Gumelnița: Then and Now. The research results of the 2017 fieldwork

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Abstract: *The tell settlement from "Măgura Gumelnița" is the eponymous site of the Eneolithic civilization with the same name. It is probably the biggest tell settlement North of the Danube, and it belonged to the Kodjadermen - Gumelnița - Karanovo VI civilization that occupied in the Balkan area in the second half of 5th millennium BC. In 2017, a complex interdisciplinary project resumed the research of the Gumelnița site. The project was led by a consortium which comprises The Gumelnița Civilization Museum, The Bucharest Municipality Museum, and The National Institute of the Heritage, alongside specialists from other Romanian institutions (Institute of Archaeology "Vasile Pârvan" Bucharest, National History Museum of Romania, University of Bucharest, "Al. I. Cuza" University of Iași, "Valahia" University in Târgoviște, "Horia Hulubei" National Institute for Nuclear Physics and Engineering, and National Museum of Eastern Carpathians). The current paper will present the preliminary interdisciplinary results of the 2017 archaeological campaign.*

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Rezumat: *Așezarea de tip tell de la „Măgura Gumelnița" este situl eponim al civilizației eneolitice cu același nume. Aceasta este probabil cea mai mare așezare de tip tell de la nord de Dunăre și aparține civilizației Kodjadermen - Gumelnița - Karanovo VI care a ocupat zona Balcanică în a doua jumătate a mileniului al V-lea BC. În anul 2017, cercetarea sitului Gumelnița a fost reluată sub forma unui proiect de cercetare interdisciplinară complex coordonat de Muzeul Civilizației Gumelnița, Muzeul Municipiului București și Institutul Național al Patrimoniului, împreună cu specialiști din alte instituții românești (Institutul de Arheologie „Vasile Pârvan", Muzeul Național de Istorie a României, Universitatea din București, Universitatea „Al. I. Cuza" din Iași, Universitatea „Valahia" din Târgoviște, Institutul Național de Fizică și Inginerie Nucleară „Horia Hulubei", și Muzeul Carpaților Răsăriteni). Lucrarea de față va prezenta rezultatele interdisciplinare preliminare obținute în campania 2017 de către această echipă.*

Keywords: *Eneolithic, Gumelnița culture, bioarchaeology, geoarchaeology, radiocarbon data.*

Cuvinte cheie: *Eneolitic, cultura Gumelnița, bioarheologie, geoarheologie, date radiocarbon.*

◈ Introduction

The Gumelnița site (known as "Măgura Gumelnița" or "Măgura Calomfirescu") is probably the biggest tell settlement north of the Danube, and it belonged to the Kodjadermen-Gumelnita-Karanovo VI civilization that occupied the Balkan area in the second half of 5th millennium BC.

The history of this site is linked to the beginnings of the archaeological discipline in Romania, and the first archaeological researches in this tell settlement (Vl. Dumitrescu 1925). The results of that investigation were the basis for the definition of Gumelnița culture.

The Gumelnita site is well known to the archaeological community especially for its tell settlement, but in its proximity, there are also several other sites (flat settlements, cemeteries, etc.) that belong to various time periods (e.g., Neolithic, Copper Age, Bronze Age, etc.) (Vl. Dumitrescu 1925, 1966a, 1966b, 1993; D. Șerbănescu 1985; Vl. Dumitrescu, S. Marinescu-Bîlcu 2001; C. Lazăr 2001; D. Șerbănescu, O. Androne 2016).

Despite several archaeological investigations carried out here by various researchers (Vladimir Dumitrescu, Ioan Nestor, Barbu Ionescu, Dinu V. Rosetti, Silvia Marinescu-Bîlcu, Ersilia Tudor, Done Șerbănescu, Olga Androne) over the last 90 years, which revealed the site's complexity, and spectacular artefacts, very few papers have been written related to Gumelnița.

In these circumstances, in 2017, a complex interdisciplinary team resumed the research of the Gumelnița site. The project was led by a consortium which comprises The Gumelnița Civilization Museum, The Bucharest Municipality Museum, and The National Institute of the Heritage alongside with specialists from other Romanian institutions (Institute of Archaeology 'Vasile Pârvan' Bucharest, National History Museum of Romania, University of Bucharest, 'Al. I. Cuza' University in Iași, 'Valahia' University in Târgoviște, 'Horia Hulubei' National Institute for Nuclear Physics and Engineering, and National Museum of Eastern Carpathians). The aim of this new interdisciplinary approach consists in evaluating the archaeological potential of the site through field surveys, test pits, cores, and geophysical prospections, alongside samples collecting for a variety of laboratory analysis (e.g. zooarchaeological, archaeobotanical, ^{14}C dating, etc.), in order to reconstruct the palaeoenvironmental and anthropic features that shaped the prehistoric habitation. Field investigations took place for two weeks in September - October 2017, and they were doubled by the study of various artifacts and ecofacts, along with the analysis of the collected samples.

The current paper will present the preliminary interdisciplinary results of the 2017 archaeological campaign conducted at Gumelnița site by our team.

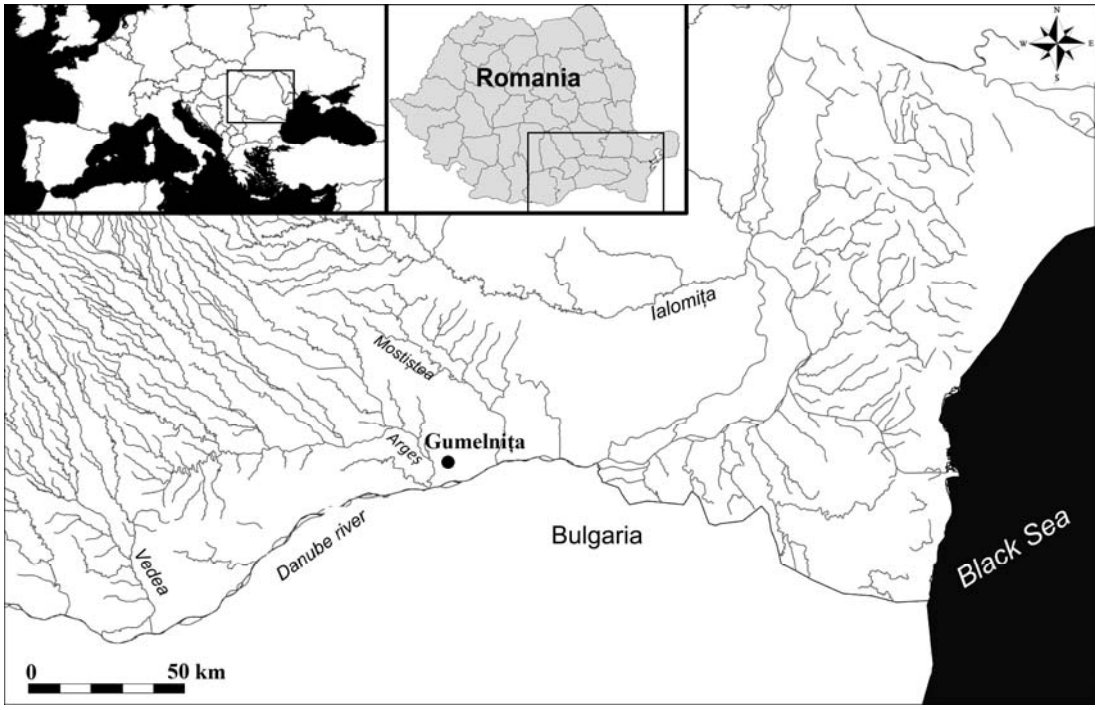

Fig. 1. The location of the Gumelnița site. Scale in km.
Localizarea sitului de la Gumelnița. Scara în km.

◈ Location and geological background

The Gumelnița site is located in the northern area of the Balkan region, in the Southeast of Romania, on the left bank of Danube River. The current distance from the Danube River is about 4.5 km. Moreover, the site is also near the Argeș River about 2.7 km east from it (fig. 1).

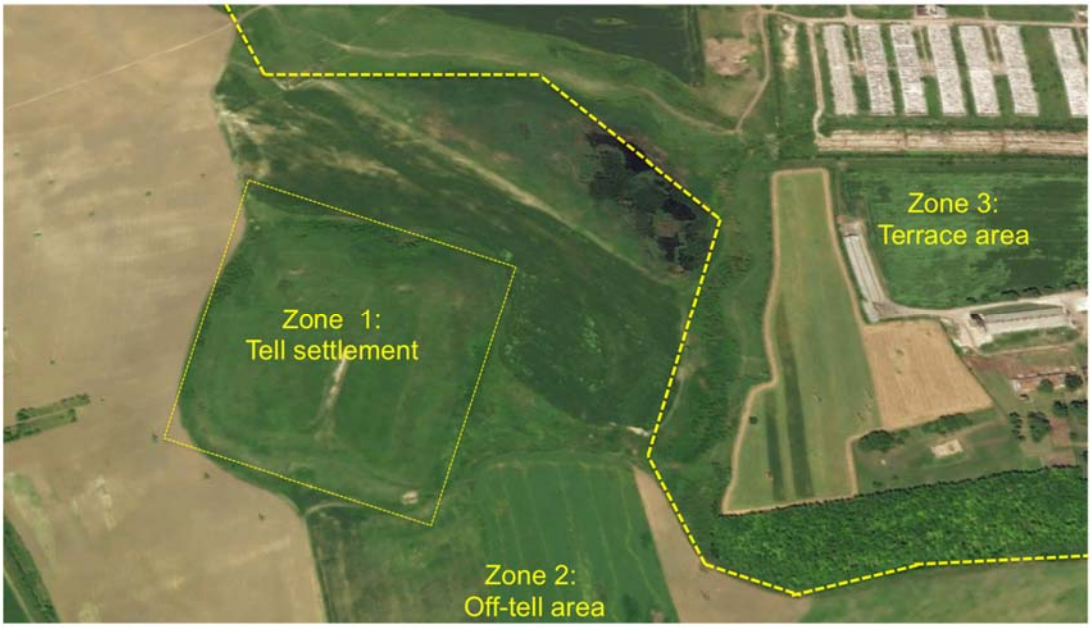

Fig. 2. The research areas of the Gumelnița site. Without scale.
Zonele de cercetare ale sitului de la Gumelnița. Fără scară.

From the administrative point of view, the site is located on the executive territory of Oltenița town, Călărași County, 4 km away from the city, near the Oltenița - Călărași local road.

From a geographic point of view, the Gumelnița tell is situated in the Danube floodplain, immediately south of the confluence area of the Argeş River with a small left tributary (Valea Mare). The tell was built by past communities on an erosional remnant from the high terrace of the Danube and is made up of loess deposits. Besides these, from a geological perspective, fine alluviums such as clays, silts, and sands, are also encountered in this area.

◈ Methods, strategy and excavation

Considering the impressive dimensions of the tell settlement (c. 6.5 ha at the base / c. 2.5 ha at the top), but also the area that we intend to investigate in the first phase of the project (2018 - 2022) of about 90 ha, it was decided to divide the targeted area into three main research zones (fig. 2): Zone 1: Tell settlement, Zone 2: Off-tell area (the area between tell and the terrace – the floodplain), and Zone 3: Terrace area (the high terrace of the Danube were the cemetery is located). This division allowed us a differentiated approach to the site, on specific or particular issues, and proper management of the available resources.

Once the research zones were established, we have set out the research strategy of our approach. Thus, in a first phase, we surveyed the area, alongside with UAV flights in order to establish the investigated area, determine the degree of human interventions in the site perimeter, and the size of previous archaeological research, but also to collect topographical data relative to the landscape. The second phase was represented by a magnetometric investigation of the area between the tell settlement and the high terrace (Fig. 3) for detecting possible anthropic structures or natural elements in the alluvial system. The next step was the archaeological diagnostic excavation (test pits) to verify the results of the magnetometry, but also another old archaeological information in respect with the tell stratigraphy and cemetery location. The archaeological investigation was accompanied by several soil corings to complete the set of palaeoenvironmental information. Last but not least, the next step was the analysis of discovered artefacts (e.g., pottery, flint, etc.) and ecofacts (e.g., seeds, animal bones, etc.), but also the other samples collected in the field (e.g., palynological samples, ^{14}C samples, etc.).

From a methodological point of view, the archaeological research undertaken on the Gumelnița site involved an interdisciplinary approach that included non intrusive prospections (e.g., magnetometry), the GIS integration of topographical data, zooarchaeological, malacological, archaeoihtyological, anthropological, palynological, carpological, and sedimentological analyses, alongside artefacts techno-typological and functional study, raw material determination and compositional study, and radiocarbon dating.

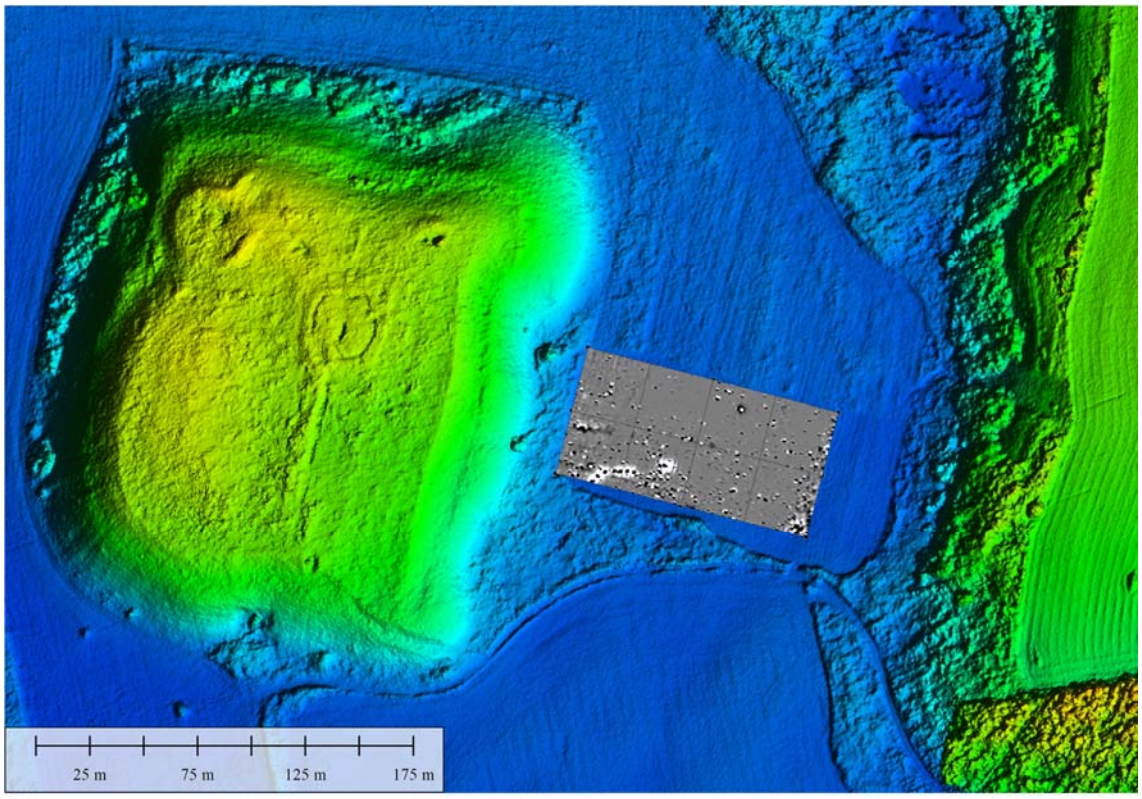

Fig. 3. Magnetic map superimposing the Digital Surface Model of the tell settlement and surrounding area. Scale in m.
Harta magnetică care suprapune modelul digital al suprafeței ocupate de așezarea de tip tell și zona înconjurătoare. Scara în m.

◈ Magnetometric investigation

The area investigated (120 x 60 m) was located in the floodplain, between the western side of the tell settlement and the high terrace of the Danube (fig. 3).

The underlying geology of this field consists of alluvial deposits overlain by shallow topsoil. The alluvial origin of the study area is an active factor that continuously remodels the stratigraphy of the valley. For this reason, it is to be expected that the prehistoric structures or other traces of human activity, if any, to be nowadays buried under a thick layer of sediments or even replaced by the alluvial dynamic effects. However, due to the placement, next to the Eneolithic tell settlement to the east, it is presumed that the study area was in the past an important passage to the nearby terrace.

The purpose of the explorations was to detect possible anthropic structures or particular natural elements in the alluvial system. Given its effectiveness, a magnetometric investigation was planned as a first step to create a preliminary map of the subsurface.

The magnetometric survey was conducted using a Bartington Grad 601-2 magnetometer. The instrument operates in gradiometer configuration with two units of sensors horizontally set apart by 1 m. Thus, the device can collect two lines of data per transverse. Each of the units comprises two single axis fluxgate sensors vertically set apart by 1 m.

Readings were recorded within a grid composed of 8 cells 30 m by 30 m each and taken every 1 m (transverse) by 0.125 m (sample), for a total surveyed area of 7200 sqm (figs. 3-4).

The location of the survey grid was established in the field and recorded using a differential GPS receiver. All the survey datasets were georeferenced in a GIS application.

The magnetic survey data was processed by a zero mean process in order to eliminate any unbalancing between the two sensor units. For displaying purposes, appropriate interpolation algorithm was used, while the maximum range of the signal was clipped to a range of ±15 nT/m.

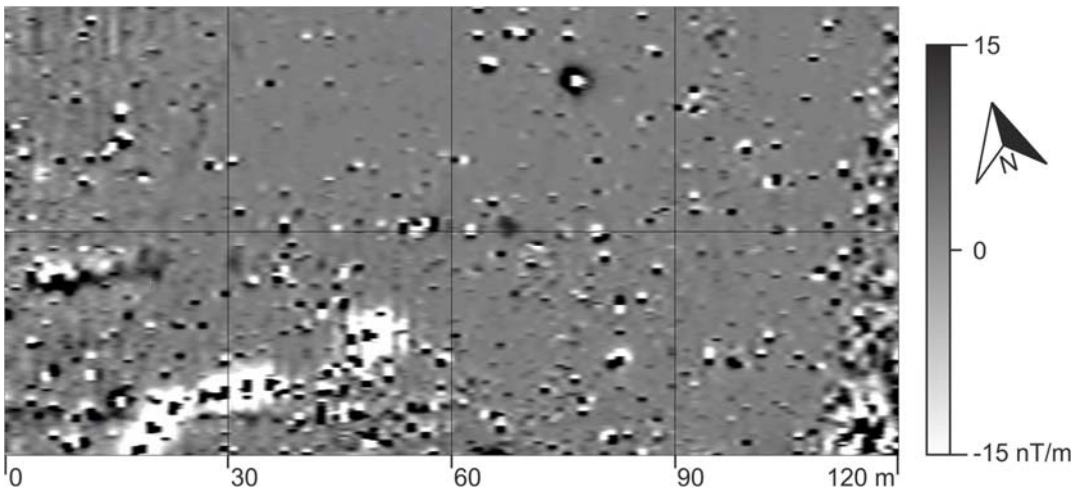

Fig. 4. The results of the magnetometric prospects in the alluvial plain area between the tell settlement and the Danube terrace. Scale in m.
Rezultatele prospecțiunilor magnetometrice din zona de luncă dintre tell și terasa Dunării. Scara în m.

