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## Sântana–Cetatea Veche. A Late Bronze Age Mega-fort in the Lower Mureş Basin in Southwestern Romania

*In memoriam Alexandru Szentmiklosi (1971–2019)*

### Introduction

Because of the site's size and the abundance of archaeological findings, the Bronze Age mega-fort at Sântana–Cetatea Veche has sparked the interest of antiquarians from a very early time onwards. The German settlers who formerly inhabited the area were already aware of the existence of an old fortification just outside of the village, as shown by the first Austrian military survey (1769–1772), which denotes the location of the “*Alte Schanz*”, clearly distinguished from the so-called “*Römer Schanz*” situated nearby (Fig. 2). The same map indicates that a tavern was established on the northeastern corner of the fortification (“*Wirthshaus an der Schanz*”),<sup>1</sup> whose remains are still visible on the ground today. We are clearly dealing once more with an example of historical memory preserved by a local community in a toponym. The name “*Cetatea Veche*”, i.e. “old fort”, was adopted by the Romanian Railways for the since decommissioned train station situated inside the perimeter of the prehistoric fortification.

This very significant archaeological site is situated in southwestern Romania, 15 km west of the Apuseni Mountains and 25 km from the point where the Mureş River exits from the mountain gorge (Figs. 1, 28,7). The fortification was erected upon a higher part of the plain, sheltered from the periodic floods of the Mureş River, which today flows at a distance of 20 km from the site. Flood control and marsh-draining works undertaken by the authorities of the Habsburg Empire during the 18<sup>th</sup> and 19<sup>th</sup> centuries have dramatically changed the landscape of the region. The palaeo-environmental analyses in conjunction with the study of the region's oldest maps have unveiled the image of a region with a strong tendency towards



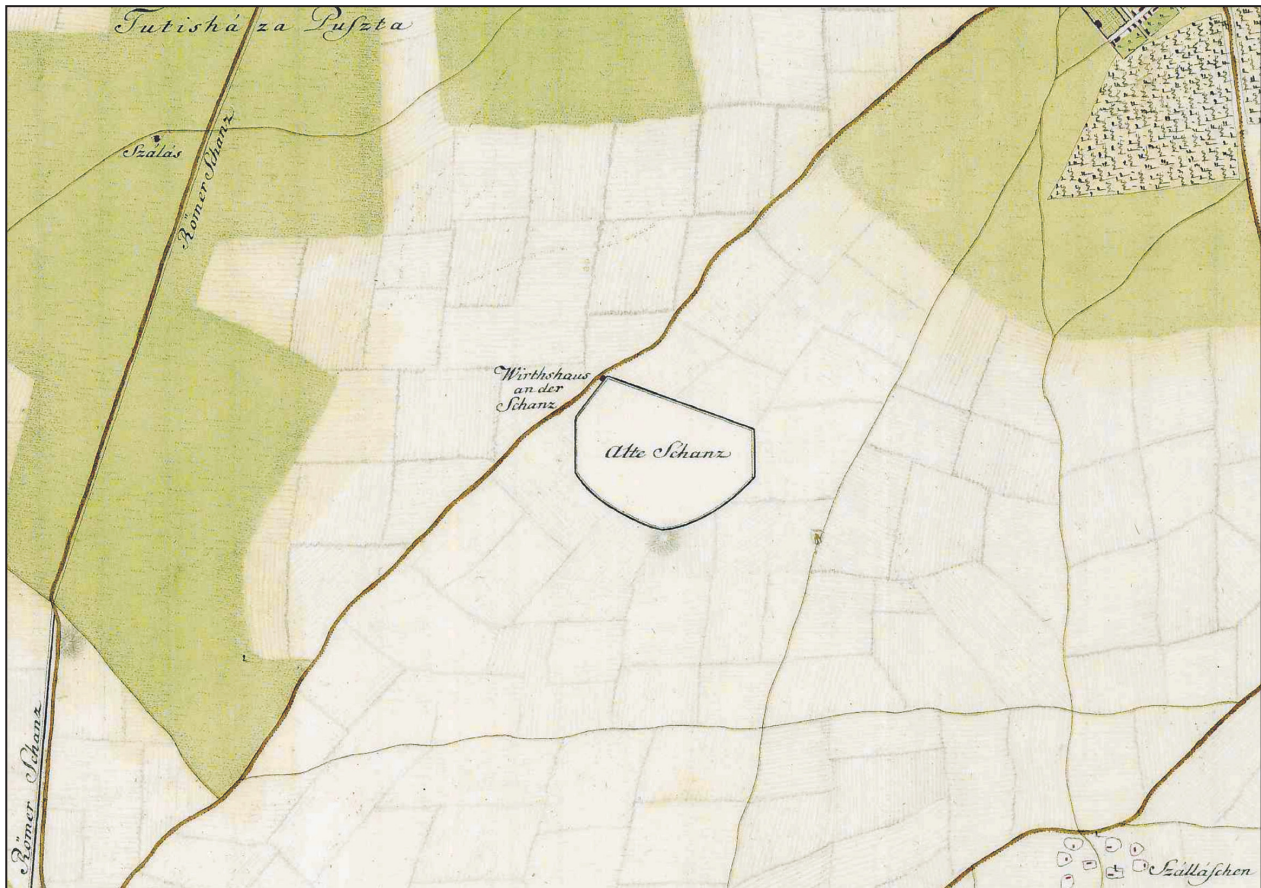
**Fig. 1** Map of the Intra-Carpathian region and the administrative map of Romania with the location of Sântana (the map of the Intra-Carpathian region was realised by H. Balész, source: <http://www.ace.hu/igcp442/maps.html>; the administrative map of Romania was elaborated by the authors)

flooding and marsh formation, especially in the lowland areas. The numerous watercourses of the plain together with the multiannual flooding of the Mureş River ensured the perpetuation of a marshy scenery. Furthermore, the high density of watercourses throughout the plain led to the fragmentation of the entire Lower Mureş Basin.<sup>2</sup>

In the following the most recent results produced by archaeological research at Sântana–Cetatea Veche in 2018 will be presented. Even though many of the aspects presented below, such as the history of research at this place, have already been published early on, we believe that it is important to precisely

<sup>1</sup> [www.mapire.eu](http://www.mapire.eu).

<sup>2</sup> Blazovich 1996; Gyucha/Duffy/Frolking 2011; Gulyás/Sümegei 2011a; 2011b; Sümegei *et al.* 2011; Salisbury/Bácsmegei/Sümegei 2013; Sava 2015, 12–15. The Italian cleric Rogerius (Rogerio di Puglia) offers a concise description of the landscape of the Criş and Mureş River Basins in his famous *Carmen miserabile (Epistola magistri Rogerii in miserabile carmen supra destructione regni Hungariae per tartaros facta)* written in the mid-13<sup>th</sup> century AD (Rogerius XXXIV–XXXIV).



**Fig. 2** The fortification at Sântana (“Alte Schanz”) and the “Wirtshaus an der Schanz” on the map of the first military survey of the Habsburg Empire (1769-1772) (source: www.mapire.eu)

establish the extent of our comprehension concerning the archaeological realities of the site. Recent research there was carried out within the framework of the LOEWE project “Prehistoric Conflict Research – Bronze Age Hillforts between Taunus and Carpathian Mountains”, abiding by its main scientific guidelines.<sup>3</sup> In addition to the archaeological excavations, the research effort also included the magnetometric survey of the entire area of the fortification coupled with a LiDAR scanning of a territory measuring nearly 850 ha. The archaeological excavation undertaken in the eastern part of the defensive line pertaining to enclosure III, has produced new absolute chronological data which in conjunction with previously obtained chronological information placed the fortification in the interval between the 15<sup>th</sup> and 13<sup>th</sup> centuries BC.

## History of research

As it was common at that time, the site drew the attention of local antiquarians during the 19<sup>th</sup> century:<sup>4</sup> The first detailed description of the “old fort” was published by Sándor Márki towards the end of the century.<sup>5</sup> Nonetheless, it is quite surprising that even though decades earlier an important Bronze Age gold hoard was discovered (**Fig. 3**),<sup>6</sup> this remarkable find did not generate immediate interest among local antiquarians. In spite of appeals for investigation made by the Hungarian Archaeological Society in Budapest, or later by Constantin Daicoviciu, director of the

<sup>3</sup> Hansen/Krause 2018b.

<sup>4</sup> Fábrián 1835, 91; Parecz 1871, 8. 19; Miletz 1876, 166-167; Péch 1877.

<sup>5</sup> Márki 1882, 112-121; 1884, 185-194.

<sup>6</sup> Hampel 1889, 375; 1890, 190; Márki 1892, 34. 39-41; Dörner 1960; Rusu 1972, 49 no. 58; Mozsolics 1973, 208 Taf. 104. 105; Rusu/Dörner/Ordentlich 1996 Pl. XII-XIII; Kemenczei 1999, 67, Kat. 52; Rusu/Dörner/Ordentlich 1999 Abb. 13-14.





Fig. 3. Sântana–Cetatea Veche. Gold artefacts from the hoard discovered in 1888 (the archive of the Museum of Arad)

Archaeological Institute in Cluj, the situation remained unchanged: No archaeological research of the site was initiated.<sup>7</sup>

Following the end of World War II and the instatement of the communist regime in Romania, all archaeological institutions were restructured. At the beginning of the 1950s numerous young archaeologists took on positions in these institutions, among them Egon Dörner at the Regional Museum in Arad and Mircea Rusu at the Institute of Archaeology in Cluj. Both were born in Arad County and bound by a lifelong friendship, circumstances which eventually prompted them to engage jointly in the commencement of archaeological research at Sântana–Cetatea Veche. Basing on a series of short unpublished reports found in the archive of the Museum of Arad, we know that the first small-scale excavations were undertaken at Sântana in the year 1952. Moreover, from the very start the Bronze Age pottery recovered from the surface during fieldwork proved that they were dealing with a prehistoric site and not a site of the Avar period, as previously thought. The dating was

corroborated by subsequent small-scale excavations and surveys carried out during the next year.<sup>8</sup>

Although the initial archaeological investigations were conducted at Sântana–Cetatea Veche in 1952, systematic research campaigns began only a decade later, in the summer of 1963. The research team included Mircea Rusu from the Institute of Archaeology in Cluj-Napoca, Egon Dörner, head of the Department of Ancient History and Archaeology in the Museum of Arad, as well as Ivan Ordentlich from the County Museum of Oradea. The first campaign focused on investigating the northern part of enclosure III, the northwestern part of enclosure I, while two further trenches were opened inside the same enclosure (see below Fig. 6). A total number of four trenches were opened during this first campaign. As a result of these investigations, the fortification at Sântana was dated unequivocally to the late stages of the Bronze Age.<sup>9</sup> The first report concerning the results of this campaign was published in the Ro-

<sup>7</sup> Gogâltan/Sava 2010, 17-18.

<sup>8</sup> Gogâltan/Sava 2010, 20-21.

<sup>9</sup> Horedt 1967a, 149; 1967b, 21; Rusu 1969; Horedt 1974, 224 no. 19; Dörner 1976, 42-44.





Fig. 4. Sântana-Cetatea Veche. Aerial photography of the fortification, April 2014 (photo by the authors)

manian language in 1996,<sup>10</sup> followed by its translation into German in 1999.<sup>11</sup> Both reports focus on general descriptions regarding the finds from every trench, display abundant illustrations and emphasise the chronology of the artefacts, especially the metal objects.

In 2008, 45 years later, as a result of a collaboration between the Museum of Arad and the Institute of Archaeology and Art History in Cluj-Napoca, the University of Bochum (Professor Tobias L. Kienlin), the West University in Timișoara (Professor Dorel Micle), the first small scale magnetometric survey were carried out on the site, covering the southeastern part of the fortification.<sup>12</sup> In 2009 rescue excavations had to be undertaken in the area of the defensive enclosure III, due to the construction of a new gas pipeline. Additionally, two further trenches were opened inside the respective perimeter.<sup>13</sup> In 2011 the northern part of the site was re-

searched again with new small-scale excavations, with the aim of understanding the stratigraphy of the respective area.<sup>14</sup>

During 2014 and 2015, a series of field surveys and aerial archaeological surveys were carried out within the framework of the project entitled “Living in the Bronze Age Tell Settlements. A Study of Settlement Archaeology at the Eastern Frontier of the Carpathian Basin”, hosted by the Institute of Archaeology and Art History from Cluj-Napoca (Romanian Academy of Sciences) (Fig. 4).<sup>15</sup> The research efforts concentrated mainly on a number of Middle Bronze Age sites in the vicinity of Sântana, and only partially on the site at “Cetatea Veche”.<sup>16</sup> Systematic research of the respective site was widely adopted in 2018 in the collaboration between the

<sup>10</sup> Rusu/Dörner/Ordentlich 1996.

