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Bronze Age Fortresses in Europe

edited by

Svend Hansen
Rüdiger Krause

2019

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Foreword

The second international, annual conference of the LOEWE project "Research on Prehistoric Conflict – Bronze Age Hillforts between Taunus and Carpathian Mountains" took place on October 9–13, 2017 in Alba Iulia in Transylvania (Romania), with the theme "Bronze Age Fortresses in Europe".[1] It was attended by some 80 participants, who came from ten countries around the Mediterranean, from Israel in the East to Greece, Slovenia and Italy as far as Spain in the West. The conference venue was in one of the core regions of the LOEWE project: the Carpathian Basin. Namely, located a short distance from Alba Iulia is the large fortified, hilltop settlement of Teleac, situated high above the left bank of the Mureş River. During the past three years excavations were conducted there by the LOEWE project in cooperation with the Muzeul National al Unirii Alba Iulia (Dr. Horia Ciugudean). Thus, the conference was arranged in cooperation with this Museum as well.

The second international LOEWE conference was host to renowned scholars, all engaged in studies on the relationships between the Mediterranean sphere and Central Europe in the 2nd millennium BC and the various influences that spread from Mediterranean cultures that built defensive structures: The oldest Bronze Age protective walls and fortified cities in the Levant and in Israel were constructed as early as the 3rd millennium BC. Now recent archaeological datings and excavations have led to the need to re-evaluate interconnections between Europe and the South and to expand examination of and studies on the eastern Mediterranean, the Adria and Spain. A further focal point was on issues and results of scientific research concerned with the reconstruction of ancient landscapes and the use of natural resources located in the surroundings of fortified settlements.

These branches of research are associated with our fieldwork in Transylvania and Banat, as well as our other projects in the Carpathian Basin. Thereby the line of inquiry pertains foremost to the influence of Bronze Age settlement activities upon different landscapes, in particular the construction of fortified settlements and forts. It investigates the extent to which changes in the economic basis, use-systems and the exploitation of resources exerted an effect upon habitation. Therefore, the aim of archaeobotanical and geomorphological investigations was to thematise the kinds and intensity of resource usage and its relation to fortifications. A further question concerned the extent to which the construction of fortified settlements was responsible for great upheavals in the natural vegetation and forest cover, such as in the Central German Mountains in Hesse. Or – by contrast – whether rampart-construction should possibly be understood as a reaction to changes in forest development.

The timespan involved in the individual contributions to the conference ranges from the Early Bronze Age strongholds in the Levant to the Early Iron Age. According to the datings gained from research until now, the fortress at Teleac was established during the second half of the 11th century BC. At approx. 920 BC a larger section of the fortification walls and part of the settlement in Teleac were destroyed. The settlement, however, continued to be occupied at first. Therefore, the fortress can be assigned to the younger and later Urnfield Culture, according to Central European terminology. In Greece this period in time is designated 'Early Iron Age', in view of the many finds made of iron objects that were found there. Numerous iron objects were noted in Teleac, too.

1 The first international LOEWE conference "Bronze Age Hillforts between the Taunus and Carpathian Mountains" was held on December 7–9, 2016 in Frankfurt/Main. See S. Hansen/R. Krause (eds.), Bronzezeitliche Burgen zwischen Taunus und Karpaten/Bronze Age Hillforts between Taunus and Carpathian Mountains. Universitätsforschungen zur prähistorischen Archäologie 319, Prähistorische Konfliktforschung 2 (Bonn 2018).

