ACKNOWLEDGING THE MESS: IMPLICATIONS OF A NEW DOCUMENTATION SYSTEM FOR UNDERSTANDING FORMATION PROCESSES OF TWO PALAEOLITHIC SITES IN THE CEAHLĂU BASIN (NE ROMANIA)

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Abstract:
It is nowadays generally well acknowledged that archaeological excavation and documentation methods have a major impact on interpretations of the record. In the last decades, the effort to mitigate potential biases became increasingly visible, generally by combining high-resolution excavations with detailed accounts of employed methodologies. However, this also highlighted the uneven quantity and quality of data obtained throughout the history of archaeological research, stressing the need to re-evaluate past interpretations. In order to understand the degree of these issues in the particular case of Romanian Palaeolithic research, a brief comparison between the 'traditional' excavation and recording methodologies in use between 1950 and 1990, and new documentation methods, based on 3D geodetic total station-aided recording, multi-proxy palaeoenvironmental sampling and systematic chronometric assessments, is proposed. Based on their comparable sedimentological background, two sites located in the Eastern Carpathians (Bistricioara-Lutărie I/II and Bistricioara-Lutărie III) were chosen for this task. The goal is obviously not to criticize an already abandoned methodology, but rather to offer a more realistic image of the state of preservation of these particular archaeological sites, with implications for defining relevant analytical units. Overall, this endeavour stressed the fact that filtering potential interferences caused by syn- and post-depositional processes is a difficult task without the input of the additional data offered by a multi-proxy approach.
Keywords: *Upper Palaeolithic; site formation; documentation; spatial analysis; database.*

1. INTRODUCTION

A natural step in solving a scientific problem is to acknowledge its complexity. Despite a widespread Baconian perspective on how science proceeds, previous frames of reference and empirical expectations do serve as landmarks for the identification of research problems and in providing their solutions; consequently, they also decide on their perceived complexity[1]. For empirically-fuelled disciplines like archaeology, virtually all aspects related to field practice and public outreach – excavations techniques, artefacts/geofacts recovery, data analysis, curation, publication, exhibitions etc. – rely massively on previous knowledge, epistemological groundings, and theoretical and empirical expectations, explicitly or not articulated into research paradigms[2]. Palaeolithic research makes no exception to this rule[3].

For archaeological reasoning today, a proper understanding of site formation processes is essential in securing inferences regarding past human behaviours. This realization, however, spurred by major progresses in archaeological theory and archaeometry, coupled with innumerable field observations, emerged gradually, in the course of many decades

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[1] BUNGE 1974; POPPER 2000.

[2] WYLIE 2002.

[3] BINFORD 1981: 195-208; STOCZKOWSKI 2002; CLARK 2009: 19-42; HUSSAIN 2019.

of research. Although the preoccupation with the destructive aspect of archaeological practice is in fact quite old[4], the history or archaeology is full of examples of (sometimes wildly) flawed interpretations built on neglected, over-simplified or poorly understood formation processes. Worse still, much information from old excavations is presently unrecoverable, while a great deal of apparently sound contextual data today proves incomplete or plainly erroneous.

Due to the expedient technology and mobile lifestyle of their makers leaving a modest material imprint, and to their complex taphonomic biographies, Palaeolithic sites were and still are particularly prone to such misinterpretations[5]. While for decades Pleistocene archaeology has been making huge progress in correcting earlier excavation and recording biases, these accomplishments remain unbalanced. The main reason is that fieldwork and documentation methodology greatly rely on site specificities, research history, national and/or supranational regulations, available equipment and funding, as well as on the formative background and expertise of the involved archaeologists. As a consequence, sets of data obtained from the same site in the course of different fieldwork stages may vary significantly, and in the worst case even turn out as being largely incompatible.

In order to understand the magnitude of these issues in the particular case of Romanian Palaeolithic research, a brief comparison between the 'traditional' excavation and recording methodologies in use between 1950 and 1990, and new documentation methods, based on 3D geodetic total station-aided recording, multi-proxy palaeoenvironmental sampling and systematic chronometric assessments, is proposed.

Contrasting research methodologies separated by decades of archaeological reflection, field experience and technological progresses might certainly appear as an unfair exercise. The main scope of our contribution is, however, not a futile past tense critique of a now largely abandoned excavation methodology. In a more positive vein, we rather attempt at providing: (1) a detailed description of the documentation system designed for the research of two open air Upper Palaeolithic (UP) archaeological sites in the challenging sedimentary context of the Eastern Romanian Carpathians; and (2) a more realistic, though perhaps less comforting image on the state of preservation of these particular archaeological sites. Grounded on ongoing research, our contribution is less aimed at 'setting the regional record straight' and more at providing some methodological food for thought. The consequences the new methodology entails for the existing regional taxonomic framework will therefore be only briefly touched upon. Many recent reassessments of the Palaeolithic record in Romania ended up in revealing complex interplays between natural and cultural processes, at various scales[6]. They clearly mark a shift from the traditional focus on the classification of 'iconic' lithic artefacts to a superior understanding of their depositional, palaeoenvironmental and behavioural contexts. The consequences of this turn for the regional palaeo-cultural framework are indeed as dramatic as their contrast with previous knowledge[7]. They further suggest the existence of some deeper taxonomical 'mess' in need of reflection. This aspect, however, will not be discussed here at length. Acknowledging the interpretative intricacies left by archaeological formation processes logically and factually precedes taxonomic rebuilding. We therefore choose to focus on this crucial step, leaving taxonomical issues to future research.

2. THE SITES

Two neighbouring UP sites in the Eastern Carpathians (Bistricioara-Lutărie I/II and III, henceforth BL I/II and BL III) are the focus of this contribution. Both sites are located in comparable sedimentary settings (loess derivates capping fluvial terrace bodies), on the middle (40-50 m, BL I/II) and lower (15-18 m, BL III) terrace of the Bistrița River, respectively[8] (**Pl. I.a**). Although conventionally separated by ca. 50 m and divided by a narrow ravine, the two findspots BL I and BL II lie on a flat terrace step and display, according to the original descriptions, the same stratigraphic and archaeological succession. For the present purpose, the two spots will therefore be treated as a single, extensive archaeological site. Both BL I/II and BL III cover, in fact, large surfaces in excess of 1000 m^2. BL I/II underwent

[4] cf. LUCAS 2001: 35-46.

[5] DIBBLE *et al.* 1997: 629-651.

[6] See for instance SITLIVY *et al.* 2012: 85-130; SITLIVY *et al.* 2014: 193-212; TUFFREAU *et al.* 2007: 5-18; TUFFREAU *et al.* 2009: 21-33; TUFFREAU *et al.* 2013: 7-39, TUFFREAU *et al.* 2018: 129-165; VERES *et al.* 2018: 35-51; ANGHELINU *et al.* 2019: 96-119; DOBOȘ, CHU 2019: 17-34; FITZSIMMONS *et al.* 2020.

[7] ANGHELINU 2018: 87-110.

[8] ANGHELINU *et al.* 2021A: 210-229; SCHMIDT *et al.* 2020.

discontinuous, but decades-long and large-scale excavations (ca. 295 m^2) since the 1950's[9]. In contrast, BL III was identified in 2007 only and subsequently explored on a much smaller surface (38 m^2)[10].

At BL I/II six discontinuously recorded archaeological layers, ranging from Aurignacian to 'final Gravettian'/Epigravettian, were originally described[11]. At BL III, six clearly distinct UP (Gravettian and Epigravettian) layers were identified but, given their discontinuous lateral extension and additional combustion traces noted in the lower part of the deposit, this number is likely a minimum figure.

At BL I/II, recent reassessments[12] already suggested that the 'classic' excavation and documentation system led to a massive over-simplification of the natural processes involved in site's formation. Additional observations made at BL III further point to the important impact of post-depositional changes, including cryofeatures, differential slope processes and erosion, soil formations, etc.[13]. As a general feature, the increase in topographic resolution complemented by systematic chronometric sampling, a detailed evaluation of the geo-archives and additional attribute analyses of lithic collections (including refitting), revealed a much more complicated depositional history for both sites[14]. This newly revealed complexity stands in sharp contrast to previous archaeological knowledge available by the start of the most recent research stage in 2006. As the most obvious explanation for this major disparity stands in the research methodologies applied, a more detailed comparison of the two field research methodologies seems appropriate.

