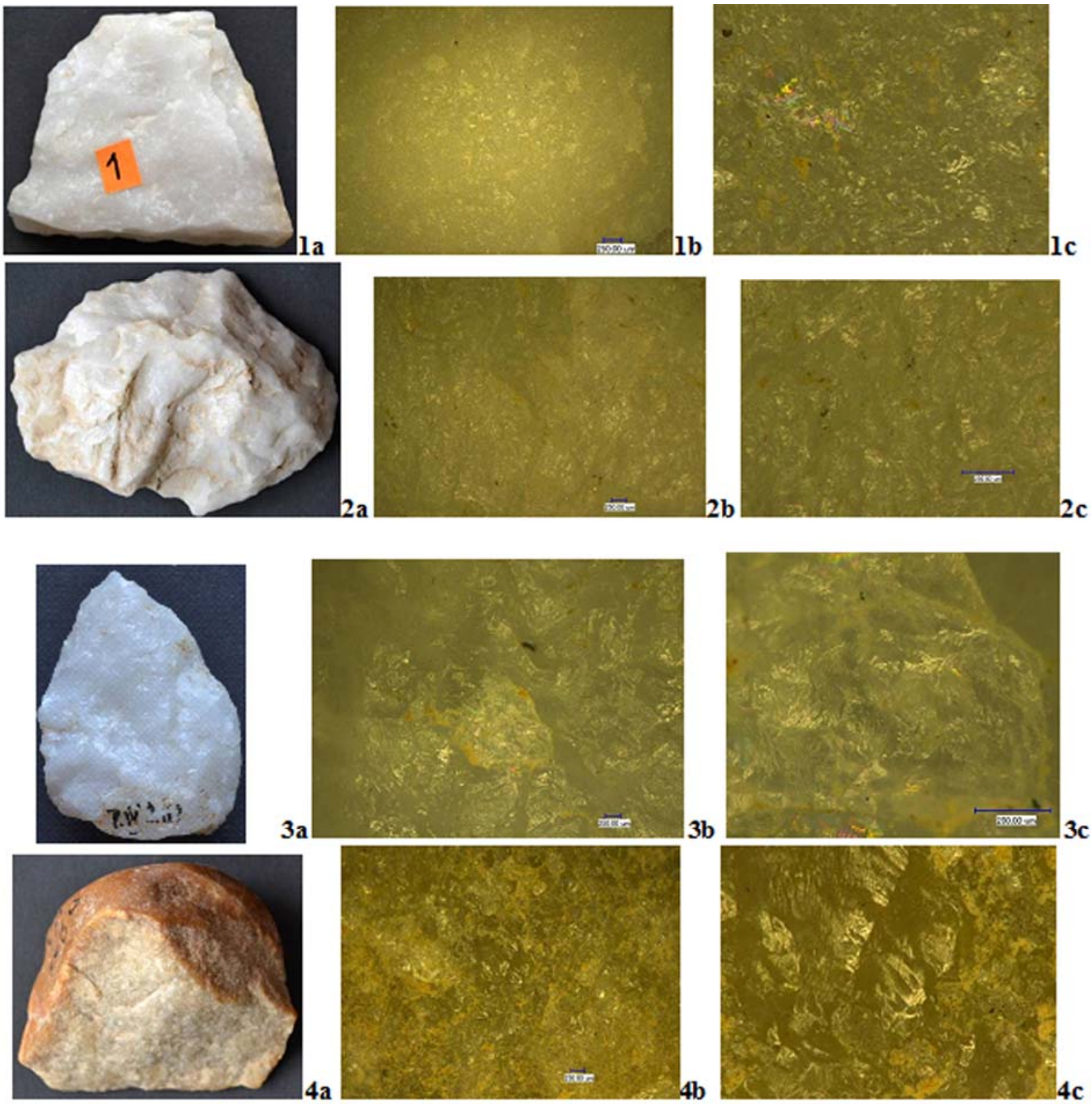

Fig. 4: Bordul Mare Cave, Mousterian III layer – 1a, 2a, 4a quartzites with disseminated quartz minerals; 3a quartzite with minerals very rich in quartz; 1 b, 1c, 2b, 2c, 3b, 3c, 4b, 4c, images provided by the VHX 600 digital microscope (1b, 2b, 3b, 4b x 50; 1c, 2c, 3c, 4c x 200)

4. ábra: Bordul Mare-barlang, moustiéri III réteg –1a, 2a, 4a kvarcit szórt kvarc kristályokkal; 3a kvarc kristályokban nagyon gazdag kvarcit; az 1b, 1c, 2b, 2c, 3b, 3c, 4b, 4c képek VHX 600 digitális mikroszkóppal készültek (1b, 2b, 3b, 4b x 50; 1c, 2c, 3c, 4c x 200)

Studies on filonian quartz debitage assemblages (very similar to what we call quartzite) have revealed that the plunging debitage accident is never represented in its classic form and is unlikely that this type of accident exist (Mourre 1996, 1997). Its presence in the Bordul Mare industry can be connected to the special properties of the used quartzite (Nițu 2012).

Quartzite with sugary texture and medium to low granulation has rather diffuse debitage stigmata, but, as in the previous case, a fracture can be sometimes noticed just below the point of impact. Quartzite with sugary texture and fine granulation or high granulation, often forms a percussion bulb, which is sometimes prevalent in the case of quartzite with high granulation. Generally, all types of quartzite with sugary texture, regardless of granulation, are more suitable for the debitage process, while the products are rather typical, especially with medium-granulation quartzite. Flakes have sharp, usable edges, the only exception being the pieces knapped from high-granulation quartzite, which have round edges, according to the constituent quartz grains.

With compact quartzite with fine texture, debitage is rather difficult despite its more homogeneous structure. In fact, the pieces present numerous hinged type accidents. The edges of the flakes are more sharpened than with granular quartzite and hardness is visibly higher. Despite these functional characteristics which more common than at other quartz types, it was probably used less because of the difficulty to control percussion or because of the low presence around the cave.