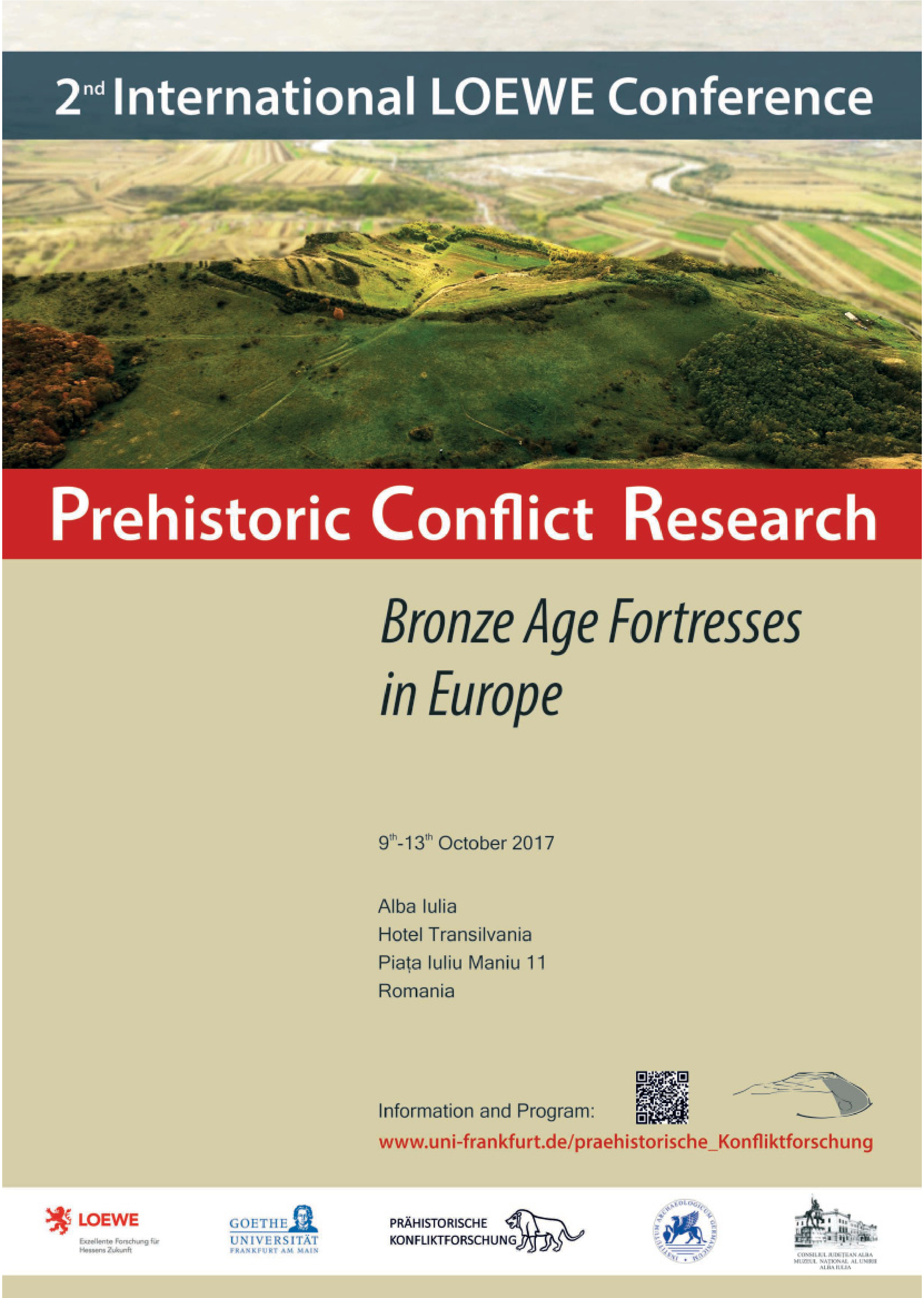
And it is here that we arrive at the time of the nascence of early Greek epics, which likely acquired their literary form in the 8th century BC. The "Ilias" is not a great work on history, but rather a description of the rage of Achilles, upon his defamation by the commander Agamemnon. This was the cause for even further battles and many slain victims. In her book *"Der Krieg des Achilleus"* (Berlin 2009), Caroline Alexander clearly illuminates the multifaceted structure of the Ilias epic and its main characters. This epic is still an important source for research on conflict in prehistoric times, because it describes a complicated war situation, which was perceived as paradigmatic already in ancient times.

The LOEWE project "Prehistoric Conflict Research – Bronze Age Fortifications between Taunus and Carpathian Mountains" is set within the framework of the Hesse Excellence Initiative. One of its major endeavours is to maintain consistent and diligent advancement in research on Bronze Age fortresses in Central Europe. For this, the second annual conference contributed towards establishing a European network of archaeologists, who can work together on the study of fortresses and on the preservation of these outstanding defensive structures. Ideally, research and conservation should be achieved on a European level.