The fluxgate gradiometer configuration used for the magnetic survey cut off any signal below 1 m depth (fig. 4). Thus, all the magnetic anomalies detected and represented in the magnetic map originated from features up to 1 m depth. Overall, many of the magnetic anomalies revealed in the chart exhibit a bipolar pattern and defined edges of the ferrous disturbances such as small objects on the surface or in the topsoil. These are spread all over the studied area. Other anomalies of the same type but larger and even more intense appeared in the south and west on the magnetic map, and are typical for some larger buried ferrous objects. Few of the observed anomalies displayed the form, nature, and pattern of the response considered as traces of human activity. In this case, slight increases in magnetic response occur in circular or linear areas with diffuse contour. However, these traces could be of any age. Particular attention may be paid to the eastern side of the investigated area where a band of magnetic anomalies appears forming a continuum (fig. 4). Here the map slightly touched a paleo-channel of the river. This channel too could have been active at any moment in time.

The results of the magnetic survey have been preliminarily verified using few small test excavations and stratigraphic drillings (both discussed in the next sections of the current article).

◈ Archaeological excavations and cores

As previously mentioned, the archaeological test excavation at Gumelnița site has focused on investigating three main research zones (fig. 2), and the general plan of the excavations is presented in fig. 5.

The excavation was undertaken using microstratigraphic methods (s.u. recording), coupled with a series of geophysical prospection, a GIS approach for the collection of topographical and archaeological data, aerial research to investigate landscape transformation processes, palaeoecological studies, sampling for various interdisciplinary analyses and also the sieving and flotation of sediment obtained from the examined features. The altimetry was measured from a zero point (P0), established in correlation with the STEREO 1970 national system, and the 1975 Black Sea elevation system. The test pits were doubled by two sedimentological corings, in order to obtain preliminary information on the natural deposits in the surrounding area.

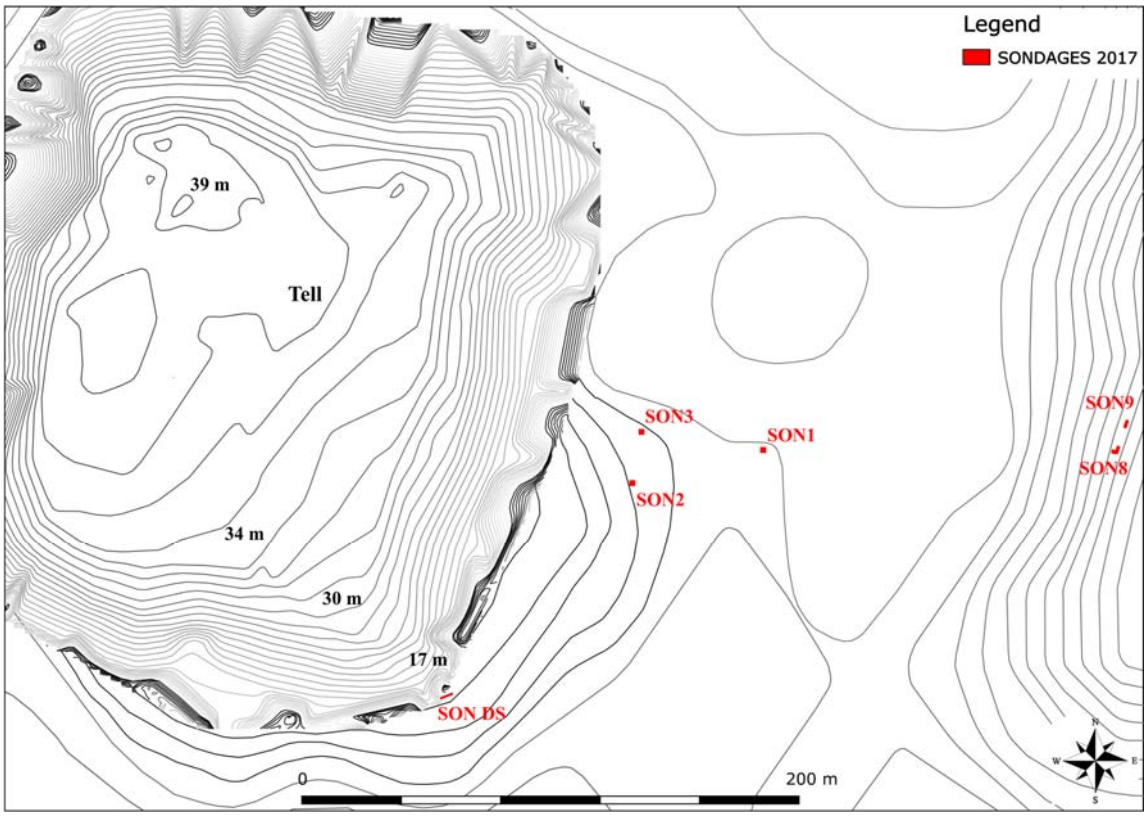

Fig. 5. The general plan of 2017 excavation at Gumelnița site. Scale in m.
Planul general al săpăturilor efectuate în 2017 în situl Gumelnița. Scara în m.

Zone 1: Tell settlement. Firstly, our approach was aimed at identifying the location of old excavations of the tell settlement. In order to achieve this goal, we made some field surveys, doubled by UAV flights for data acquisition. After obtaining the Digital Surface Model (fig. 2), the data were collected within the field and from available publications (Vl. Dumitrescu 1925, 1966a, 1966b, 1993; Vl. Dumitrescu, S. Marinescu-Bîlcu 2001; D. Șerbănescu, O. Androne 2016). Based on this analysis we were able to establish that Vladimir Dumitrescu's trenches were located in the north-west area of the tell-settlement. Dinu V. Rosetti's trenches are located most probably in the top northern area of the settlement, and those of Done Şerbănescu in the central area (fig. 2). The study of the Digital Surface Model, as well as the field research, indicates other interventions of smaller size (probably made by Barbu Ionescu), alongside a large area affected in the central - northern part, which, we know, it is related to a counter-air defence system from World War II. The trench I/2011 excavated by Done

Șerbănescu between 2011 and 2012 (39 x 2 m) is still open and noticeable from any aerial images (including Google Earth). Publication of this excavation from 2011 - 2012 (D. Șerbănescu, O. Androne 2016) shows us the existence of other archaeological trenches in the southern side of the Gumelnița mound, at the base of it, due to public works. Unfortunately, although the text discusses those excavations, their plans, dimensions, and location have not been published (D. Șerbănescu, O. Androne 2016), but their existence is being confirmed by our surface research.

In these circumstances, considering that the trenches from the southeastern base of the Gumelnița mound, made previously by Done Șerbănescu, show visible traces of potential archaeological features, we decided to clean and straighten a vertical section of them (northern side) in order to record the stratigraphic data (fig. 5). The length of the vertical cross section was 5 m with a maximum height of 1.20-1.30 m. The straightening process was done manually, and the excavated surface area was not more than 20-30 cm. Also, our archaeological intervention named Son DS (fig. 5) did not go deeper than the old section base. The resulting profile gave us an overview of the archaeological situation in this perimeter.

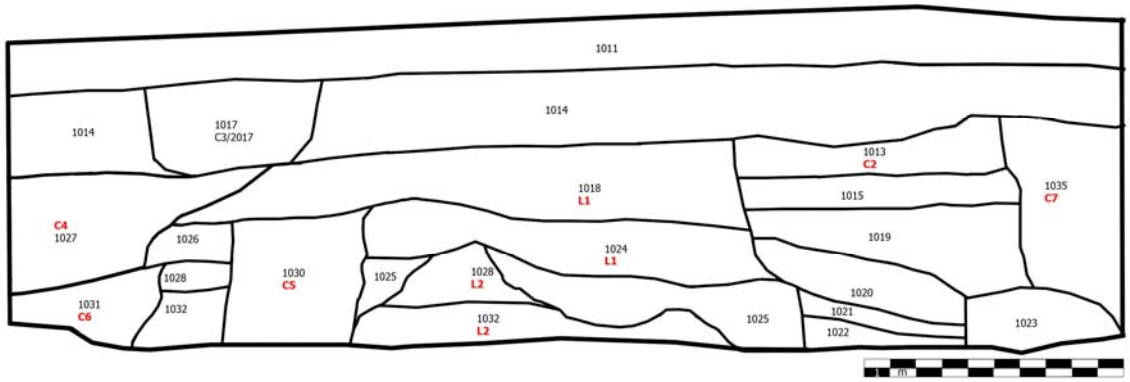

Fig. 6. The vertical cross section of Son DS located southeastern side of Gumelnița tell settlement. Scale in m.
Profilul sondajului Son DS din partea de sud-est a așezării de tip tell de la Gumelnița. Scara în m.

Thus, just below the modern soil unit (s.u. 1011), there are several occupation levels attributed to the Gumelnița culture, A2 phase (fig. 6). The identified features consist of two dwellings – one unburned (L1) and another burned (L2), alongside a domestic waste area (C4) and several pits (C2, C3, C5, C6, C7), perforating the other complexes (fig. 7. b-c). The vertical section drawing is shown in fig. 6 and the stratigraphic matrix in fig. 7.a.

Almost all artefacts and ecofacts, as well as other various samples presented in this study, are from these archaeological features (see next sections of the article).

Moreover, at the base of the old excavation from 2011-2012, where our team straightened a vertical section, a sedimentological coring (C 3) was made in order to understand the geomorphological context of the anthropological succession in this area (tab. 1).

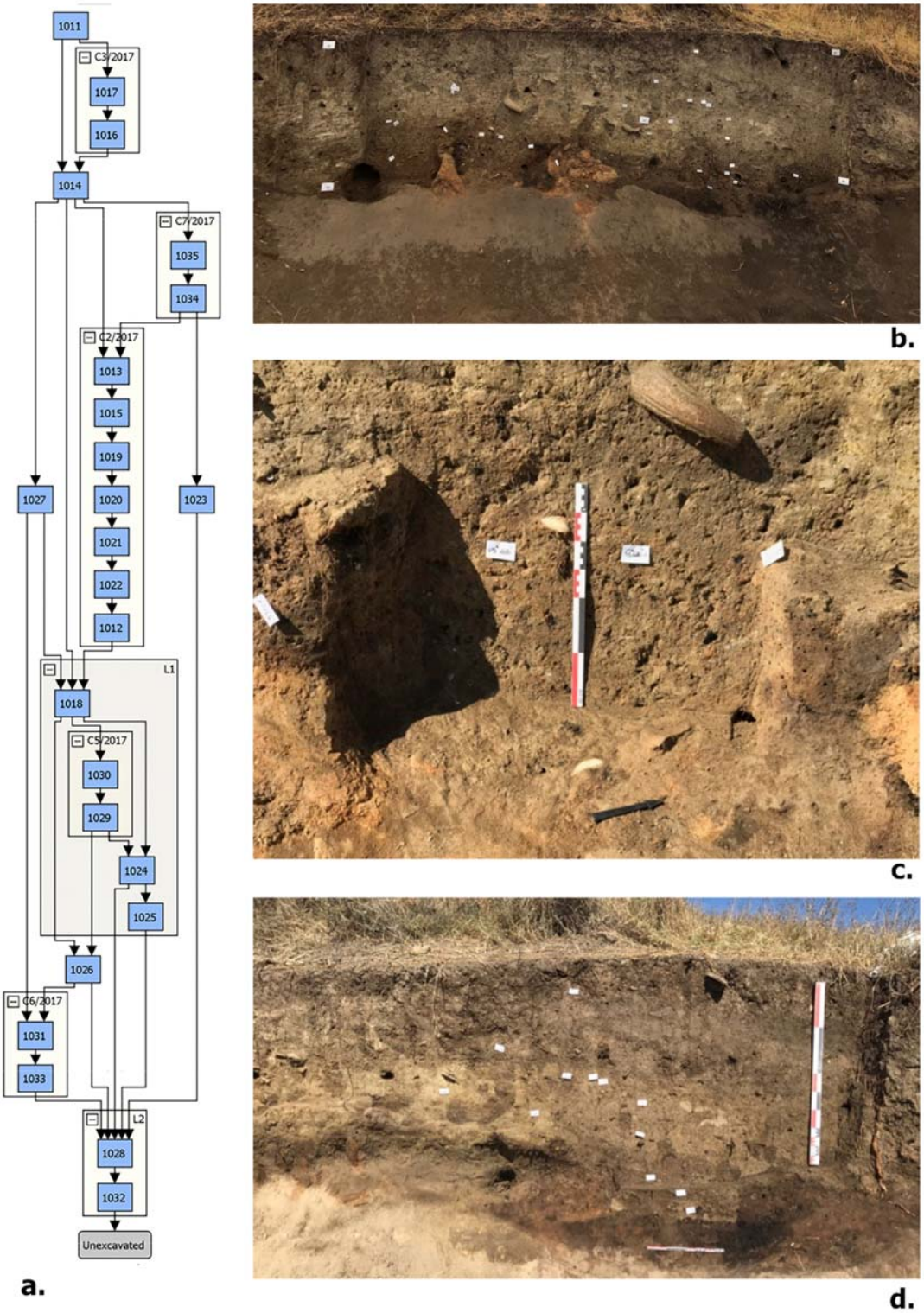

Fig. 7. The stratigraphic matrix (a) and details of the vertical cross section from Son DS (a general view – b, pit C5 – c, and pit C2 – d).
Diagrama stratigrafică a profilului (a) și detalii ale acestuia (vedere generală – b, groapa C5 – c și groapa C2 – d).

Depth (cm)	Stratigraphy	Description	Interpretation
0 - 30		Silt, well sorted, yellowish, homogeneous, without anthropogenic constituents (c. a.).	Colluvium.
30 - 50		Silt, well sorted, light brown, finely granular, slightly heterogeneous, organic, with fine modern roots.	Colluvium / Filling.
50 - 70		Silt, moderately sorted, medium - dark brown, fine granular, slightly heterogeneous, with rare c. a. - 2 ceramic fragments 1-3 cm, 2 bone fragments 2-3 cm, rare granules mm of charcoal and burnt daub.	Filling.
70 - 110		Silt, moderately sorted, yellowish brown, finely granular, slightly heterogeneous, 1-2% burnt daub and fine charcoal, 2 ceramic fragments, 1-2.5 cm.	Filling.
110 - 120		Silt, poorly sorted, light gray brown, fine granular, slightly heterogeneous, with rare (2-3%) c. a. – burnt daub, fine charcoal, 2 ceramic fragments 1-2 cm, and organic.	Filling.
120 - 150		Silt, poorly sorted, yellowish brown and light reddish, granular, heterogeneous, with more frequent (10-15%) c. a. – fine burnt daub and fine charcoal, 12 fragments of burnt daub 1-2 cm, 9 ceramic fragments 1.5-4 cm, 1 limestone fragment of 3 cm.	Filling.
150 - 190		Silt, poorly sorted, gray, light grayish brown, granular, heterogeneous, with rare (5%) fine c. a. and very rare fragments of burnt daub 1-2.5 cm and ceramics 1-3 cm, 2 fragments of burned bone 2-4 cm, 2 pieces of rock 2-3 cm.	Filling.
190 - 240		Clay silt, moderately sorted, yellowish brown, relatively homogeneous, finely granular, 1-2% fine charcoal and burnt daub, 1 ceramic fragment 3 cm.	Filling.
240 - 280		Clay silt, well sorted, yellowish brown, slightly heterogeneous, without c. a., with bioturbation structure.	Soil unit.
280 - 300		Clay silt, well sorted, medium brown, slightly heterogeneous, with very rare (1-2%) c. a., burnt daub and yellowish clay.	Colluvium?
300 - 360		Clay silt, well sorted, medium brown, slightly heterogeneous, without c. a., with bioturbation structure and rare (5%) fine, mm, iron oxides.	Soil unit.
360 - 370		Clay fine sandy silt, well sorted, yellowish brown, slightly heterogeneous, without c. a., with rare (1-2%) fine iron oxides.	Fine alluvial deposits.
370 - 390		Clay silt, well sorted, yellowish brown, slightly heterogeneous, without c. a., with rare (5%) fine iron oxides.	Fine alluvial deposits.
390 - 400		Silty clay, well sorted, light grayish brown, slightly heterogeneous, without c. a., with rare (5%) fine iron oxides.	Fine alluvial deposits.

Tab. 1. Sedimentary succession observed in coring C 3 / 2017.
Succesiunea sedimentară observată în carotajul C 3 / 2017.

Although the anthropogenic levels were not found in situ, the area being the subject of an older archaeological excavation, (e.g., the sedimentary sequence observed up to a depth of 4 m from the base of the studied profile) (tab. 1), provided signals of the possible stratigraphic expansion of the Gumelnița occupation in this area.

The sequence observed here highlighted the fact that the occupation area presents an important stratigraphy, which continues from the present surface up to a depth of 2.40 m, and that this area was located on the palaeosol formed before the Eneolithic settlement. The dating of these levels will be able to establish the chronological connection with the primary habitation of the Gumelnița tell settlement.

Depth (cm)	Stratigraphy	Description	Interpretation
0 - 30		Clay with finely sandy silt, moderately sorted, brown gray medium, relatively homogeneous, organic, with modern roots and aggregate structure, with rare brick granules.	The organic horizon of the actual soil.
30 - 60		Silt fine sandy, light brown and yellowish, relatively heterogeneous, with very fine fine mica flakes.	The organic horizon of the actual soil.
60 - 80		Fine sandy silt, well sorted, yellowish, homogeneous, with rare fine mica flakes.	Fine alluvial deposits.
80 - 100		Silty clay, fine sandy, well sorted, yellowish and yellowish brown, relatively homogeneous, with rare fine mica and rare (2-3%) ferruginous concretions and impregnations.	Fine alluvial deposits.
100 - 110		Clay silt, fine sandy, yellowish, homogeneous, with fine mica and rare iron oxides.	Fine alluvial deposits.
110 - 130		Fine - medium sand, well sorted, yellowish, very homogeneous, with more frequent (5%) fine mica.	Fine alluvial deposits.
130 - 150		Silty clay, finely sandy, well sorted, yellowish and light brown, relatively homogeneous, with rare (2-3%) mica flakes and iron oxides, concretions and impregnations up to 1 cm, and rare fine vegetable fragments.	Fine alluvial deposits.
150 - 160		Clay silt, fine sandy, well sorted, homogeneous, with rare mica flakes and iron oxides.	Fine alluvial deposits.
160 - 200		Silty clay, very well sorted, grayish green, with areas with more frequent (5-10%) reddish iron oxides, mm-cm stains, with heterogeneous appearance.	Fine alluvial deposits.
200 - 210		Fine sandy silty clay, well sorted, light grayish brown, homogeneous, with rare (2-3%) fine mica and stains of iron oxides, 1-2 cm.	Fine alluvial deposits.
210 - 220		Fine sandy silty clay, light gray, light grayish brown, with rare (3%) fine mica and 1-2 cm iron oxides.	Fine alluvial deposits.

Tab. 2. Sedimentary succession observed in coring C 2 / 2017.
Succesiunea sedimentară observată în carotajul C 2 / 2017.

Zone 2: Off-tell area. In 2017 we researched only the area between the tell and the terrace – the floodplain that surrounds the tell settlement (fig. 2), which was beforehand magnetometric prospected (see the previous section of the article). The main reason for selecting that area was its location next to the Eneolithic tell settlement, to the east. It is presumed that the study area was in the past an important passage to the nearby terrace were the cemetery is located.

Thus, in order to verify the magnetic anomalies, seven test pits (2 x 2 m) were designed in the prospected area (Son 1-7). However, the situation determined us to excavate only 3 of them (Son 1-3 – fig. 5). The main reason for that decision was the soil hardness, but also the occurrence, in the upper part of the excavation, of numerous contemporary human traces (including a pit of an electric pole in Son 1 – fig. 8), alongside with other modern materials. Besides that, in the lower part of the test pits, some consistent alluvial deposits have been identified, which is why the sections have not been further excavated.

Fig. 8. Photo of the eastern profile of the Son 1 test pit.
Imaginea pofilului estic al sondajului Son 1.