Siliceous rocks different from quartzite, though present in a very small proportion in the Bordul Mare collection, are extremely diverse. Furthermore, it is difficult to place them in classic categories used in archaeology, such as flint, jasper etc. Differences can be noticed in terms of texture, granulation, homogeneousness, cortex. Colour, though a frequently used characteristic in differentiating this type of rocks, has no particular significance because there are sufficient examples of debitage products which incorporate several colours in their structure.

Given this huge variety of rocks, we have turned to a macroscopic differentiation according to texture and homogeneity. Based on this principle, we have determined the existence of the following categories: flint, jasper, chaille, chert, radiolarite, siliceous sandstone and volcanic rocks.

Some data on the existence of raw material sources can be found in the geologic literature. Around the settlements of Ohaba-Ponor, siliceous accidents in spatic limestone, attributed to the Jurassic, were encountered (Boldur & Stillă 1967). Chaille-type rocks are mentioned in the Pui area, Arsului hills, Luncani valley (Ciclovina), Piatra Roşie knob, Ţiflea, between Lăutu and Cioclovina cave (Stillă 1985). Al. Codarcea and Gr. Răileanu (1961) note the presence of siliceous accidents in the Haţeg Basin, Pui area.

Alfred Mamulea (1952, 1953) makes a very interesting description of the cherts in the Haţeg Depression as light-yellow, almost white rocks, caught in Callovian-Oxfordian layers, of high hardness, fine and compact, often cornean structure. Even if they do not derive from the gaize or spongolite type of rock, like flint from limestone, the chert of this region presents, to the centre of concretions, a "porcelain, translucent" aspect which reminds of the flint fracture. Chalcedony, sponge and opal spicules, in intimate association, are prevalent in their structure. Mesozoic deposits, which comprise these rocks that seem to have often satisfied the demands of Palaeolithic man, imposed by controlled debitage, stretch from Cioclovina to Barul Mare, including various points located on the southern rim of the Haţeg Depression, such as Valea Lupului, Şerel, Coroeşti and so on.

In order to identify lithic raw material sources other than quartz or quartzite, the Bordul Mare area was researched in 2008-2011, during the rescue excavations performed in this cave. Unfortunately, we did not manage to identify around the cave flint pebbles or other similar rocks, such as jasper, chert, etc., though we had expected to find them among the quartzite-type rocks derived from the erosion of the conglomerate deposits in the area neighbouring Bordul Mare. This does not mean necessarily that they did not exist when the cave was inhabited by the Neanderthal man. Due to rapid dynamics of landscape alteration and massive forestation of the area, they may have been hard to recover nowadays (Niţu 2012).

The next step was to analyse the water courses which might have affected a horizon with siliceous rocks. With the exception of smaller valleys around the Bordul Mare cave that did not reveal flint, jasper or chert, the only water crossing a pretty wide area, which has the possibility of collecting several types of rocks, remains the Strei. During the exploitation of some gravel levels along this river (**Fig. 5/1.**), several sources of flint, jasper (**Fig. 5/2.**), but mostly chaille and chert (**Fig. 5/3.**) were collected. Macroscopically, they only vaguely resemble the raw material used at Bordul Mare and there is a considerable distance between the river and the cave. The rocks from Strei could have been used by Palaeolithic communities by knapping them from the banks of the Strei and bringing them inside the cave. In this sense, according to observations on lithic material, a part of the pieces found in the settlement were brought to the site after they had been knapped.

The current exploitation of the gravel from the Strei river allowed us to make significant observations regarding the economy of Palaeolithic communities. We were able to notice the existence of an extremely wide variety of igneous and metamorphic rocks: basalt, andesite, diorite, rhyolite etc. (**Fig. 5/1.**). Furthermore, the Bordul Mare collection includes several pieces of volcanic rocks, of which one is knapped from andesite. Apparently, the existence of these rocks on the Strei did not particularly attract the humans since these rocks were only exceptionally used. The best example is Cioarei cave, where Mousterian communities used different igneous and metamorphic rocks, collected from the Bistricioara river in the immediate vicinity of the cave.

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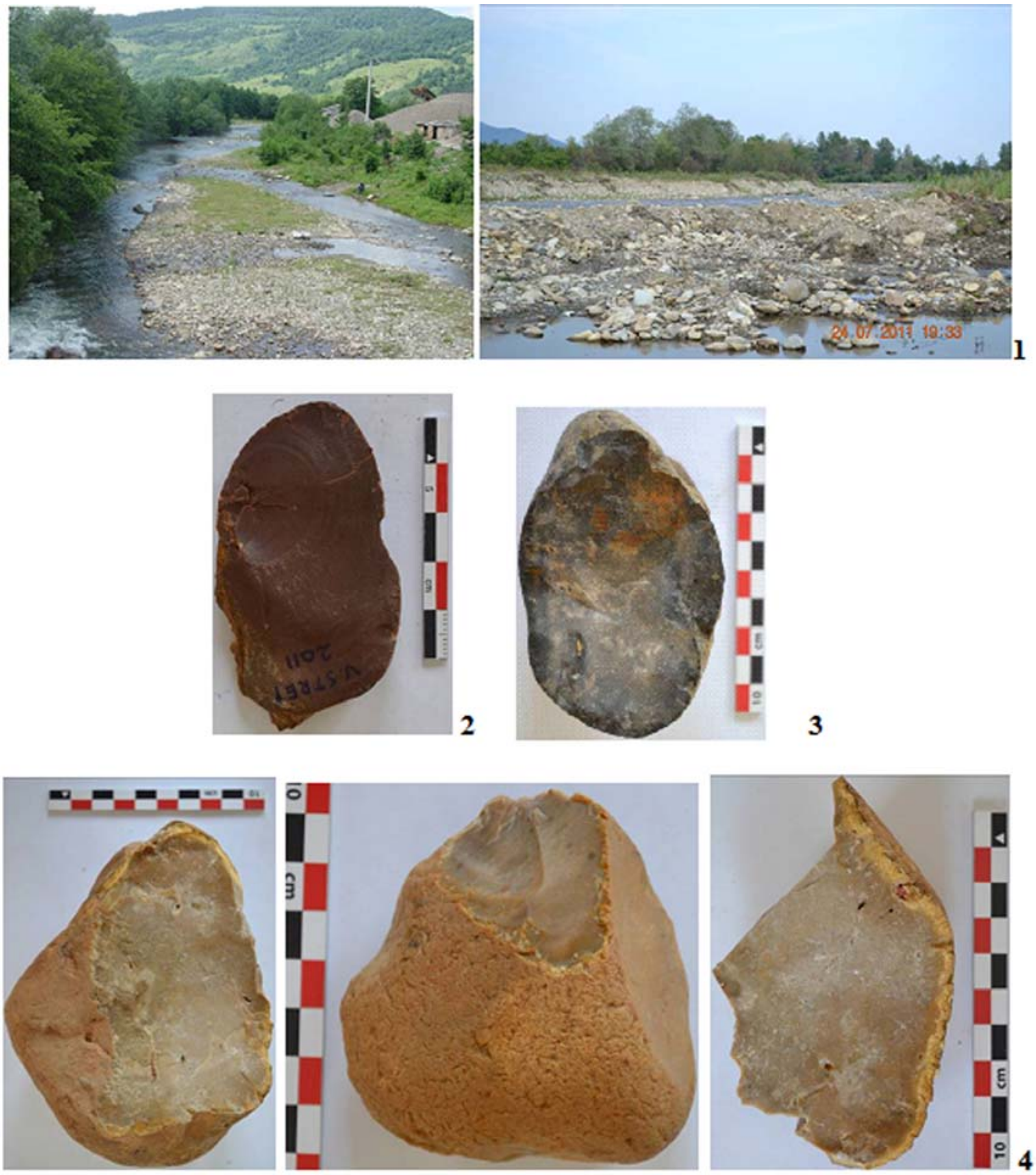