3. TYPOLOGY FIRST: A BRIEF LOOK AT THE 'TRADITIONAL' EXCAVATION AND RECORDING METHODOLOGY

Evaluating the excavation/documentation biome of previous archaeological research stages is often difficult, as a preoccupation for methodological issues, including explicit presentations of excavation, recording and information-processing techniques, generally post-dates the birth of processualism in most archaeological traditions. In many cases, apart from field notebooks and archived plans/drawings/photos, only the archaeological publications and the current state of archaeological collections offer (indirect) information on these issues. Fortunately, in the particular case of the Palaeolithic sites in the Eastern Carpathians, quite detailed reports are available[15]. Some timely critiques[16] shed additional light on the excavation and documentation routines of the Romanian Palaeolithic research of that time.

Palaeolithic research in Romania took a scientific profile in the first decades of the 20th century, but its connection to mother-disciplines such as stratigraphic geology and palaeontology remained alive for many decades[17]. The symbol of its affiliation to natural sciences was the lithic 'type-fossil', used as an analytical index to all cultural and adaptive Palaeolithic matters[18]. According to a practice widespread across Europe[19], type-fossils acted as not only as a chrono-cultural guide amongst lithic collections, but also as an implicit guide for field research. It is this widespread, decades-long authority of type-fossils, ossified in archaeological excavation routines, which fully justifies the 'traditional' epithet for this type of field research.

Much like in other preeminent Palaeolithic research traditions (the French school, for instance[20]), the heuristic authority of lithic type-fossils in Romanian prehistoric archaeology proved strong enough to in some cases obliterate the most obvious stratigraphic evidence. Different occupational episodes, separated by sterile breaks and occasionally even associated to separate distinct combustion features were lumped into single 'assemblages' based on their typological

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[9] PAUNESCU 1998: 121, STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46.

[10] ANGHELINU *et al.* 2021A: 210-229.

[11] See also ANGHELINU, NIȚĂ, STEGUWEIT, 2012: 7-46; SCHMIDT *et al.* 2020.

[12] STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46, SCHMIDT *et al.* 2020.

[13] ANGHELINU *et al.* 2021A: 210-229.

[14] STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46; ANGHELINU *et al.* 2019: 96-119; SCHMIDT *et al.* 2020.

[15] NICOLAESCU-PLOPŞOR, PĂUNESCU, MOGOȘANU 1966: 5-116, PAUNESCU 1998.

[16] BOLOMEY 1989: 271-287.

[17] For more comprehensive discussions, see ANGHELINU 2004; ANGHELINU 2006: 135-158.

[18] ANGHELINU 2006: 135-158; ANGHELINU 2018: 87-110.

[19] See SAUER, RIEDE 2018: 155-184.

[20] See SACKET 1991: 109-142.

similarities (e.g., Udești-Poiana[21]). Thick (>50 cm) lithic scatters were regularly treated as single assemblages (e.g., Ripiceni-Izvor, Bicaz-Ciungi[22]). Not surprisingly such gross contextualization occasionally led to a mixing of chronologically very distant layers, as was the case at Mitoc-Valea Izvorului[23]. An opposite practice, i.e. the *ad hoc* splitting of presumably mixed 'layers' based on raw materials and/or typological outlook, was also common (e.g. for the Banat Aurignacian sites[24]). The impact of these biases was further aggravated by the use of coarse mechanical spits, generating by default artificial clusters, particularly problematic in artefact-rich, short sedimentary sequences. Depending on the nature of the sedimentary archives involved, and on the density of archaeological finds, both lumping and splitting practices could have acted in tandem and their effects in terms of arbitrary assemblage delimitation can easily be imagined.

The two dozen UP sites located in the Eastern Carpathians provide exemplary case-studies for the excavation and recording practices described above. Most of these sites were extensively excavated in a rather short interval between 1955 and 1958, followed by a less massive, but still impressive, second stage between 1962 and 1986[25]. This remarkable endeavour relied however on a massive use of untrained workers and a proportionally low number of professional archaeologists present in the field. Given the large surfaces excavated (reaching up to 900 m^2 per site), this imbalance likely made work supervision, find recording and manual drawing efforts particularly overwhelming.

Although summarizing two distant research stages, the two monographs[26] clearly attest to the use of a quite homogenous excavation and documentation system across the entire interval. The only significant differences stand in the improved focus on the horizontal layout of features (hearths, pits, boulders, etc.) and in the statistical treatment of lithic assemblages, which characterize the second major stage.

Despite their eventual large scale, all excavations in the first stage were characterized by long (>10 m) and narrow (1-2m) trenches[27], and somewhat wider 'cassettes' in the second[28]. In both stages, the topographic control remained poor, as layers' identification relied either on their relative depth in relation to major pedological units or simply in relation to the modern surface. The sites' variable topography and the natural differences in thickness of various pedological horizons may explain why presently curated collections often contain lithics attributed to the same layers, despite the massive differences in depths marked on individual artefacts[29]. It is also possible that some empirical expectations (e.g. that coarse raw materials and flake cores likely belong to 'Aurignacian' layers, or that Cretaceous flint is usually associated to Gravettian occupations, etc.) *ad-hoc* 'corrected' potential stratigraphic incongruities, according to the lumping/splitting biases mentioned above, especially after the early definition of the regional archaeological type-sequence at key sites such as Ceahlău-Dârțu, Ceahlău-Cetățica or BL I/II. The frequency of this practice remains impossible to assess today.

Lithic collections were recovered through mechanical spits of unknown depth and curated according to the *in situ* defined layers. Even if originally recorded horizontally per square meter, at least in the second research stage, the spatial information for each individual artefact, except for the depth, are presently impossible to trace in the existing collections[30]. The huge total count differences and the meagre presence of the microlithic segment (e.g., bladelets), when compared to recent collections in similar or even adjacent contexts[31], suggest the use of large tools and/or lack of sieving. As many curated collections appear today as technologically fragmented (e.g., cores lacking knapping debris), a secondary selection upon finding of typologically/technologically relevant lithics was possibly also practiced.

At BL I/II, much like at most sites in the vicinity, archaeological layers were described as laterally extensive, sub-horizontal 10-30 cm thick accumulations, usually connected to shallow combustion features, ash lenses and rare, poorly preserved faunal remains. Due perhaps to their key role in the recognition of individual archaeological layers, some (all?)

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[21] Cf. PĂUNESCU 1998.

[22] PĂUNESCU 1993, PĂUNESCU 1998: 101-105.

[23] TUFFREAU *et al.* 2009: 21-33.

[24] SITLIVY *et al.* 2012: 85-130; SITLIVY *et al.* 2014: 193-212.

[25] PAUNESCU 1998: 19-21.

[26] NICOLAESCU-PLOPŞOR, PĂUNESCU, MOGOȘANU 1966: 5-116; PAUNESCU 1998.

[27] NICOLAESCU-PLOPŞOR, PĂUNESCU, MOGOȘANU 1966: 5-116.

[28] PAUNESCU 1998: 121, Fig. 24.

[29] cf. NIȚA-BALAȘESCU 2008.

[30] NIȚA-BALAȘESCU 2008.

[31] STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46; ANGHELINU *et al.* 2021A: 210-229.

combustion features/ash concentrations were excavated only after removing the surrounding contexts to considerable depths[32].

All earlier descriptions of the geology and archaeology at UP sites on the Bistrița terraces[33] insisted on the inter-site sedimentary, geo-chronological and palaeo-cultural homogeneity. A 'master sequence' of seven pedological horizons and seven major archaeological layers/cultural stages (Aurignacian, Gravettian), variably preserved at each site, was consequently proposed[34]. The subsequent multiplication of cultural 'stages', based on scattered radiocarbon measurements[35], while adding more chronologic details, did not significantly alter this basic framework[36].