Moreover, in Son 1 (2 x 2 m), a sedimentological coring (C 1) was made using a soil auger, up to a depth of 1 m. Coring C 2 was made in its eastern neighborhood, in a slightly higher area within the alluvial plain. The sedimentary succession is presented in table 2. As in C 1, fine alluviums, ranging from silty clays to fine and medium sands, which do not contain anthropogenic indices, have been observed.

Although the core drillings made in natural deposits (C 1 and C 2) did not exceed the depth of 2.50 m, a succession of fine sediments was observed that records in detail the alluvial history of the floodplain area (tab. 2). There were no identified deposits of alluvial bars or loess remnants from the terrace, which could have constituted the geomorphological support of the

anthropogenic occupation. It is to be expected that these deposits will only record the history of the last few hundred years.

Instead, the presence of a lacustrine sedimentation area in the immediate proximity of the tell settlement makes it possible to carry out research to include both radiocarbon dating and palaeovegetation history. This area will be investigated in the 2018 campaign.

Zone 3: Terrace area. Another goal of our diagnostic campaign from 2017 was to verify the area of the high terrace located at about 200 m east from the tell settlement (fig. 2). There, in the second half of the 20th century, several archaeologists (e.g., Silvia Marinescu-Bîlcu, Ersilia Tudor, Barbu Ionescu, Done Șerbănescu) discovered and researched the cemetery of Gumelnita's settlement (C. Lazăr 2001).

Whereas the landscape has changed since the 60s and 70s when these researches have been carried out, it was not possible to dig in the same area due to the existence of an acacia forest. For this reason our test pits were located a few hundred meters north on the same terrace (fig. 5).

Only two test pits of 3 x 1 m were made in this zone (Son 8-9). In the first of them (Son 8) no archaeological features have been identified. Instead, in Son 9 we discovered a pit, with no archaeological materials (almost undoubtedly modern), but also an inhumation grave (M1 – fig. 9) in the western profile of the section at ca. 1.50 m depth.

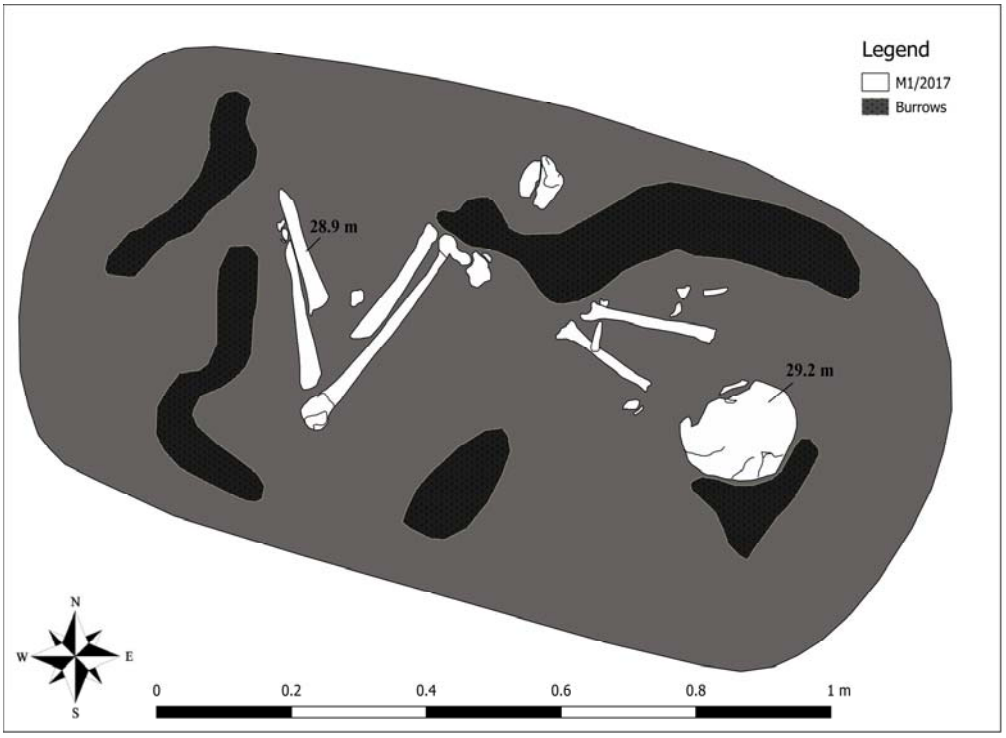

Fig. 9. The grave no. 1 (M1) discovered in the Gumelnița cemetery. Scale in m.
Mormântul nr. 1 (M1) descoperit în cimitirul de la Gumelnița. Scara în m.

The funerary pit was an ordinary one, with an ovoid shape (1.35 x 0.70 m), E - W oriented, devoid of plaster lining or any traces of related constructions. It contains a human skeleton laid out in a foetal lateral position (that follows the same orientation as the funerary pit), with no grave goods (fig 9). A flint fragment identified in the pit fill is unrelated to the

funeral context. More information about that individual is available in the next section of this article.

◈ Anthropological data

The skeleton from grave no. 1 (M1) was poorly preserved. The remains were washed, cleaned and restored. The evaluation of the human remains indicates that the fragments belonged to two individuals (MNI=2), named I1 and I2.

I1. The overwhelming majority of the skeletal remains have the surface strongly affected by taphonomic agents from within the soil and, especially, bioturbation. Also, the bones display numerous exfoliations, and, in some of the cases, are discolored/whites. This particularity would correspond to the 4th rank of erosion/abrasion (M. Brickley, J.I. McKinley 2004).

There were many fragments of the neural skull recovered, and after the restoration, only the right parietal and the left temporal turned out to be quasi-complete (fig. 11. a-b). Also, three teeth were conserved: M^1-M^2 from the left side and M^1 from the right side. Regarding the postcranial skeleton mainly diaphysis of long bones (humerus, femur, tibia and the right fibula) were identified (fig. 11. c). The visceral skull, the vertebrae, the ribs, the hip bones, as well as the majority of the epiphyses were not preserved.

Fig. 10. The degree of dental abrasion of individual I1 in the Gumelnița grave. Scale in mm.
Gradul de abraziune dentară a individului I1 din mormântul de la Gumelnița. Scara în mm.

Based on the skull features (low and rounded forehead, frontal eminences, glabella and the superciliary arches slightly protuberant, flat, rounded orbit, thin and sharp left supraorbital margins, small and sharp left mastoid process), but also the general characteristics of the long bones (thin, gracile) (G. Acsádi, J. Nemeskéri 1970; D. Ferembach *et alii* 1980), the subject is a female. The age at death was estimated around 33-35 years (mature adult) based on the molars features (attrition) (D. R. Brothwell 1981). The dentin is evenly distributed over the occlusal surface and is delimited externally by an enamel ring (fig. 10).

Indexes and cranial dimensions	Dimensions	Category
10. Maximum frontal width (co-co)	121.74 mm	Middle
26. Frontal sagittal arch	136.00 mm	–
29. Front sagittal cord	114.13 mm	–
Sagittal frontal index (29:26)	83.92	Ortomethop

Tab. 3. Dimensions of the cranial bones of the I1 skeleton discovered at Gumelnița grave.
Dimensiunile scheletului cranian al individului I1 din mormântul de la Gumelnița.

Unfortunately, the high degree of fragmentation allowed us to perform only a few measurements, exclusively on the skull, and these measurements are shown in tab. 3.

The absence of all the long bones prevented us from calculating the skeletal stature. However, based on the very small dimensions of the preserved fragments, and by comparison with other Eneolithic skeletons, we believe that the individual has a stature of the very small/small categories.

Fig. 11. Individual I1 from Gumelnița grave: skull – the frontal view (a), and the vertical view (b); long bones (c). Scale in cm.
Individul I1 din mormântul de la Gumelnița: craniul – normă frontală (a) și normă superioară (b); oasele lungi (c). Scara în cm.

I2. The second individual is represented only by a fragment of a right femoral diaphysis, belonging to an adolescent/adult. On a small bone surface, a blackish spot is visible, resulting from combustion in a reducing atmosphere, in a smoldering fire (fig. 12).

Fig. 12. Individual I2: The femoral diaphysis fragment with traces of burning. Scale in cm.
Individul I2: fragment de diafiză femurală ce prezintă urme de ardere. Scara în cm.

◈ Zooarchaeological data

The faunal samples analyzed came from the archaeological features identified in Son DS (Zone 1: Tell settlement). The 485 skeletal remains were directly collected from a series of stratigraphic units and studied complexes (see previous sections). Various animal taxa have been identified: six belonging to mollusks, three to fish, one to reptilia, and eight to mammals (tabs. 4 and 5). These fragments show all the characteristics of some household wastes (traces of cutting – disarticulation and defleshing, burning and traces of carnivorous teeth/swine, etc.) but also of use as tools in various activities.

Methodologically, we used the methods presented in Valentin Radu's works (2011) – for molluscs, fish, reptiles and Adrian Bălășescu's works (2014) – for mammals.

Features		**C2**			**C3**	**L1**			**C4**	**L2**	**C5**	**C6**	
Species/S.U.	**1014**	**1013**	**1019**	**1022**	**1017**	**1018**	**1026**	**1027**		**1028**	**1030**	**1031**	**Total**
Unio tumidus		3	2	1	7	6		5	3	1	3	4	35
Unio pictorum					2		2	4	3	1	8	1	21
Unio crassus							1					2	3
Unio sp.	2		2		5	6	1	6	3		7	2	34
Anodonta sp.	3	1	5	1	6	10		5	1		6		38
Viviparus sp.					3						1		4
Dreissena sp.					1								1
Total Mollusca	**5**	**4**	**9**	**2**	**24**	**22**	**4**	**20**	**10**	**2**	**25**	**9**	**136**
Esox lucius						1							1
Cyprinus carpio					2	1							3
Silurus glanis			1						1				2
Pisces IND	1			1									2
Total Pisces	**1**		**1**	**1**	**2**	**2**			**1**				**8**
Reptilia (*Emys orbicularis*)					**1**								**1**
Total	**6**	**4**	**10**	**3**	**27**	**24**	**4**	**20**	**11**	**2**	**25**	**9**	**145**

Tab. 4. Faunal remains distribution (fishe, mollusks and turtles) discovered in the Gumelnița site. Repartiția resturilor faunistice (pești, moluște și țestoase) descoperite în situl de la Gumelnița.

Mollusks. Only 136 mollusks shells have been identified. Of these, the most numerous (93) belong to the three species of the *Unio* genus (*U. pictorum, U tumidus, U. crassus*), followed (38) by the lake bivalve (*Anodonta* sp.). *Viviparus* sp. gastropod is also present with four shells and *Dreissena* sp. with one shell (tab. 4).

The dimensions of *Unio* individuals are of medium size, but there are also individuals of smaller or larger size (fig. 13). The values of the shell height for the 13 individuals of *Unio pictorum* vary between 23.7 and 38.3 mm (medium – 33), that of the 16 *Unio tumidus* individuals between 28.2 and 39 mm (medium – 33.2), and that of the three *Unio crassus* individuals between 25.4 and 30.6 mm (medium – 27.6). These data correspond with the limits specific to Gumelniţa A2 level (V. Radu 2011).

Fishes. Only eight remains belonging to three species have been identified (tab. 4). Pike (*Esox lucius*) vertebra comes from a medium-sized individual (0.54 m in length and 1 kg in weight). Carp (*Cyprinus carpio*) is also present with a medium-sized individual having a length of 0.34 m and a weight of 0.55 kg. As for the wels catfish (*Silurus glanis*), the dimensions of two individuals were reconstituted: one of medium size with a length of 1 m (7.97 kg) and another with a very large size reaching about 2.3 m lenght (92 kg).

Reconstituted sizes are medium and large, and all individuals are breeders.

Reptiles. Only one fragment of turtle carapace was identified (*Emys orbicularis*).

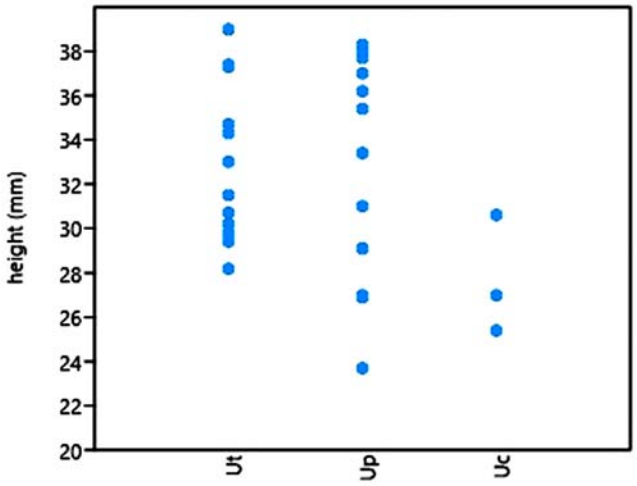

Fig. 13. Variation of the *Unio* genus shells height (Ut - *Unio tumidus*; Up - *Unio pictorum*; Uc - *Unio crassus*), existing in the Gumelnița sample.
Variația înălțimii cochiliilor din genul *Unio* (Ut - *Unio tumidus*; Up - *Unio pictorum*; Uc - *Unio crassus*) prezente în eșantionul de la Gumelnița.

Mammals. Mammalian remains are the most numerous with 340 fragments (70.1%). Among these, 184 (54.1%) remains were determined to the taxonomic level. The list of identified taxa is not very large. There are eight taxa amongst which four of them are domesticated: cattle (*Bos taurus*), sheep (*Ovis aries*), pig (*Sus domesticus*), dog (*Canis familiaris*) and four are wild: aurochs *(Bos primigenius*), red deer (*Cervus elaphus*), wild boar (*Sus scrofa*) and fox (*Vulpes vulpes*). We can add the goat (*Capra hircus*) which can be found within the ovicaprine group (*Ovis aries*/*Capra hircus*) but which could not be identified in a precise manner due to the extremely high fragmentation of the faunal remains. In figure 14 *Bos* sp. and *Sus* sp. groups are still present. They bring together remains of bovines (*Bos taurus* / *Bos primigenius*) and swines (*Sus domesticus* / *Sus scrofa*) for which it was not possible to establish precisely the status of domestic or wild mammals. At this point of our study, we did not estimate the minimum number of individuals (MNI) given that the analyzed sample is small (from our point of view) with less than 200 mammals remains with a specific determination.

Within the faunal spectrum domestic mammals remains are dominant (84.2%), and within them, the most numerous are the cattle bones (42.39%), followed by ovicaprines with 33.7% (fig. 14). At a fairly large distance, there is the dog (4.89%) and the pig (3.26%). At this stage of research, we can see that bovines are exploited in a mixed manner both for meat (1-4 years old animals) and for milk (4-9 years old adult animals) while ovicaprines are mainly grown for meat (young animals between 6-24 months). This exploitation system of large and small horned mammals was also observed in other Gumelnița settlements (S. Brehard, A. Bălășescu 2012). The pig is grown exclusively for meat, and we notice that there are mainly animals aged 1-2 years.

Complex			C2					C3	C4	C5	C6	L1						
Specie/S.U.	1011	1014		1013	1015	1019	1022	1017		1030	1031	1018	1024	1027	1032		Total	%
Bos taurus	24	3	1			10	4	10	4	1		12	1	8			78	42,39
Ovis aries								1	1								2	1,09
Ovis aries/Capra hircus	16	3				10	4	2	11		2	8		4			60	32,61
Sus domesticu	6																6	3,26
Canis familiaris	7			1								1					9	4,89
Sus sp.	4	2				1			1			2		2		1	13	7,07
Bos sp.		2												2	1		5	2,71
Bos primigenius												1		1			2	1,09
Cervus elaphus	2																2	1,09
Sus scrofa	4	1															5	2,71
Vulpes vulpes	2																2	1,09
Total mammals determined	**65**	**11**	**1**	**1**	**0**	**21**	**8**	**13**	**17**	**1**	**2**	**24**	**1**	**17**	**1**	**1**	**184**	**100**
Mammals big size undetermined	**38**	**5**		**3**	**3**	**6**	**2**	**4**	**2**			**5**		**3**		**1**	**72**	
Mammals medium size undetermined	**44**	**5**		**2**		**10**	**3**	**6**			**2**	**6**		**6**			**84**	
Total mammals	**147**	**21**	**1**	**6**	**3**	**37**	**13**	**23**	**19**	**1**	**4**	**35**	**1**	**26**	**1**	**2**	**340**	

Tab. 5. Mammalian faunal remains distribution in the Gumelnița sample upon stratigraphic units (s.u.) and archaeological features.
Repartiția resturilor faunistice de mamifere din eșantionul de la Gumelnița pe unități stratigrafice (u.s.) și complexe arheologice.

On the other hand, a number of osteological remains of *Sus* sp. (7.07%) and *Bos* sp. (2.72%) could not be determined in a precise manner due to lack of pertinent criteria for identifying the slaughtered animals vs. hunted animals, alongside with other causes (e.g., fragmentary state of bones, but also the very young age of some specimens, etc.).

Hunted animals are under-represented both as some remains (6% - tab. 5, fig. 14) as well as taxa (only four examples). In particular, large and medium-sized mammals were hunted which provided a relatively rich amount of meat but also other products: skins, bones, antlers, etc. Among the hunted species on the first place is the red deer.

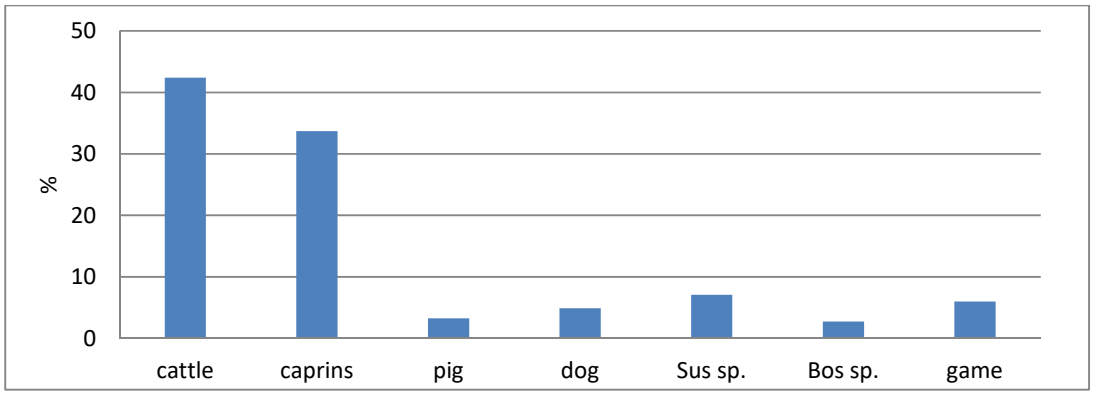

Fig. 14. Mammal remains distribution in the Gumelnița sample, by species.
Repartiția resturilor faunistice de mamifere pe specii din eșantionul de la Gumelnița.

In sum, the current study highlights the exploitation of aquatic resources in the neighboring areas of the site. Both river (*Unio* sp.) and lake (*Anodonta* sp.) bivalves were consumed. The fishing has provided a significant amount of animal protein by capturing large

size species. The exploitation of mammals played a particular role through two subsistence activities: livestock breeding and hunting. Considering that domestic animals prevail within the studied sample, we can conclude that the breeding of large (bovines) and small (ovicaprines) horned mammals were significant. The pig's importance was extremely low (under 3.5%) compared to other Gumelnița settlements (A2 phase) (A. Bălăşescu *et alii* 2005a; 2005b). The presence of red deer and wild boar in wildlife would suggest the existence of forests close to the settlement but also open spaces that were populated by aurochs, which consisted of pastures for large and small horned mammals.