Fig. 5.: Raw material sources - 1. images of the Strei valley and abundance of existent rocks; 2. jasper; 3. chert; 4. flint found at Fântâna Socilor, not far from the Bordul Mare Cave from Ohaba Ponor.

5. ábra: Nyersanyagforrások - 1. a Strei völgye és az elérhető nyersanyagok gazdagsága; 2. jáspis; 3. kova; 4. tűzkő Fântâna Socilor közelében, nem messze a Bordul Mare-barlangtól, Ohábaponor közelében.

Another assumption regarding the transportation to the cave of the pebbles of siliceous rocks for debitage purposes is related to the existence of sources on top of Bordul Mare, thus pebbles could be easily brought down to the cave instead of carrying them up. Starting from data provided by a participant in the 1954-1955 excavations, on top of Bordul Mare there is a plateau called Fântâna Socilor where we have identified mainly flint, macroscopically similar to that knapped inside the cave (**Fig. 5/4.**). Fântâna Socilor lies at an absolute altitude of 945 m and has the shape of a plateau on which quartz and, rarely, flint, chaille and chert pebbles are scattered, chert pebbles being considerably bulky to suit a debitage that could result in products similar to those of Bordul Mare cave. Furthermore, several flint flakes, of Levallois type, have been recovered from the slipped banks of the plateau.

According to the observations made concerning the lithic material from Bordul Mare Cave (Nițu 2012), the raw material sources other than quartz and quartzite may come from different places, considering the great variety noticed in the entire series.

Fig. 6.: Images of the Petac valley at Nandru (1); quartzite with abundant quartz minerals alongside various instances of mineralisation from the Curată Cave (2) and various raw material sources of the jasper, flint, chert etc. category from the Petac valley (3; scale 30 cm) (2b x50; 2c x200 – images provided by the VHX 600 digital microscope).

6. ábra: A Petac völgye Nándor mellett (1); kvarc szemcsékben gazdag kvarcit a Curată-barlangból (2) különféle nyersanyagok a Petac völgyéből (jáspis, kova, tűzkő) (3; a mérce hossza 30 cm) (2b x50; 2c x200 – a mikroszkópos képek VHX 600 digitális mikroszkóppal készültek).

Both the conglomerate levels situated on the plateaus over the cave, as the one from Fântâna Socilor, as well as along the valleys of certain rivers, such as the Strei, which crosses the entire depression, probably represented opportunities for the Neanderthal man. The Mousterian communities from Bordul Mare have a typical Middle Palaeolithic behaviour, in which the use of the raw materials present around the cave is a crucial component, although, at small distances, they could have found and used a larger variety of rocks.

Curată Cave

All the rocks used in this settlement are exclusively local and can be found in large quantities along the Petac valley (or Roatei valley), which flows at the foot of the cave. The numerous research works we carried out along this valley have allowed unprecedented observations on the use of raw material sources during the Mousterian and have given us a solid base for the thought concerning the interpretations that can be made on the strategies adopted by the Neanderthal man. Although high-quality siliceous rocks (jasper, chert, flint etc.) can be found abundantly along the above-mentioned valley, in the two Mousterian layers of the Curată Cave, the quartzite has a slightly higher value than the rocks from the flint, jasper and chert category. We are in front of an unparalleled situation as far as the Mousterian is concerned, because in all the other settlements of Europe, the quartz and the quartzite are not used in such a high proportion except in the case when the high-quality siliceous rocks are absent from the region. This observation totally contradicts to the classical theories on the behaviour of the Mousterian communities. Moreover, the quartzite was selected and preferred to the numerous types of magmatic and metamorphic rocks present along the Petac Valley (Nițu 2012) (**Fig. 6.**).

The question we must answer is why the Nandru communities selected mainly quartzite to make tools out a huge variety of rocks. We may assume it was a very powerful cultural tradition, which would be perfectly consistent with some of the definitions of the Mousterian of Carpathian caves as "quartzite Mousterian" (Mogoşanu 1978), or it was some specific activities which required the use of quartzite tools. In order to understand this situation, we have tried to approach this issue in a different manner.