<sup>11</sup> Rusu/Dörner/Ordentlich 1999.

<sup>12</sup> Gogâltan/Sava 2010, 27.

<sup>13</sup> The preliminary results of the excavations were published in Gogâltan/Sava 2010, while the Eneolithic finds were discussed in Sava *et al.* 2014 and Sava 2015,

51-54, 227-230, 233-234. In addition to aforementioned publications, the Bronze Age finds which came to light in 2009 were also partially addressed in Gogâltan/Sava 2012; Gogâltan/Sava/Mercea 2013; Gogâltan/Sava 2018; Sava/Gogâltan/Krause 2019.

<sup>14</sup> The majority of finds as well as the identified features belong to the Eneolithic period (Baden Culture), see Gogâltan/Sava/Mercea 2012; Sava 2015, 52-53.

<sup>15</sup> Gogâltan/Cordoș/Ignat 2014; Gogâltan 2016.

<sup>16</sup> Sava 2014.



Museum of Arad, the Goethe University in Frankfurt am Main and the Institute of Archaeology and Art History in Cluj-Napoca. The project was generously financed by the LOEWE program “Pre-historic Conflict Research – Bronze Age Hillforts between Taunus and Carpathian Mountains”.

### Geomagnetic prospection and 3D-landscape modelling

The magnetometric prospection in 2018 was carried out by Dr. Arno Patzelt & Partner in two campaigns. Accordingly, the first campaign took place parallel with the archaeological fieldwork during July 2018, while the second campaign was organized later that year in October. In order to cover the entire fortification, the area included in the geophysical survey was extended to 102 ha (Fig. 5). No information could be gathered, however, from a number of areas, such as the railway line crossing roughly through the middle of the site, the gas pipelines, the transmission towers and in addition a small area in the northern part of the site where the ruins of the former Sântana–Cetatea Veche train station can be located. The obvious aim of these investigations was to identify the defensive elements and their characteristics, together with the evolution of the habitation within the perimeter of these defences. As we shall see, in order to ensure a better understanding of the structure of the site, the extension of the geophysical survey area was necessary.

The magnetometric anomalies confirmed the existence of at least three defensive systems, which since the 1963 investigations are designated enclosures I, II and III (Fig. 6). Traces of huge amounts of burnt material such as clay at the surface, as well as the results of the archaeological investigation confirmed that the fortifications had all burned down. Enclosure I has an approximately rectangular shape with rounded corners, measuring almost 20 ha. Its defensive architecture consists of a ditch and palisade. The results of the magnetometric survey suggest that the defensive system was not built uniformly: the northeastern side only displays a palisade, while the rest of the perimeter incorporates more complex defences consisting of a rampart<sup>17</sup> and ditch combination. Unquestion-

ably, the interpretation of the magnetometric data needs to be validated in detail by archaeological excavations. The entire perimeter seems to have had a single gate, positioned in the northwestern corner and constructed in the so-called “*en chicane*” technique, which thus sets it apart from the cases documented at Cornești–Iarcu<sup>18</sup> and Csanádpalota–Földvár.<sup>19</sup> The closest analogy can be found at Munar–Wolfsberg (Fig. 28). Nevertheless, without proper archaeological investigations it remains uncertain as to whether the respective gate belongs to the Middle Bronze Age tell or to the large Late Bronze Age fortified settlement from Munar.<sup>20</sup>

Enclosure II displays a different defensive system (Fig. 6), apparently consisting of a ditch and palisade combination, whereby the palisade shows traces of fire in various places. No traces of a rampart can be seen on the ground today, nor in the magnetometric anomaly map, as is the same case with the other two enclosures I and III. The constructors of this defensive area seem to have focused on the integration of the old watercourse that originally bordered enclosure I. A similar strategy was employed at Cornești–Iarcu through the extension of the second ring and the integration of the Carani and Lacului valleys.<sup>21</sup> Still, the reasons behind such measures are difficult to explain. The defences in this part of enclosure II could only fulfil their role efficiently in conjunction with the eastern and northeastern part of the so-called enclosure III. Indeed, as shown below in detail, our excavations in the summer of 2018 resulted in the identification of two construction phases of the palisade/timber and clay wall. Furthermore, it is possible that the four interruptions in the ditch are in fact the entrances into the fortification.

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Valley. The palisade proper, as will be shown below, was incorporated into a wood and clay structure, resulting in a wall with a thickness of more than 1 m constructed on the edge of the rampart.

<sup>18</sup> Szentmiklosi *et al.* 2011 Figs. 12–13; Heeb *et al.* 2012 Abb. 6; Heeb/Jahn/Szentmiklosi 2014, 19–20 Fig. 19; Szentmiklosi *et al.* 2016, 106 Fig. 1.2; Heeb *et al.* 2017b, Fig. 5; 2018 Abb. 3.

<sup>19</sup> Szeverényi/Priskin/Czukur 2014 kép 7; Czukur *et al.* 2017 kép 2; Szalontai *et al.* 2017 ábr. 3.

<sup>20</sup> Gogáltan 2016, 93–94 Fig. 5; Sava/Gogáltan 2017, 91 Figs. 10–13.

<sup>21</sup> Szentmiklosi *et al.* 2011 Fig. 2; Nykamp 2017, 30 Figs. 14–15; Heeb *et al.* 2018 Abb. 1; Krause *et al.* 2019, 136 Abb. 3–4; Lehmphul *et al.* 2019, 254 Fig. 1.

<sup>17</sup> Henceforth, the term “palisade/wall” will be used with regard to the hitherto unique situation documented in Late Bronze Age mega-forts in the Lower Mureș



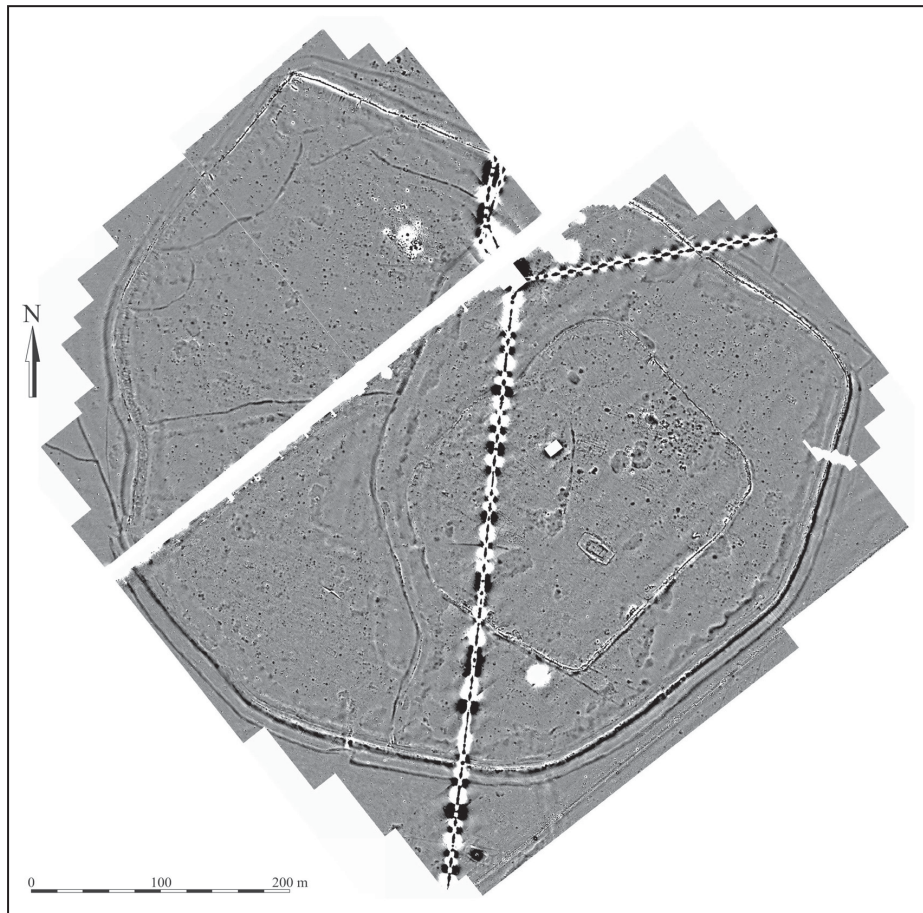


Fig. 5. Sântana-Cetatea Veche. The magnetometric survey of the fortification (magnetogram by Dr. Patzelt & Partner)

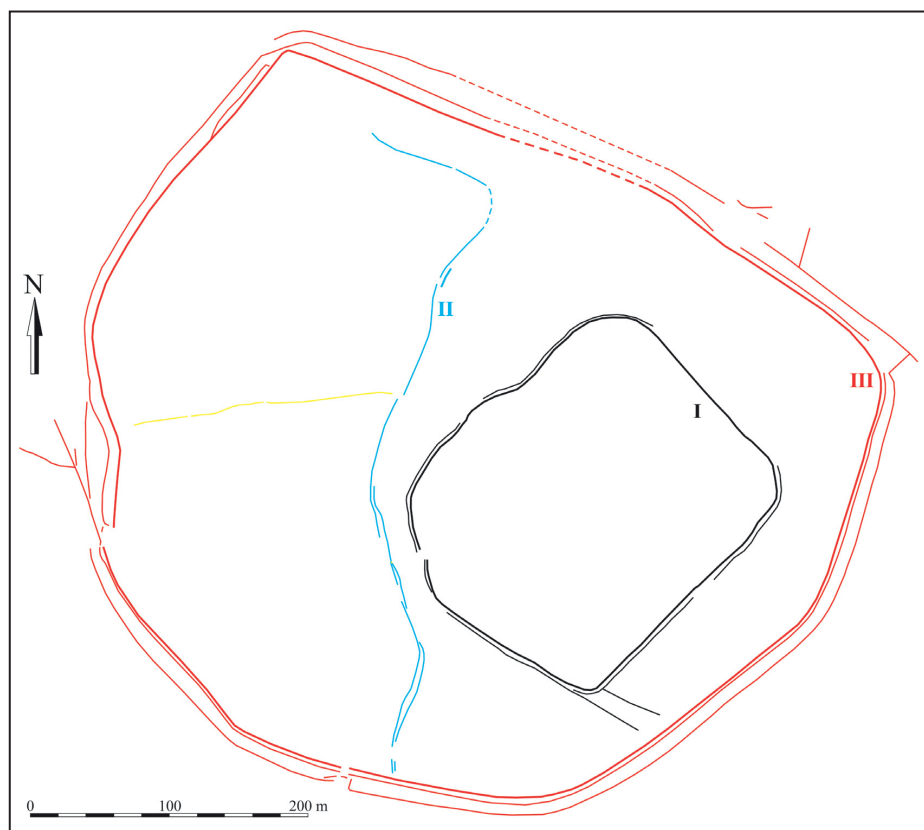


Fig. 6. Sântana-Cetatea Veche. Plan of the main defensive systems (enclosures I-III) (plan by the authors)





**Fig. 7** Sântana-Cetatea Veche. Plan showing the main defensive systems and the buildings identified in the magnetometric survey (plan by the authors)