Svend Hansen und Rüdiger Krause
Berlin/Frankfurt, December 2018

Information and program:
www.uni-frankfurt.de/praehistorische_Konfliktforschung under "Events"
(conference program is accessible as PDF)

Excavations carried out in 2016–2018 in the Central German Mountains in Hesse and in Romania as part of the LOEWE project can be accessed in the homepage:
www.uni-frankfurt.de/praehistorische_Konfliktforschung under "Highlights"



Poster for the conference in Alba Iulia 2017

Rüdiger Krause

Fortresses and Fortifications. On Fortified Hilltop Settlements of the Bronze Age

The construction of fortified settlements upon mountain summits and mountain spurs signifies a new form of defensive architecture for the Bronze Age in the 2nd millennium BC, which we designate 'Bronze Age' hill-forts or fortresses. With mighty walls and gates built using various techniques with wood, clay and stone, the fortified hill settlements manifest an eminent need for protection from assault, while at the same time they were obviously centres of power, from which territories and natural resources as well as travel routes could be controlled. Within the focus of the Hesse excellence initiative LOEWE "Prehistoric Conflict Research – Bronze Age Fortifications between Taunus and Carpathian Mountains" new approaches are made on the subject "War and Fortresses as Architecture of Power" in 2016–2019. These studies are being carried out by the Goethe University in Frankfurt/Main and the Römisch-Germanische Kommission in Frankfurt/Main.[1] *The objective was to observe the development and character of fortified structures in cultural spheres south of the Alps and landscapes north of the Alps in diachronic comparison in order to better understand the genesis and function of fortifications in their cultural milieu.*

War and fortresses – architecture of power

As of the Early Bronze Age fortified hill settlements with walls commonly built of wood, earth and stone (**Fig. 1**) began to appear increasingly along the Danube River as well as in cultural spheres and geographical landscapes adjoining to the north in Central Europe. This new building of defensive architecture reached a peak in the Late Bronze Age, and numerous hill summits were fortified by sometimes massive walls or ramparts (**Figs. 2-3**).[2] What were the causes and underlying factors that stimulated this new development in the construction of settlements and defences in the course of the 2nd millennium BC? What natural or economic factors were instrumental that a fortified settlement was built on the summit of one particular mountain or hill and not on one of the neighbouring heights? What cultural background can be named in this regard? What role did metallurgy, the production and development of weapons for attack and those for long distances play? Above all, what developments occurred in the political (power-) structure that underlay all of these aspects?

Therefore, the focus here is – on the one hand – on weaponry and the obviously increasing potential of conflict or violence based on new techniques in weapons and fighting, and – on the other – the new phenomenon of fortresses being built. Both of these factors open a new sociohistorical perspective of violent conflicts in the Bronze Age.[3] For not only do the epics of Homer describe war-like aggression of violent dimensions; also the first appearance of weapons exclusively meant for killing humans, such as the sword, or the erection of mighty walls around settlements lead to the impression that war and conflict reached a new dimension during the Bronze Age.[4]

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1 Hansen/Krause 2017; see also the LOEWE homepage: http://www.uni-frankfurt.de/61564916/LOEWE-Schwerpunkt (last call 27.10.2018). – Within the framework of the second international LOEWE conference on "Bronze Age Fortresses in Europe" in Alba Iulia (Romania) in 2017, the focus was on fortifications and hill-fort landscapes of the Mediterranean, from the Levantine coast in the East through Asia Minor and the Greek islands to the Italian Peninsula and the Adria, and as far as the Iberian Peninsula, see LOEWE-homepage http://www.uni-frankfurt.de/65329449/Konferenz-2017 (last call 27.10.2018)

2 Jockenhövel 1982; 1990; Rind 1999.

3 Hansen 2013; 2015.

4 Hansen 2015; O'Brien *et al.* 2018; Peter-Röcher 2018; Veit 2018.

Warlike confrontations and events of aggression are evidenced in contexts of unusual archaeological findings. Here to emphasise are excavations on the Heunischenburg near Kronach in Upper Franken.[5] This small, rather unassuming fortification is situated upon a hill spur at a distance from the actual associated settlement. Archaeological fieldwork revealed that the complex had been enclosed by a sandstone wall in the 10th century BC and then in the 9th century BC was expanded into a mighty stronghold with a 3.5-m high and 2.6-m wide stone wall with a gate. The construction of the gate can be ascribed to Mediterranean prototypes. Indeed, early defensive structures along the Danube River and in the Alps have long been correlated with east Mediterranean, Mycenaean influences.[6] The great number of weapons found at the wall indicates that battles took place at the Heunischenburg: many fragments of sword blades, spearheads, c. 100 arrowheads as well as parts of armament made of bronze, defective or bent, were found along the massive fortification wall.[7] Direct traces of warlike conflict and slaughter are provided by sensational finds and contexts from the Tollense valley in Mecklenburg-Vorpommern.[8] Thus far, a great number of human bones – accounting for more than 130 individuals and scattered together with horse bones and weapons – have been discovered in a c. 1.5-km long section of the valley and excavated at sites or retrieved from the river by divers. The finds date to the middle of the 13th century BC. Some of the human bones display wounds caused by blows and slashes. Recent investigations have concluded that there was a single battle event, in which possibly as many as several thousand warriors and other persons were involved.[9]