The first step was to collect various samples of rocks from the Petac valley, including both siliceous sedimentary rocks (**Fig. 6/3**.) and metamorphic rocks. Each rock was tested. This allowed us to make very interesting technological observations. Siliceous sedimentary rocks are in plenty, there are large-sized and very large-sized pebbles (20-30 cm), so, quantitatively, one could make a great number of products out of each of them. The same thing was noticed with igneous and metamorphic rocks. The difference between these rock types is technological: they react in a different manner to the knapping procedure. Following the testing of the pebbles, we noticed that sedimentary siliceous rocks, flint, chaille, chert and jasper are, more often, pretty hard to chip and require an extremely rigorous control of the platforms and of dosing the force exercised with a view to obtaining mere flakes. Instead, quartzite has a structure which is homogeneous enough to allow easier knapping of any product (**Fig. 6/2.**). Consequently, the explanation of the prevalent use of quartzite in the Curată cave may be rather technological. The quartzite used is quite compact, with average or average-to small granulation. In fracture, it is whitish-glassy or greyish. From a technical perspective, the resulting tools have extremely resilient cutting edges. The stigmata are close to those characteristic to the vein quartz, yet there are also items that have a bulb of percussion. The communities in this settlement selected mainly a rock category that can be processed more easily, obtaining in this way different products necessary for diverse activities with a minimum effort and time consumption. From here, one can deduce the ingenuity of the Mousterian communities that – more often than not – have been characterised in a simplistic manner in the archaeological literature.

Muierii Cave

Although the stratigraphic situation is quite complicated in this settlement and Mousterian tools have been discovered in several galleries, the entire collection comprises almost exclusively quartzite (98%), the rest of the materials were knapped in flint, jasper and sandstone (**Fig. 7**.) (Doboş et al. 2010). This rock has obviously a local origin. For years, specialised archaeological literature postulated that raw material came mainly from the valley of the Galbenu River, which flows in the vicinity of the cave. At a first sight, this theory was absolutely reasonable, but we were to discover, during our own field research, that, surprisingly, the situation in the settlement is much more complicated. Ever since 2007, we have noticed a great variety of volcanic and metamorphic rocks on the Galbenu valley, but we haven't been able to identify any quartzite pebble (**Fig. 7/1.**). This prompted us to return to the area each year, however we haven't found quartzite-type rocks on the Galbenu valley. It is hard to conceive that the prevailing raw material in the Muierii Cave may come from great distances, especially since we are talking about quartzite, but, up to the present, we have not been able to identify the supply area of this source. The geological map, however, shows that the Galbenu valley does not intersect geological layers rich in quartzite.

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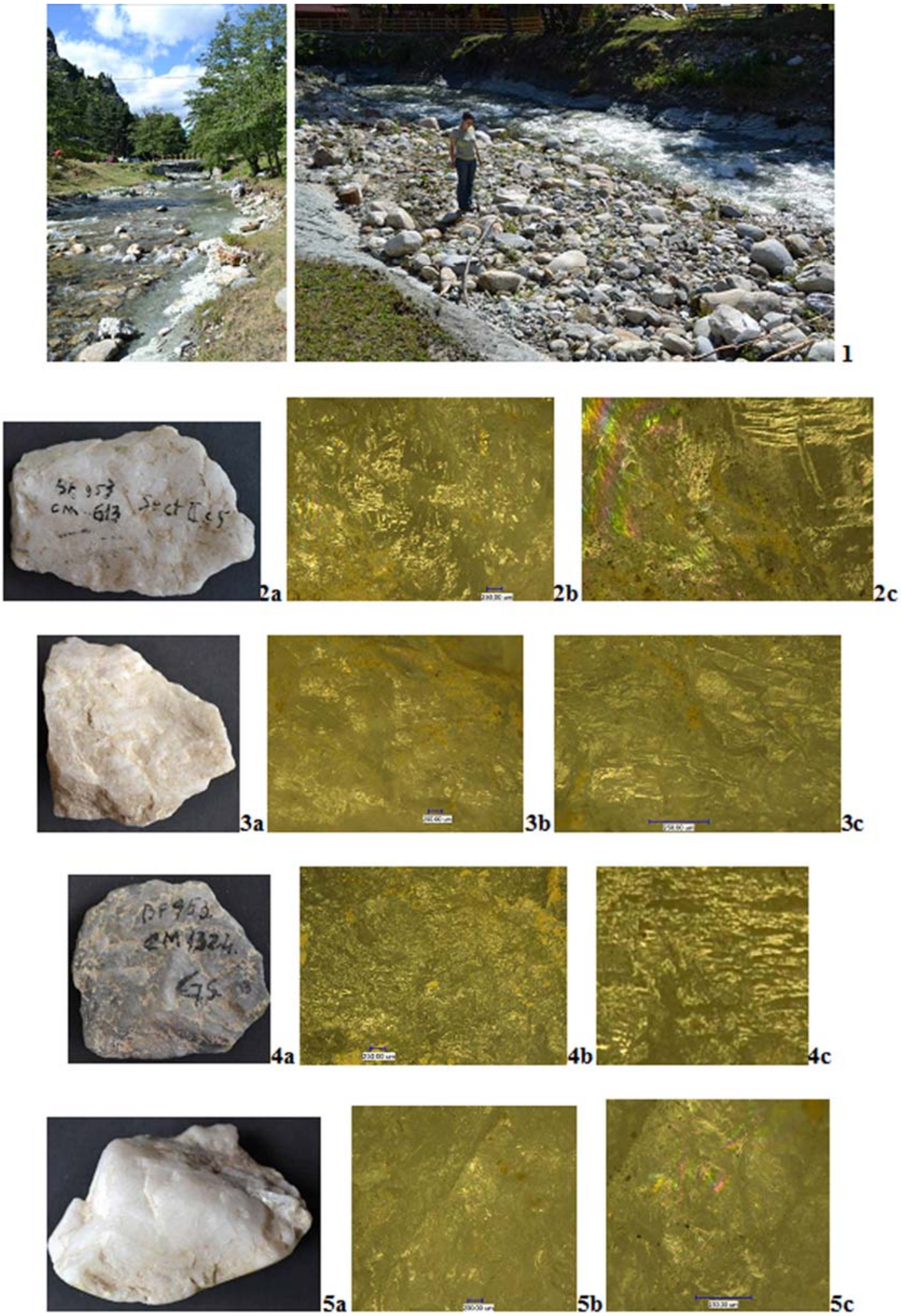

Fig. 7.: Muierii Cave – Images showing the abundance of magmatic and metamorphic rocks on the Galbenu valley just outside the Muierii Cave (1); quartzites very rich in quartz minerals (2, 3); quartzites with rich quartz minerals (4); disseminated quartz minerals (5); (2b, 3b, 4b, 5b x 50; 2c, 3c, 4c, 5c x 200) – images provided by the VHX 600 digital microscope).