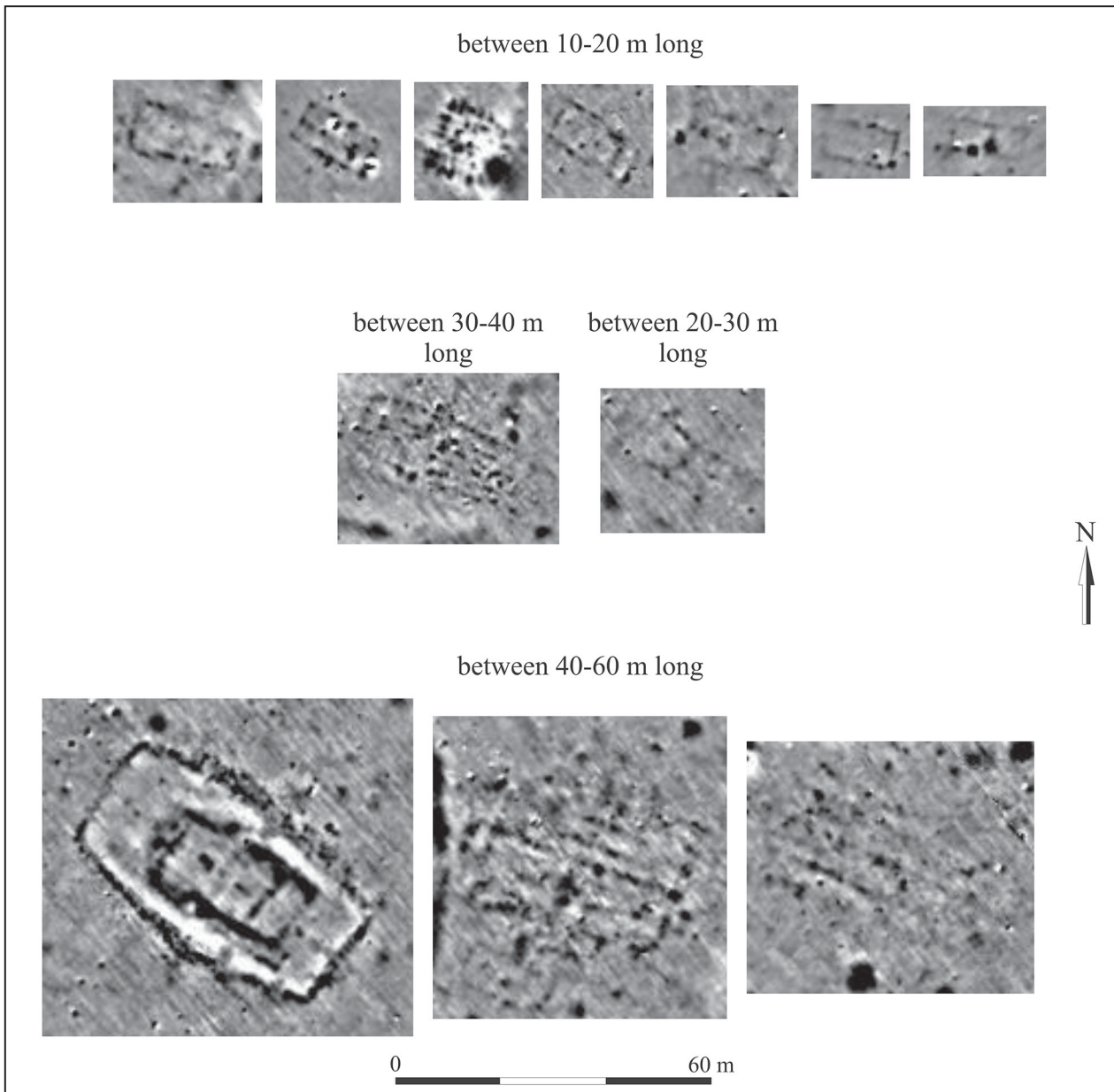
The largest enclosure III at Sântana-Cetatea Veche, covers an area of approximately 90 ha and has mostly an oval shape, whereas its northern side is almost straight (**Fig. 6**). In this case, the results of the magnetometric investigation were confirmed by the three campaigns of archaeological excavations undertaken in 1963, 2009 and 2018. Accordingly, the defensive elements of enclosure III are composed of a large earthen rampart, a palisade or a timber-and-daub wall built on the edge of the rampart and two ditches that ran along most of the enclosure's length. The northern and eastern sector of the palisade or timber-and-clay wall was certainly destroyed in a massive fire. The strong anomaly recorded on the eastern, southern and southwestern segments is a result of the wall's remains being washed into the defensive ditch below. The two ditches run along most of the rampart's length with the exception of the western side, where the magnetometric data suggests the existence of a single ditch. Moreover, it should also be noted that on a small part of the northern sector of enclosure III, on the line of the gas pipeline, the ditches are ab-

sent. This is the area where the enclosure and the old watercourse meet. Here it seems that the two ditches running along the rampart were relocated along the watercourse. Further, it can be noted that in certain parts, such as the northeastern corner and the area in the vicinity of the southwestern gate, the distance between the ditches and the rampart increases. On the southwestern side the rampart is interrupted in two places, most likely these being the only entrances to enclosure III. These entrances or gates seem to be blocked by ditches positioned in front of them, most likely intended as a defensive measure. Visible in back of the rampart running along enclosure III are clay extraction points, just as in the case of the first and second ring enclosures in Cornești-Iarcuri.<sup>22</sup>

In addition to the three fortifications that are actually visible on the ground, the magnetometric survey identified further ditches inside the fortification, which are situated in the western half of enclosure III (**Fig. 6**). One of these ditches, which

<sup>22</sup> Szentmiklosi *et al.* 2011 Fig. 12a-c.





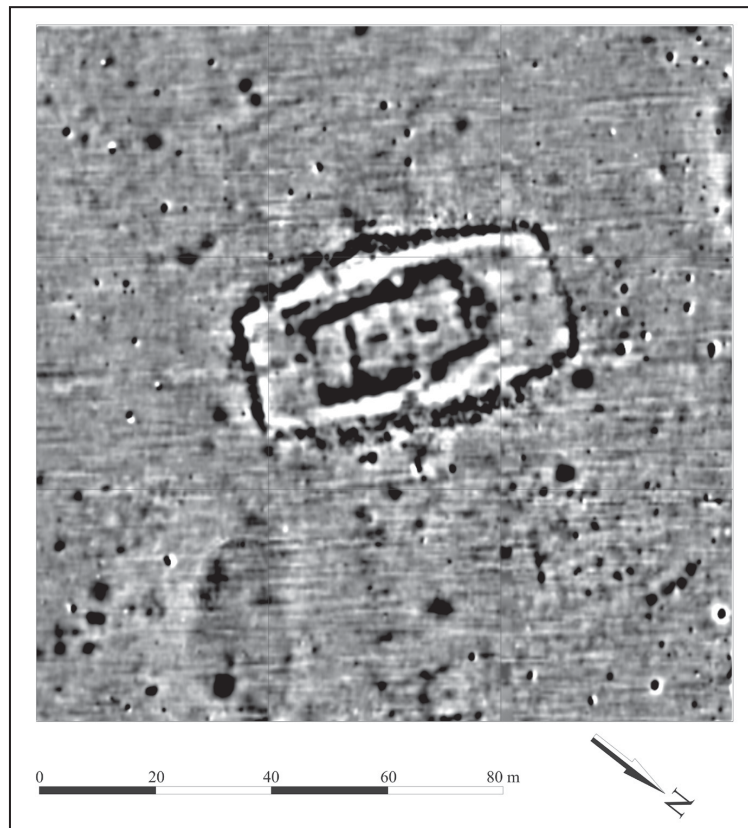
**Fig. 8** Sântana–Cetatea Veche. Examples of buildings identified in the magnetometric survey, arranged according to their length (illustration by the authors)

separates the entire area along an east-west axis, seems to be oriented towards the north; this was deduced in view of a clay extraction point located behind the ditch. Other ditches delimit larger as well as smaller areas in the northwestern corner of enclosure III. Some of the interruptions might indicate possible entrances to the fortification, but this hypothesis needs to be validated by archaeological research. Furthermore, the aforesaid inner ditches may possibly demarcate areas with various economic functions or even residential areas, considering the high density of surface dwellings within the northwestern sector of enclosure III (**Fig. 7**).

A further surprising fact provided by the magnetometric survey is the existence of a complex

system of ditches outside enclosure III. Considering the size of the researched area, it is impossible to state with certainty at this time whether we are dealing with newly discovered defensive works, or whether these ditches had an altogether different role. The fact that a ditch situated in the western sector of the fortification, north of the railway line, is in reality the continuation of enclosure III's inner ditch, seems to indicate a certain degree of contemporaneity between the two ditches. For example, similar ditches positioned outside of the fortification are also present in Csanádpalota–Földvár<sup>23</sup> and

<sup>23</sup> Szeverényi *et al.* 2017, 138-139 Fig. 5.



**Fig. 9** Sântana–Cetatea Veche. The largest building structure discovered 2018 at Sântana (magnetogram by Dr. Patzelt & Partner)

Makó–Rákos-Császárvár,<sup>24</sup> both located not too far from Sântana–Cetatea Veche (**Fig. 28**), as well as at Gradište Idjoš in the Serbian Banat.<sup>25</sup>

In addition to the identification of the main defensive elements of the mega-fort at Sântana–Cetatea Veche, the magnetometric survey offered a first insight into the dynamics of habitation within this fortification (**Fig. 7**). The identified structures are concentrated in the smallest enclosure I as well as in the northern corner of enclosure III. The space between these structures varies, depending on the dimensions of the buildings. Even though a certain degree of linearity can be observed with regard to their layout, such an assertion can only be substantiated by means of archaeological research once the chronological relation between the buildings is determined (**Fig. 8**). At any rate, the situation differs from that of the dwellings investigated inside the Late Bronze Age fortifications in Cornești–Iarcuri<sup>26</sup> and at Căuaș–

Sighetiu, which thus far represents a unique situation with regard to the realities of the eastern Carpathian Basin.<sup>27</sup> A further aspect that should be noted is the lack of dwellings in the area of the watercourse and the absence of fort gates.

There are quite a few cases in which the shape of the structures as well as their interior partition can be studied based on the geophysical data. What we can determine so far is that the constructions are rectangular, some of them displaying multiple compartments, the majority having a north-northwest – south-southwest orientation (**Fig. 8**). Most structures display a length between 10 and 20 m; however, some of the constructions are truly impressive in terms of size, with lengths exceeding 40 m. Indeed, one of the buildings situated inside enclosure I is ca. 60 m long and 40 m wide, and the geomagnetic structures of at least two large complexes can be recognised (**Fig. 9**). Here we expressly warn against any overly hasty attempt at interpreting this unusual find complex, for the geomagnetic findings and structures exhibit constructions that might belong to different contexts and buildings.

<sup>24</sup> Szeverényi *et al.* 2017, 139. 141 Fig. 6.

<sup>25</sup> Molloy *et al.* 2017, 164-165 Fig. 2.

<sup>26</sup> Lehmphul *et al.* 2018, 38-43; Heeb *et al.* 2018 Abb. 4; Krause *et al.* 2019, 143. 145-146 Abb. 12. 15-17. 20; Lehmphul *et al.* 2019 Fig. 13.

<sup>27</sup> Kienlin/Marta 2014, 385-392.





Fig. 10. Sântana–Cetatea Veche. Aerial photography of enclosure I (photo by N. Kapcsos)

From the very beginning it was noticed that the respective structures were positioned in an area with higher elevation, which is in fact the most visible point within the fortification, as shown by the digital terrain model (Fig. 11). The freshly ploughed field revealed a large quantity of burnt daub fragments, some quite large in size, deriving from the demolition of the building's walls, as well as typical Late Bronze Age II (Reincke Bronze C and D) pottery fragments. The fact that we are dealing with a structure of impressive dimensions is also suggested by the lighter colour displayed by the surface of the mound, due to the high concentration of daub fragments and traces of burning, a situation usually only encountered along the burnt rampart parts in enclosures I and III (Fig. 10). On the other hand, we must repeat our counsel against hasty interpretations of this find context. Namely, the geomagnetic anomalies and the structures deduced from it must first be verified through archaeological excavations. Investigations in the area of this specific structure began in 2019; the first results will be presented in a forthcoming publication.