Various post-depositional perturbations were however noticed in both stages of research. Most referred to cold-related sedimentary features (ice wedges, congelifluction, laminar stratifications etc.), visibly affecting the general horizontal layout of the archaeological layers, or to climatically induced erosional episodes explaining, for instance, the presence of Palaeolithic artefact in the recent, Holocene soil[37]. Their impact was nonetheless considered marginal in terms of basic archaeological succession, as each lithic assemblage was presented as a discrete, clearly segregated unit.

In sum, the dominant feature of the 'traditional' documentation system was the vertical/diachronic focus and a marked trust in the simplicity/homogeneity of the local archaeological and sedimentary contexts. These premises were supported by the generally gentle slope of the local terraces, sub-parallel orientation of pedological horizons and combustion traces, further warranting the integrity of related 'cultural layers'. The layers were equated to discrete occupation episodes of various duration and function, straightforwardly measured through the size of lithic collections and the outlook of related combustions/habitat features[38]. Coupled with the poor preservation of organic remains (except charcoal) and the general lack of evident habitat features, the assumed unproblematic character of the geological archives allowed a certain exploratory comfort and bolstered a research routine built on empirical expectations that could supposedly be easily extrapolated from one site to another. It further encouraged the already strong focus on (selected) lithics, essentially aimed at refining a stadial taxonomic framework.

4. CONTEXT FIRST: THE NEW DOCUMENTATION SYSTEM

Initiated much later, the current research stage expectably started from a different theoretical background and built on a considerably higher diversity of datasets. It consequently revealed a much more complicated reality in the field.

In the last decades, the growing emphasis on the destructive or merely displacing character of archaeological excavations[39] brought about a need to constantly evaluate and optimize field methods. Even if there is virtually no consensus in regards to what a proper documentation should imply, the quest to recover as much data as possible has become synonymous with on-site recording and documentation. This trend would not have been successful, debatably even possible, without the application of new technologies (equipment, software). This proved helpful both for on-site recording, as well as for post-excavation processing, reducing the required time while simultaneously increasing the resolution of the gathered information. This approach inevitably results in large quantities of raw data. In consequence, custom-made databases became crucial for the administration of large amounts of information.

Even though high-resolution excavations of Palaeolithic sites are certainly not a novelty[40], the rate at which new methods were adopted increased significantly in the last decades. Following the general trend, with the increasing use of theodolites, total stations and computer applications, new methods became more and more approachable and appealing, eventually becoming the standard for modern research. As expected, new methods were accompanied by a growing interest in spatial analyses, site structure and behavioural patterns, stressing the importance of detecting syn- and post-

[32] See for instance PAUNESCU 1998: 124, Fig. 27.

[33] NICOLAESCU-PLOPȘOR, PĂUNESCU, MOGOȘANU 1966: 5-116, PAUNESCU *et al.* 1977: 157-183; PAUNESCU 1998: 110-115.

[34] NICOLAESCU-PLOPȘOR, PĂUNESCU, MOGOȘANU 1966: 5-116.

[35] PAUNESCU *et al.* 1977: 157-183; PAUNESCU 1998: 117.

[36] However, see STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46; ANGHELINU *et al.* 2021B: 241-257.

[37] NICOLAESCU-PLOPȘOR, PĂUNESCU, MOGOȘANU 1966: 14; PAUNESCU *et al.* 1977: 157-183.

[38] PAUNESCU *et al.* 1977: 157-183.

[39] LUCAS 2001: 35-46.

[40] GOWLETT 1997: 154-159.

depositional disturbances[41], and therefore in controlling the post-occupational site formation factors[42]. For Palaeolithic sites, where evident structures are rare and much relies on identification of latent features, single find recording is a *conditio sine qua non* [43].

As already suggested[44], Romanian research tradition for a long time followed a distinctive path and a reconnection to global trends was achieved only in the last decades, in many cases as a result of international collaboration projects. Such collaborations also resulted in several high-resolution excavations[45].

At Bistricioara-Lutărie, new field investigations started in 2006 with a small test trench for chronometric and environmental magnetism sampling at BL I/II. Extended excavations in 2007 targeted the previously investigated site (BL I/II), as well as two new locations (BL III and BL Shore)[46]. At BL I/II, the excavated area (S2/2007) measured 3 x 2.5 m and was, in fact, an extension to the north of the 2006 test trench (S1/2006). At BL III, first investigations (2008) concentrated on an exposed section facing the shoreline of today's artificial lake in the Bistrița valley, where an 8 m long and 1.5 m wide trench (T0) was opened[47]. Two survey trenches (T1, 9 m^2 and T2, 4 m^2) were excavated in 2015 in order to assess the site's extension to the south, expose the lower parts of the stratigraphic sequence and clarify the basic archaeological succession in the northern sector of the site.

Excavations were conducted using small tools (trowels, metal or wooden spatulas) by removing successive spits ranging, depending on finds size and density, between 2 and 10 cm, aiming at keeping the finds *in situ* in order to accurately record their position. At BLI/II, the entire amount of excavated sediment was dry sieved (2 mm sieves). At BLIII, where much larger volumes of sediment were excavated, wet sieving (2 mm) of samples of sediment associated to high-density concentration of finds or *in situ* preserved features was preferred.

With the exception of the two survey trenches at BL III in 2015, on-site recording at BLI/II and BLIII was carried out with the help of a total station, employing a local coordinate system. A standardized list of measurement types (codes) was established beforehand, in order to avoid an excessively branched classification. These measurements describe features (measure point and boundary), finds (flint, charcoal, bone, etc.), and collected samples (samples), as well as topographic markers. One or more measurements were recorded for individual finds and features, based on size, shape, and other relevant aspects. Each measurement was attributed to an ID number and introduced into the Microsoft Office Access database in real-time. Apart from ID number and measurement type, the database included additional information, such as the geological and archaeological horizons, the number of the spit, direction and inclination for the finds, X/Y/Z coordinates, trench number, as well as date and time of recording. A remark section was also included, in order to add further descriptions if necessary (e.g., Type: Boundary, Remark: north slope to Bistrița Valley) or include other pertinent observations (e.g.: Charcoal, Remark: not preserved). The recovered finds and samples were collected individually and packed in zip-lock plastic bags labelled with their assigned ID number/s. The stratigraphy of the trenches was documented based on the resulting profiles. Visible stratigraphic boundaries were documented by recording lines of measurement points along the identified interfaces. Individual databases, following the principles mentioned above, were developed for each site (BL I/II and BL III).

A similar methodology of excavation and documentation was employed at BL III in 2018 and 2019, when two new areas (T3/2018 - 2 x 3 m, respectively T4/2019 – 1 x 9 m) were excavated. Unfortunately, the profile had since 2008 been intensively damaged by natural erosion and clay extraction. This prohibited drawing a direct connection between the 2008, 2015 and 2018/2019 excavation areas (with approximately 7.5 m missing between T0 and T3) (**Pl. I.b**).

The excavation method was similar to the one described above (small tools, successive spits of 3-5 cm and contextual recording). Given their poor state of preservation, recoverable faunal remains were treated with Paraloid B72 before removal. An *in situ* detailed description by an archaeozoologist (size, position, species identification, anatomic parts etc.) of all unrecoverable faunal remains preceded their introduction into the data base.

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[41] HENRY 2012: 246-266.

[42] SCHIFFER 1983: 675-706.

[43] DIBBLE 1987: 249-254; MCPHERRON, DIBBLE 2002; MCPHERRON, DIBBLE, GOLDBERG 2005: 243-262; HÄNDEL 2010: 185-293.

[44] ANGHELINU 2004, ANGHELINU 2018: 87-110.

[45] See SITLIVY *et al.* 2012: 85-130; TUFFREAU *et al.* 2018: 129-165; NOIRET *et al.* 2016: 13-49; NIGST *et al.* 2021: 189-209.

[46] STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46.

[47] ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46.

Some differences in documenting in between 2006-8 and the most recent fieldwork are worth mentioning. An important novelty was the employment of the Romanian projected coordinate system (Dealul Piscului 1970). The replacement of the previously used local coordinate system has clear advantages, as the new measurements are compatible with any official topographic survey data, eliminating the need for transformations. Also, continuity with data recorded in the future will be given as the system no longer relies on ephemeral markers, which may go missing.