Conflict can be evidenced by horizons of frequent events of burning and destruction. Burnt fortifications were possibly the result of siege and successful destruction of the walls. However, it is also debated that the burning of fortified walls might also be attributed to a ritual and intentional performed event, for instance, in association with the abandonment and annihilation of a population.[10] So-called 'glass castles' or *Schlackenwälle* are a well-known phenomenon that until now has been attested mainly in Iron Age fortresses in central and northern Europe, foremost the British Isles.[11] The term 'vitrified fort' designates a completely burnt fortification that was originally built of wood, earth and stone and whose constructive components were 'baked' together due to extremely high temperatures of fire. In some cases the stones are partly glazed (vitrified): for example, basalt melts at temperature above 1000 °C.[12] Examples of burnt fortification walls of the Bronze Age within the study area of the LOEWE project are found on the Haimberg near Fulda,[13] the Middle Bronze Age fort in Bernstorf in upper Bavaria,[14] and the large Late Bronze Age fortification in Cornești-Iacuri in Romania.[15] These examples demonstrate that burnt fortification walls were already present in the 14th century BC and that this phenomenon reaches back to the Middle Bronze Age. Through systematic analyses and new excavations more details could be explained and further indicators gained, which provide information about the causes of the destruction and burning of fortifications and which clarify whether these events can be attributed to warlike conflicts or to the ritual destruction and the intentional eradication of defence walls.[16]

Our investigations also concern the environment of fortresses and their influence upon Bronze Age settlement in different cultural and geographi-

5 Abels 2002.
6 For Slovakia cp. Furmánek *et al.* 1999; for the Alps cp. Krause 2005.
7 Abels 2002 Fig. 30a Pls. 16-21.
8 Jantzen *et al.* 2014; Terberger *et al.* 2014; 2018.
9 Terberger *et al.* 2018.

10 On the burnt fortification of Bernstorf: Gebhard *et al.* 2004; Bähr *et al.* 2012; Bähr in press; further, O'Brien/O'Driscoll 2017; O'Brien *et al.* 2018.
11 See Ralston 2006; for Ireland, cp. O'Brien/O'Driscoll 2017.
12 On investigations about the Glauberg in Hesse, cp. Baitinger/Kresten 2012.
13 Vonderau 1901; 1929b. – The Haimberg is located c. 5 km west of Fulda and consists of a basalt cone with muschelkalk. Basalt was quarried there until 1998, for which reason the summit of the mountain has been eradicated. Nonetheless, today the Haimberg is still 416 m high. In prehistoric times a vitrified wall encircled the summit, enclosing an area of 1.3 ha. Today all has been completely destroyed. Among the finds, those dated to the Urnfield culture predominate, especially the numerous finds made of bronze. Cf. Vonderau 1929a; Hansen 1991.
14 Gebhard *et al.* 2004; Bähr *et al.* 2012; Bähr in press.
15 Heeb *et al.* 2017 with more references.
16 Benjamin Richter M.A. is studying the burnt fortifications of the Bronze Age as PhD thesis within the frame of the LOEWE project.

cal landscapes.[17] The line of inquiry involve the extent to which changes can be recognised on hand of the respective economic bases, which affected use systems as well as the exploitation of natural resources. Here archaeobotanical and geomorphological soil investigations play an important role, for they can approach questions on the kind and intensity of use of a landscape and its relation to fortification in close combination with archaeological contexts and results. For instance, one question in the foreground concerns the extent to which the construction of forts and associated settlements can also be associated with the great forest changes of the Late Bronze Age in the Central German Mountains in Hesse, or should this construction be viewed as a reaction to these changes.

Settlement areas and structures around the fortresses are included in the investigations, as they served for the economic supply of the forts and also represent the range of the forts' political influence. The political sphere of a fortress could shift, yet the economic basis and the source of supplies had to attain a specific size and constancy, and thus they represent a hard factor for maintaining the steadfastness of a fortified complex. Furthermore, a substantial amount of information can be gained from the so-called municipal areas *(Weichbild)* around a fortress, not only pertaining to the environment and economy (cf. archaeobotany), but also about the population itself (cf. cemeteries), their ritual practices (depositions, places of cult), as well as settlement habits and forms (cf. architecture). On the basis of this information questions on the sustainability or – oppositely – short-term existence of a site, that is, temporality, can be pursued. Can continuity or breaks in settlement development be attributed to long-lasting stable phases or – oppositely – in disruptions in times of need and conflicts? Can the theory of fortress-building as a preventative measure against assault be supported archaeological findings? Or through proof that the erection of a fortification usually followed an obviously longer phase of peace?