Geomagnetic survey is an essential part of every modern archaeological research; however, the results need to be validated by archaeological investigations in order to avoid the risk of speculation. Accordingly, invasive methods are essential in the analysis and interpretation of any archaeo-

logical context, especially in the case of Sântana–Cetatea Veche, where several Eneolithic features are known in addition to places of medieval and modern structures. Comparing the magnetometric data of Sântana–Cetatea Veche with similar coeval fortified settlements on the lower course of the Mureş River, one can note both marked similarities as well as considerable differences. First of all, the ditches in Sântana–Cetatea Veche, when compared with those of the Early- and Middle Bronze Age tells in the region,<sup>28</sup> seem to have lost their central defensive role.<sup>29</sup> Emphasis was placed by the constructors of the period on the massive ramparts built in various techniques and completed by strong palisades and earthen walls.<sup>30</sup>

With regard to the differences, the most significant aspect concerns the relatively large number of buildings identified at Sântana–Cetatea Veche, as well as their dimensions. For example, at Corneşti–Iarcuri only a small number of rectangular structures could be documented, each with lengths varying between 10 and 20 m.<sup>31</sup> During

<sup>28</sup> Gogâltan 2016, 92 Fig. 5, 95, 8, 96, 9, 97, 10.

<sup>29</sup> Gogâltan/Sava 2010, 33, 36; Szentmiklosi *et al.* 2011, 826 Fig. 4; Szentmiklosi *et al.* 2016, 110 Fig. 4; Szeverényi *et al.* 2017, 138–139.

<sup>30</sup> Gogâltan/Sava 2010, 29–30; Szentmiklosi *et al.* 2011, 826 Figs. 4–7; Szeverényi *et al.* 2017, 141.

<sup>31</sup> The first enclosure comprised a single, relatively small-sized rectangular building (Heeb *et al.* 2012 Abb. 7).



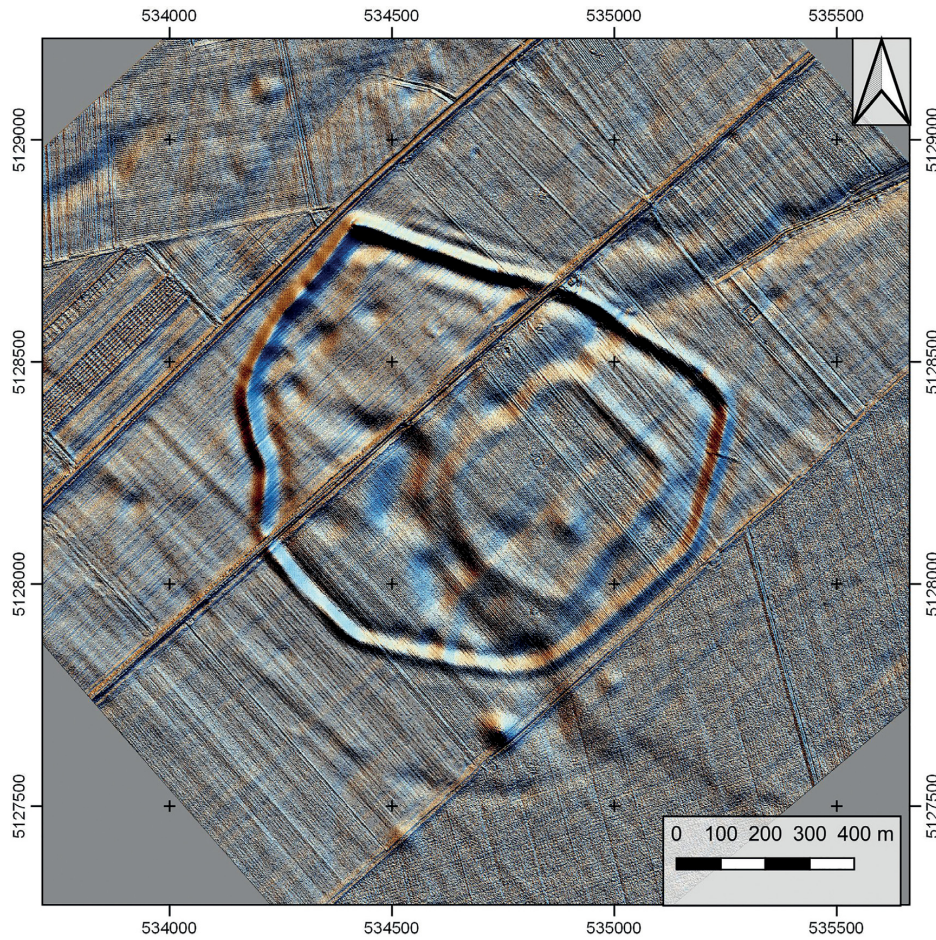


Fig. 11 Sântana–Cetatea Veche. The LiDAR survey of the fortification and of its surroundings (National Institute for Aerospace Research, Bucharest; data processing and mapping by F. Becker)

the 2013 campaign a 16-m long and 10-m wide rectangular structure with two compartments was investigated. The charcoal remains offered a wide dating, which covers a period set between 1610 and 1210 cal BC, the latter date representing the *terminus post quem* for the respective structure.<sup>32</sup> In the case of Csanádpalota–Földvár, neither the magnetometric survey nor the rescue excavation carried out there in 2011 managed to identify surface structures that are similar to those documented in Sântana–Cetatea Veche. The same can be stated concerning the fortifications at Gradište Idjoš<sup>33</sup> and Munar–Wolfsberg.<sup>34</sup> The closest, albeit still quite relative analogy for the large structures

Recently further structures were identified in the second enclosure; however, their interpretation is somewhat problematic. These structures seem to have been constructed exclusively of rammed earth (Lehmpful *et al.* 2018).

<sup>32</sup> Heeb *et al.* 2018, 398 Abb. 4; Krause *et al.* 2019, 143, 145 Abb. 11-14.

<sup>33</sup> Marić *et al.* 2016; Molloy *et al.* 2017.

<sup>34</sup> Gogâltan 2016, 90-94; Sava/Gogâltan 2017.

constructed inside the fortifications has been hitherto found at Lăpuș, in northwestern Romania, located at a considerable distance from Sântana. Recent excavations in Lăpuș, which focused on so-called tumulus 26 have highlighted numerous burnt and superimposed rectangular structures with a north-northwest – south-southeast orientation. The largest building documented at Lăpuș was 22 m long and 11 m wide and fitted with a porch façade and a central hearth. It has been compared to the structure of a *megaron*.<sup>35</sup>

In October 2018 the LiDAR scanning of the fortification and its surroundings was undertaken in an area covering up to 850 ha. The scanning and the aerial photography was carried out by the National Institute for Aerospace Research “Elie Carafoli”/I.N.C.A.S. Bucharest, with the use of a Hawker Beechcraft King Air C90-GTx model plane equipped with a Giegl LMS Q680i system.

<sup>35</sup> Metzner-Nebelsick/Kacsó/Nebelsick. 2010, 221-222, 224 Fig. 4; Kacsó/Metzner-Nebelsick/Nebelsick 2011, 347-349.



The highly important aspect with regard to the relation of the mega-fort at Sântana–Cetatea Veche and its surroundings has already been highlighted (Fig. 11). As mentioned above, it seems that the position of enclosure I was determined by the watercourse found there. At a certain point, due to natural causes (possibly drought or the shift in the watercourse), or human intervention, the riverbed had either dried out or was drained, and part of enclosure III was erected upon it.<sup>36</sup> Furthermore, the digital terrain model shows that the largest and most complex construction at Sântana–Cetatea Veche (Figs. 9–10) was situated upon a small hill, which offered good visibility over the entire area. Moreover, the existence of three other artificial mounds in the southern and southeastern part of enclosure III should also be noted.

### The archaeological excavations 1888–2018

The first small-scale archaeological investigation at Sântana–Cetatea Veche was carried out in 1888 by Aurel Török, prompted by the discovery of the gold hoard. Although the results of the excavation were never published, it seems that the finds comprised three inhumation burials and several pottery fragments.<sup>37</sup> As stated above in the section concerning the history of research, the investigations were effectively put on hold for more than half a century until the small campaign by Egon Dörner and Mircea Rusu took place, which was aimed at the chronological evaluation of the fortification.<sup>38</sup> The first systematic campaign was further delayed until 1963,<sup>39</sup> this investigation focusing on the northern part of enclosure III. Two construction phases were identified, each with its own defensive ditch. Furthermore, the edge of the rampart revealed the presence of a timber palisade. In the same area, behind the rampart, an inhumation burial assigned to the Late Bronze Age was discovered. The second trench was aimed at assessing the northwestern side of enclosure I. Based on the publication, the de-

fences in this sector consisted solely of a simple palisade. A further two trenches were opened in the interior of the same enclosure, both yielding pottery finds, bronze artefacts, and burnt clay platforms interpreted as traces of dwellings. Two such approximately rectangular structures measuring ca. 14/15 × 8 m were investigated. Based on these excavations the authors of the investigations concluded that Sântana–Cetatea Veche had two phases of evolution: the first one typical for Bronze Age D, when the first defensive elements were constructed, and the second phase dated to the Hallstatt A1 period, during which the fortification was extended to 80 ha.<sup>40</sup>

The next archaeological excavations took place only after almost half a century later, when the expansion of the gas pipeline network during 2009 affected certain parts of the fortification at Sântana–Cetatea Veche. Although a major pipeline was already in place since the time of the communist regime, a ramification was added to the network towards the town of Pâncota, which cut through the northern defences of enclosure III. Consequently, a team composed of archaeologists from the Museum of Arad and the Institute of Archaeology and Art History in Cluj-Napoca carried out rescue excavation work in autumn 2009. A total of three trenches were opened, one of which sectioned the defense line of enclosure III, while the other two trenches were placed in the interior of the fortification.<sup>41</sup> Trench S1, perpendicular to the defensive system, initially measured 80 × 4 m, but was later widened to 6.5 m in the front and the back of the rampart. The investigation showed that the rampart was made of rammed earth and was 27 m long and approximately 2.5 m high. In order to ensure its stability, the rampart was built upon a bed of beams enforced with rocks. A palisade and a wall made of large wooden posts joined with planks and wattle coated with clay were erected on the edge of the rampart. Approximately 8 m in front of this rampart a 10-m wide and 3-m deep ditch was dug.<sup>42</sup> Three burials were revealed, two inhumations and one cremation, in back of the rampart as well as in the earthen lenses.

<sup>36</sup> Based on the data gathered on the occasion of the 2009 campaign, the hypothesis whereby the watercourse was deviated in order to fill the ditch pertaining to enclosure III, was put forward (Gogâltan/Sava 2010, 36).

<sup>37</sup> Dörner 1960, 472; Gogâltan/Sava 2010, 17.

<sup>38</sup> Gogâltan/Sava 2010, 20–21.

<sup>39</sup> Rusu/Dörner/Ordentlich 1996; 1999.

<sup>40</sup> Rusu 1969, 1298; Dörner 1976, 42–44.

<sup>41</sup> The preliminary results of this campaign were presented shortly after the conclusion of the investigations (Gogâltan/Sava 2010).

<sup>42</sup> See the graphical reconstruction of this part of enclosure III in Oltean 2016, 9 and Gogâltan/Sava 2018 Fig. 2.



Fig. 12 Sântana–Cetatea Veche. Aerial photography of trench S5, enclosure III. July 2018 (photo by the authors)

All of the burials were heavily disturbed; they were ascribed to the Late Bronze Age.

Excavation trenches S2 and S3 were opened in back of the clay extraction pit for the construction of the rampart.<sup>43</sup> The initial dimensions of the trenches were 10 × 1.5 m; they were extended later in order to allow the comprehensive examination of the archaeological features identified. The features comprised two Late Eneolithic pits belonging to the Baden Culture, a Late Bronze Age pit and a semi-subterranean house of modern times.

Owing to the lack of sufficient funds the investigation in the summer of 2011 was limited to a single trench (S4) measuring 3 × 3 m. The trench was opened at 20 m northwest-west from the gas pipeline in the northwestern area of enclosure III. Its aim was to clarify the stratigraphic sequence in this part of the fortification and additionally to identify a possible habitation level that might be contemporary with the third enclosure. With regard to the stratigraphy, it should be noted that the artefacts found above the level of -0.45 m were without ex-

ception in secondary position due to agricultural activity. The finds include a number of Late Eneolithic pottery fragments, as well as pottery sherds decorated with channels typical for the Late Bronze Age. Under this mixed layer emerged a habitation level belonging to the Baden Culture.