Compared with the 1966 study (O. Necrasov, S. Haimovici 1966), the differences are not significant: the cattles prevail, followed by ovicaprines and pigs, while hunting is poorly represented. Preliminary data in this study correspond to the paleoeconomics characteristics of the Gumelnița communities (A. Bălășescu *et alii* 2005a; 2005b).

◈ Carpological data

During the 2017 campaign at Gumelnița, 368 liters of sediment were collected from different archaeological features located in Son DS (Zone 1: Tell settlement). The sediment was sieved through a column of two strainers of 3 mm, and 1 mm, respectively. After drying, the samples were sorted under a magnification lamp. The next step was the determination of plant remains discovered in these samples. The remains recovered from the 3 mm sieve were analyzed under a stereomicroscope (only one sample, from a 1 mm sieve was sorted and the remains determined).

From 122 liters of sediment that were sieved and sorted, we have discovered 208 plant macro-remains. Of these plant remains, only 12 were uncharred. The most abundant batch feature is from dwelling no. 1 (unburned house L1) with 81 plant macro-remains found in 26 liters of sediments, followed by the pit C5 with 48 charred plant remains.

The representation of species identified and their contextual distribution is shown in tab. 6. Except the fragments of *Cerealia*, the species that prevails is *Prunus* sp. (fig. 15.a) with charred plum nutstone fragments (11%). As for cereals, barley is prevalent with 4.32% (fig. 15.b). Other cereal species encountered are: einkorn grains (2.4%) and einkorn spikelet fragment (0.4%), emmer grains (1.9%) and emmer chaffs (3.3%) and rye grains (1.44%). Likewise, seeds of legumes were found, such as pea (0.96%), lentil (1.44% - fig. 15.d) and bitter vetch (0.4% - fig. 15.c). The emmer chaffs were found in dwelling no. 1 (L1).

An interesting finding is that of the acorn nutstone fragment with a dimension of 2.2 cm in length, 1.3 cm in width and 0.6 cm in thickness. Most of the elderberry nutstones were uncharred, except for one nutstone recovered from feature C2/2017 (tab. 7). The grape pip found in dwelling no. 1 (L1) was uncharred, most probably modern.

Only the seed of common knotgrass (0.9%) found in dwelling no. 1 (L1) and pit C4/2017 are charred. This situation may suggest the plant remain is debris of an accidental burning. The seed of common sorrel (0.4%) discovered in dwelling no. 1 (L1) is uncharred and it may be a modern plant remains. Also, the plant remains from feature C2, s.u. 1021 (tab. 7) may represent a multiple burning due to the poorly preservation of charred remains discovered in this sample.

All the species discovered in the batch discussed above are well represented in other Gumelnița sites in Romania (e.g., Grădiștea Ulmilor, Vlădicească, Lăceni, Căscioarele, Radovanu, Pietrele, Teiu, Vitănești, Cunești, Hârșova, Bordușani, Mălăiești de Jos, Sultana-*Malu Roșu*, etc.) (M. Cârciumaru 1996; F. Monah 1999, 2007; A. Boogaard 2001; A. Frînculeasa 2009; M. Toderaș *et alii* 2009; M. Golea *et alii* 2014; D. Popovici *et alii* 2014).

								TOTAL	%
	Liters	26	21	24	15	24	12	122	
	S.U.	1026	1027	1030	1017	1013,1019, 1021,1024	1031		
	Feature	**L1**	**C4**	**C5**	**C3**	**C2**	**C6**		
Plant species									
Triticum monococcum	Einkorn grain	1		2	1		1	5	2.4
Triticum monococcum	Einkorn spikelet	1						1	0.48
Triticum dicoccum	Emmer grain	2		1		1		4	1.9
Triticum dicoccum	Emmer chaff	4	2	1				7	3.36
Hordeum vulgare	Barley grain		1	1	1	1	2	6	2.8
Hordeum vulgare subsp. *nudum*	Naked Barley grain	4	2	1		2		9	4.3
Secale cereale	Rye grain	2			1			3	1.4
Triticum sp.	Wheat grain fragments	2		1				3	1.4
Hordeum sp.	Barley grains	2	1	3			1	7	3.36
Cerealia	Grain fragments	10	7	17	3	7	2	46	22.1
Pisum sativum	Pea seed						1	1	0.48
Pisum sp.	Pea seed fragments	1						1	0.48
Lens culinaris	Lentil seed fragments	2		1			1	3	1.4
Vicia ervilia	Bitter vetch seed		1					1	0.48
Vicia sp.	Seed fragments	1						1	0.48
Quercus robur subsp. *penduculiflora*	Acorn nutstone fragments	1						1	0.48
Prunus cerasifera	Plum nutstone fragments		1		4			5	2.4
Prunus sp.	Plum nutstone fragments	5	4	6	1	4	3	23	11
Sambucus nigra	Elderberry nutstones	2			1	1	8	12	5.76
Vitis sp.	Grape pip	1						1	0.48
Polygonum aviculare	Common knotgrass seed	1	1					2	0.96
Rumex acetosa	Common sorrel seed	1						1	0.48
Unidentified		38	1	14		10	2	65	31.25
TOTAL		**81**	**21**	**48**	**12**	**26**	**21**	**208**	**100**

Tab. 6. Vegetal taxons identified in Gumelnița sample.
Repartiția taxonilor vegetali identificați în lotul de la Gumelnița.

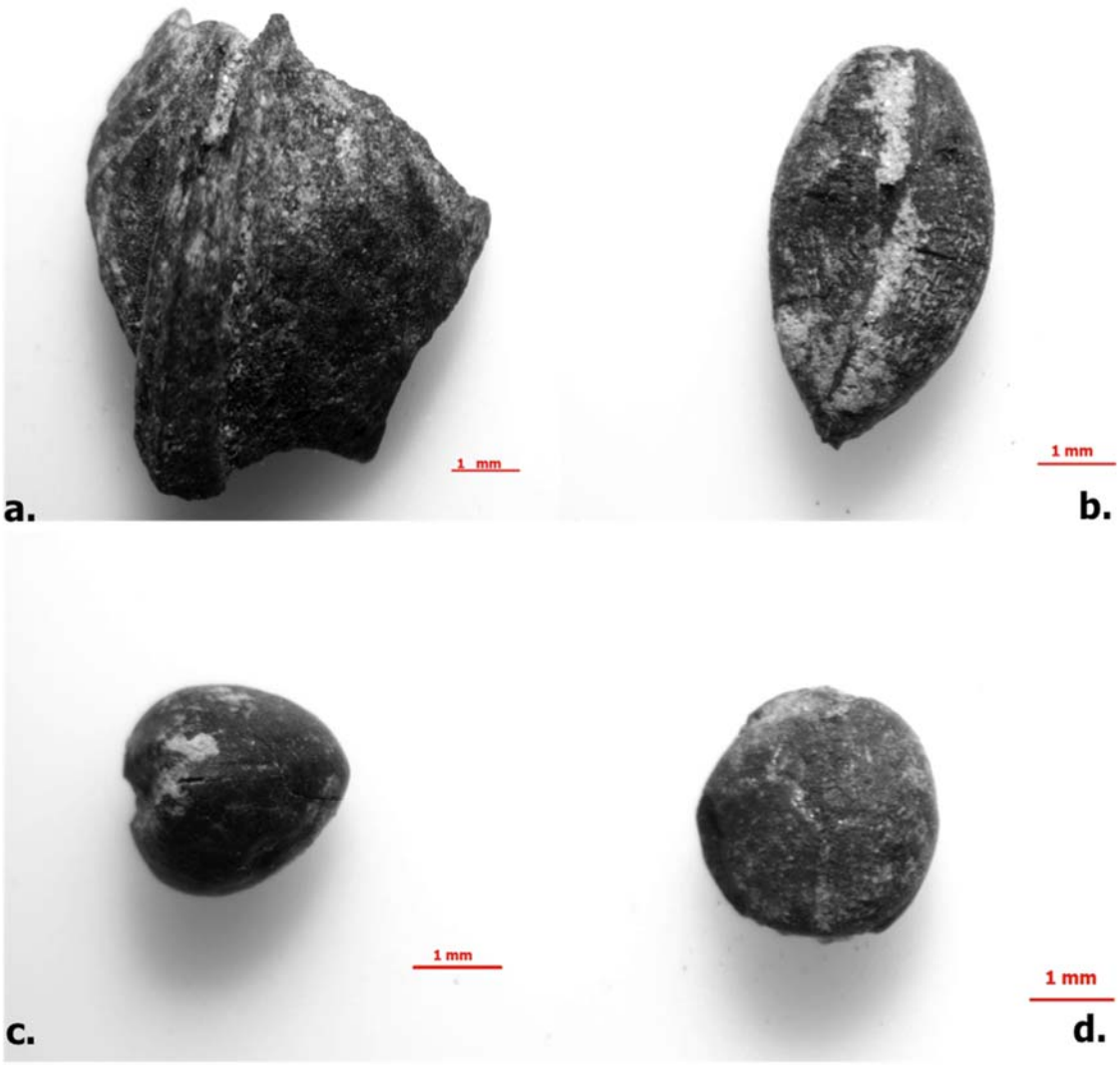

Fig. 15. Seeds identified at Gumelnița tell settlement: a. *Prunus cerasifera* found in pit C4; b. *Hordeum vulgare* discovered in pit C3; c. *Vicia ervilia* from dwelling no. 1 (L1); d. *Lens culinaris* found in dwelling no. 1 (L1). Scale in mm.
Semințe identificate în așezarea de tip tell de la Gumelnița: a. *Prunus cerasifera* din groapa C4; b. *Hordeum vulgare* descoperit în groapa C3; c. *Vicia ervilia* din locuința nr. 1 (L1); d. *Lens culinaris* din locuința nr. 1 (L1). Scara în mm.

As one can see, most of the plant remains identified in the eponymous site were also found in different archaeological sites of Gumelnița culture from Romania. Also, almost all species identified here can be consumed by humans. An exciting discovery is the presence of acorn (*Quercus robur* subsp. *penduculiflora*), which may be the result of oak wood used in domestic hearts, but also as fodder. Likewise, the 28 fragments of plum nustones are an important finding due to the scarcity of this plant species of macroremains in Gumelnița culture. Bitter vetch has already been discovered in Gumelnița culture at Căscioarele-*Ostrovel* in a large quantity (M. Cârciumaru 1996, p. 70).

Last but not least, the *Cerealia* species found here, could provide an insight into the plant cultivation practices used by the human communities that lived at Gumelnița.

						TOTAL	%
	Liters		9	9	6	24	
	S.U.	1013	1019	1021	1024		
Plant species	**Vernacular name/ Plant organ**						
Triticum dicoccum	Emmer grain		1			4	9.75
Triticum dicoccum	Emmer chaff						
Hordeum vulgare	Barley grain				1	6	14.6
Hordeum vulgare subsp. *nudum*	Naked Barley grain		1		1	9	21.9
Cerealia	grain fragments	5	2			7	17
Prunus sp.	Plum nutstone fragments	1	1	2		4	9.75
Sambucus nigra	Elderberry nutstones	1				1	2.43
Unidentified				10		10	24.39
TOTAL		**7**	**5**	**12**	**2**	**41**	**100**

Tab. 7. Distribution of vegetal taxa identified in pit C2 from Gumelnița tell settlement.
Repartiția taxonilor vegetali identificați în groapa C2 din tell-ul de la Gumelnița.

◈ Pollen and phytoliths

The data referring to the paleovegetation spectrum is completed by palynological analysis. Four samples of sediment from Gumelnița site were chemically prepared in order to extract pollen grains and phytoliths. The samples were collected from Zone 1: Tell settlement (Son DS - dwelling no. 1/L1 and pit C4) and Zone 3: Terrace area (Son 9, grave no. 1/M1).

Unfortunately, none of the samples were adequate for pollen analysis. After applying the standard chemical procedure for this type of analysis (HCl 10%, KOH 10%, $ZnCl_2$, acetolysis – 8 minutes), only a few pollen grains of coniferous taxa (*Abies, Pinus, Picea*) and grains of spontaneous Poaceae (Gramineae), *Artemisia* and Asteraceae were identified. The grains number was inadequate for analysis.

Phytoliths were extracted following the chemical standard protocol: removing carbonate and sieving of sediment, deflocculation of clays, oxidation of organic material, washing and drying for density separation. For the last process sodium polytungstate with 2.35 density was used. Phytoliths were analyzed under an optical microscope (magnification 400x), the residue was mount in immersion oil. For the identification of phytoliths, the ICPN (International code for phytolith nomenclature) was used. The optical microscope analysis distinguished the presence of phytoliths in two samples. Only one of these two samples – waste area C4 , s.u. 1027 had preserved a sufficient number of phytoliths for the validation of statistical analysis (tab. 8, fig. 16).

Elongate	Elongate dendritic	Rondel	Cylindric polylobate	Trapeziform sinuate	Bulliform	Globular	Cylindric sulcate	Acicular	Acicular 2	Sponge spicules
10.43 %	52.75 %	24.64 %	0.29 %	3.48 %	3.48 %	0.29 %	0.29 %	4.06 %	0.29 %	8 %

Tab. 8. Distribution of the phytoliths identified in dwelling no. 1 (L1) from Gumelnița tell settlement.
Repartiția fitolitelor identificate în locuința nr. 1 (L1) din tell-ul de la Gumelnița.

We identified 345 phytoliths that we grouped into ten morphological types: *rondel*, *elongate*, *elongate dendritic*, *trapeziform sinuate*, *cylindrical polylobate*, *globular*, *bulliform*, *cylindric sulcate*, *acicular*, *short acicular* (tab. 8). Also, *sponge spicules* were identified.

The analysis shows that the *elongate dendritic* type is dominant (52.75%). This type is found in the inflorescence of Poaceae (T.B. Ball *et alii* 2001), and it is used in discerning the cereal usage and the domestication of these plant by early communities (A. Novello, D. Barboni 2015). The pourcentage of these elements establishes proof for cereals usage at Gumelnița.

The second most abundant phytolith type is *rondel* with a representation of 24.64%. This type is usually associated with Pooideae subfamily (S. Mulholland 1989). The species of this subfamily have a C3 metabolism and they develope in a temperate environment. Most of the cereal species belong to this subfamily. Also, these types can be formed by other subfamilies of Poaceae such as Arundinoideae (D. Barboni, L. Bremond 2009).

The *elongate* phytoliths type is forming in the epidermis of Poaceae (C. Twiss *et alii* 1969, D.R. Piperno 1988, Fredlund, Tieszen 1994), but it can also be formed by other plant groups (D.R. Piperno 1988; C.A. E. Strömberg 2002). In this sample, they have a 10.43% representation of total phytoliths.

The type *trapeziform sinuate* (3.48%) is also present in the phytolith spectrum. This type is a good marker for Pooideae subfamily (D. Barboni *et alii* 2007). Taxons such as *Triticum*, *Hordeum*, *Avena* etc. are part of this subfamily.

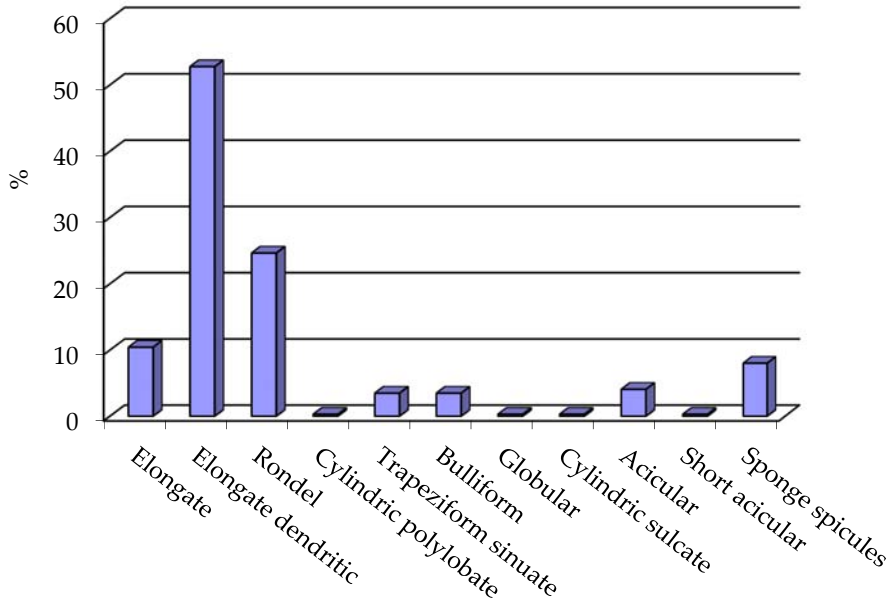

Fig. 16. Graphical distribution of the phytoliths identified in dwelling no. 1 (L1) from tell settlement.
Repartiția grafică a fitolitelor identificate în locuința nr. 1 (L1) din tell-ul de la Gumelnița.

The *globular* type is attribuited to Dicotyledonous (S. Bozarth 1992; A. Alexandre *et alii* 1997). This type does not allow a more specific identification. However, since dicots plants produce a small number of phytoliths in comparison to Poaceae, the relatively modest

percentages of these type can be interpreted as being significant. In this sample globular type represents less than 0.30%%.

Likewise, the *cylindric sulcate* type was identified. This phytolith type is frequently attribuited to Dicotyledonous, but its origins are not precise. It can be produced by a wide range of plants. In this sample it had a 0.29% representation. However, this data correlated with other percentages of other phytolith types it can provide essential information regarding different aspects.

The *cylindrical polylobate* (0.29%) type is atributed to Pooideae subfamily, which includes taxons such as *Festuca* sp., *Poa* sp., *Bromus* sp. (D.R. Piperno 2006). These phytoliths show the presence of leaves of Pooideae (D.M. Pearsall 2015), including the Poeae and Bromeae tribes' grains.

The types of *acicular* and *short-acicular* can be produced by Gramineae (Poaceae) and also by taxons from Asteraceae, Boraginaceae or Urticaceae families (D.R. Piperno 2006).

The *bulliform* phytoliths are deposited in leaves, alongside the leaf nervures, allowing plant leaves to fold in order to retain water. The silicification of plants is connected to the leaf senescence or the environmental conditions (hydric stress). These types have a 3.48% representation of total phytoliths.

Sponge spicules show the presence of water (fresh water) or soil humidity conditions (A. F. Zucol *et alii* 2005). Their representation (8%), together with *bulliform* phytoliths which suggesting a humid environmental condition or a high evapotranspiration condition, but also a submerse sublayer (L. Bremond *et alii* 2005), indicate a warm and wet environment.

To sum up, the phytoliths spectrum highlights the clear predominance of elements from Poaceae. The morphotypes characteristic of cereal inflorescences predominate. Thus, the presence of cereals on site is confirmed. The presence of dendritic phytoliths is understandable due to the collected sample for a waste pit. This area can be interpreted as a waste area or as a storage area for subproducts of cereal processing (straw, chaff), with the purpose of subsequent usage (fodder and/or manure).

The phytolith analysis also shows the presence of leaves from Gramineae or other plants. Moreover, the significant presence of *sponge spicules* might confirm the existence of fresh water. The next question is if the place were the sample was collected was in fact used for producing adobe or clay rolls for building constructions.

Other results obtained from different proxies may help to provide a better interpretation of these results.

◈ Pottery

Despite the small scale of the research, the amount of pottery that was collected from Son DS (Zone 1: Tell settlement) is, nevertheless, impressive. A quantity of 534 sherds was discovered and afterward subjected to a primary restoration process that led to the forming of 504 individuals weighting a total of 9149 grams. A large number of collected sherds owes to the dry sieving of a part of the sediment and the wet sieving of the other part (259 sherds were identified using these methods).