The LOEWE project addresses the different forms of fortifications (**Fig. 1**), their functions and their significance within a settlement landscape, and the reconstruction of the social model of its communities. Thereby, our guiding premise is that Bronze Age fortifications should not necessarily be understood as the expression of acute conflicts, but instead far more as the expression of the "expectation of future conflict", that is, a frightening deterrent effect and preventative measure against intersocietal violent acts. The premise that the construction of fortifications during the Bronze Age in Central Europe was largely influenced by impulses from the Mediterranean sphere (see above) follows premises that were set forth and introduced into discussion by A. Jockenhövel, namely, that they are the expression of a centralised, hierarchically structured society.[18] For a critical analysis of this assumption the focus of the LOEWE project will also make comparative evaluations of ethnographic sources, for example, the extent to which indigenous populations built fortifications, even though their respective social and political organisation was of a different and other form.[19]

Archaeological sources attest manifold forms of defensive architecture, as illustrated by the reconstruction of the different phases of the fortification at Bullenheimer Berg in Mainfranken.[20] This information enabled a reconstruction to be made, ranging from outposts with simple fences and palisades to complex wood-earth-stone constructions in which massive fortification walls are well imaginable (**Figs. 1-3**). At first they seem to have been a defensive measure, which surely had a none-too-small psychological effect outwardly. Thus, the central question is all the more: by whom and against whom were the mighty walls erected. Fortified complexes took on the function of communities that represented their wealth and their status.

In a study on the Early Bronze Age (3rd millennium BC) in the southern Levant, H. Ashkenazi presented interesting considerations about the function of walls and fortifications.[21] He proposed the following features that serve as archaeological evidence and proof for acts of war and war-

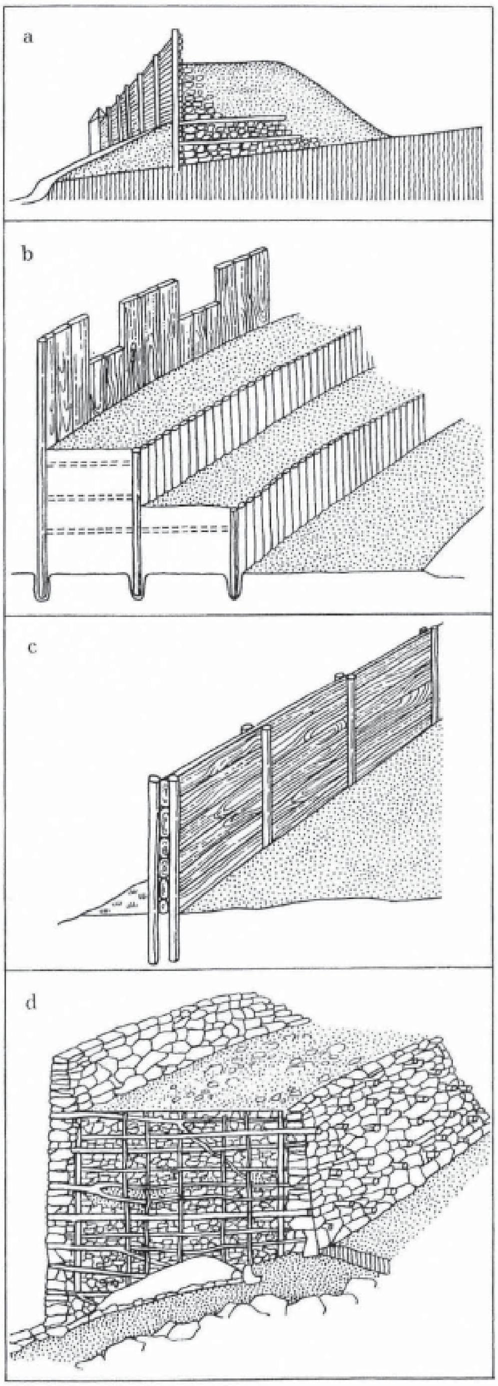
17 Bringemeier/Stobbe 2018. Archaeobotanical component project in the LOEWE project, conducted by Dr. Astrid Stobbe. Cf., http://www.uni-frankfurt.de/61909490/Archaeobotanik.