Some modifications and improvements were applied to the Microsoft Access database. Predefined codes were used for most of the recorded information (except fields with numerical values), aiming at a more standardized data collection which allows for more possibilities regarding processing and statistical analyses of the data. As before, each measurement is connected to an ID number, trench, geological layer, archaeological layer, number of the spit, orientation (e.g., E-W) and position (e.g. horizontal) of individual finds, X/Y/Z coordinates, date, as well as the useful remark section. Nine individual codes are used as main measurement types (Find, Sample, Assemblage, Point, Line, Outline, Surface, Feature, Photo) and an additional category named Object was created, further classifying each measurement (**Pl. V.a**). Stratigraphic boundaries are recorded both in the course of the excavation as surfaces and as lines in the sections. In addition, series of photographs were taken in order to create high-resolution orthophotographic plans of surfaces and profiles (referenced with marked and recorded points, measurement type: Photo), as well as a 3D model of the trench, using the structure-from-motion (SfM) approach.

Larger finds or features were measured with multiple points, either as lines (each end measured for oblong objects) or outlines (more complex shapes). Individual finds (≥ 1 cm) and samples were recorded individually and labelled with their assigned ID number. All finds < 1 cm were collected as part of the assemblages recovered during sieving of the excavated sediment. Assemblages are recovered per square meter and spit. To mark each assemblage, a single measurement (therefore one ID number) was taken in the centre of the square meter after excavation of each spit (e.g., ID: 176, Type: Assemblage, Object: Lithic, Square meter: M3, Spit: 6). A sub-number field was added into the database in order to manage finds individualized from the assemblages. In the case of lithic artefacts, this is applied when finds ≥ 1cm in general, or for modified pieces also < 1cm, end up in and are therefore retrieved from the assemblages. While most of the database fields are entered on-site, the total station data (X/Y/Z) is updated on a daily basis, at the end of the work day, and connected with the other attributes via the ID number which is used synchronously in both the database and the total station log.

The advantages of high-resolution excavations have been shown for countless cases[48]. The obtained data can easily be connected to data gathered by interdisciplinary approaches. The use of a total station facilitates such an endeavour. Total station measurements are less prone to errors caused by faulty reference lines and the necessary time to document finds and features is significantly reduced. Given the use of compatible projections, different sets of data collected during different field incentives can be combined and processed together without difficulty. Also, either directly from the total station or with minor conversions, the data can be uploaded in countless computer applications for processing and analyses. An important addition to the database and total station measurements is the systematic use of orthophotos as photographic plans, i.e., the combination of spatial and visual data. This provides a complementary but less interpretative source of data than sketches and drawings, and therefore represents a valuable addition to these and other analogous records such as field descriptions and turned out a significant asset for post-excavation interpretations.

Many total stations provide the option to enter a specific code for each measurement. For complex requirements as the case for documentation of Palaeolithic sites which rely on single-find recording, this option is insufficient. Therefore, a digital field database designed to store and manage the collected information is to be preferred. Not only does it offer the possibility to diversify, and if required expand the attributes assigned to a single measurement, but it also simplifies the processing stage. Other than requiring an extra person and a laptop in order to make the entries during the excavation, there are virtually no drawbacks in implementing a digital field database. Total stations with an according data interface also allow for control by computers via specific software, e.g., EDM (Entity Data Model)[49].

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[48] GOWLETT 1997: 152-171; PARKER, ELDRIDGE 2014: 115-122.

[49] DIBBLE, MCPHERRON 1988: 431-440.

5. BRIEF ASSESSMENT OF THE INTEGRITY OF ARCHAEOLOGICAL FEATURES AT BL I/II AND BL III

Establishing proper analytical assemblages (archaeological finds grouped together based on their discovery context) is vital for processing data and rendering adequate interpretations. Therefore, a fair understanding of site formation processes is essential in determining relevant archaeological features and their boundaries, as well as their integrity, an aspect especially important in Palaeolithic sites, often exposed to significant post-depositional processes over thousands of years. The alternation of geologically defined stratigraphic units has long stood at the basis of differentiating between analytical assemblages in Palaeolithic sites; a method which overall proved its worth. However, stratigraphic units may not always be sufficient for identifying and isolating relevant archaeological assemblages, so that it is important to record parameters that can be used independently. Hence, in addition to a good understanding of the local stratigraphy and formation processes, a precise provenience of artefacts in form of three-dimensional single find recording is applied, together with records on orientation and inclination.

In the following, a brief assessment of the archaeological features in BL I/II and BL III will be presented, based on field observations and preliminary spatial analyses. This is aimed at demonstrating how the use of an all-encompassing database can facilitate a relatively fast and straightforward assessment, as geological, archaeological and 3D provenience data are stored together in a congruent manner. Hereby, GlobalMapper (v19.0) was used, which is not only a user-friendly software, but also provides a large number of tools, including an interactive 3D-view, very helpful for visualizing data. With minor conversions, the entire database can be imported into GlobalMapper. Data can be individually selected, comparable to queries in data bases, and the selected groups can be visualized.

Recent detailed observations at both BL I/II and BL III, coupled with sedimentological, environmental magnetism and chronometric sampling, proved extremely helpful[50]. Compared to the earlier interpretations, which wagered on the uniformity and lateral continuity of the sediment sequence capping the Bistrița terraces, the new data show several particularities for each terrace, with clear implications for interpreting the archaeological data.

BL I/II preserves a significant amount of detrital carbonate and many features of loessic deposits (coarse silt, porosity, pseudo-mycelia) in the lower part of the deposit, indicating a predominantly aeolian origin of the silt component. At BL III, the lack of carbonates points to massive sediment redeposition. Despite their apparent similar aspects (**Pl. II**), the two silt deposits (conventionally attributed to the same major unit G2[51]) therefore display different genetic features. This is in fact well expressed by OSL estimations – showing considerably older ages at BL I/II.

Several other features point to important sedimentary differences between the two archives. The mottled pedogenic imprint in a depth of 1.65-1.75 m at BLIII is completely missing at BL I/II. The strong lamination displayed in the lower part of PS1 at BL I/II is virtually absent at BL III. Furthermore, the chronology of unit G2 which hosts most of the archaeological features is, in fact, much shorter and younger than previously estimated[52], and ranges between 33/32 – 15 ka calBP[53].

The influence of various cryo-features and pedogenesis on the archaeological features should be given more credit than in previous interpretations as well. At BL I/II the pedo-complex in the upper part (PS1) developed on calcareous loess derivates and shows at its base strongly developed frost-lamination typical for permafrost or recurrent strong and long-lasting deep frost events. The frost-lamination and the rolling top of the pedo-complex do, however, not follow the geological stratification and the sub-horizontal orientation of archaeological layers, but form a pointed angle similar to the uppermost humic horizon of the recent soil, which again is not strictly parallel to the stratigraphic levels below. This suggests consistent post-depositional effects (e.g., vertical/horizontal displacement) over pre-existing archaeological accumulations. At BL III, all archaeological layers seem to be more or less affected by slope processes, and, in some cases, by cryoturbation, periglacial deformation, and polygonal frost structures.

Other than several well-defined charcoal patches, no other evident or latent features were observed at BL I/II. Three main charcoal clusters are clearly visible on various plots (**Pl. III.a**). While the upmost two are related to

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[50] TRANDAFIR *et al.* 2015: 487-492; ANGHELINU *et al.* 2019: 96-119, SCHMIDT *et al.* 2020; ANGHELINU *et al.* 2021A: 210-229.

[51] See SCHMIDT *et al.* 2020.

[52] NICOLAESCU-PLOPŞOR, PĂUNESCU, MOGOȘANU 1966: 5-116; PAUNESCU *et al.* 1977: 157-183.