The pottery analysis was based on macroscopic observations. Specific features of each sherd were quantified in a database created in Microsoft Access. Based on the gathered data compared to theoretical and experimental models, we tried to investigate the nature of archaeological contexts (M.B. Schiffer 1996; L. Thissen 2015), the techniques by which pottery was produced (O.S. Rye 1981; P.M. Rice 1987; J. Vuković 2014), the typology of shapes and decorations (V. Voinea 2005) and the possible uses of the vessels (J.M. Skibo 2013; 2015).

Previous studies about materials discovered within site mentioned only general qualitative assessments about the pottery (Vl. Dumitrescu 1925; 1966a; Vl. Dumitrescu, S. Marinescu-Bîlcu 2001), while quantitative analyses were not considered. Consequently, they were of little use for making comparisons to our gathered data.

Feature	S.U.	<2.5 cm	<5 cm	<7.5 cm	<10 cm	>10 cm	Total individuals	Total fragments
	1014	12	22	1	0	0	39	39
C2 (pit)	1013	18	12	1	0	0	31	31
	1019	15	26	9	0	0	50	50
	1021	4	0	0	0	0	4	4
	1022	0	4	1	1	0	6	6
C3 (pit)	1017	62	32	2	1	0	97	98
C4 (waste area)	1027	92	32	11	1	1	137	140
C5 (pit)	1030	24	23	0	0	0	47	47
C6 (pit)	1031	3	8	5	2	0	18	18
L1 (house)	1018	3	19	9	3	2	36	52
	1024	1	3	1	1	0	6	6
	1026	12	6	3	1	1	23	24
L2 (house)	1028	0	1	1	0	0	2	2
	1032	0	4	1	1	2	8	17
	Total	246	192	49	11	6	504	534

Tab. 9. Contextual distribution of the pottery by sherd size.
Distribuția contextuală a ceramicii raportată la dimensiunea fragmentelor.

The context. The pottery analyzed here was discovered in primary deposition (M.B. Schiffer 1996, p. 199) in various archaeological contexts as pits fillings, houses debris or waste areas (tab. 9). None of these contexts were exhaustively researched, and the batches of the collected pottery will be completed by future digging campaigns. However, given that the previous diggings carried out in the area had affected to an unknown extent the archaeological deposits, the recovery of a full amount of pottery from every context is impossible.

The mixed pottery discovered in a secondary deposition, in a colluvium layer (s.u.1011) formed on the slope surface, was not included in our analysis. However, it is worth mentioning the discovering in that layer of a Boian - Vidra pottery sherd (fig. 24.5), that once again attests (Vl. Dumitrescu 1966a, p. 53) to the presence of a Boian culture community in the area of the Gumelnița tell settlement.

Returning to the pottery in the primary deposition, most of the analyzed sherds reached their final destinations as a secondary (M.B. Schiffer 1996, p. 58) or even as tertiary refuse (L. Thissen 2015, p. 7). This assumption can be made especially for the pottery sherds from the pit fillings (C2, C3, C5, C6 and C7) and for those from the waste area (C4) and is based on their severe fragmentation (a high incidence of fragments of small dimensions (tab. 9; fig. 17) and the lack of joins between fragments. The presence of sherds secondarily fired when already in a fragmented state (fig. 24.4) and the visible erosion of the edges on most of the fragments are further evidence of a tertiary deposition of the pottery from the contexts mentioned above. This situation is not the case with the pottery discovered in the debris of the houses denoted as L1 (unburnt) and L2 (burnt). In the debris of each house, large sherds that

joined together were discovered. Moreover, these partially formed vessels were abandoned as primary refuse (fig. 21.3), while the single discovered sherds have the characteristics of secondary refuse. Later, some of the pottery from the remains of both houses was disturbed by human actions such as the digging of the subsequent pits. There were at least two cases when sherds from pit fillings were joined with sherds from house debris.

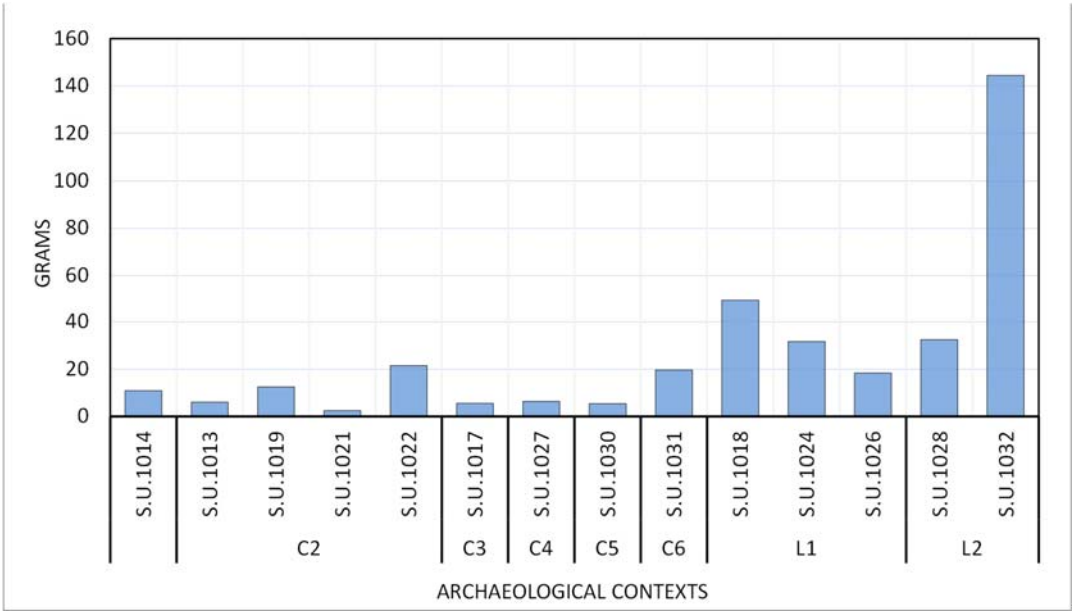

Fig. 17. Contextual distribution of the mean values of sherds weight (n = 504).
Distribuția contextuală a valorilor medii ale greutății fragmentelor ceramice (n = 504).

Paste analysis. A macroscopic examination was deployed in order to define and count the paste characteristics of the analyzed pottery. This action was obstructed in the case of some of the fragments, which were covered with calcareous deposition or when the sherds margins were highly eroded. Thus, in these cases, a pair of pincers was used to break the sherds and observe the inclusions in the fresh sections.

Three main types of paste (T. Ignat *et alii* 2012, p. 106) were differentiated by the size of the observed inclusions (mainly grog): fine, semi-fine and coarse (tab. 10). Regarding the paste recipes, grog was added in most of the analyzed specimens (tab. 10), resulting in a mix of clay, pores and old crushed pottery (fig. 18.1) that characterize the main tradition of making the paste of the pottery discovered last year at Gumelnița. Therefore, the absence of grog can be considered as a deviation from the rule and was noted for only five sherds (less than 1%): one of them was tempered with dense organic fibers and in four cases sand was present with a high frequency. In other three cases, both grog and organic fibers were added as tempers.
Besides the added tempers, natural or accidental inclusions were also spotted. While natural non-plastics can be indicative of the clay sources, the accidental ones reach the paste during the processes related to the extraction and preparation of the clay. *Muscovite* is a natural inclusion that was identified as ubiquitous in all the sherds, and its presence was not counted. *Limestone*, identified as calcareous concretions of variable sizes (0.5-5 mm) and low frequencies (<5%), was the most present type of natural inclusions. Another type that was less often observed is the *fine sand*.

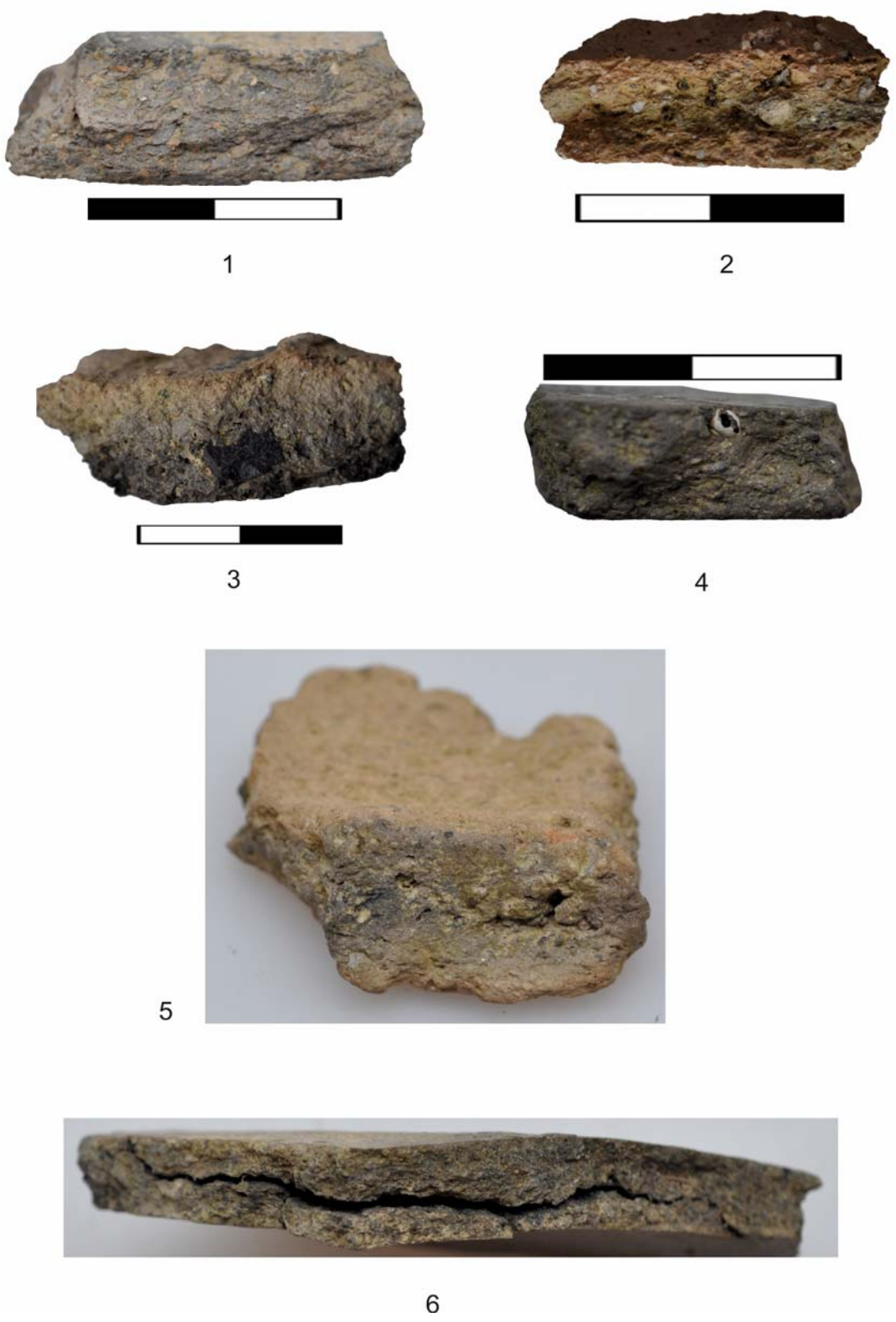

Fig. 18. 1-4. Main type of identified inclusions (1 - grog; 2 - sand; 3 - burnt flint; 4 - snail shell); 4-5. Forming methods (4 - coiling; 5 - molding). Scale in cm.
Principalele tipuri de incluziuni identificate (1 - cioburi pisate; 2 - nisip; 3 - silex ars; 4 - cochilii); 4-5. Metode de formare (4 - colaci; 5 - tipar). Scara în cm.

The inclusions of fine quartz grains are rounded and well sorted, with a medium frequency. The *coarse sand* (fig. 18.2) has the same characteristics, but its presence is much less often encountered. There are clays that contain calcareous concretions located at the base of the loess deposits beneath and close to the settlement, while fine and coarse sand are abundant in the alluvial sediments deposits around the site. Therefore, it can be suggested that prehistoric people used local clays to make their pottery. Further archaeometric analyses on pottery and clay samples will be decisive in order to test this hypothesis.

Inclusions		**Paste categories**			**Total**	
Identified as	Type	Fine	Semi-fine	Coarse	No.	%
Tempers	Grog	107	316	73	496	99
	Sand	0	4	0	4	0.5
	Organic fibers	0	1	0	1	0.1
	Grog and organic fibers	0	3	0	3	0.4
Natural/Accidental inclusions	Limestone	11	110	37	158	31.3
	Fine sand	10	51	6	67	13.3
	Coarse sand	0	4	5	9	1.8
	Organic fibers	13	31	4	48	9.5
	Shell	2	4	0	6	1.2
	Flint	0	1	1	2	0.5
	None	71	122	21	214	42.4

Tab. 10. The distribution of identified inclusions within the main categories of pottery paste.
Distribuția incluziunilor identificate în principalele categorii de pastă.

Spalls of *burnt flint* (fig. 18.3) were identified in two sherds, one flint spall in each pottery fragment. Also, *shell inclusions* can be categorized as accidental inclusions being present as sparse little snail shells (fig. 18.4) that are related most probably to the clay sources. The vast majority of the organic fibers can be categorized as accidental inclusions, mainly based on their sparse distribution and low frequencies. There is also a possibility that some of them were already part of the collected clays (C. Haită 2015; M. Dimache, C. Haită 2015) if we admit that the alluvial deposits around the settlement could have been used as clay sources for pottery.

	Vessels shape							**Total**	
Forming technique	Dish	Bowl	Storage vessel	Pear-shaped	Simply truncated	Lid	Indeterminable shape	No.	%
Coiling	5	15	5	3	1	2	96	127	25.2
Slab building	1	0	1	0	0	0	15	17	3.4
Molding	8	0	0	0	0	1	16	25	5
Unknown	13	19	1	3	0	3	296	335	66.4
Total	27	34	7	6	1	6	423	504	100

Tab. 11. Primary forming techniques and vessels shapes (n=504).
Tehnici de modelare primară și forme de recipiente (n=504).

Forming techniques and constructed shapes. Given the fragmentary state of the analyzed pottery, the forming techniques were quantified only for those sherds that had evident marks, indicative of one or more methods of creating a vessel. Consequently, the presence of these techniques is valid only for the part of the vessel from where the analyzed sherds belong and not for the entire vessel.

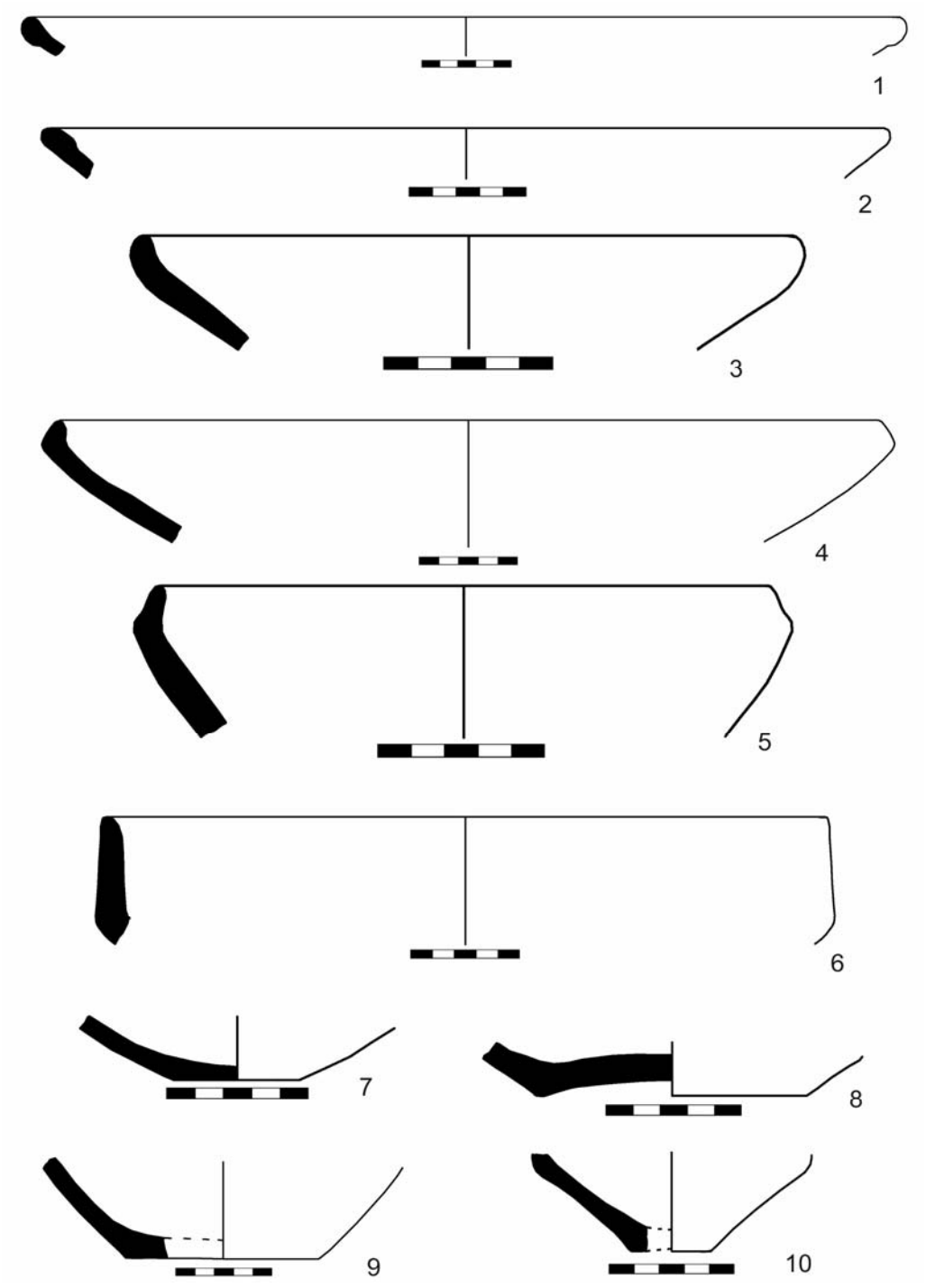

Fig. 19. Variants of dishes (1-4; 7-8) and bowls (5-6; 9-10). Scale in cm
Variante de străchini (1-4; 7-8) și castroane (5-6; 9-10). Scara în cm.

Regarding the primary forming techniques, the coiling technique (O.S. Rye 1981, p. 66; P.M. Rice 1987, p. 127-128) was the most often encountered, being observed as horizontal breaks (fig. 18.5) on the whole range of identified shapes and on several sherds of indeterminable shape (tab. 11). For dishes and lids, this technique was used mainly for attaching the rim, while for the other shapes the coils were added to build the body and the upper part of the vessels.

The slab building technique (O.S. Rye 1981, p. 71) had a low frequency and was identified mainly on base fragments (based on the presence of oblique and laminar fractures). Slabs of clay were also occasionally used to reinforce the upper parts of some vessels.

The molding technique (P.M. Rice 1987, p. 125-126) was used to primary form large open vessels such as dishes and lids. The distinctive marks of this technique are the elongated uneven laminar fractures (fig. 18.6) that appeared between two lumps of clay that were separately pressed in a mold (O.S. Rye 1981, p. 81). The use of this technique was also suggested by experimental attempts of creating large dishes that are specific to the Gumelnița tradition (T. Ignat *et alii* 2016).

Traces of secondary forming processes (O.S. Rye 1981, p. 84-87) were only occasionally observed, such as the scraping of internal surfaces, made with hard-material tools that removed clay in order to control the final thickness of the vessel's walls.