18 "... a complex achievable only by a larger community, in contrast to a rigidly ordered society of earlier times ..." („*nur durch eine größere Gemeinschaft ausführbaren Anlagen eine gegenüber früheren Zeiten straffer geordnete Gesellschaft*") Jockenhövel 1975; see also Schauer 2007.

19 Reymann 2018; component project on fortifications in the ethnographic sphere. http://www.uni-frankfurt.de/61384856/Soziologie.

20 Bullenheimer Berg: Diemer 1995; Falkenstein *et al.* 2011; Nomayo/Falkenstein 2012.

21 Ashkenazi 2016.



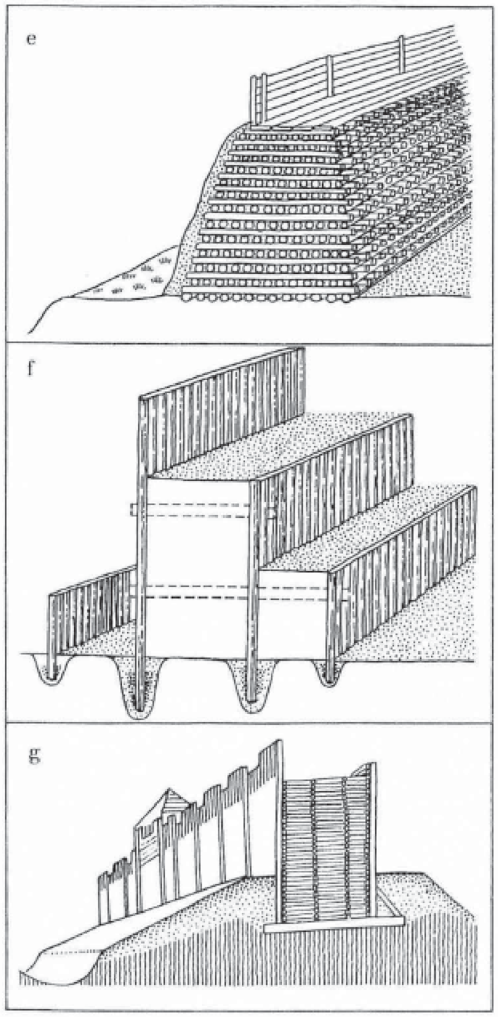


Fig. 1 Graphic reconstruction of the Bronze Age fortification walls built of wood, earth and stone. Bullenheimer Berg (a-c) and other sites (d-g) (after Herrmann 1989, 115 with references)

like conflicts: traces of destruction levels or horizons, repair or renovation of fortified structures in regular intervals, the shift of the population into a fortress, the strategic position of a fortification, gates that provide only indirect entrance into a fortification, blockage of the gates, and the willingness of the population to participate in building a large fortification. Thus, according to Ashkenazi, the function of fortifications lay in their symbolic representation of power and ideology of the elite, that is, the border between outside and inside, between 'we' and 'they'. The erection of stone walls and fortresses fostered group identity, whereby the occupants were restricted within the awareness and use of urban and interurban space. Hence, fortified complexes took on the function of cities and towns that represented their wealth and status. Furthermore, Ashkenazi concludes that evidence for war cannot be sought only in the archaeological context of defensive architecture and fortifications alone. The threat of violence present in social differentiation and the rise of an elite did indeed play an important role; yet fortifications nevertheless had far more a social function.

Fig. 2 Still present today in the massive walls of prehistoric fortifications are the remains of previous defensive walls. View of the graduated defensive walls around the summit plateau of the Ipf near Bopfingen, which were already erected in the Late Bronze Age and expanded later in the Hallstatt period (photo by R. Krause)

Fig. 3 The circular, 600-m long stone fortification around the summit of the 533-m high Stallberg near Hünfeld-Kirchhasel, distr. Fulda, is evidenced by the immense rubble of basalt boulders. In the foreground – an old trench from the excavation by Josef Vonderau in 1903, in which the front face of the stone wall can be recognised (photo by R. Krause)