7. ábra: Muierii-barlang – magmás és metamorf kőzetek a Galbenu völgyében a Muierii-barlang előtt (1); kvarc szemcsékben nagyon gazdag kvarcit (2, 3); kvarc szemcsékben gazdag kvarcit (4); szórtan jelenlevő kvarc szemcsék (5); (2b, 3b, 4b, 5b x 50; 2c, 3c, 4c, 5c x 200) – a mikroszkópos képek VHX 600 digitális mikroszkóppal készültek).

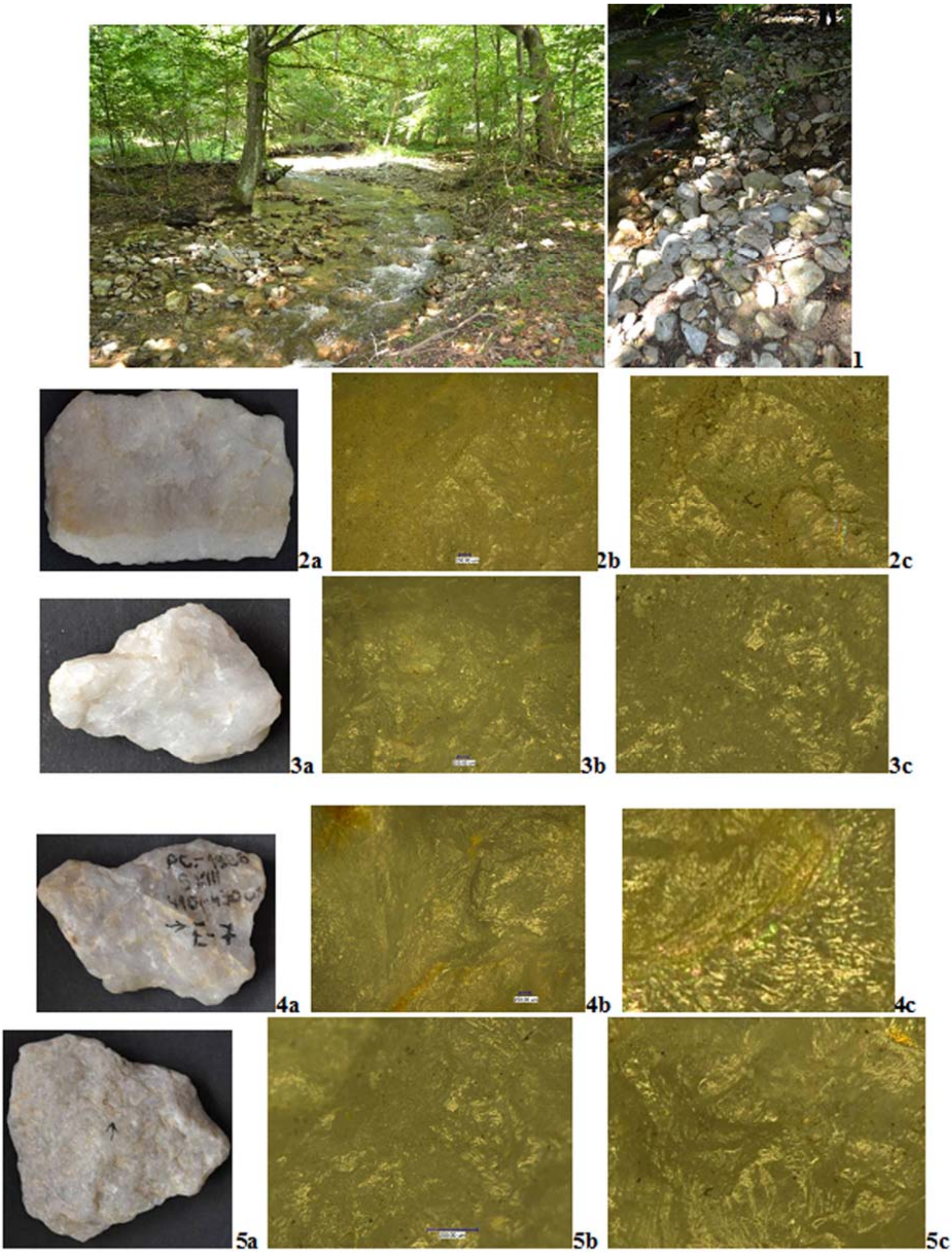

Fig. 8.: Cioarei Cave – Images showing the abundance of magmatic and metamorphic rocks on the Bistricioara valley from Boroşteni (1); quartzolites rich in quartz minerals (2); quartzolite rich in quartz (3); quartzolite with biotite (4); alkali feldspar granite rich in quartz(5) (2b, 3b, 4b, 5b x 50; 2c, 3c, 4c, 5c x 200 – images provided by the VHX 600 digital microscope).

8. ábra: Cioarei-barlang – magmás és metamorf kőzetek a Bistricioara völgyében a Cioarei-barlang előtt, Boroşteni mellett (1); kvarcban gazdag kvarcolit (2-3); kvarcolit biotittal (4); kvarcban gazdag alkáli földpátos gránit (5) (2b, 3b, 4b, 5b x 50; 2c, 3c, 4c, 5c x 200 – a mikroszkópos képek VHX 600 digitális mikroszkóppal készültek).