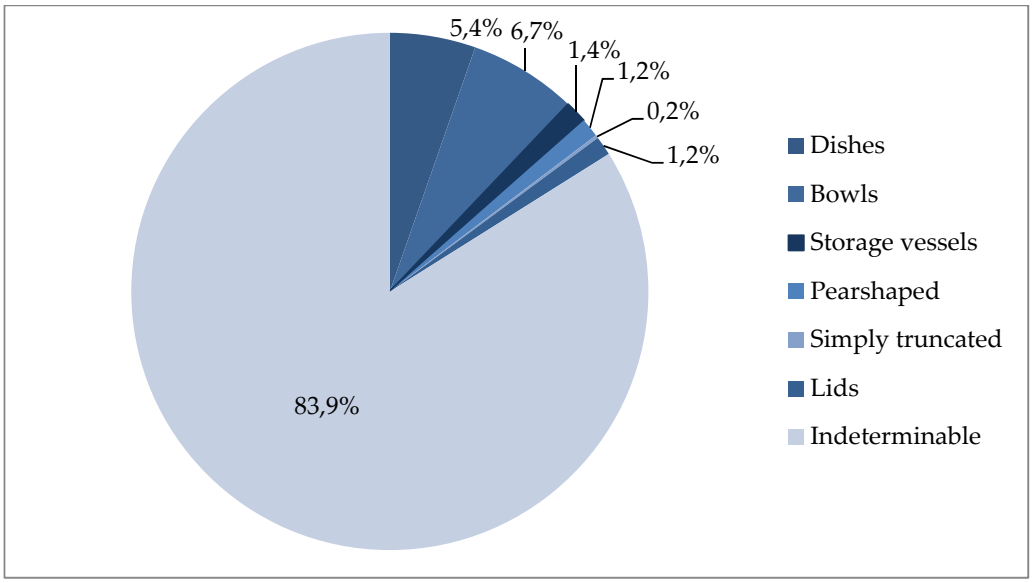

Fig. 20. Relative distribution of the indeterminable and determinable shapes (n=504).
Distribuția relativă a formelor nedeterminabile și determinabile (n=504).

The identification of the constructed shapes was difficult due to the fragmentary state of the pottery (fig. 20). There was a small range of general shapes made using the methods mentioned above, but each general shape had their variants and sub-variants (figs. 19, 21), all of them being specific to the A2 phase of the Gumelnița culture (V. Voinea 2005). The ratio between open and closed forms is 4:1.

The open forms consist mainly of bowls, dishes, and lids of various types and sizes, while storage and pear-shaped vessels were included in the category of the closed forms.

Fig. 21. 1-3. Storage vessels. Scale in cm.
Vase de stocare. Scara în cm.

Fig. 22. 1-2. Treatment of internal surfaces (1 - polishing; 2 - scraping); 3-6. Decoration methods (1 - organized barbotine; 4 - incisions; 5 - excisions; 6 - graphite painting). Scale in cm.
Tratarea suprafețelor interne (1 - lustruire, 2 - răzuire); 3-6. Metode de decorare (1 - barbotină organizată, 4 - incizii, 5 - excizii, 6 - pictură cu grafit). Scara în cm.

Surface treatments and decoration methods. More than a half of the internal surfaces of the vessels were treated by burnishing while smoothing and polishing (fig. 22.1) are also well represented (tab. 12). Scraping (fig. 22.2) was counted as a surface treatment (tab. 12), but as we have just mentioned before, this technique was part of the secondary forming processes (J. Vuković 2014, p. 180). Thus, the scraping traces are evidence that a surface finishing method was not applied. Most of the external surfaces were treated by using the same techniques as those applied to the interior of the vessels (tab. 12). A specific method to treat the external surfaces of Gumelnița pottery was the application of a coarse watery clay coat that has been denoted as barbotine. When no patterns of decorations were identified on the pottery, we categorized it as unorganized barbotine and counted it merely as an external surface treatment. In other cases, the barbotine was organized in vertical, horizontal or oblique lines forming patterns that were counted as decoration (tab. 12). Some of the small sherds have one or both of the surfaces damaged entirely (tab. 12).

			Decoration type						
Surface	**Treatment method**	**Undecorated surfaces**	**Embossed**		**Excised**	**Incised**	**Painted**		
			Organized barbotine	Channels			White	Red	Graphite
Internal	Scraping	22	0	0	0	0	0	0	0
	Smoothing	74	0	0	0	0	0	0	0
	Burnishing	286	0	0	0	0	0	0	0
	Polishing	90	0	0	0	0	0	0	9
	Damaged	23	0	0	0	0	0	0	0
External	Scraping	10	1	0	0	1	0	1	0
	Smoothing	93	56	0	2	7	0	1	0
	Burnishing	119	0	3	0	11	2	0	0
	Polishing	140	0	0	1	2	0	1	8
	Unorganized barbotine	26	0	0	0	0	0	0	0
	Damaged	19	0	0	0	0	0	0	0
	Total	902	57	3	3	21	2	3	17

Tab. 12. Types of surface treatments and decorations applied on analyzed sherds (n=504).
Tipurile de tratare a suprafețelor și tipurile decorative aplicate pe ceramica analizată (n=504).

The main categories of identified decorations were embossing, excision, incision, and painting (tab. 12), although the decorated sherds had a small share in the analyzed batch (fig. 23). The embossing was made mostly by applying organized barbotine (fig. 22.3), except for three sherds that were decorated with wide channels. Excised patterns (fig. 22.5) were identified on other three sherds. This type of decoration is a rare finding in the pottery repertoire of the Gumelnița A2 phase (V. Voinea 2005, p. 53). The incised decoration (fig. 22.4) was more often encountered, and in three cases the incisions were filled with white paste. Around 4.4% of the sherds were decorated by painting. The white and red colors were rarely used, and their application was made most probably after the initial firing of the vessels. The graphite motifs were painted on the inside part of the dishes (fig. 22.6) or in the external part of small cups. The graphite paint was applied before firing and exclusively on well prepared surfaces treated by polishing.

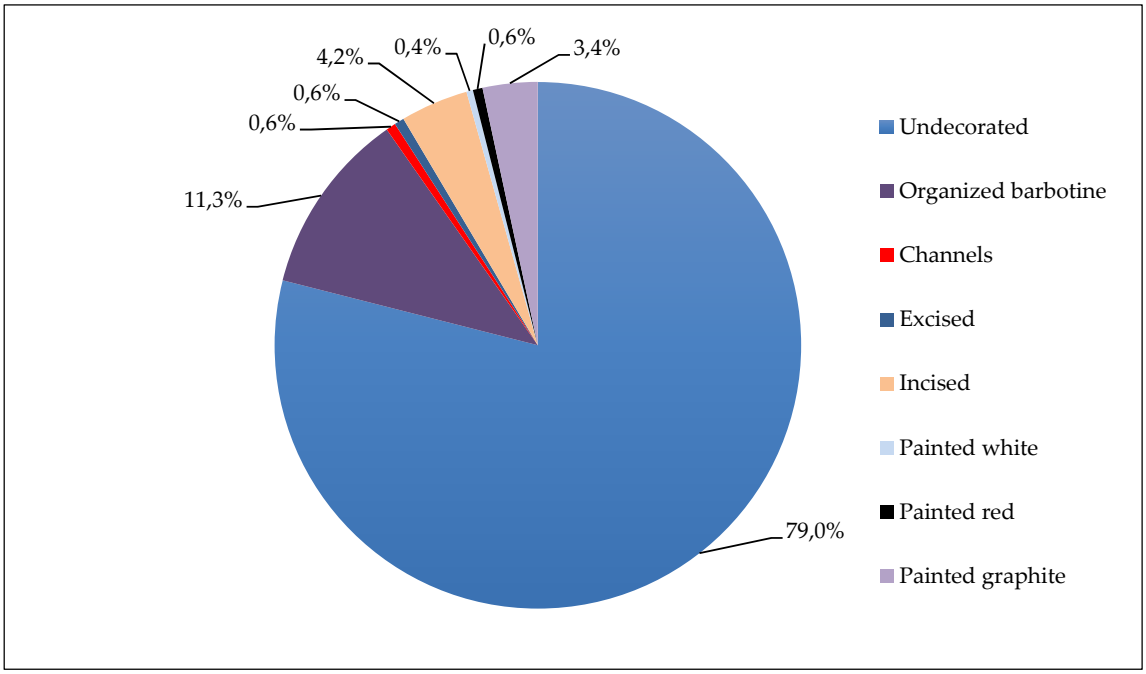

Fig. 23. Frequency (%) of undecorated and decorated sherds (n=504).
Distribuția relativă procentuală a ceramicii nedecorate și decorate (n=504).

Firing observations. Four major firing categories were identified (tab. 13), based on the observed colors of surfaces and sections (O.S. Rye 1981, p. 114-119). The secondary fired sherds were discovered in all the researched contexts and were separately counted (tab. 13). Incomplete oxidised sherds with reddish-brown surfaces and black cores were the most often encountered. Fragments with uniform colors from black to dark grey came from vessels fired in an unoxidised or reduced atmosphere and are well represented also. Most of them were parts of dishes or little bowls (e.g., cups) with surfaces treated by burnishing or polishing. A small part of the pottery was wholly oxidised and without any traces specific to a secondary firing. The irregular firing had a very low frequency.

Firing category	Complete oxidised	Incomplete oxidised	Unoxidised/ Reduced	Irregular firing	Secondary firing
No.	22	261	179	5	37
%	4.4	51.8	35.5	1	7.3

Tab. 13. Overall distribution of firing categories (n=504).
Distribuția totală a categoriilor de ardere (n=504).

Use-wear analysis. The observations on use-wear attritions formed during the use-life of the vessels were difficult to be made considering the high fragmentation of the analyzed batches. Besides this, almost a half of the analysed sherds (45%) display signs of margins erosion formed during the movement of the pottery when in a fragmentary state. These actions have also affected the sherds surfaces and could have removed the use-wear signs developed during the actual use of the vessels. However, some use-wear marks and patches were identified, as abraded areas, zonal spalling or soot patches on the internal or external surfaces (J.M. Skibo 2013).

Fig. 24. 1-3. Use-wear traces (1 - abraded base; 2 - external sooting; 3 - internal sooting); 4. Secondarily fired sherd when in fragmentary state; 5. Boian - Vidra sherd. Scale in cm.
1-3. Urme de utilizare și uzură (1 - bază abrazată, 2 - urme exterioare de funingine, 3 - urme interioare de funingine); 4. Urme de ardere secundară; 5. Fragment ceramic Boian – Vidra. Scara în cm.

Abraded surfaces were observed on nearly 80% of the total number of the base fragments (n=24) (fig. 24.1), while only five rims had traces created by abrasion. The processes that led to pottery abrasion are hard to be outlined only by macroscopic analysis (V. Forte *et alii* 2018), but the presence of abraded areas can be considered as clear evidence of intensive usage of the vessels before breakage.

Zonal spalling of internal surfaces was observed on 23 sherds. Based on their size, shape, and frequency they could be formed by a chemical reaction as fermentation of liquids or crystallization of salt (J. Vieugue 2014, p. 623). Other use-wear stigmas were identified as internal or external soot patches (fig. 24.2-3) that attest at a general knowledge the use of vessels for cooking on open fires (J.M. Skibo 2013, p. 84-93).

Summing up, this preliminary analysis is just the beginning of a new way of understanding the relations between pottery and people that inhabited the tell settlement at Gumelnița. Further excavations scheduled for the next years will bring more pottery for analysis that will update the results and interpretation.

◈ Flint artifacts

As is already known, previous archaeological researches of the Gumelnița tell settlement led to the discovery of a rich flint inventory, more than 2000 items in the 1920's and other 688 in the 1960's (Vl. Dumitrescu 1924, 1925, 1966a).

The flint assemblage discovered in 2017 campaign was recovered in the field (n=20) from features researched in Son DS (Zone 1: Tell settlement), but also from sediment samples collected for sieving (n=123). This batch is rather small, and it is in relation to the various features. Thus, more than a half of the flint items were found in waste area C4 (s.u. 1027), which represents a rubbish deposit, and more than a quarter was found in pit C5 (s.u. 1030).

Feature	Blanks			Tools				Flakes		Total	
	Blade	Bladelet	Big Flakes	Endscaper	Burin	Scaper	Sickle blade	Debris	Burnt splinters	No.	%
C2 (pit)		1	2	1	1		3	5		**13**	**9.1**
C3 (pit)	1		1							**2**	**1.4**
C4 (waste area)	1	1		1	2	1		58	9	**73**	**51.0**
C5 (pit)	1	1						27	9	**38**	**26.6**
C6 (pit)			1		1					**2**	**1.4**
L1 (house)			2	3	1			7	1	**14**	**9.8**
s.u.1014					1					**1**	**0.7**
Total	3	3	6	5	6	1	3	97	19	**143**	**100**
Percent	2.1%	2.1%	4.2%	3.5%	4.2%	0.7%	2.1%	67.8%	13.3%		**100**
Total %	8.4%			10.5%				81.1%			**100**

Tab. 14. Flint assemblage composition discovered in 2017 according to the archaeological context.
Structura asamblului de silex decsoperit în 2017 din punct de vedere tipologic în raport cu contextul arheologic.

Almost 10% were found in dwelling no. 1 (L1), and it is interesting that 11 out of 14 pieces were found in s.u. 1024, which stands for the floor of the house (tab. 14). All of the

researched layers, features and dwellings can be attributed to the A2 phase of the Gumelnița culture. We also noticed that all sickle implements were found in pit C2.

The raw material for the majority of the items is represented by a good quality flint, opaque with a fine texture and a fine grain, of a yellow like honey color (with different tones), corresponding to what is called, in the archaeological literature as "Balkan flint" (C. Bonsal *et alii* 2010, p. 9). In small amounts we have encountered more reddish color flint pieces but similar in every other aspect with the one before mentioned. The nearest flint sources are undoubtedly south of the Danube in Bulgaria (C. Bonsal *et alii* 2010; M. Gurova 2012).

The typological structure of the assemblage (tab. 14) is very unbalanced for two main reasons: the small scale of the digging and the intensive use of flotation, dry and wet sieving. As mentioned before, 123 pieces were found during this process. Meanwhile, blanks and tools only represent 18.9% (27 pieces). No hammerstones or nucleus were discovered.

Concerning technology, we noticed the usage of multiple techniques, from hard hammer knapping to pressure and indirect soft percussion (P. Andreeva *et alii* 2014, p. 26). Retouching of the blades and bladelets is predominantly straight, thin, simple and located either on both sides or only on the right side.

Endscrapes are made on straight, trapezoidal blade blanks, while burins on straight triangular blade blanks (fig. 25). Only one fragmented scraper was found, made on a flake, and the sickle implements mostly used straight, trapezoidal, mesial blades. The characteristic luster of these implements is generally present on the right side of the blades, and in one case on both sides due to re-usage (fig. 25).

Burins are typologically and morphologically diverse (fig. 25). We have simple, double and triple burins and dihedral and on retouched truncation. Endscapers are simple, most of them with a convex active part that has angles between 40° and 70° (fig. 25).

However, most of the pieces are very small debris, and also small flakes resulted from heat exposure of the flint (116 pieces). These pieces have an average length of 0.66 cm an average width of 0.49 cm and an average thickness of just 0.13 cm (standard deviations are 0.24 cm in length, 0.21 cm in width and 0.13 cm on thickness) (tab. 15).

	Type	**Average length (cm)**	**Average width (cm)**	**Average thickness (cm)**
Blacks	Blades	2.30	2.53	0.52
	Bladelets	2.03	1.24	0.29
	Flakes	1.99	1.19	0.40
Tools	Endscrapes	6.10	2.57	0.68
	Burins	4.69	2.32	0.65
	Sickle blades	3.91	1.94	0.41
Debries	Debris	0.66	0.51	0.13
	Burnt splinters	0.66	0.42	0.17

Tab. 15. Average dimensions of flint artifacts from 2017 assemblage.
Dimensiunile medii ale pieselor de silex aparținând lotului descoperit în 2017.

In terms of average size, we notice that endscrapers are the largest, followed by burins and sickle blades. Given that the sickle blades had to be embedded in some sort of instrument, shorter fragments were obviously required. The size of blank blades and bladelets suggest that there were too short to be transformed into tools or even used as sickle implements (fig. 25).

Another interesting observation is nevertheless the significant number of debris and splinters. Most of these pieces were recovered from the waste deposits as features C4 or C5, but also on the floor of the dwelling no. 1 (L1) (tab. 14). These numbers highlight the characteristics of waste deposit areas and rubbish pits in general and place the action of retouching flint tools inside houses.

Previously excavated flint artefacts add to almost 2700 pieces. Out of these more than 1200 are published (Vl. Dumitrescu 1924, 1925, 1966a) with a different focus on details. We have managed to extract some data regarding the assemblage structure.

The 1920's assemblage counts for 540 flint artefacts in which tools are predominant, mostly endscrapers and also a significant percentage of hard hammers. Blank blades are also present in large numbers.

Blanks		**Tools**						**Total**
Blades	**Nucleus**	**Endscapers**	**Axe**	**Arrow head**	**Spear Head**	**Percoir**	**Hammer**	
120	3	298	25	6	3	2	63	520
23.1%	0.6%	57.3%	4.8%	1.2%	0.6%	0.4%	12.1%	100.0%

Tab. 16. The structure of the Gumelnița 1920's assemblage from typological perspective.
Structura lotului de silex de la Gumelnița din anii 1920 din perspectivă tipologică.

For a small part of this assemblage (32 pieces), we have managed to measure dimensions of blades and tools on blade support. In this respect, we used the published measurements of the pieces but also our scaled measurements when it was possible. For most of the illustrated pieces it was impossible to do so, as not even one flint tool had their dimensions taken. The result perfectly reflects the stage of research and publication characteristic for that period. Archaeological materials were macroscopically recovered and selected from the field, and the publication process involved yet another selection focusing on the most impressive of these. This situation is best reflected by the difference between the average sizes of the tools on blade support recovered from both archaeological campaigns. The average size of the flint tools from the 2017 campaign is much closer to the past realities, as we have collected every item from our research, whereas the one from 1920's archaeological campaigns is much higher (tab. 16) as it includes multiple *superblades* (M. Gurova 2012, p. 17).

During the 1960 campaign 688 flint artefacts were recovered, most of them in a fragmentary state. The majority were recovered from the A2 (most of them) and B1 levels. No typological or morphological differences were noticed between levels. Flint artefacts are published in a general manner emphasizing the prevalence of endscrapers (both on blades and flakes), blades and also different types of burins, which are not mentioned on previous excavations. The report shows the discovery of many flakes, which were considered as debris.

Axes are also mentioned (one in B1 level and three in A2 level). These have a trapezoidal shape and lamellar imprints on one side. Flint hard hammers are rather small in size, mostly discovered in the upper levels, and some of the nucleus shows evidence of reuse as hammers.

Of great interest is the discovery of a flint rectangular block (44 x 18 x 12 cm) (Vl. Dumitrescu 1966a) that offers direct evidence for ways of transport and (or) exchange of this raw material from south of the Danube.