As mentioned above, the systematic research of the site recommenced in 2018 as a result of the partnership between the Museum of Arad, the Goethe University in Frankfurt am Main and the Institute of Archaeology and Art History in Cluj-Napoca. In the summer of 2018 the defences of enclosure III were once again investigated with the aim of clarifying a series of features with regard to the construction method employed as well as to collect samples for radiocarbon dating. Trench S5 measuring 62 × 3 m was opened in the vicinity of the eastern corner of enclosure III (Fig. 12). To our surprise the investigation there revealed archaeological structures, which had not been observed during the 2009 campaign. Specifically, at a distance of 400 m to the east, the defences consisted of a rampart, palisades/walls in two construction phases, both destroyed by fire, as

<sup>43</sup> See Gogâltan/Sava 2010 Fig. 17.





Fig. 13 Sântana–Cetatea Veche. Aerial photography of trench S5, enclosure III with two ditches. July 2018 (photo by the authors)



Fig. 14 Sântana–Cetatea Veche 2018. The southern profile of trench S5, enclosure III. Detail of the earth rampart and the first ditch in the foreground (photo by the authors)



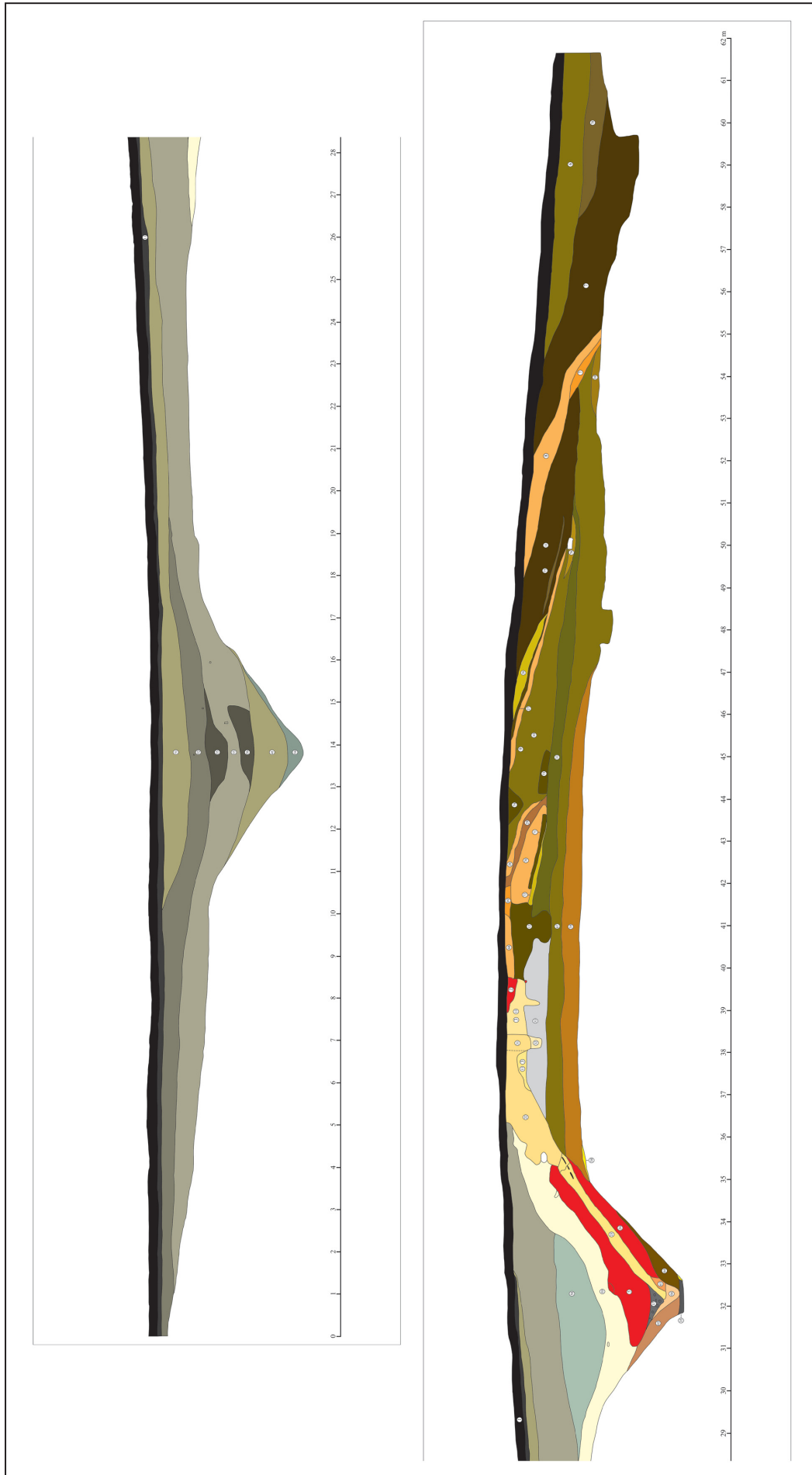
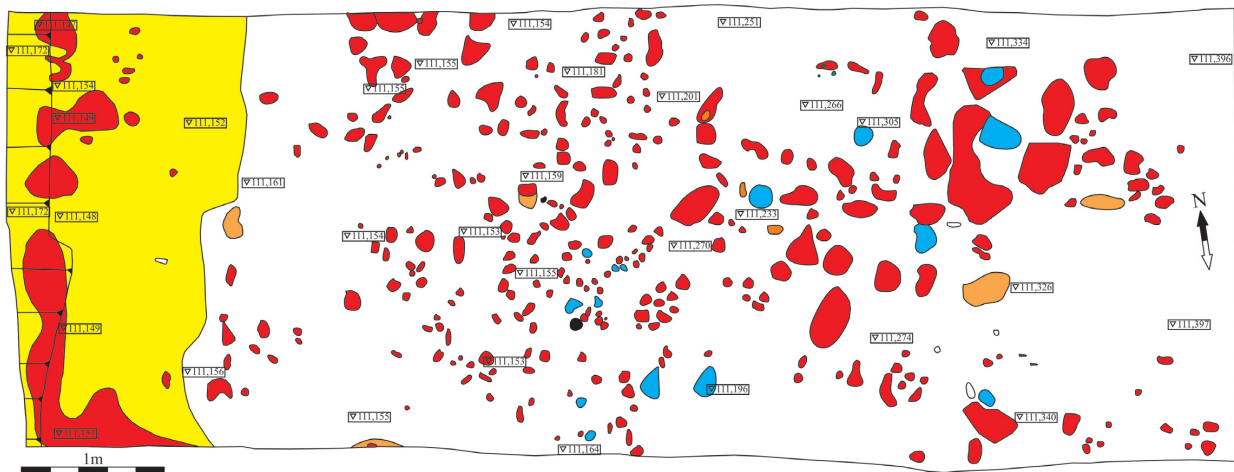


Fig. 15 Sântana-Cetatea Veche 2018. The southern profile of trench S5, enclosure III (drawing by the authors)





**Fig. 16** Sântana–Cetatea Veche 2018. The burnt remains of palisade no. 2, which had fallen into the ditch. Trench S5, enclosure III (photo by the authors)



**Fig. 17** Sântana–Cetatea Veche 2018. The remains of palisade no. 2 with a lot of burnt daub. Trench S5, enclosure III (drawing by the authors)





**Fig. 18** Sântana–Cetatea Veche 2018. Postholes of a wooden construction on the edge of the rampart. Trench S5, enclosure III (photo by the authors)

well as two defensive ditches placed in front of the rampart (**Fig. 13**). As expected, the rampart was constructed of rammed earth. This simple, yet efficient construction method was already documented in the northern sector of enclosure III during the campaigns of 1963 and 2009. It is clearly visible that the rampart was built by adjoining the soil lenses extracted from the ditch, especially from the area behind it; these were then rammed into place. As a result, the structure of the rampart displays deposits of various colours (**Fig. 14**). Furthermore, the investigation revealed that the rampart was erected upon an archaeological level, which dates to the Eneolithic period and extends across the entire length of the rampart. The excavation also uncovered three pits cut from the aforementioned level and belonging to the same period, reaching down until the yellow clay below. Due to the fact that this sector of the rampart is situated on higher ground, there was no need for the additional stabilization of the foundation with wooden beams and rocks, as was the case in the

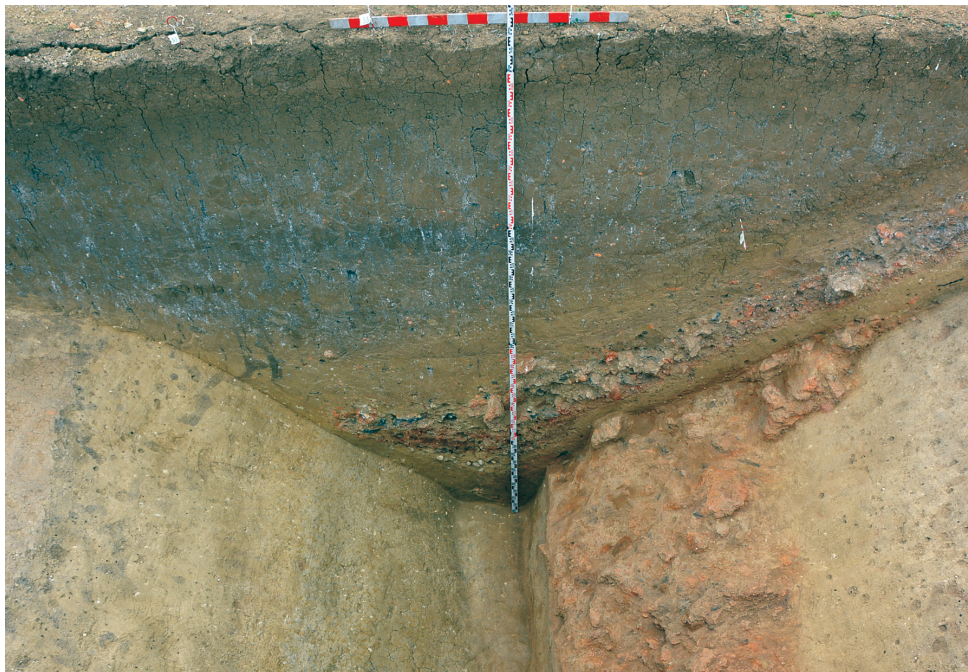
area investigated in 2009. Accordingly, the preserved width of the rampart is nearly 20 m, while its height is 1.8 m, of which the earth added on top of the Eneolithic habitation level makes up only 1.1 m (**Fig. 15**).

The front side of the rampart revealed the charred remains of a structure, which began to emerge already at a depth of -0.25 to -0.30 m, directly below the plough level, and exhibiting traces of charring and fragments of daub of various sizes. The entire structure erected on the edge of the rampart had slid a distance of 8 m down the slope of the rampart into the defensive ditch found at its base (**Figs. 16-17**). Following the removal of the charred remains, a number of six postholes displaying a zigzag shape were outlined, while a ditch and further postholes were identified in front of them (**Fig. 18**). Based on the analysis of the daub fragments and of the dimensions and the distribution of the postholes, it seems that the building technique of the palisade/wall corresponds to that used for the construction of houses





**Fig. 19** Sântana–Cetatea Veche 2018. The remains of palisade no. 1 with the burnt remains fallen into the ditch.  
Trench S5, enclosure III (photo by the authors)



**Fig. 20** Sântana–Cetatea Veche 2018. Southern profile of ditch no. 1 with burnt daub fallen into the ditch in two layers.  
Trench S5, enclosure III (photo by the authors)

in the region. According to this method, the wooden poles were adjoined by a network of wattle and planks, after which the entire construction was coated with a consistent layer of clay. Most likely the wall was provided with a roof; otherwise it would have rapidly deteriorated as an after-effect of the precipitation (**Fig. 27**).