[53] SCHMIDT *et al.* 2020.

archaeological finds, the lower one, most substantial (ca. 10 cm thick), lacks associated artefacts. If one bears in mind the results of the older excavations, where six well individualized archaeological layers were described[54], the distribution of finds (predominantly lithic artefacts) in the 2007 trench is quite striking. Apart from a few scattered lithics present in G1, most appear as a rather sparse cloud in G2 (especially in PS1). With due caution, only a handful of lithics found beneath PS1 can be related to the second charcoal cluster. The available radiocarbon ages, ranging between ca. 25 and 28 ka calBP[55] for the topmost find clusters, suggest representation of multiple occupations, but a clear stratigraphic distinction between assemblages is hitherto impossible. Refitted lithics vertically spaced 0.2 - 0.3 m apart (**Pl. III.b**), as well as the predominant oblique and vertical positions of artefacts (**Pl. IV.a**) confirm the hypothesis of significant post-depositional processes. Nevertheless, a preferential orientation of finds was not noticed **(Pl. IV.b)**, which suggests that such interpretations based on the more recent analysis of old data may in fact reflect a documentation bias[56].

At BL III, apart from more or less distinct lithic, charcoal and fauna clusters, several evident anthropogenic features were also identified. This suggests better preservation presumably linked to faster sedimentation rates, likely influenced by colluvial contribution. At least four remnants of palaeo-surfaces were noticed. The first one (from top to bottom) is assigned to archaeological horizon (AH) 2.2 and includes a two-phased hearth. Overall, the occupation layer shows a dark-brown to blackish matrix with high density inclusions of charcoal, burnt bone fragments, red ochre, sandstone fragments, chunks of burnt sediment, and lithic artefacts. A few poorly preserved bones were also identified. The occupational layer was affected by various post-depositional processes (solifluction and cryoturbation), illustrated by frost cracks and vertical shifts (**Pl. VI.b**). The second layer (assigned to AH 2.3) is highly eroded and only a few finds remained *in situ* (charred bone, charcoal, several lithics). This layer fans out downslope forming several layers with redeposited finds. Connected to the occupation layer a two-phased combustion feature was recorded. However, the two phases do not exactly overlap. Both hearth phases show frost cracks forming a polygonal pattern with vertical shifts of up to 6 cm (**Pl. VI.c**). The following feature (assigned to AH 2.4) is represented by a combustion structure paved with sandstone slabs, identified in the south-west corner of the 2019 excavation (**Pl. VI.d**). As only a few (redeposited) lithics and charcoal clusters were connected to this structure, it is highly probable that the actual occupation floor, located slightly higher, was eroded. In contrast, the underlying occupational floor (assigned to AH 2.5), with multiple features (hearths and pits), is very rich in anthropogenic inclusions, embedded in a dark-brown ashy matrix (**Pl. VI.e**). This layer exhibits a considerably better (though far from ideal) preservation for unburnt organic materials like faunal remains. The occupation layer and features are, however, affected by slope and periglacial processes, i.e. deformed and partly eroded but still well-recognizable. Another interesting feature at BL III is represented by a layer with substantial combustion traces (dark red to bright orange burnt sediment patches), located several centimetres beneath AH 2.5 (**Pl. VI.e**). Although the combustion traces are probably anthropogenic, securely associated lithic artefacts have hitherto not been recorded.

The 3D spatial distribution of finds largely confirms the field observations. Most artefacts are organized in distinct clusters, in strata following the current topography. A 10^0 slope towards the north and a 4^0 slope to the east are determined for all archaeological layers. Therefore, potential slope distortions were taken into consideration when projecting the finds onto the geo-referenced profiles. The south profile of the 2018 trench (**Pl. V.b**) and west profile of the 2019 trench (**Pl. V.c**) were used for this task. In the case of the 2018 profile, only the finds located within a 0.5 m range were considered for the projection, while in the case of the 2019 profile, the lower slope allows increasing this range to 1 m. In both projections the topmost clusters found in the lower part of GH 1 and the upper part of GH 2 (PS 1) are not well defined, pointing towards post-depositional displacements (bioturbation, modern roots, slope influence, frost cracks). The position of lithic artefacts also reflects such processes, with a large percentage lying in oblique or vertical positions (Pl**. VII.a**). Also, a potential preferred orientation along and perpendicular to the main slope was noticed (**Pl. VII.b**) for the late Epigravettian layers AH 1.1 and AH 2.1.

The find layer beneath is AH 2.2. In the 2018 profile, the accumulation appears ca. 0.08 m thick, while its thickness ranges between 0.05 - 0.15 m in the 2019 profile. Overall, the south-west part of the investigated area shows a higher density of finds, especially in the approximately 1.5 m^2 occupied by the hearth (**Pl. VI.b**). Due to the lower density of artefacts and the thin sediment accumulation in between, the underlying layer AH 2.3 is virtually undetectable in the 2018 profile and only slightly more obvious in the 3D view of the entire 2018 trench. However, the longer profile coupled

[54] NICOLAESCU-PLOPȘOR, PĂUNESCU, MOGOȘANU 1966: 36-37; PAUNESCU 1998: 121-122.

[55] STEGUWEIT *et al.* 2009: 139-157.

[56] ANGHELINU *et al.* 2019: 96-119.

with a higher density of finds renders a better image for the 2019 profile. As the slope becomes slightly more accentuated towards the north (up to 12^0), the two layers AH 2.2 and AH 2.3 seem to be more affected by the topography and show that distinct layers in the southern sector slowly dissipate and mingle towards the north. Based on the presently available data, a more pronounced orientation along the slope to the north is noticed for lithics assigned to AH 2.2 (**Pl. VII.c**). In the case of AH 2.3, the substantially lower number of artefacts renders such inferences as irrelevant at this point. A significant difference between the 2018 and 2019 data is the visibility/presence of AH 2.4 exposed in the south-western corner of T4, which was not identified in 2018. So far, the spatial distribution of the finds confirms the field observations, suggesting that we are dealing with a heavily eroded layer. Although not evident in the 2018 profile (but clearly visible in the 3D view of the trench), the most substantial and diverse (in terms of finds composition) cluster in both trenches is the one assigned to AH 2.5. The layer was identified immediately beneath the mottled horizon. It ranges in thickness from 0.1 - 0.17 m and finds density is higher in the southern part of the investigated area, where several pits were identified. Most of the faunal remains and ochre pigments seem to be contained within these pits. In addition, the percentage of finds in a vertical or oblique position is considerably higher in the pit area. As with other layers, the influence of the slope appears to be reflected by the orientation of artefacts (**Pl. VII.d**).

Overall, based both on field observations and spatial analysis, the identified archaeological layers at BL III are clearly influenced by the topography, especially by the more accentuated slope towards the north, as well as by various periglacial processes. Although ice-related polygonal structures, mottled horizons and other periglacial features are well documented at BL III[57], no specific sorting patterns, such as polygons or stripes[58] are evident in the finds plots, but we do expect such features to become visible as larger areas are excavated and more data is gathered and processed.

Summing up, even with a precise recording system, the clear distinction between archaeological features and/or analytical units is not always evident. Instead, it depends on factors such as various displacements, artefact density, spacing in between layers and clusters, etc. Given all these interfering factors, we can only assume how difficult (if even possible) it would have been in previous stages of research to assess the integrity of archaeological features and distinguish between relevant analytical units without sedimentological analyses, chronostratigraphic frame, relevant field observations and a 3D recording system. We can only hope that systematic refitting for the BL III assemblages, which is currently in progress, will bring much-needed additional data to this preliminary assessment and give more weight to future interpretations.

6. DISCUSSION AND CONCLUSIONS

The superior chronometric control allowed by luminescence and radiocarbon dating, and the detailed palaeoenvironmental/geological assessment revealed by sedimentological and environmental magnetism proxies, all simply unavailable to previous generations of researchers, have already considerably changed the understanding of some key archaeology-bearing Late Pleistocene sequences in the Eastern Carpathians[59]. Highly significant for the regional palaeo-cultural picture seems the documented massive (and possibly systematic) erosion of initial deposits accumulated on the middle terrace of the Bistrița river[60]. Although we are presently far from being able to provide a comprehensive image on this issue across the entire Ceahlău Basin, it is now clear that on at least some middle terraces the deposits accumulated prior to the Late Glacial Maximum *sensu lato* were truncated by episode(s) of increased erosion while the resulting colluvia accumulated in part on lower terraces such as at BL III. This observation raises the intriguing possibility that the sparse image of the earlier Upper Palaeolithic occupations in the Ceahlău Basin (i.e., prior to the Late Gravettian) is due rather to conservation than to actual archaeological reality.