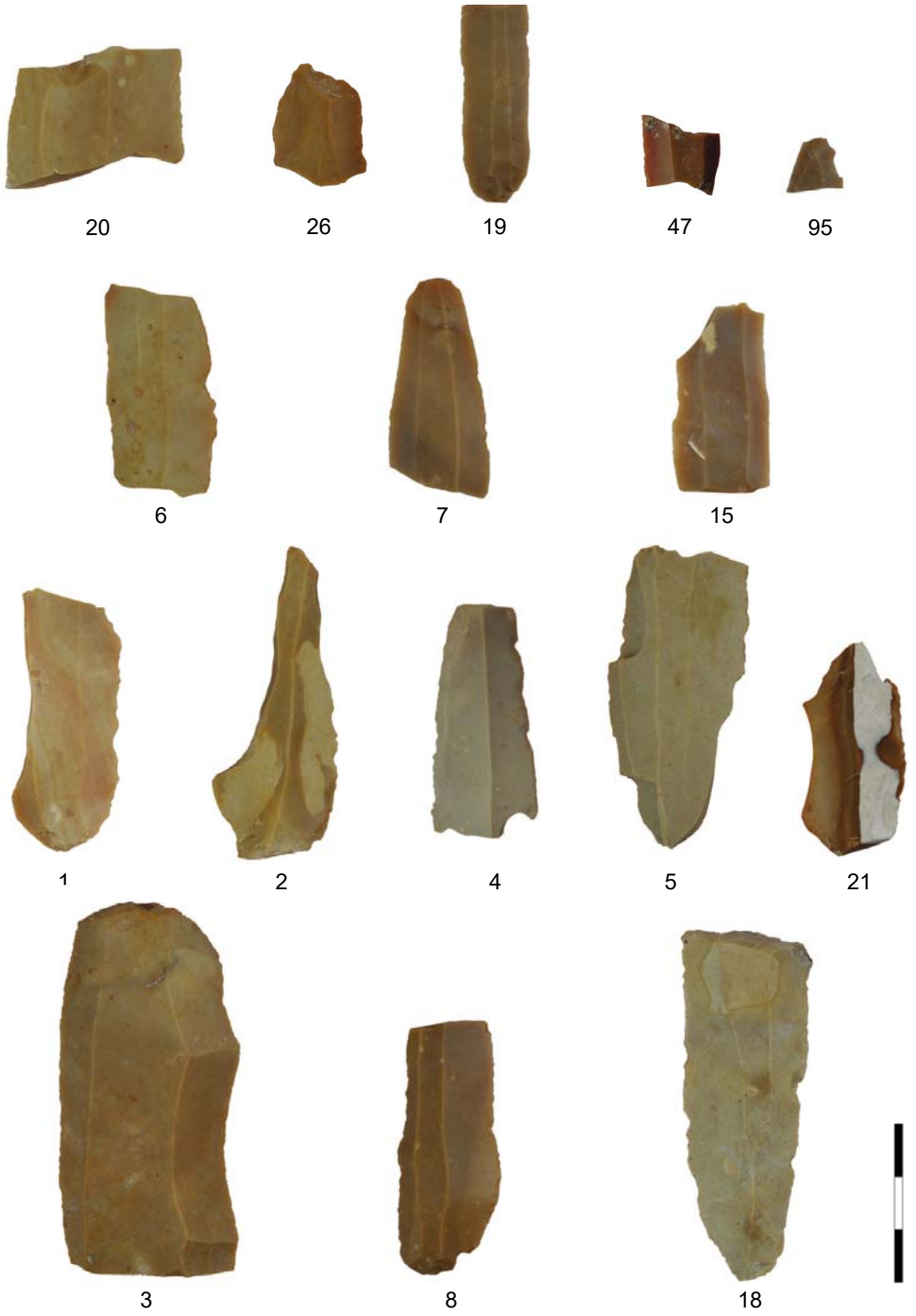

Fig. 25. Blanks: Blades (20, 26); Bladelets (19, 47, 95); Tools: Sickle blades (6, 7, 15); Burins (1, 2, 4, 5, 21); Endscrapers (3, 8, 18). Scale in cm.
Suporturi: lame (20, 26); lamele (19, 47, 95); Unelte: lame de seceră (6, 7, 15); Burine (1, 2, 4, 5, 21); Răzuitoare (3, 8, 18). Scara în cm.

In sum, the flint assemblage from the 2017 archaeological campaign at Gumelnița is rather small, and a profound statistical analysis that covers a wide spectrum of typological and technological choices would have been less relevant.

It is the reason why we have chosen only to present a general, thus more relevant set of information. These will be updated by further research.

A series of conclusions can still be drawn, if we also consider the information given by earlier excavation. There is clear evidence that all stages of flint tool production were carried out in the settlement. As proof we first mention the discovery of a large rectangular flint block, the presence of a significant number of hard flint hammers, a few nuclei, and many axes that bear traces of blade extraction and also a high amount of small debris as evidence of retouching.

We thus emphasize the use of dry and wet sieving as it is the only way of recovering the complete spectrum of any assemblage and it is a way that ensures reliable sets of data. Flint tools underwent multiple reuses before being discarded. Axes were turned into hammers, while sickle blades were used on both sides. It is worth mentioning the lack of burins in the assemblage discovered in the 1920's. We expect that further research will bring more data that will refine our analysis.

◈ Petrographic observations on flint material

Lithic chipped pieces were analyzed using a stereomicroscope for a more detailed description of the raw material. This analysis took into account the texture or degree of crystallization, the degree of homogeneity, the frequency and nature of inclusions, the structure (massive / non-oriented or concentric / in strips) and color.

Depending on these characteristics, the following silicolite types were established:

1. Fine, homogeneous silicolite – without impurities (**1a**) or with fine and rare impurities (**1b**);

2. Fine, heterogeneous silicolite – with frequent impurities (**2a**), with irregular, diffuse boundaries and heterogeneous aspect (**2b**) or with banded structure (**2c**);

3. Silicolite with very fine granular texture, with grains ≤1 mm, homogeneous (**3a**) or heterogeneous (**3b**).

Studied silicolite tools and fragments were assigned as follows:

1a. The two described pieces thus have a very fine or fine texture, are homogeneous, yellowish or light grayish brown (0005 and 0017);

1b. The pieces included here are very varied, yellowish, yellowish brown, light gray or light brown, with rare or very rare (few) yellowish, light gray or reddish, impurities, 1-2 mm, very rarely 3 or 4 mm (0003, 0004, 0006, 0015, 0019, 0020);

2a. This type is light brown and has frequent yellowish impurities, 1-3 cm (0002);

2b. The two pieces included here have yellowish, light gray, light grayish brown areas, of few centimeters, sometimes with few gray and light reddish, ferruginous, impurities, 1-3 mm (0018, 0024);

2c. The pieces attributed to this type are very varied, with fine, sub-cm, yellowish, light brown and medium brown strips and light gray cortex; yellowish and light reddish very fine strips, mm-cm; yellowish, light gray and light reddish strips or yellowish with a thin light reddish band, and they do not present impurities; in one case a light brown zone, homogeneous, with rare grayish impurities, mm, and another, grayish brown, heterogeneous, with frequent light gray impurities, mm, were observed (0001, 0007, 0008, 0009, 0021, 0023, 0026);

3a. The piece described here is homogeneous, light reddish, with few light gray impurities, 1-2 mm (0022);

3b. This piece is heterogeneous, light brown and yellowish, with many yellowish impurities, 1-3 mm (0025).

Three quartzitic fine gravels, as well as a small fragment of a silicolite gravel, have been identified. These are represented by a finely crystallized quartzite, light gray and reddish, heterogeneous, burnt, 4 mm; two fine crystallized, light gray and light reddish, homogeneous, 2-2.5 cm, as well as one small fragment of fine silicolite, dark grayish brown, homogeneous, with few light gray impurities, mm. Most of the silicolites can be attributed to the inclusions in the limestone (of chert type), as indicated by the inclusions, the banded structure, and the presence of the cortex.

◈ Hard animal material industry

The assemblage of tools and ornaments made of animal bones is identified only in Zone 1: Tell settlement (Son DS) in various archaeological features during the sieving process, but also on the filed.

Tools, instruments, and accessories. The ribs of large mammals were used to manufacture three platelets with a rectangular morphology, which were discovered in the C1 and C5 features. Two of them (fig. 26.a, f) are longitudinally fractured. The blank is flat, without being able to identify the longitudinal debitage process because the entire surface of the items was abraded (fig. 26.b-c). Transversally, there seems to have been a segmentation by sawing (fig. 26.g). The pieces are provided with a central perforation achieved through bifacial rotation (fig. 26.h). The items use-wear is advanced, especially on the upper side. Thus, the median surface is flattened, with the modification of the bone structure and a macroscopic polish, which covered the abrasion marks (fig. 26.d, i). Besides, the use-wear is also present at the perforation level being characterized by the smoothing of the walls and the disappearance of the rotation scratches (fig. 26.e, j). The length of the pieces is of 30 mm and 21 mm respectively and the thickness is of 1.8 mm. The data provided by these pieces draw us that the rectangular platelets are not preforms of bone beads. They have been used in this form but, for instance, we can not identify how the items were used.

The third piece is a preform (fig. 26.k), and it is essential because we can reconstitute the sequence of stages within the debitage method. It is a flat blank, obtained by longitudinal debitage through rcussion. Segmentation has been achieved by sawing (fig. 26.l), followed by a bending detachment. Centrally, a perforation was made by a unifacial rotation from the lower side (fig. 26.m). The dimensions are of 12x11 mm, the thickness of 2.1 mm and the perforation diameter of 3.5 mm.

The category of pointed tools is represented by two items (fig. 27.a, c), both made of long bone diaphysis discovered in the C1, and C4 features. They were processed on the flat blank by putting into practice a bone partition by percussion. The proximal extremity is fractured in both cases. The debitage edges have not been entirely shaped. The active front was carried out by abrasion (fig. 27.b) applied on the debitage edges (just at the distal level) in order to create a sharp morphology of the end. In the first case, the active extremity is fractured, but at its periphery, we identified use-wear marks. For the second item, the active extremity is very smooth (fig. 27.d) with a full macroscopic polish and fine marks perpendicular on the extremity, which erased technological marks (fig. 27.e).

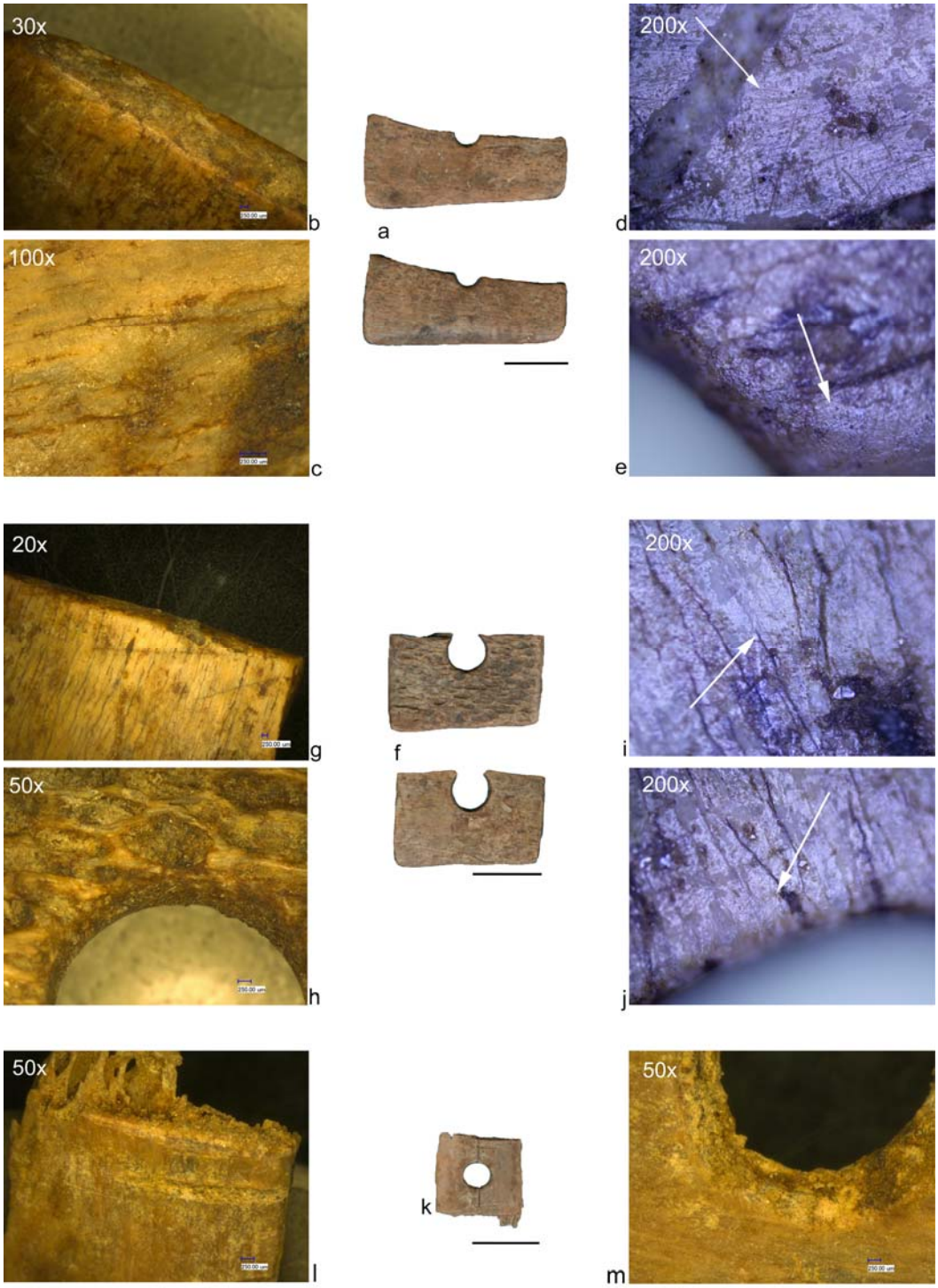

Fig. 26. Rectangular platelets made of bone; a, f. finished pieces; b. abrasion of the debitage side; c. abrasion of the dorsal side; d, i. use-wear traces developed on the dorsal side; e, j. use-wear traces at perforation level; g. segmentation by sawing; h. detail of perforation; k. preform; l. segmentation by sawing; m. detail of perforation. Scale in cm.
Plăcuțe rectangulare confecționate din os: a, f. piese finite; b. abraziunea laturii de debitaj; c. abraziunea feței superioare; d, i. uzura pe fața superioară; e, j. uzura la nivelul perforației; g. segmentare prin *sciage*; h. detaliu perforație; k. preformă; l. segmentare prin *sciage*; m. detaliu perforație. Scara în cm.

The width of the pieces is of 11 mm and 6 mm respectively and the thickness of 8 mm and 2.1 mm respectively.

An *Ovis aries*/*Capra hircus* astragalus (fig. 27.f) was discovered in the C2 feature. It preserves a perforation made on the medial side by unifacial rotation (fig. 27.h) after which both the medial and the lateral sides were intensively processed by abrasion (fig. 27.g) until they became perfectly flat. Areas with abrasion marks also appear on the dorsal side. On the surface, cuts from skin removal are visible. The microscopic analysis of the piece (fig. 27.i-j) shows us that the use-wear of the perforation is not very advanced.

The perforation wall rounded off, and perpendicular functional marks began to form at the perforation level. However, the technological marks are still present. The length of the piece is of 25 mm, the width - 14 mm, the thickness - 13 mm and the perforation diameter - 5.6 mm.

A single *Unio* sp. valve (fig. 28.a) was discovered in the C4 feature. Its edge was abraded, gaining a rectilinear morphology. The marks of abrasion are perpendicular to the edge (fig. 28.b-c), illustrating the direction of the movement. We do not believe that valve represents an adornment, but rather the abrasion is a functional one (resulting from their use in finishing ceramics, for example). The valve is fractured at one extremity. The width is 23.1 mm and the thickness 1.2 mm.

Personal adornments. A pendant was discovered on the floors of the dwelling no. 1 (L1). It was made from the compact tissue of a *Cervus elaphus* antler (fig. 28.d). The piece is fractured at the proximal end. The blank is flat and obtained by longitudinal partition in percussion (fig. 28.e), with the rigorous shape by abrasion of the inferior side. We do not know the process of transversal segmentation. At the distal end, the morphology of the extremity is atypical. We think that the piece was fractured and was fixed by the abrasion of the extremity (fig. 28.f). The item has a biconical perforation (fig. 28.g), created by bifacial rotation. On both sides of the perforation, two grooves were made by sawing (fig. 28.h). The morphometric data are as follows: width – 15 mm, thickness – 5 mm, perforation diameter – 5 mm.

Feature	Item ID	Diameter of item (mm)	Thickness of item (mm)	Diameter of perforation (mm)
C4 (waste area)	1	2.2	1.2	0.9
C4 (waste area)	2	2.1	1.2	0.9
C4 (waste area)	3	1.8	1.2	0.8
C4 (waste area)	4	1.7	0.8	0.9
C4 (waste area)	5	4.0	1.3	1.6
L1 (house)	6	3.2	1.2	1.3
C4 (waste area)	7	4	2.1	1.3
C4 (waste area)	8	3.5	1.4	1.2
C2 (pit)	9	3.2	1.3	0.8

Tab. 17. Dimensions of the cylindrical beads.
Dimensiunile perlelor cilindrice.

Nine beads with a cylindrical morphology and small dimensions (tab. 17) were discovered in the C2 and C4 features, but also in the dwelling no. 1 (L1). (tab. 17). The pieces were processed from a black stone (fig. 29.a).

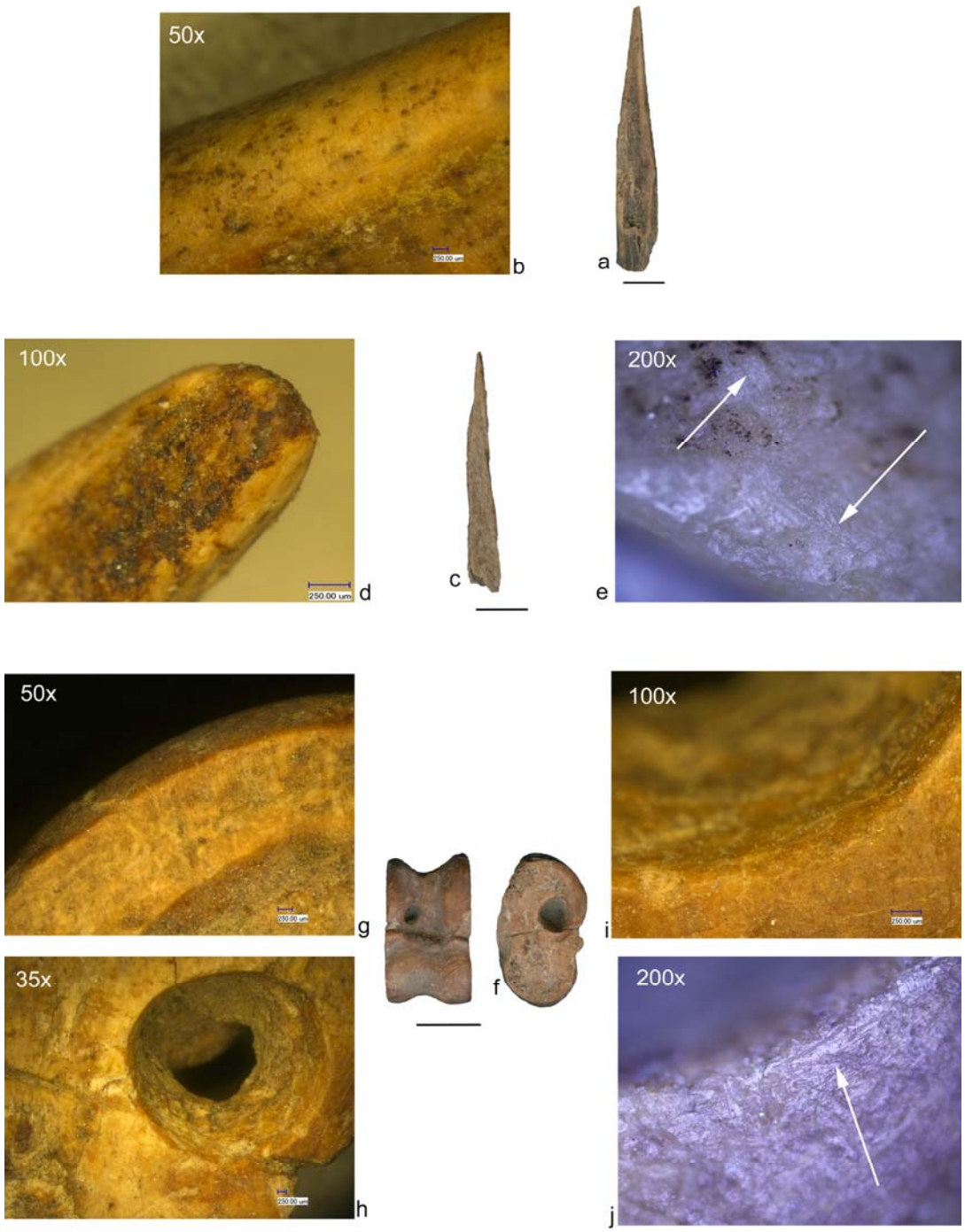

Fig. 27. Bone artefacts: a, c. pointed tools; b. abrasion of the debitage edges; d. detail of distal extremity; e. use-wear area; f. abraded astragalus; g. abrasion area; h. detail of perforation; i, j. use-wear area at perforation level. Scale in cm.
Artefacte confecționate din os: a, c. vârfuri; b. abraziunea laturilor de debitaj; d. detaliu al extremității distale; e. suprafața de uzură; f. astragal abrazat; g. suprafața de abraziune; h. detaliu perforație; i. j. suprafața de uzură la nivelul perforației. Scara în cm.