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Cioarei Cave

This settlement represents a special example of the usage of a high diversity of magmatic rocks. Furthermore, no item of flint, chaille, chert or other siliceous sedimentary rock of this type was found. Given the similar proportions of using the different rock types on each level, considerations shall be made for the entire lithic assemblage discovered. The complex petrographic analyses carried out on the lithic material collection from the Cioarei Cave brought to light the use of 22 rock types (Cârciumaru 2000). However, they can be grouped in a few distinct families. Half of the entire series is processed from rocks included in the quartzolites category (**Fig. 8.**). The following category of processed rocks is that of granites (almost 28%), followed by diverse types of diorites (about 10%). Other rocks were used in very low proportions: monzonite, lamprophyre, gritstone, gneiss, rhyolite, basalt, sideritic limestones.

All the rocks that were used can be found in abundance along the Bistricioara valley, which flows at the foot of the cave (**Fig. 8/1**.), and around the cave. Although the diversity of the rocks noticed along this valley is extremely significant, it seems that, nevertheless, the Mousterian populations preferred quartzolites, granites and diorites. Macroscopically, the quartzolite in the Cioarei cave is very similar to the quartzite defined in other settlements and even to the vein quartz defined by the French literature (Mourre 1996, 1997). Yet, in this collection, there is also another rock type, which from a macroscopic viewpoint is similar to quartzite and which any archaeologist would have included in this category. We are referring to the alkali feldspar granite, rich in quartz (**Fig. 8/5.**). Without petrographic analyses, using only macroscopic observations, this rock type would be impossible to distinguish from quartzite.

Although all the rocks are local, they were used differently. Quartzolite and granite were knapped inside the site, while diorite pieces were knapped outside the cave and brought into the site. In terms of quality, the most representative tools are made of diorite, while most of the quartzolite and granite products are atypical.

Quartz, quartzite, quartzolite - similar, but different

Throughout the time, Romanian archaeologists have identified quartzites as being the prevalent raw material used in Carpathian caves. Moreover, based on this consideration, the material culture of this settlement was defined, at one point, as “quartzite Mousterian” (Mogoşanu 1978). Obviously, this classification lacks scientific arguments for a culture cannot be defined by the raw material used. Furthermore, as we have shown in this study, there has been a confusion regarding the raw material of the Cioarei Cave: one of the rocks used is not quartzite, but quartzolite. For these reasons, we have considered it necessary to detail the petrographic features and mechanical particularities of quartz, quartzite and quartzolite.

Western archaeological literature (Bracco 1997, Mourre 1996, 1997, Collina-Girard 1997, Lombera-Hermida 2008, Colonge & Mourre 2009, Lombera-Hermida et al. 2011), based on the French geological terminology (Foucault & Raoult 1992), is using more and more, when referring to Palaeolithic industries, especially in France and Spain, industries which are known in Romania as quartzite, the term quartz. Since in the geological literature, quartz is considered as a mineral and quartzite is included in the category of metamorphic rocks in petrographical point of view, the ‘abusive’ use of the term quartz for rocks which are rich in quartz as well creates not only confusion, but also limits the identification of raw material sources used in various settlements in lithic debitage.

V. Mourre (1996, 1997) admits that, macroscopically, quartzite can easily be confused with common quartz. In French literature, quartz is presented in two forms: hyaline quartz (also known as rock crystal, which implies the mineral state of quartz) and filonian quartz (Mourre 1996, 1997; Lombera-Hermida 2008; Lombera-Hermida et al. 2011). Also, V. Mourre (1997) interprets the notion of hyaline quartz as the mineral named quartz (unanimously known as rock crystal), with a well-defined crystallisation system and translucent aspect. We do not understand why it has to be called hyaline when, in fact, this name has no justification so long as it expresses an aspect which defines its specific hyaline (vitreous=glass) structure. Quartz as a mineral with hyaline structure has no other variety to justify the addition of this feature.

J. Collina-Girard (1997) presents an interesting scheme based on the different cooling speed, which explains the inclusion of hyaline quartz into the category of filonian quartz (**Fig. 9/1.**). The symbol used for hyaline quartz suggests the form of crystallisation of quartz as a mineral (probably produced hydrothermally). In the vein imagined by the author, inside a package of granites (obviously, admittedly, with a fairly high proportion of quartz, beside other minerals), two other categories of so-called filonian quartz are presented to us: macrocrystalline white quartz and microcrystalline sugar quartz.