More importantly for the study presented here, these recent results unravelled an unsuspected complexity of natural formation processes. Various syn- or post-depositional perturbations (differential erosion and accumulation, slope processes, frost action and permafrost features, palaeosol formations, etc.) very specifically affected the anthropogenic accumulations even at sites in close proximity, such as BL I/II and BL III (but also BL-Shore[61]), or even across the very

[57] ANGHELINU *et al.* 2021A: 210-229.

[58] BERTRAN *et al.* 2010: 17-29.

[59] ZEEDEN *et al.* 2011: 100-107; TRANDAFIR *et al.* 2015: 487-492; TUFFREAU *et al.* 2018: 129-165; SCHMIDT *et al.* 2020.

[60] SCHMIDT *et al.* 2020; ANGHELINU *et al.* 2021A: 210-229.

[61] See ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46.

same sedimentary sequence in one spot. The most obvious implication is that both intra- and inter-site variability in terms of preservation of UP contexts is much higher than originally assumed.

The implications of the new excavation and documentation data from BL I/II and BL III for the UP human presence in the Eastern Carpathians go however far beyond these palaeoenvironmental and geochronological observations. Firstly, when viewed from the perspective of the size of lithic assemblages measured against excavated surfaces/sediment volumes, the collections recovered during the most recent stage of research are orders of magnitude larger than earlier assemblages even when only essential counts (i.e., without chips and fragments < 1 cm) are considered[62]. The intensity of UP human presence and activity in the Eastern Carpathians was thus grossly underestimated. Unsurprisingly, the technological and typological structure of old and new lithic collections is considerably different, with predictable consequences for behavioural inferences. This observation adds to early doubts regarding the clear segregation, completeness and therefore analytical relevance[63] of lithic collections previously recovered at BL I/II and possibly at most if not all other sites investigated in a 'traditional' manner.

Accurate 3D recording of individual artefacts and features clearly show the difficulty of separating the lithic finds into discrete layers, irrespective of the recording methodology used. Various depositional (palimpsest of occupations in rapid temporal succession without time for intermediary sediment accumulation) and post-depositional processes (frost-related, differential erosion, solifluction, etc.) raise serious challenges even for modern documentation systems, which clearly need to be supplemented by additional 'noise' reduction means (e.g., refitting). In absence of 3D recording, all 'layers' defined in the course of previous research stages should be rather seen as artificial associations of lithics emerged through an artificial 'flattening'/horizontal forcing of finds recovered along variable depth slices of minimum 20 cm. This practice has likely had dramatic effects in the proper segregation of lithic assemblages, which can largely explain, among others, the many taxonomical issues lingering to present day[64]. The new high-resolution excavation and documentation system also revealed preservation potential for actual UP living floors, fragments of which were observed and documented at BL III in the course of fieldwork in 2019. At the moment these are exposed in limited areas only (patches ≤ 2 m^2), so that spatial analysis could not yet reveal any significant patterns which can be interpreted in a behavioural key. Nevertheless, with the extension of the research area, especially towards the south-west where a better preservation and higher density of artefacts were observed, meaningful patterns are expected to emerge. Preliminary refitting conducted on the AH 2.5 lithic assemblage suggests that at least for this layer most conjoining fragments are found in the western part of the excavated surface, at distances ranging between 0.2 and 2.7 m [65]. This already foreshadows the next challenge, which will be to discern between the small-scale instant displacements associated with human behaviour on one hand, and the impact of post-occupational long-term formation processes on the other hand.

Documentation systems are obviously always perfectible. This is also the case for the new methodology applied at the Bistricioara sites which has its own drawbacks. As a rule, higher resolution in archaeology comes at the expense of excavated surfaces, which tend to become much smaller. There is of course no easy trade-off between wide, low-resolution full site coverage and high-resolution small excavation. Therefore, all tactical choices need to be anchored in long-range strategies with clear research objectives, correct estimations of predictability/continuity in funding, time/resources available etc.

As our experience clearly shows, despite their challenging depositional contexts, the Eastern Carpathian UP sites hold a huge research potential, provided that high-resolution and constantly improving research methodologies are implemented.

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[62] ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46; ANGHELINU *et. al.* 2021B.

[63] NIȚA-BALAȘESCU 2008; STEGUWEIT *et al.* 2009: 139-157; ANGHELINU, NIȚĂ, STEGUWEIT 2012: 7-46.

[64] ANGHELINU *et al.* 2018: 183-219; ANGHELINU *et al.* 2021B: 241-257.