A 6.5-m wide and 2.48-m deep ditch (ditch no. 1) was dug at the base of the rampart. A second defensive ditch, 7.6 m wide and 2.5 m deep, was identified at a distance of approximately 12 m from the first one, towards the exterior (**Figs. 13, 15**). Ditch no. 2 yielded only a small number of finds, as it had filled up gradually under natural circumstances. Ditch no. 1, by contrast, presented a far more interesting archaeological situation. Upon clearing away the remains of the burnt palisade/wall (context 5 – palisade no. 2), a yellow clay layer approximately 20 cm thick (context 23) was identified. Underneath this layer the remains of a second burnt palisade, which had collapsed and slid into the ditch, were documented (context 24 – palisade no. 1) (**Fig. 19**). Both the radiocarbon data as well as the stratigraphy attest the existence of two different stages in the functioning of the fortification. The destruction of palisade no. 1 (context 24) was followed by the refurbishment of the entire defensive system, whereby the rampart and the remains of the burnt palisade were covered by a layer of yellow clay. Subsequently, ditch no. 1 was deepened and a new palisade/wall (context 5 – palisade no. 2) was erected. This too was eventually destroyed by fire (**Fig. 20**).

### Chronology of enclosure III at Sântana–Cetatea Veche

The destruction layer of palisade/wall no. 2 yielded a series of pottery fragments decorated with horizontal or diagonal channels or with channels arranged as garlands, bowls with inturned rims, as well as various types of biconical vessels (**Fig. 21**).

Identical finds were also reported from the previous excavations.<sup>44</sup> The vessel shapes and decoration of the pottery documented here are found throughout the eastern part of the Carpathian Basin, from the Serbian Banat to southeastern Slovakia.<sup>45</sup> The lower Mureş Basin comprises numerous settlements that yielded such ceramic finds.<sup>46</sup> This pottery is traditionally assigned to the Bronze Age D – Hallstatt A1 period, bearing various names among which are Sântana-Lăpuş-Pecica, Cruceni-Belegiş II, Lăpuş or proto-Gáva.

Leaving aside these typo-chronological considerations, 13 AMS radiocarbon dates were made to set up an independent chronology. The samples were collected from various archaeological contexts belonging to the third fortification (enclosure III). Four of these stem from trench S1, i.e. from the northern sector of the defensive system, while the remaining nine come from trench S5 and the eastern sector. In the case of trench S1, three samples were collected from the fill of the defensive ditch and one from a burial found in back of the rampart, the burial designated cx. 41.<sup>47</sup> The nine samples from trench S5 were collected in palisade no. 1 (three samples), palisade no. 2 (two samples), the postholes (two samples) and defensive ditch no. 1 (two samples) (**Figs. 22–24; Table 1**).<sup>48</sup> Analysing solely the five contexts which effectively pertain to the fortification, thereby excluding burial cx. 41, the following chronological situation can be described (**Fig. 24**). The fact that palisade no. 1 is earlier than palisade no. 2 (**Figs. 15, 20**), as indicated by the stratigraphy, is corroborated by the AMS results. If we exclude the very late date MAMS 37709, then palisade no. 1 can be dated to the 15<sup>th</sup> century BC. Even the average value of the three dates indicates a dating at the end of the respective century. The other contexts (palisade no. 2, the postholes and the two ditches) are all approximately contemporary and functioned throughout the course of the 14<sup>th</sup> century BC, or possibly during the first half of the 13<sup>th</sup> century BC as well.

<sup>44</sup> Gogâltan/Sava 2010 Figs. 11-12. 37-38.

<sup>45</sup> Przybyła 2009, 76-95; Szabó 2017.

<sup>46</sup> Pădureanu 1985 Pl. VII,2; Sava/Hurezan/Mărginean 2011 Figs. 171-172. 197; 2012 Pls. 10. 11,4-6. 12; Sava/Matei 2013 Pl. 9,1; Sava 2016 Pls. 6,1. 7,2-8.

<sup>47</sup> For a detailed discussion regarding the chronology of the finds from the 2009 excavation see Sava/Gogâltan/Krause 2019.



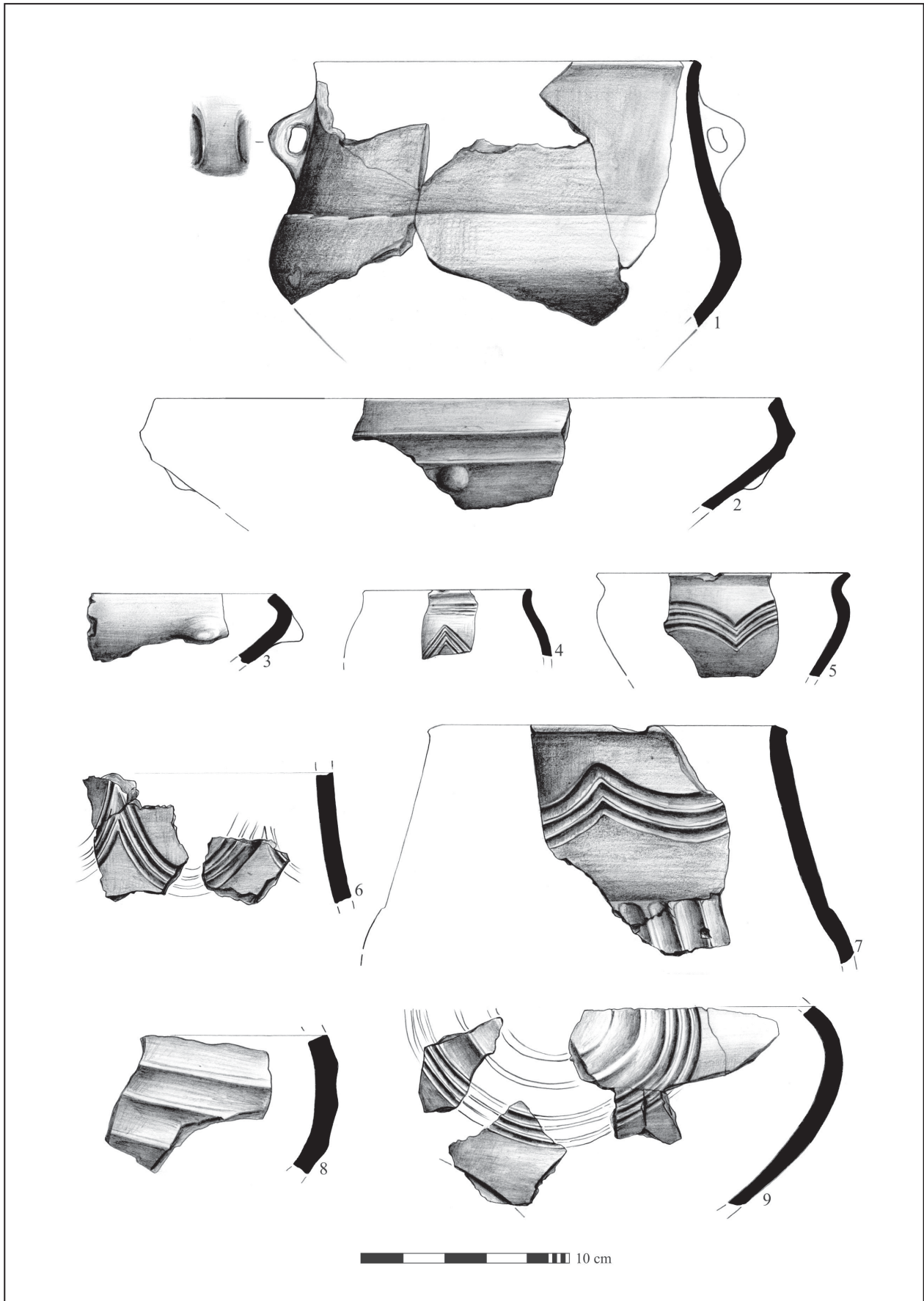


Fig. 21 Sântana-Cetatea Veche. Pottery fragments from palisade no. 2 (drawings by C.I. Popa)

Nr. Crt.	Lab no. MAMS	Sample name	14C age [year BP]	±	Cal 1-sigma	Cal 2-sigma	Material	Context
1	33944	1_Santana, Cetatea Veche S1, 70A	3064	27	cal BC 1388-1283	cal BC 1409-1236	human bone	ditch
2	33945	2_Santana, Cetatea Veche S1, cx.41	3118	23	cal BC 1427-1322	cal BC 1438-1303	human bone	cemetery
3	33946	3_Santana, Cetatea Veche S1, 62A	3066	24	cal BC 1388-1286	cal BC 1407-1263	human bone	ditch
4	33948	5_Santana, Cetatea Veche cx. 38	3131	23	cal BC 1433-1327	cal BC 1487-1306	animal bone	ditch
5	37706	San_18_30_16 _posthole 16	3087	25	cal BC 1406-1303	cal BC 1417-1282	charcoal	palisade, posthole cx. 16
6	37707	San_18_31_17 _posthole 17	3104	19	cal BC 1414-1315	cal BC 1427-1302	charcoal	palisade, posthole cx. 17
7	37708	San_18_9_24_ ditch 1	3227	20	cal BC 1513-1454	cal BC 1591-1439	charcoal	ditch 1, palisade 1, cx. 24
8	37709	San_18_11_24 _ditch 1	3047	19	cal BC 1377-1266	cal BC 1393-1232	charcoal	ditch 1, palisade 1, cx. 24
9	37710	San_18_12_24 _ditch 1	3147	20	cal BC 1440-1409	cal BC 1493-1324	charcoal	ditch 1, palisade 1, cx. 24
10	37711	San_18_23_5_ ditch 1	3055	20	cal BC 1383-1277	cal BC 1397-1236	charcoal	ditch 1, palisade 2, cx. 5
11	37712	San_18_21_5_ ditch 1	3081	19	cal BC 1397-1303	cal BC 1410-1286	charcoal	ditch 1, palisade 2, cx. 5
12	37713	San_18_28_36 _ditch 1	3087	20	cal BC 1405-1305	cal BC 1413-1291	charcoal	ditch 1, cx. 36
13	37714	San_18_24_36 _ditch 1	3102	24	cal BC 1414-1308	cal BC 1428-1296	animal bone	ditch 1, cx. 36

**Tab. 1** Sântana–Cetatea Veche. List of AMS dates (enclosure III, excavations 2009, 2018)



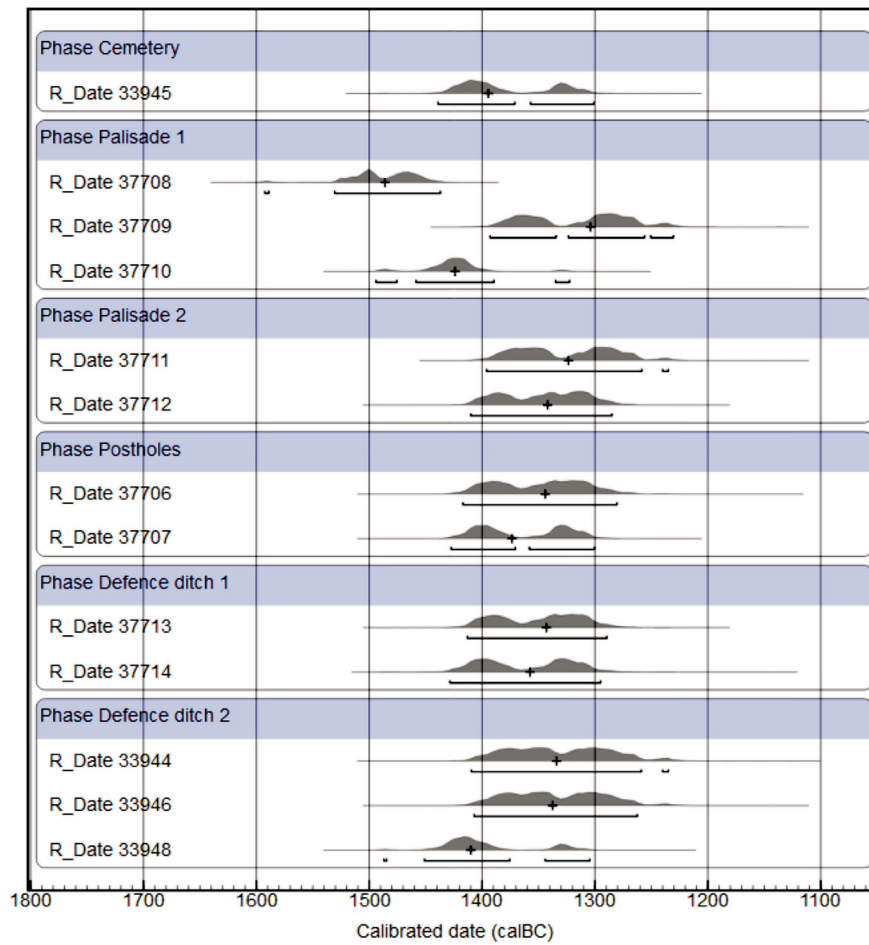


Fig. 22 Sântana-Cetatea Veche. The calibrated AMS data from enclosure III (excavation 2018)