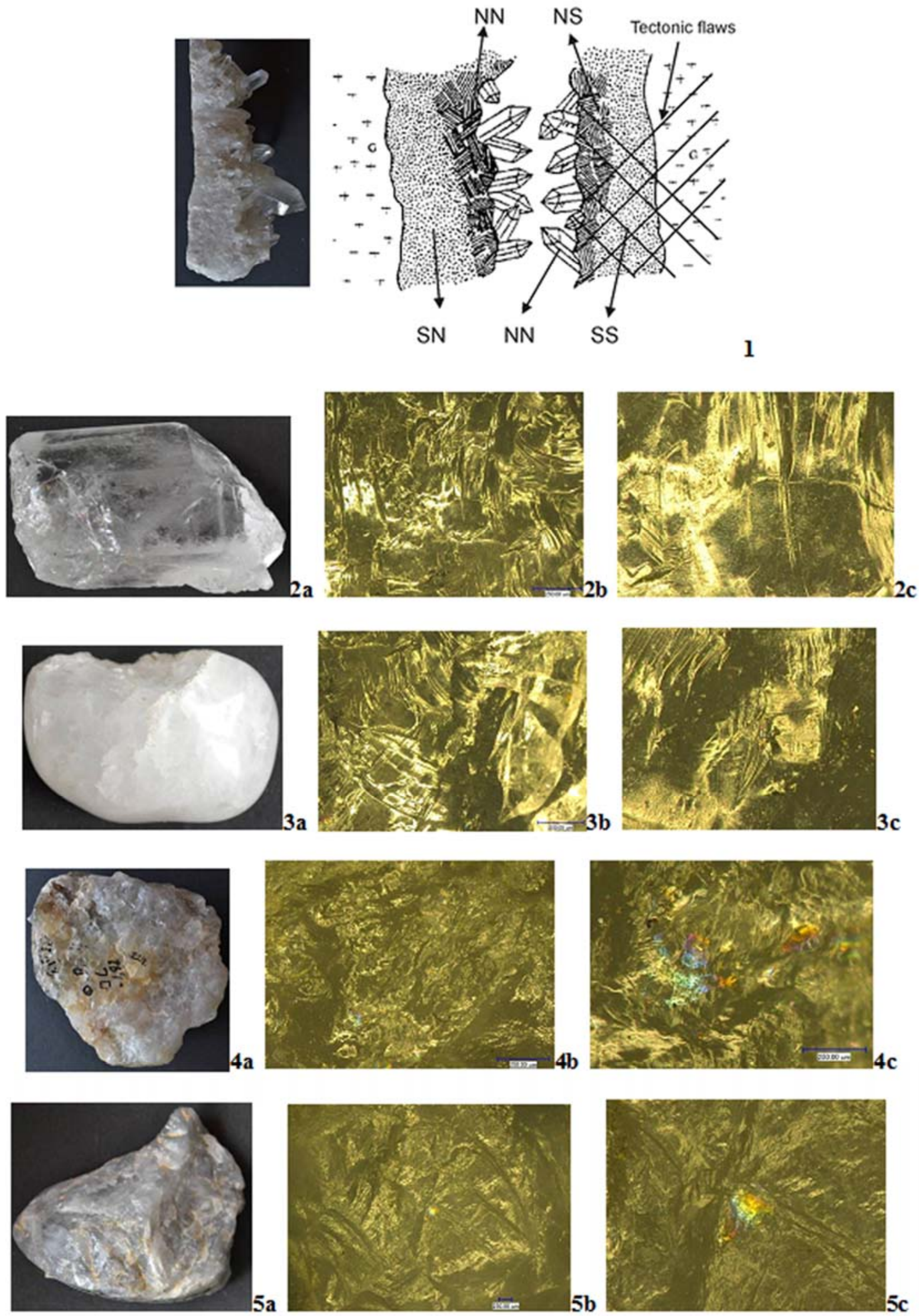

Fig. 9.: 1 Formation of a quartz vein (scheme acc. to J. Collina-Girard, 1997 and the image added by us); Quartz mineral (rock quartz) in the typical crystallisation shape (2a) and rolled pebble shape (3a) with microscopic images of composing pure minerals (2b, 3b x50; 2c, 3c x200); Filonian quartz (4a, 5a) from the Bordul Mare Cave, Mousterian III layer (4b, 5b x50; 4c, 5c x200 – images provided by the VHX 600 digital microscope).

9. ábra: 1 Kvarc ér képződése (J. Collina-Girard, 1997 nyomán); kvarc (hegyikristály) jellemző kristályos alakja (2a) és görgetett kavics formája (3a) az ásványok mikroszkópos képével (2b, 3b x50; 2c, 3c x200); tömeges kvarc bekérgeződés (4a, 5a) a Bordul Mare-barlangból, moustiéri III réteg (4b, 5b x50; 4c, 5c x200 – a mikroszkópos képek VHX 600 digitális mikroszkóppal készültek).

They, apparently, do not represent more than layers in different stages of diagenesis, which did not reach the similar stage of the formation of quartz as a mineral. Unfortunately, there is no mention of the mineralogical composition and the degree of diagenesis of the matrix which holds the quartz crystals of the categories proposed under the names of macrocrystalline white quartz and microcrystalline sugar quartz, in other words, of whether these layers are made exclusively of quartz or contain other minerals as well. This is an extremely significant aspect for, if they were exclusively made of quartz crystals, the term filonian quartz would be justified. But, since quartz is only prevalent, alongside other minerals as well, we find it more appropriate to use the term quartzite as metamorphic rock.

If we were to start from the scheme proposed by J. Collina-Girard (1997) (**Fig. 9/1.**), we could consider that what he calls hyaline quartz is the mineral form of quartz, its automorphic state, produced in hydrothermal conditions. The forms of monocrystalline agglomerates of xenomorph quartz crystals would include macrocrystalline white quartz and microcrystalline sugar quartz, with all their rather variable features owing to precipitation conditions of the silica caused by the saturation degree, temperature and pressure which account for the diversity of types of siliceous rocks produced in such conditions. Naturally, we can accept xenomorph quartz formed at high temperatures which would have a cryptocrystalline structure and a more transparent aspect as opposed to that formed at lower temperatures, not exceeding 400°C, which contains larger crystals, giving the rocks a more granular structure. Since cooling speed varies in such situations, the texture of products is as such, with great variations (Lombera-Hermida et al. 2011). Towards the boundaries of the vein, temperature is expected to decrease more rapidly and the frequency of crystallisation nuclei gradually lowers up to the point when they get lost in the mass in which other minerals mix as well, constituting the matrix of that particular rock. This results in the formation of a rock which has similar features to the metamorphic rocks.

Under such circumstances, we believe that accepting the term of filonian quartz (and by no means that of quartz only, for it would be mistaken for the mineral) may be an acceptable option, without eliminating that of quartzite, where necessary.

Our research performed using the Keyence VHX-600 digital microscope, with the capacity of penetration into and identification of mineralogical and petrographic features, on lithic materials defined as quartzites from the studied caves, allowed several observations. In order to justify the term of filonian quartz, we identified certain samples in which quartz crystals are very rich, close to the rock crystal in terms of their way of dispersion (Fig. 9/2,3). Consequently, we separated from the materials considered so far as quartzites certain pieces that may be included in the category of the filonian quartz (Fig. 9/4, 5). Let us mention that this petrographic re-categorisation of these particular lithic tools is based, in this situation, strictly on the specified microscopic observations. Unfortunately, in the studies on Palaeolithic lithic tools from industries defined on quartz carried out in France or Spain we have not identified microscopic observations which would allow us to draw pertinent comparisons and justify, ultimately, the petrographic classifications invoked. Therefore, we consider that, as one can notice in the illustration of materials, in France in particular, assigning many of them to the category of quartz is exaggerated and subject to relativity, so long as it relies only on macroscopic observations. In this sense, we can provide several examples from caves we have researched in Romania, quartzite rich in quartz, which macroscopically, in the French acceptation terminology, seems more tempting to assign to filonian quartz, but microscopically has no sufficient features to justify such assignation (**Figs. 3-4.**).