[65] NIȚĂ, ANGHELINU, CORDOȘ 2021: *in press.*

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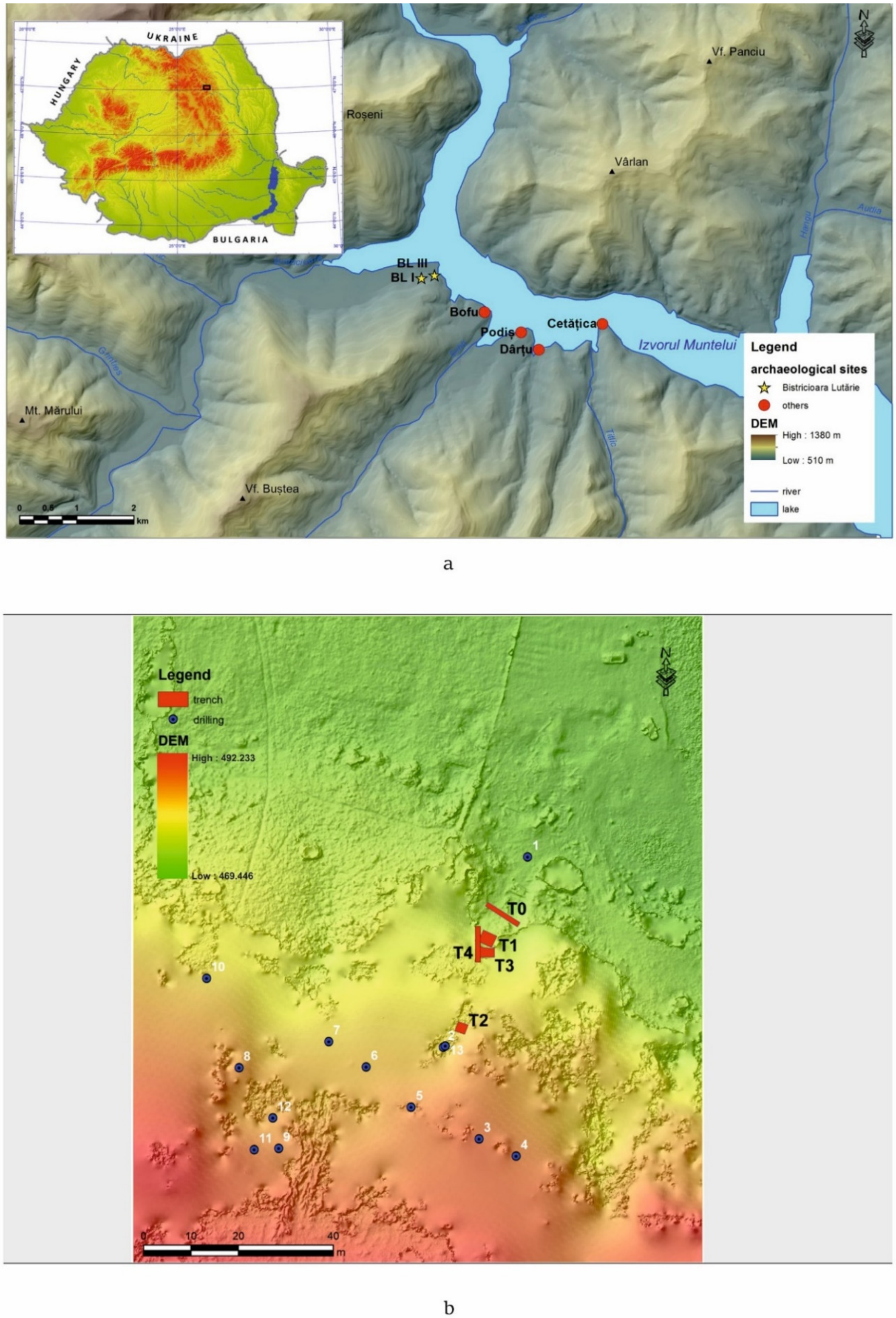
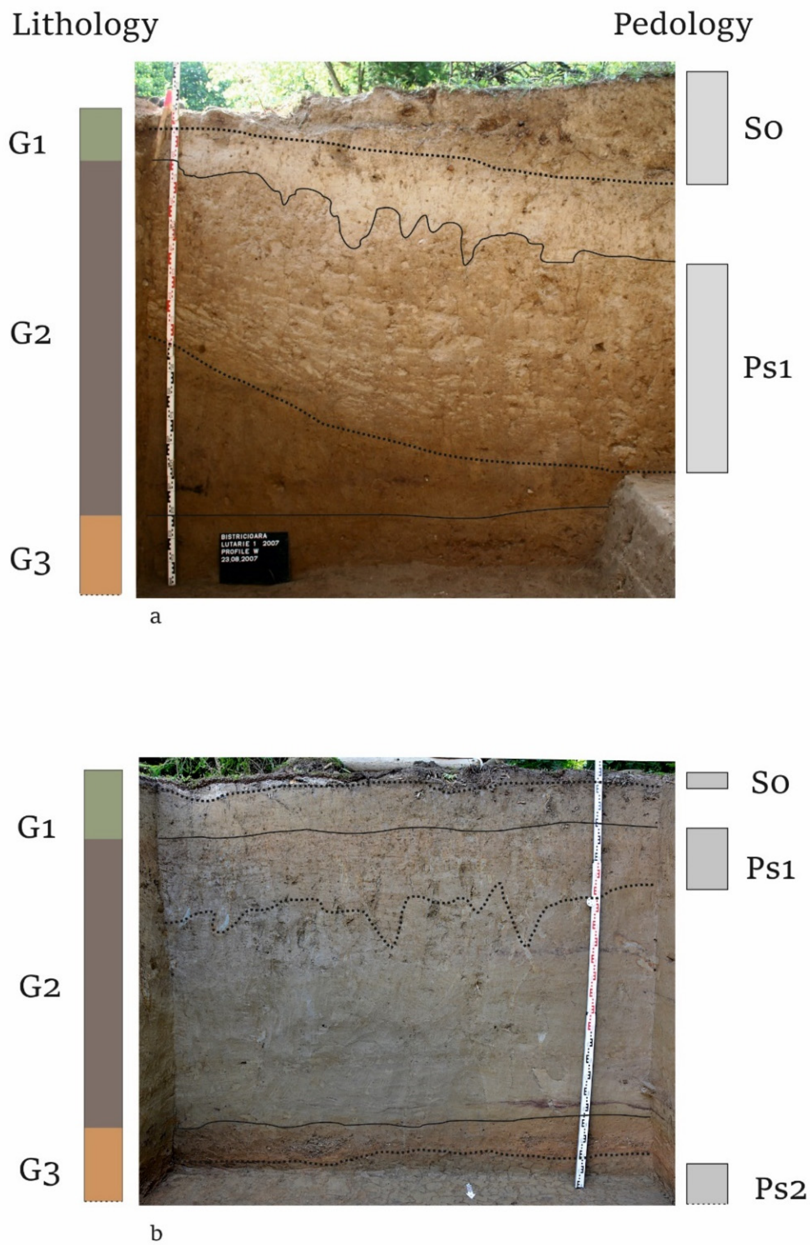
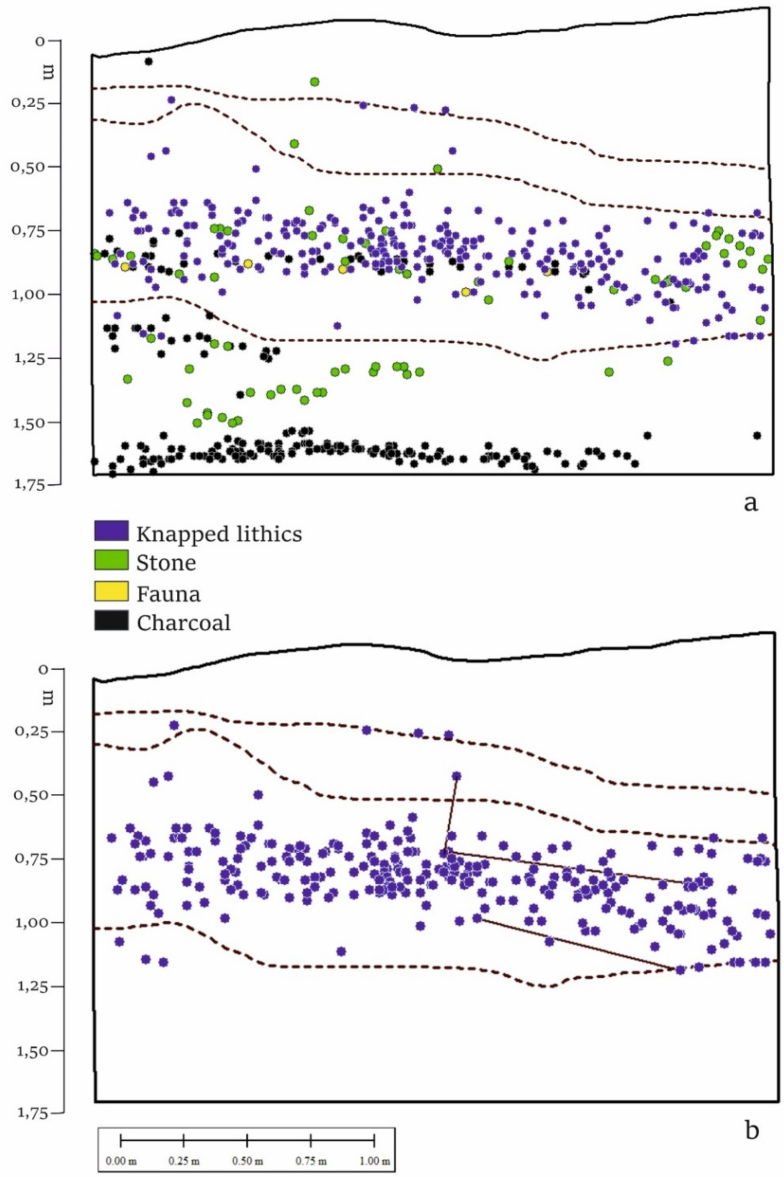


Pl. I. a. Location of the Bistricoara-Lutărie sites BL I/II and BL III in the Ceahlău Basin (map design G. Murătoreanu); b. Location of trenches at BL III (DEM design: Lukas Dörwald).



Pl. II. Schematic lithology and pedology at BL I/II (a) and BL III (b).



Pl. III. YZ plotted finds (a) and knapped lithic refits (b) at BL I/II.