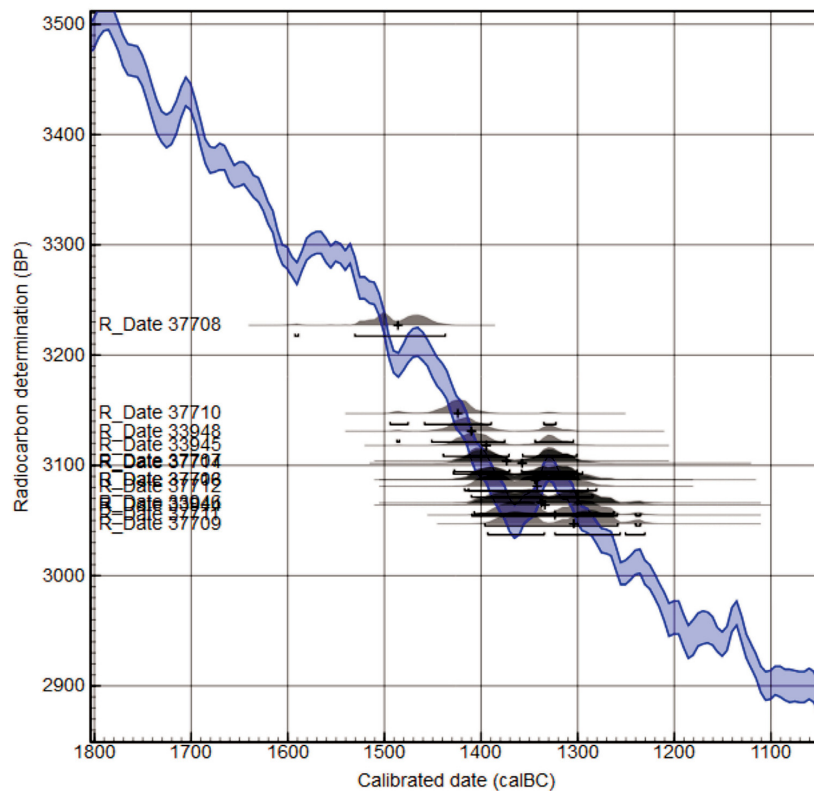


Fig. 23 Sântana-Cetatea Veche. Enclosure III, excavations 2009, 2018. Distribution of the AMS measurements on the calibration curve

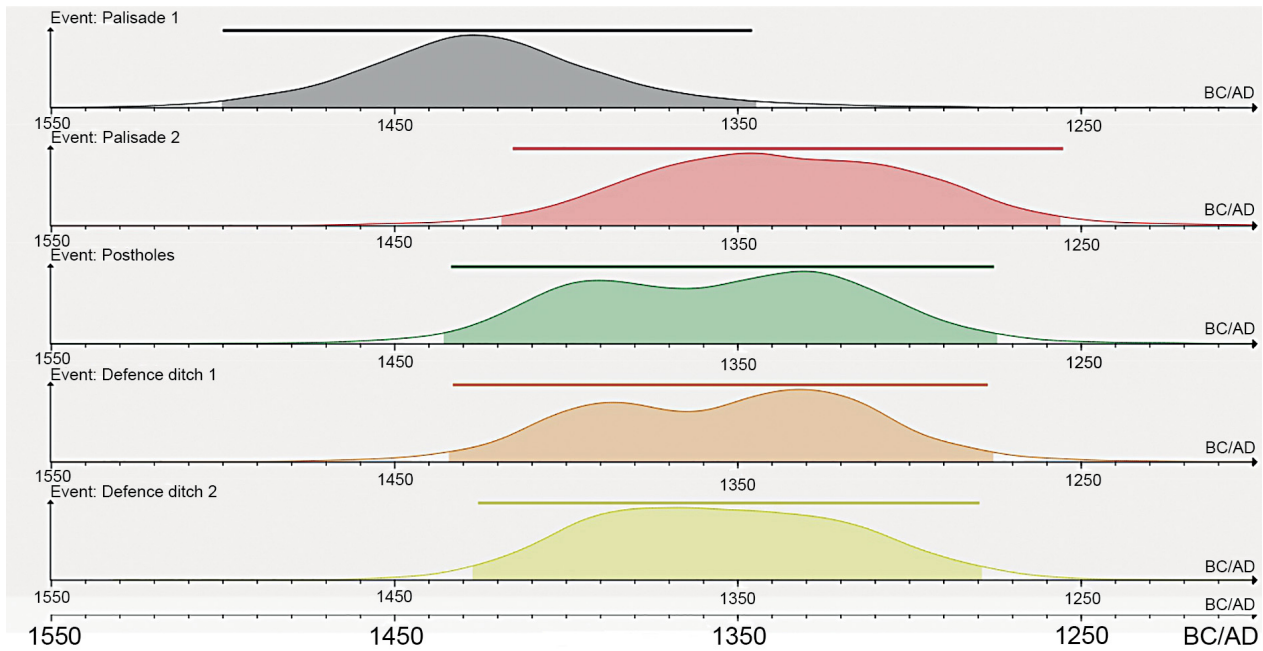


Fig. 24 Sântana–Cetatea Veche. The chronological and stratigraphic model of enclosure III (graphic by the authors)

## Conclusions

Even though the magnitude of the archaeological excavations carried out over time within the perimeter of the fortification at Sântana–Cetatea Veche seems to be insignificant compared to the huge dimensions of the site, essential facts regarding the construction methods employed, as well as the functioning and destruction of enclosure III can be put forward. Both the old and new archaeological investigations have proven that the outer rampart was constructed of rammed earth with a palisade/wall made from timber and daub erected on its edge. The entire fortification was enclosed by defensive ditches, their course indicated by the magnetometric mapping. Trench S5 opened in 2018 yielded clear evidence with regard to the existence of two palisades/walls. Palisade no. 1 (context 24) represents in chronological terms the first stage of the fortification, which was eventually destroyed. As a result of this devastating event, a new palisade/wall was built, which corresponds with the postholes identified on the edge of the rampart and with the destruction layer (context 5). While in the case of palisade/wall no. 1 no clear evidence of an attack mounted against the fortification could be determined (apart from the de-

struction by fire), the finds yielded by palisade/wall no. 2 include 23 burnt clay projectiles (Fig. 25) in addition to a bronze arrowhead.

It must be noted that besides these finds, which in addition to the destruction by fire of the palisade/wall, effectively attest the existence of a siege, previous campaigns have also produced numerous burnt clay projectiles,<sup>49</sup> an arrowhead,<sup>50</sup> as well as two spearheads<sup>51</sup> (Fig. 26). To this we can add the remains of the young male individuals found in the defensive ditch, revealed in trench S1, with one of them displaying traces of blows to the cranium.<sup>52</sup> All of these pieces of evidence indicate that enclosure III was destroyed as a result of siege. The reconstruction of the palisade/wall revealed in trench S5 (Fig. 27), and its subsequent destruction has the potential of indicating two violent events occurring at some distance apart in time. There is a gradually growing amount of evidence with regard to recurring conflicts that took place at the end of the Bronze Age. During this period conflicts and war activities seem to increase, as is documented in the Tollense Valley in

<sup>48</sup> The AMS data were analysed by the laboratory at Klaus-Tschira-Archäometrie-Zentrum at Curt-Engelhorn-Zentrum Archäometrie gGmbH in Mannheim.

<sup>49</sup> Gogâltan/Sava 2018.

<sup>50</sup> Gogâltan/Sava 2010, 43 Fig. 43; Gogâltan/Sava/Mercea 2013, 38 Pl. 10,3-4.

<sup>51</sup> Rusu/Dörner/Ordentlich 1996 Pl. XIV,11.13; Gogâltan/Sava/Mercea 2013, 31 Pl. 1,13-14.

<sup>52</sup> Gogâltan/Sava 2012, 70 fn. 92 Fig. 10.



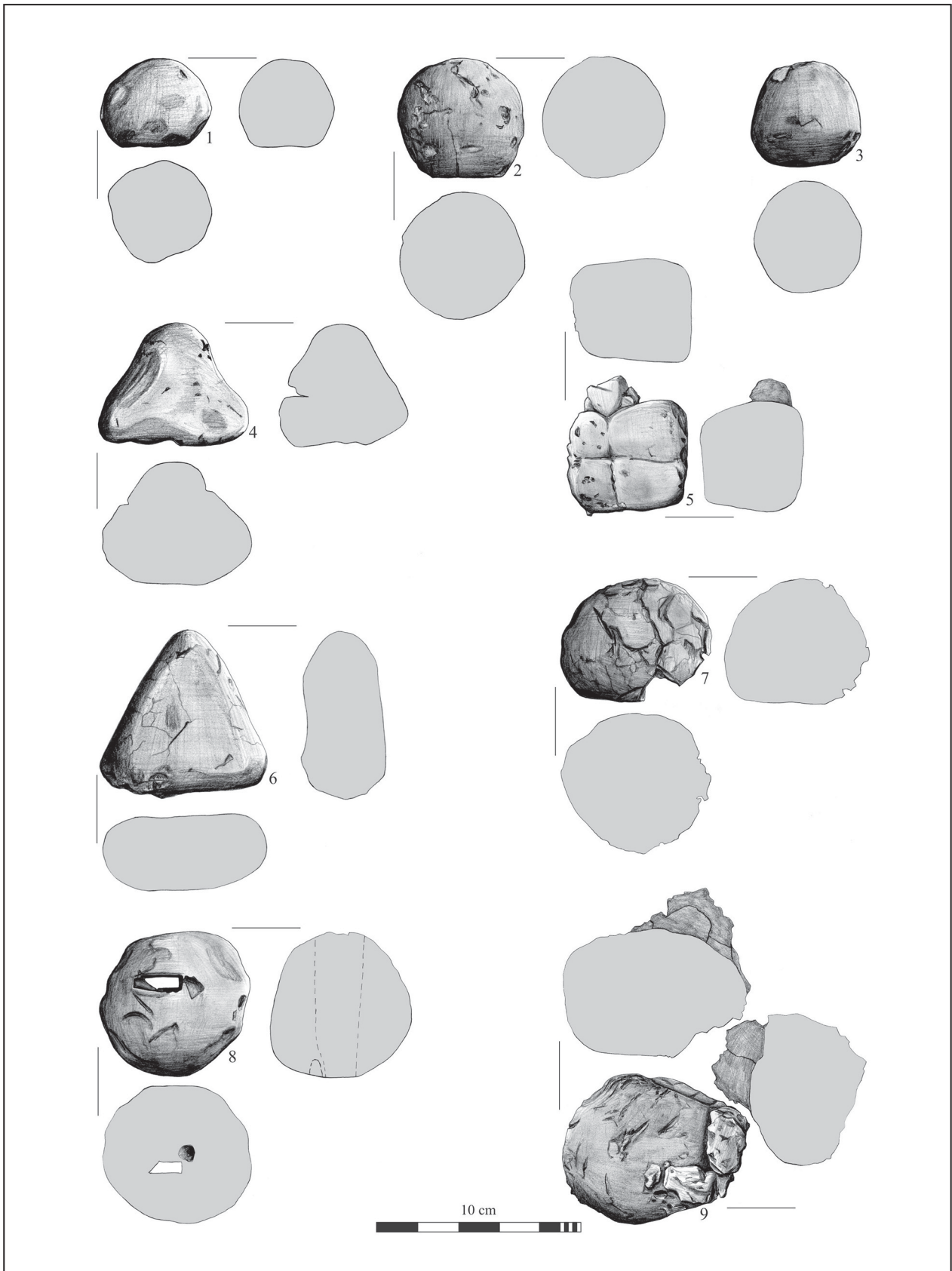


Fig. 25 Sântana-Cetatea Veche. Burnt clay projectiles discovered among the remains of palisade no. 2 (drawings by C.I. Popa)