Quartzite should be regarded as a category of different rocks because petrographically this type of rock differs genetically from many other rocks. Quartzite is defined as a metamorphic (Mareş et al. 1989) and sedimentary rock which underwent processes of metamorphosis. Quartzite derived from metamorphism is also named metaquartzite, as opposed to orthoquartzite which is a rock of sedimentary nature. This later one derives from siliceous sandstones which contain a high proportion of quartz. In our country, such an example could be the Kliwa sandstone (Papiu 1960). The petrographic study of the Kliwa sandstone showed that it is composed of 90-97% granular quartz and corresponds, both mineralogically and chemically, to quartz-arenites (Grasu et al. 1988). These terminological differences on quartzites were noticed by archaeologists as well. D. Colonge and V. Mourre (2009) state it is necessary to use the correct terminology by employing the terms of orthoquartzite, metaquartzite, quartz-arenites or quartzose arenites. A great variety of often macroscopically different rocks can fall into the category of the quartzites. Furthermore, microscopic analysis performed on them revealed differences between quartzites in terms of a more abundant or less evident presence of quartz minerals (**Figs. 3-4.**).

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Following determinations based on thin sections of raw material sources used by the Neanderthal man who lived in the Cioarei cave, the name quartzolite was adopted for several of the rocks used (**Fig. 8.**) (Cârciumaru et al. 2000). Quartzolites are rocks derived from metamorphism with a low degree, having a blastopsamitic or blastopsephitic structure (Pavelescu 1980). Macroscopically, they are very similar to quartzites, but, in the present study, we have revealed the existence of extremely different rocks, of the granite type, rich in quartz, very similar to quartzites, which can only be distinguished through complex petrographic analyses (**Fig. 8/5.**).

Conclusions

At first sight, the situation of raw material sources used by Mousterian communities of Carpathian caves seems pretty simple and typical of the Middle Palaeolithic: the prevalent use of local rocks, which denotes opportunistic behaviour and particular adaptability in relation to resources existing around the settlements. By deeper analysing the situation in the four settlements, we find there are differences in selecting local rocks. Therefore, we shall try to explain the particularities of each settlement and, consequently, the behaviour of Mousterian communities.

Perhaps the most interesting case of raw material selection is the Curată Cave. Traditionally, prehistorians understand by selection of certain rock categories the use of high-quality raw material such as flint. In the Curată Cave, the situation is reverse, quartzite being the most commonly used rock, despite the abundance of rocks generally considered by archaeologists as more appropriate for debitage. As we have demonstrated in this study, the intentional choice of quartzite to the detriment of other siliceous sedimentary rocks (some of them of very good quality) is obvious, so far a unique element for the Mousterian in Romania and perhaps Europe. This can be explained by the special technical properties of quartzite on the Nandru valley as opposed to other rocks. Furthermore, the selection in terms of the morphology of quartzite pebbles and their sizes (which are quite similar) is remarkable. The majority of intact or fragmented pebbles have an elongated morphology, slightly flattened. For instance, in the Mousterian II level, an intact pebble and a "tested" one have the same length and height, with an indistinguishable 1 mm-difference, only the thickness differs a little: 107/82/49 mm and 106/83/62 mm. Therefore, we can speak about a selection of morphology and size of raw material, taking into account that there are, around the cave, pebbles of quartzite of various sizes (Nițu 2012).

In the Bordul Mare Cave, located quite close to the Curată Cave (approximately 50 km), the prevalent use of local rocks of the quartzite category is obvious, without a rigorous selection of these. In addition to them, flint pieces seem to have been brought to the site, probably from close distances, considering that the area offers the necessary resources. The lithic industry is characterized by the efficient exploitation of quartzite or vein quartz sources from the vicinity of the cave, but also the identification of the more profitable rock sources from the flint category, situated not far away.

To the south of the Southern Carpathians, where raw material resources of good quality are absent, the prevalent use of igneous and metamorphic rocks is obvious. For example, in the Cioarei Cave, highly diverse magmatic rocks were used, while tools of the flint, jasper, chaille category are absent, to the extent that the first ones can be found on the valley of the Bistricioara, which flows at the foot of the cave. Of the 22 types of existent igneous rocks, the Neanderthal man preferred to knap half of the lithic ensemble out of quartzolite-type rocks, without remaining indifferent to granite (almost 30%) and even diorite (10%). We must say that alkali feldspar granites rich in quartz (**Fig. 8/5.**) can be easily mistaken, at first sight, for quartzites, as they probably borrowed plenty of mechanical properties which made them suitable for the debitage process. One may thus assert that Mousterian people from the Cioarei Cave prove undeniable opportunism as regards the almost exclusive use of rocks supplied by the nearest valley (quartzolite, granite, diorite, monzonite, lamprophyre, grit stone, gneiss, rhyolite, basalt), even though they do not seem the most appropriate for knapping.

In the Galbenu Valley, along which one can find the Muierii Cave, the magmatic and metamorphic rocks are about the same as those from the Bistricioara Valley, except for quartzites. However, the most frequently used rock of all during the Mousterian is quartzite. It may have been taken from the neighbourhood. It is very interesting that the inhabitants of the Muierii Cave had a different behaviour than those of the Cioarei Cave, in the sense that they did not use the igneous rocks present along the nearby valley, even though quartzite was absent from the immediate vicinity of the cave.

The presence of these options fully demonstrates the selection capacity of the Neanderthal man, doubled by a high opportunism, but also the conceptual contradictions still dominating the interpretation of the Neanderthal man's behaviour, which should constitute a subject for reflection.

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