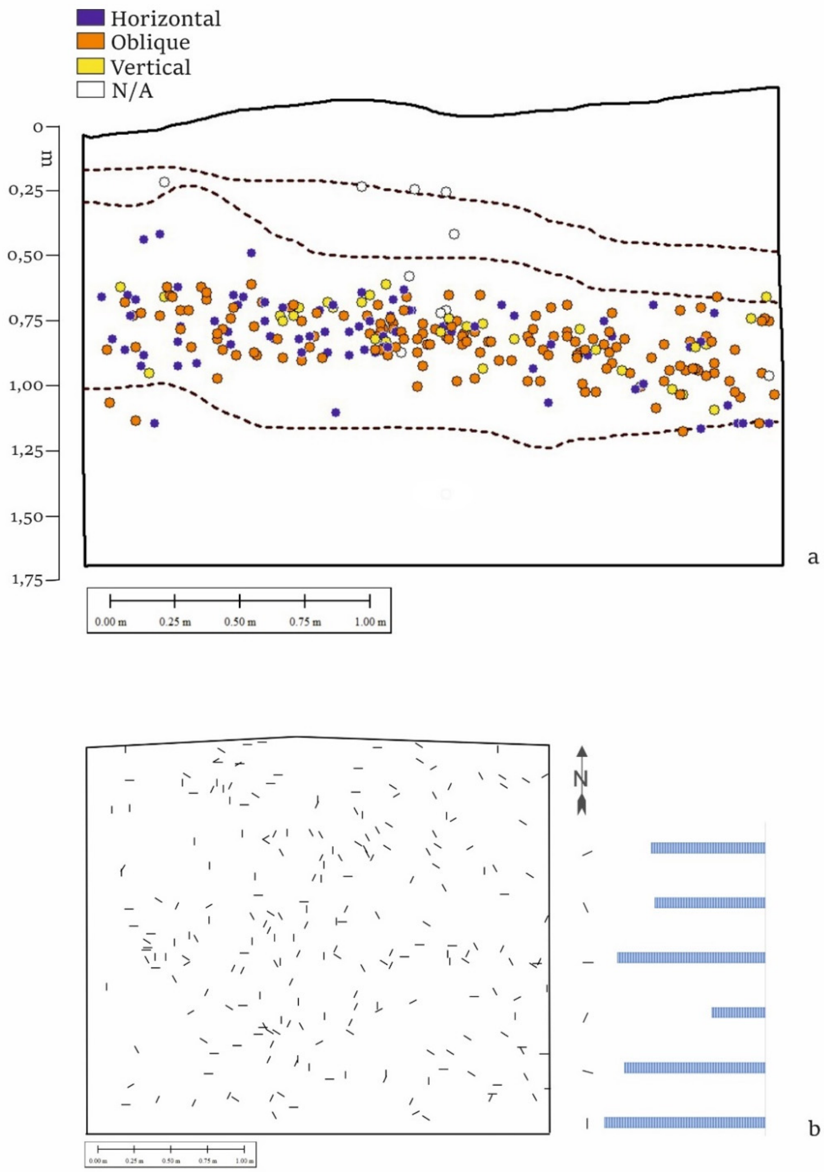
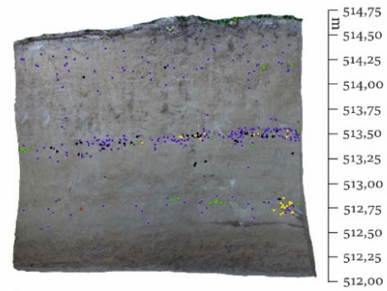


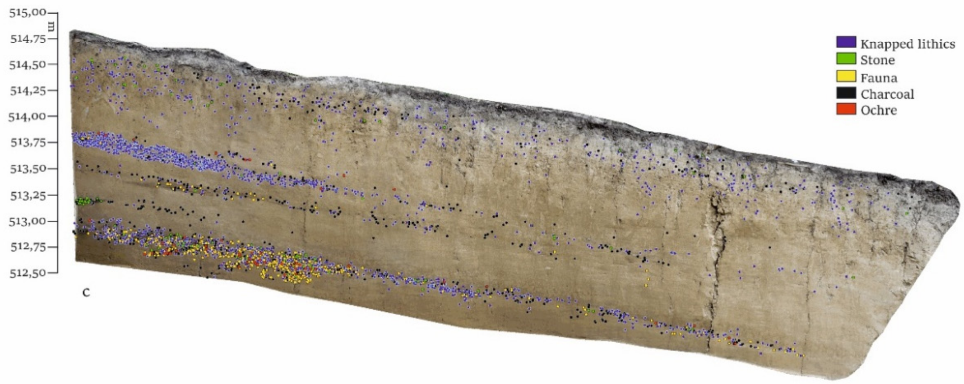
Fig. IV. Position (a) and orientation (b) of knapped lithic artefacts at BL I/II.

Type codes	Find	Sample	Assamblage	Point	Line	Outline	Surface	Feature	Photo
Object codes	Lithic	Charcoal	Lithic	Concretion	Layer	Trench	Topography	Top Point	
	Fauna	OSL	Fauna	Colour	Boundry	Pit	Layer	Outline	
	Stone	Sediment	Stone	Charcoal	Root	Hearth	Pit	Base point	
	Ochre	TL		Fauna	Crack	Burned Patch	Level	Interm Point	
	Stoneblock	Sieve		Charcoal Cluster	Profile	Fauna			
	Ceramic			Ortho	Fauna	Stone			
				Spit	Lithic				

a



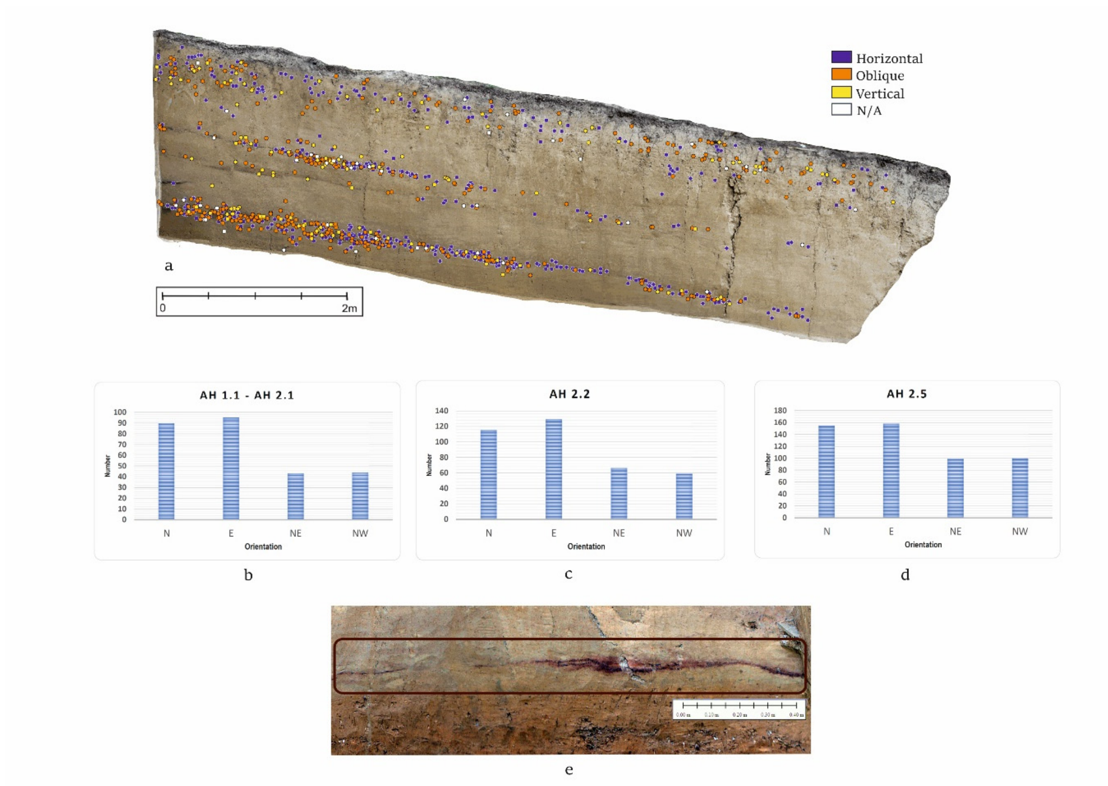
b



c

Pl. V. a. Main database codes. Finds plotted on the T3 (2018) south profile (b) and T4 (2019) west profile (c) at BL III.

Pl. VI. West profile of T4 (2019) and remanent palaeo-surfaces associated to AH 2.2 (b), AH 2.3 (c), AH 2.4 (d), and AH 2.5 (e).



Pl. VII. Position of knapped lithic artefacts plotted on west profile of T4 (2019) (a) and orientation of knapped lithics assigned to AH 1.1 and AH 2.1 (b), AH 2.2 (c) and AH 2.5 (d). Combustion layer seen in the south profile of T3 (2018) (e).