Fig. 26 Sântana-Cetatea Veche. Spearheads and arrowheads from different find spots within the fortifications (photo by I. Scripciuc)

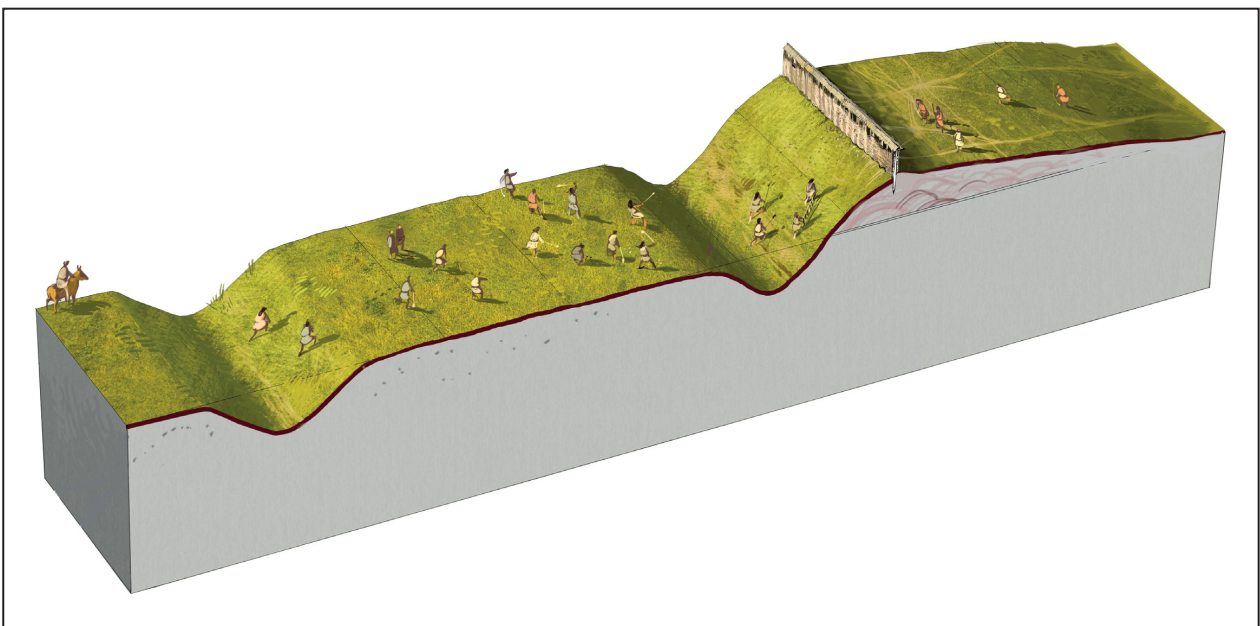
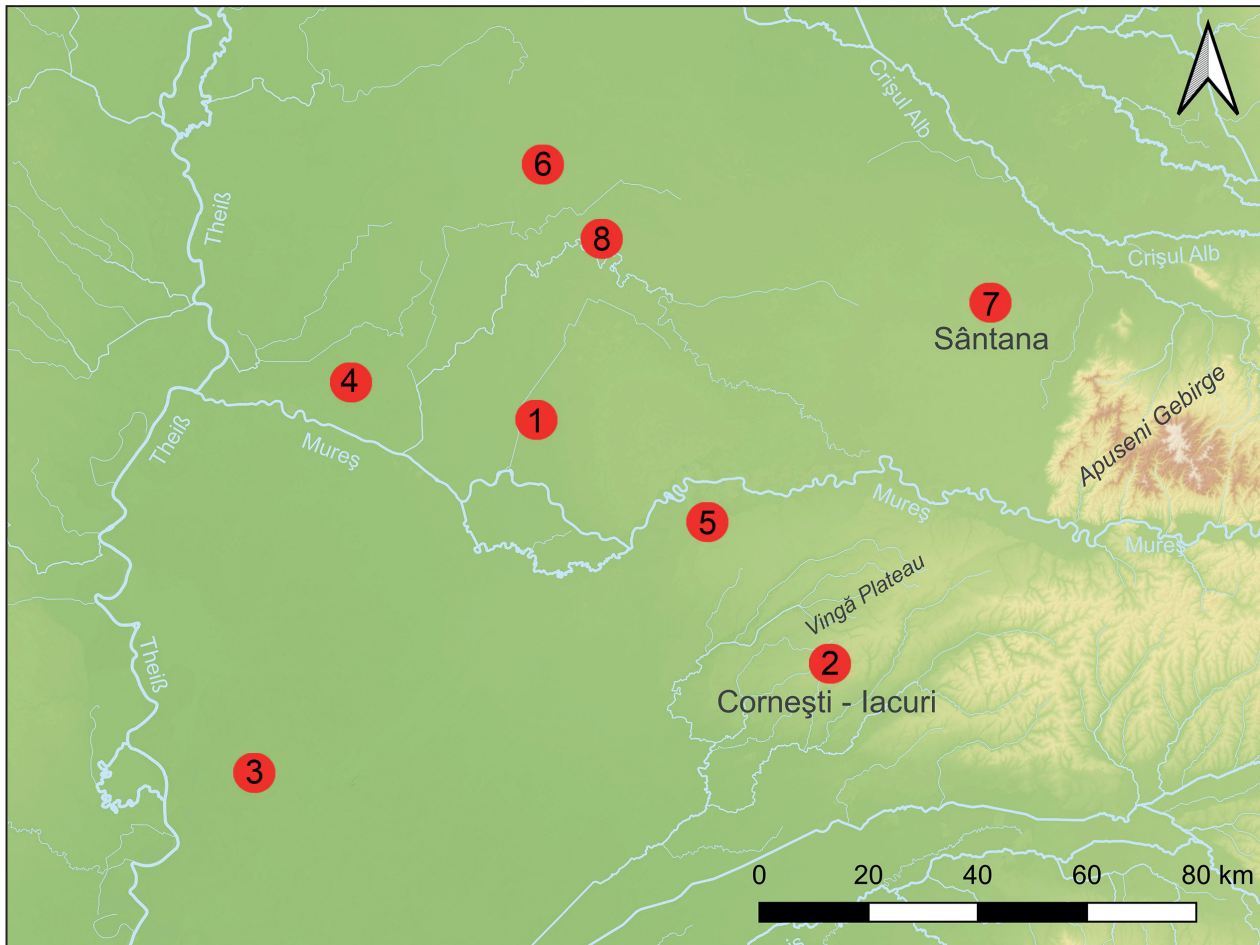


Fig. 27 Sântana-Cetatea Veche. Reconstruction of the combat situation in front of enclosure III (trench S5) (graphic by R. Olteanu)





**Fig. 28** Map of the Lower Mureș Basin with the location of Late Bronze Age fortifications: 1 Csanádpalota–Földvár; 2 Cornești–Iacuri; 3 Gradište Idjoš; 4 Makó–Rákos–Császárvár; 5 Munar–Wolfsberg; 6 Orosháza–Nagyatársánc; 7 Sântana–Cetatea Veche; 8 Végegyháza–Zsibrik-domb (mapping by F. Becker, basis of data: EU-DEM v. 1.1 © European Union)

northeastern Germany.<sup>53</sup> Hence, the Bronze Age mega-fort at Sântana–Cetatea Veche is an important component in the debate regarding the existence of warfare,<sup>54</sup> and armies consisting of professional warriors<sup>55</sup> during this period.

Equally of interest are the various aspects of differentiation and social life within the fortification. The identification of large-sized buildings is surprising, as such constructions are effectively unknown in most regions of Europe (Fig. 9). Accordingly, the exact dating, the assessment of the construction method, as well as the identification of its function present a challenge to research for the future. It goes without saying that only archaeological excavations can provide answers to these issues. At the same time they also hold the potential of opening up new perspectives for

our understanding of Bronze Age society. Virtually every contemporary unfortified settlement in the region comprises only modest dwellings, which do not have anything in common with the impressive dimensions and the complex nature of constructions identified at Sântana–Cetatea Veche through the geophysical surveys.<sup>56</sup>

The Lower Mureș Basin, covering an area of approximately 11.700 km<sup>2</sup>, has hitherto yielded eight fortifications, all built in the lowlands (Fig. 28). The same environment half a century or a century earlier witnessed the flourish of multi-stratified or so-called tell settlements, enclosed by impressive defensive ditches.<sup>57</sup> Gaining an un-

<sup>53</sup> Terberger *et al.* 2018 with the older literature.

<sup>54</sup> Hansen 2015.

<sup>55</sup> See Krause in this volume.

<sup>56</sup> This is the case of the settlements at Șagu (Sava/Hurezan/Mărginean 2011), Sânicolau Mare (Stavilă 2015), Felnac (Sava 2016), Peciu Nou (Szentmiklosi 2016), Voiteg (Szentmiklosi/Medelet 2016) and recently at Conop (excavations by V. Sava in 2018).

<sup>57</sup> Gogâltan 2016.

derstanding of the processes that led to the disappearance of these communities, together with the emergence of the large Late Bronze Age fortified settlements represents our second challenge. In the case of Sântana–Cetatea Veche, the impressive number of gold, bronze and copper artefacts discovered there may suggest the possible exploitation of the metal deposits found not far away, at the base of the Zarand Mountains.<sup>58</sup> In the future, complex geochemical analyses of artefacts and ores can shed light on the source of raw materials employed for these artefacts. Above all, we need to gain basic information and data on the issue of economy and subsistence, from archaeobotanical and osteological studies as well, in order to better understand the socio-economic foundations of these large mega-sites and their surroundings. Only then we can offer explanations for the rise and fall of these huge sites at the eastern edge of the Pannonian Basin.

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**Florin Gogâltan, Victor Sava and Rüdiger Krause, Sântana–Cetatea Veche. A Late Bronze Age Mega-fort in the Lower Mureş Basin in Southwestern Romania**

Our contribution provides an overview of the archaeological investigations carried out, including those in 2018, at the large fortification of Sântana–Cetatea Veche, north of Arad in Romania. The new research was undertaken within the framework of the LOEWE project “Prehistoric Conflict Research – Bronze Age Hillforts between Taunus and Carpathian Mountains”. In accordance with the main scientific guidelines of the project, the research efforts encompassed archaeological fieldwork, magnetometric surveys of the entire area of the fortification, as well as a LiDAR scan covering an area of nearly 850 ha. As a result of the excavation undertaken in the eastern part of the defences pertaining to enclosure III, new absolute chronological data were obtained, which in corroboration with the older information offer a clear dating of the fortification system to the 15<sup>th</sup> to 13<sup>th</sup> centuries BC.

**Florin Gogâltan, Victor Sava und Rüdiger Krause, Sântana–Cetatea Veche. Ein spätbronzezeitliches “Mega-fort” im unteren Mureş-Becken in Südwest-Rumänien**

Unser Beitrag gibt einen Überblick über die archäologischen Untersuchungen, einschließlich derjenigen im Jahr 2018, die in der großen, nördlich von Arad in Rumänien gelegenen Befestigung von Sântana–Cetatea Veche durchgeführt wurden. Die neuen Forschungen fanden im Rahmen des LOEWE-Projekts “Prähistorische Konfliktforschung – Burgen der Bronzezeit zwischen Taunus und Karpaten” statt. Gemäß den wissenschaftlichen Hauptrichtlinien des Projektes umfassten die Forschungsarbeiten archäologische Feldarbeiten, magnetometrische Surveys des gesamten Gebietes der Befestigung sowie LiDAR scanning auf einer Fläche von 850 ha. Als Ergebnis der Ausgrabung im östlichen Teil der Verteidigungsanlagen im Bereich der Befestigung III wurden neue absolute chronologische Daten gewonnen, die in Verbindung mit den älteren Informationen eine zuverlässige Datierung des Befestigungssystems in das 15. bis 13. Jh. v. Chr. ergeben haben.