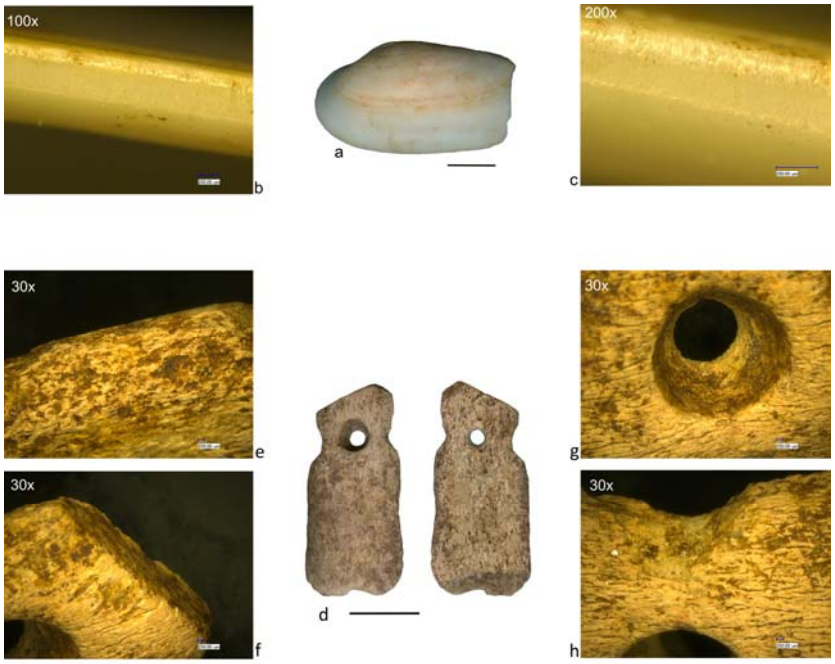

Fig. 28. Various items: a. *Unio* sp. valve with use-wear marks; b, c. area of abrasion; d. antler pendant; e. debitage edge; f. abrasion of distal extremity; g. detail of perforation; h. detail of groove. Scale in cm.
Piese diferite: a. valvă de *Unio* sp., cu stigmate de uzură; b, c. suprafața de abraziune; d. pandantiv din corn; e. latura de debitaj; f. abraziunea extremității distale; g. detaliu al perforației; h. detaliu al canelurii. Scara în cm.

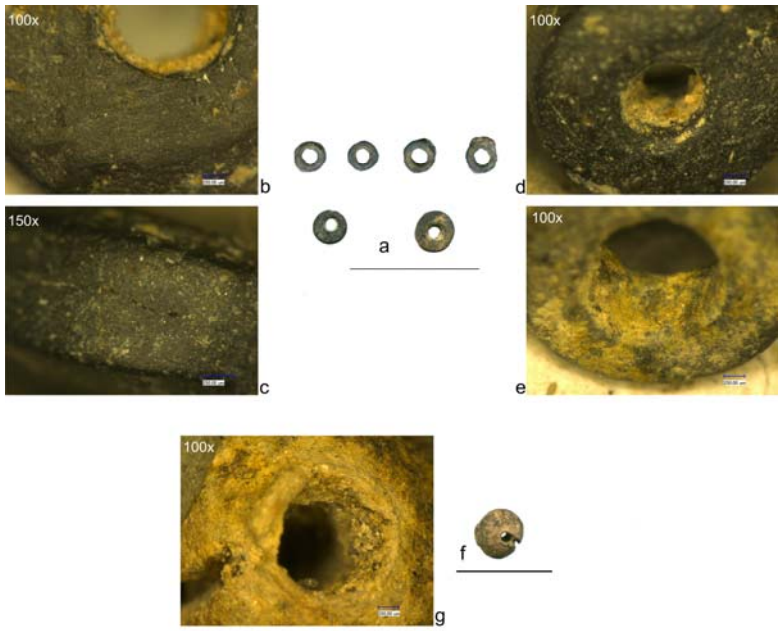

Fig. 29. Various beads: a. stone beads; b, c. surface abrasion: d, e. details of perforation; f. clay bead; g. detail of perforation. Scale in cm.
Diferite podoabe: a. mărgele din piatră; b, c. abraziunea suprafeței; d, e. detalii ale perforației; f. mărgea din lut; g. detaliu al perforației. Scara în cm.

They have a circular section and rectilinear edges. We do not know the procedures for obtaining the blank because the entire surface of the items was strongly abraded (fig. 29.b-c), gaining their circular section. The beads have a slightly biconical perforation in the center, created by bifacial rotation (fig. 29.d-e).

Alongside these beads, a biconvex specimen of clay (fig. 29.f) was discovered in the C2 feature. It had a perforation with a conical morphology (fig. 29.g). Its dimensions are as follows: maximum diameter – 3.2 mm, thickness – 4.6 mm, perforation diameter – 1.8 mm.

◈ Anthropomorphic figurine

An interesting outcome of the 2017 field season at Gumelnița tell settlement is the discovery of an anthropomorphic figurine, preserved in a fragmentary state of conservation (length – 2.5 cm, thickness – 1 cm, weight – 3.8 g) (fig. 30). The figurine was found in feature C3 (s.u. 1017), a pit where pottery, shells, adobe, animal bones and a copper fragment were also found. Only the median part of the figurine is preserved, presenting small breasts. The figurine was made of semi-fine clay with sand and grog in its composition. The representation of the anatomical features resembles the figurines found at Căscioarele (R. Andreescu 2002, pl. 4/3-4; pl. 22/4), Glina (R. Andreescu 2002, pl. 5/1), Gumelnița (Vl. Dumitrescu 1941, p. 97; S. Marinescu-Bîlcu, B. Ionescu 1967, Pl. IV/3), Geangoiești (R. Andreescu 2002, pl. 17/2, 6), and Sultana (R. Andreescu 2002, pl. 33/4). The anthropomorphic representation found at Gumelnița *tell* is a common discovery within the Gumelnița sites. Neither the intentional nor the accidental fragmentation can be established.

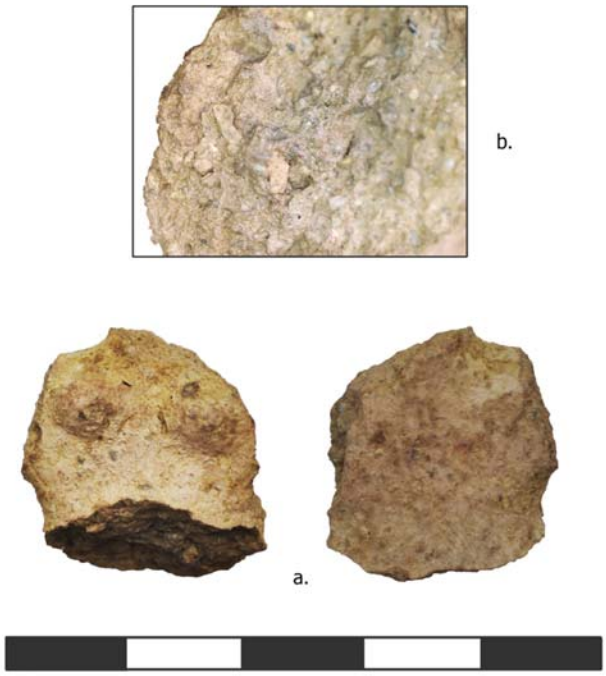

Fig. 30. Fragmentary anthropomorphic figurine: a. front and back view; b. Microsocopic details of clay paste. Scale in cm.
Figurină antropomorfă fragmentară: a. vedere frontală și posterioară; b. detaliu microscopic al pastei. Scara în cm.

◈ Metal items

A particular aspect regarding the Gumelnița tell settlement is represented by the metal items identified during the past excavations, as well as the current excavation.

Various copper utensils and gold ornaments were found during the excavation phases from 1925, 1939, 1960 conducted by Vladimir Dumitrescu as well as the survey by Barbu Ionescu in 1957 (Vl. Dumitrescu 1925, 1966a; E. Comșa 1974; E. Comșa, B. Ionescu 1979; A. Vulpe 1975; S. Marinescu-Bîlcu 1981; C. Bem 2000; I. Mareș 2002).

During the archaeological excavation from 2017, a copper fragment was found in pit C3 from Son DS (Zone 1: Tell settlement), s.u. 1017, in association with pottery, shells, adobe, animal bones and a fragmentary anthropomorphic figurine. The copper fragment (length – 3.2 cm, thickness – 0.2 cm, weight – 0.5 g) presents a round cross-section (fig. 31.a).

The fragment was also studied through XRF method, using an Innov-X Systems Alpha Series portable XRF spectrometer, SiPIN detector, 40kV voltage, 35mA intensity, acquisition time 120s (tab. 18). The studied artefact is rich in copper (97.7%), which indicates that it derived from native copper ores. The minor chemical elements detected such as iron (1.99%) and those found at the limit of detection (strontium and zirconium – 0.001%) could derive from the soil composition, as a large part of the exterior surface of the artefact was affected by corrosion. The low values of lead (0.19%) and arsen (0.13%) indicate that the minor elements were not intentionally added, as their percentages situate below 5% (E. Pernicka 2014, p. 256).

The clean surface of the artefact (1.3 cm from a total of 3.2 cm) was analyzed under a digital microscope (HDM Pro Celestron #44308), which offered us information regarding the technological process. The object was most likely manufactured from a copper wire through cold hammering (Fig. 31.b) which corresponds with the observations made on previous occasions (I. Mareș 2002, p. 64).

Considering the results of the non-invasive XRF analysis performed on the copper fragment from Gumelnița, as well as those conducted on the copper artefacts from Sultana-*Malu Roșu* (C. Lazăr *et alii*, *in press),* Vidra (A. Darie, M. Georgescu 2017*)*, and Luncavița (C. Micu 2005, p. 48) tell settlements, a specific technological pattern could be observed. The Eneolithic utensils are rich in copper, which means that the copper objects from the Gumelnița sites were manufactured from pure copper ores, with values of copper that exceed 90%. The values of the minor elements are influenced by the object's state of conservation, and increased values of iron (around 10%) can be observed on powerfully corroded objects (e.g., Vidra).

Elements (wt %)						
Description	Fe	Cu	Pb	As	Sr	Zr
Copper fragment	1.99	97.7	0.19	0.13	0.001	0.001

Tab.18. Results of the XRF analysis performed on the copper fragment found at Gumelnița tell settlement, using an Innov-X Systems Alpha Series portable XRF spectrometer, SiPIN detector, 40 kV voltage, 35 mA intensity, and acquisition time 120 s.
Rezultatele analizelor XRF realizate pe fragmentul de cupru găsit în așezarea tip tell de la Gumelnița, utilizând spectrometrul Innov-X Systems Alpha Series, detector SiPIN, 40 kV, 35 mA, timp de lucru 120 s.

The composition of the Eneolithic gold artefacts were studied through XRF, micro-PIXE, FRX method (V. Cojocaru, D. Șerbănescu 2002, R. Bugoi *et alii* 2003, Gh. Lazarovici *et alii* 2012,

A. Ilie *et alii* 2017); the results from the EDXRF analysis performed on the gold discoidal pendant discovered at Gumelnița *tell* settlement were also published (V. Cojocaru, D. Șerbănescu 2002, p. 88).

In conclusion, the typo-morphological characteristics of the copper fragment, as well as the results of the XRF analysis are integrated into the broader perspective of the early phases of the copper metallurgy during the Eneolithic period in southeastern Romania with clear analogies across the KGK VI area.

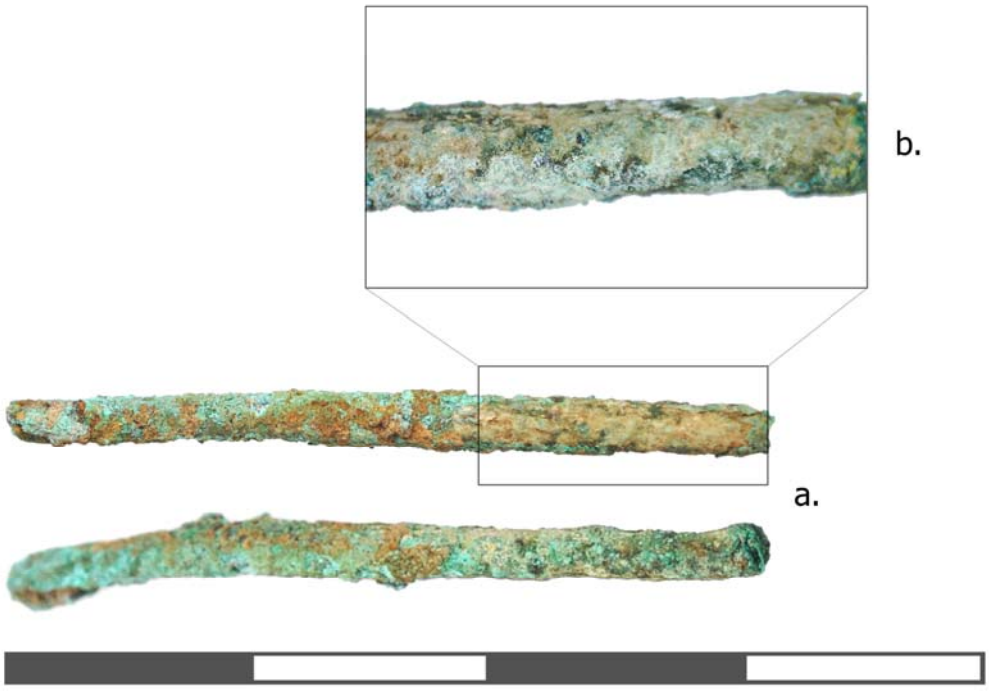

Fig. 31. Fragmentary copper item: a. front and back view; b. Microscopic details of item. Oxidation process as well as traces of cold hammering can be observed. Scale in cm.
Obiect de cupru fragmentar: a. vedere frontală și posterioară; b. detaliu microscopic al piesei. Procesul de oxidare dar și urme ale operațiunii de ciocănire la rece pot fi observate. Scara în cm.

◈ Radiocarbon dates

In order to set the absolute chronology of the researched features from Gumelnița site in 2017, five radiocarbon samples were dated. The samples were collected from grave no. 1 (Zone 3: Terrace area) and some features from Son DS (Zone 1: Tell settlement).

The 14C analysis was performed at RoAMS laboratory, and the results are presented in tab. 19. Calibration (2σ) of the BP dates was made through the OxCal 4.3.2 software (P.J. Reimer *et alii* 2013; C. Bronk Ramsey 2017).

Based on the radiocarbon dating, the results indicate a timespan of 4461 – 4263 cal.BC (95.4% probability). Under these circumstances, we can place the archaeological features from Gumelnița tell settlement investigated in 2017 alongside grave no. 1 (M1) in the A2 phase of Gumelnița culture. That assumption was also sustained by the pottery characteristics.

Sample ID	Feature	Sample material	Quantity	BP	cal. BC(2σ)
655.4	Grave no. 1 (M1)	Human bone (right tibia)	5 g	5527±43	4458 – 4273
656.4	Dwelling no. 2 (L2), s.u. 1032	Animal bone (ovicaprin distal humerus)	5 g	5560±39	4461 – 4340
657.4	Pit C6, s.u. 1031	Animal bone (*Bos taurus* rib)	5 g	5556±41	4462 – 4337
658.4	Pit C2, s.u. 1013	Animal bone (*Bos taurus* tibia)	5 g	5582±36	4486 – 4349
659.4	Pit C5, s.u. 1030	Animal bone (*Bos taurus* scapula)	5 g	5538±37	4453 – 4337

Tab. 19. The results of radiocarbon dating from Gumelnița site (2017 fieldwork).
Rezultatele datărilor radiocarbon din situl Gumelnița (campania 2017).

◈ Conclusions

These are the results obtained by our team in the short two weeks diagnosis campaign in 2017. Obviously, the data are preliminary, and following research will complement this information.

However, the archaeological and palaeoenvironmental data achieved in our research provides a broad picture of the human communities who lived at Gumelnița 6000 years ago.

Interdisciplinary data obtained by us confirm and supplement those known from previous research (Vl. Dumitrescu 1925, 1966a, 1966b; D. Șerbănescu 1985; Vl. Dumitrescu, S. Marinescu-Bîlcu 2001; C. Lazăr 2001; D. Șerbănescu, O. Androne 2016) and on the other hand, set the Gumelniţa site in the broad context of other contemporary settlements from the Balkans in fifth millennium BC.

Perhaps the most important conclusion of our approach is that a small excavation, but with an interdisciplinary research team that can provide the proper analyzes, brings much more significant data about the past communities than an extensive excavation, which is limited to digging and collecting artifacts.

The potential of Gumelnița site is obvious, and our interdisciplinary project will continue on an extended scale in the coming years.

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◈ Author contributions

Cristina Covătaru, Adelina Darie, Mădălina Dimache, Ovidiu Frujina, Theodor Ignat, Cătălin Lazăr, Bogdan Manea, and Vasile Opriș conducted archaeological excavations. Cristina Covătaru made the topographical measurement on the field. Ionela Crăciunescu performed the GIS analysis, and photogrammetric data processing. Dan Ștefan performed the magnetometry and interpreted the results. Constantin Haită made the field cores, assembled and interpreted the geological data, and performed the petrographic determination of flint pieces. Adrian Bălășescu and Valentin Radu assembled and interpreted the zooarchaeological data. Mihaela Golea made the carpological analysis. Mihaela Danu made and interpreted the palynological data. Gabriel Vasile made the anthropological study of human skeleton. Monica Mărgărit and Ovidiu Frujina performed the hard animal material industry analysis. Vasile Opriș, Mădălina Dimache, Theodor Ignat, and Bogdan Manea realized the pottery study. Adelina Darie conducted the analysis of metal item and anthropomorphic figurine. Theodor Ignat and Vasile Opriș performed the flint analysis. Gabriela Sava and Tiberiu Sava performed the radiocarbon dating. Cătălin Lazăr supervised the work and wrote the paper, with input from all co-authors.

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