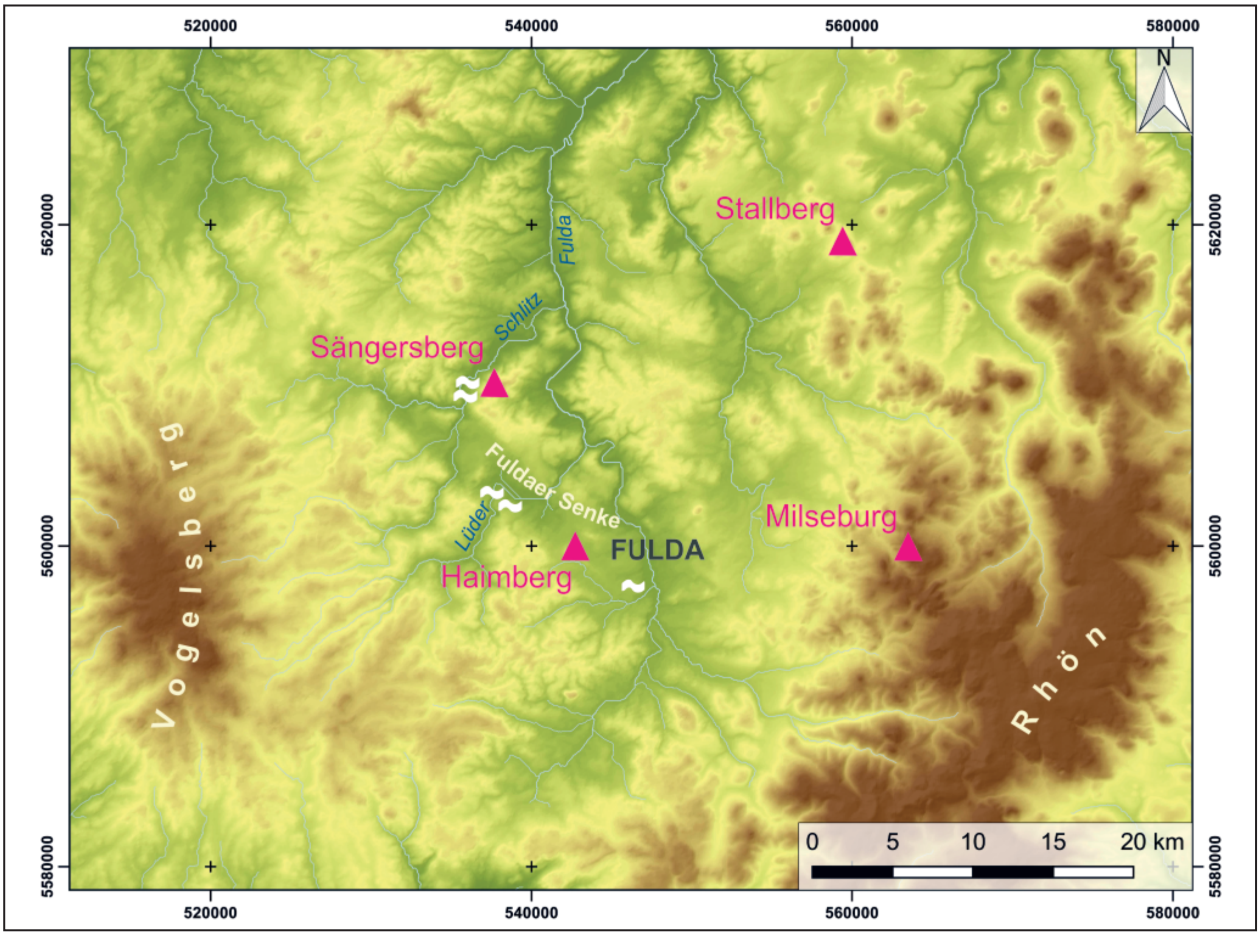


Fig. 4 The landscape between the Vogelsberg and the Rhön with the Fulda basin in eastern Hesse, showing hilltop settlements of the Late Bronze Age or evidence of prospection and salt springs (map by F. Becker based on the EU-DEMs v. 1.1)

New perspectives for understanding the Bronze Age fortification-building

Analyses of Early Bronze Age in the Levant have shown, that the phenomenon of wall construction in the Bronze Age must be accounted for and comprehended even further. Investigations of the LOEWE project carried out at different levels have revealed the likewise multifaceted foundations, the differing find contexts and above the different biographies of fortifications, as seen against the background of the genesis of a settlement landscape in diachronic perspective. There is general agreement that defensive fortifications are an expression of a hierarchical structure and that the fortress was a central element in the settlement community. However, the point in time at which a fortress was erected and the motivation behind its construction are still unanswered. Indeed, it could be proposed and premises presented that strongly fortified complexes were erected mainly as preventative measures to preserve peace, that is, as a deterrent to violence. Or from the perspective of the aftermath of a battle, a strongly fortified complex could have had the aim of peace-keeping, a deterrence, and also hindrance to aggressive confrontations in the future. Similarly, the social function of a fortress with mighty walls played a none-too-small role in a community. The erectors of a fortress not only demonstrated their power outwards; they also expressed their own ideology in a way, which is also manifested in the materiality of their weaponry as well as ritual activities. In summarising, the following factors can be named that were crucial to the erection of Bronze Age fortifications:

- Fortifications are the expression of a centralized hierarchical structure.
- Fortifications are not the expression of an acute conflict, but instead an anticipated conflict.
- Fortifications and walls create a boundary line between 'inner' and 'outer', between 'us' and 'the other'.
- Fortifications fulfilled a social function.
- Fortifications and defensive architecture symbolise the power and ideology of elites.

Fortified hill settlements between the Vogelsberg and the Rhön in eastern Hesse

Investigations and analyses of the LOEWE project have resulted in concrete criteria as the stimulation for the erection of Late Bronze Age fortresses, particularly in the Central German Mountains in southern Hesse between the Taunus in the West and the Vogelsberg and the Rhön in the East (**Fig. 4**).[22] Thereby especially historical and natural environmental factors play an important role when evaluating the different topographical situations. The following factors can be named:

1. Interconnecting routes, old pathways and communication axes.
2. Boundaries between cultural spheres.
3. Natural resources.
4. Topography and visibility.
5. The natural as well as the cultural landscape.

Applying these criteria to investigations on historical topography to fortresses of the Late Bronze Age too, has resulted in the following contexts:

1. Interconnecting routes

In a course passing from Mainz through the Wetterau over the Vogelsberg to the East through the Fulda Basin to Thuringia are several old roadways and long-distance routes, some of which can be traced back to the early Middle Ages (**Fig. 4**).[23] These tracks, which are conspicuously unite or intersect in the Fulda Basin form a kind of axis, along which the fortifications of Glauberg, Haimberg and Sängersberg of the Late Bronze Age are situated, and also Iron Age complexes, such as the Milseburg and Stallberg (**Fig. 5**). With them the view of K. Th. Ch. Müller gains greatly in credibility that these old interconnecting routes date back into prehistoric times.[24] Accordingly, fortifications of the Urnfield culture lie along already existent communication axes, which was an essential prerequisite for the erection of fortresses in such topographical positions. Impressive confirmation for this is supplied by the multitude of bronze artefacts from different origins found in the Haimberg. They are evidence for far reaching relations and exchange networks, well into the Nordic Bronze Age.[25]

2. Boundaries between cultural spheres

Cultural spheres and their borders may also represent significant criteria for the erection of fortifications. One premise is that the construction of fortresses was undertaken to secure political as well as socioeconomical relations, depending upon the stability or instability of communities. In the area under study the so-called Fulda-Werra-group was singled out for the Middle Bronze Age,[26] which is distinguished from neighbouring groups of mound graves by their burials under mounds and the grave and costume traditions that could be reconstructed from them. No fortified hill settlements are known yet from the Middle Bronze Age.[27]

The situation changed fundamentally with the Late Bronze Age Urnfield culture.[28] The regions of the Fulda Basin and Rhön became a landscape between larger units and possibly – in the best sense of the word – a border region, in which in any case influences from adjacent regions became notable. In the South was the Northeast Bavarian group of the Urnfield culture, in the West, North and East were the off-shoots of the Lower-Main-Swabian group, the lower Hessen group as well as the Unstrut group. The landscape between Vogelsberg and Rhön cannot be ascribed to any one of these groups. Hence, when considering the reconstruction of connecting routes as well as the occurrence of brine there, this area could have possessed a strong potential for conflict, which might have led to the erection of fortresses and defensive structures for better control.

3. Natural resources

The only noteworthy natural resources in prehistoric times in these areas were likely occurrences of salt and brine springs (**Fig. 6**), which are found

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22 See Neumann 2018 and Blitte/Verse 2018.

23 Müller 1927; on the Glauberg, see Baitinger in press. My thanks to PD Dr. Holger Baitinger for his very inspiring help and in advance for his manuscript (in press). See also Heinke 2012.

24 Müller 1927.

25 Vonderau 1929b; Hansen 1991.

26 On the Fulda-Werra group see Jockenhövel 1995.

27 On prehistoric settlement in general, see Verse 2015; on the Middle Bronze Age, see Görner 2015; on the Late Bronze Age or Urnfield culture, see: Müller 2017, 43 ff.

28 On the Urnfield culture in the district of Fulda, see Müller 2017, 43 ff.

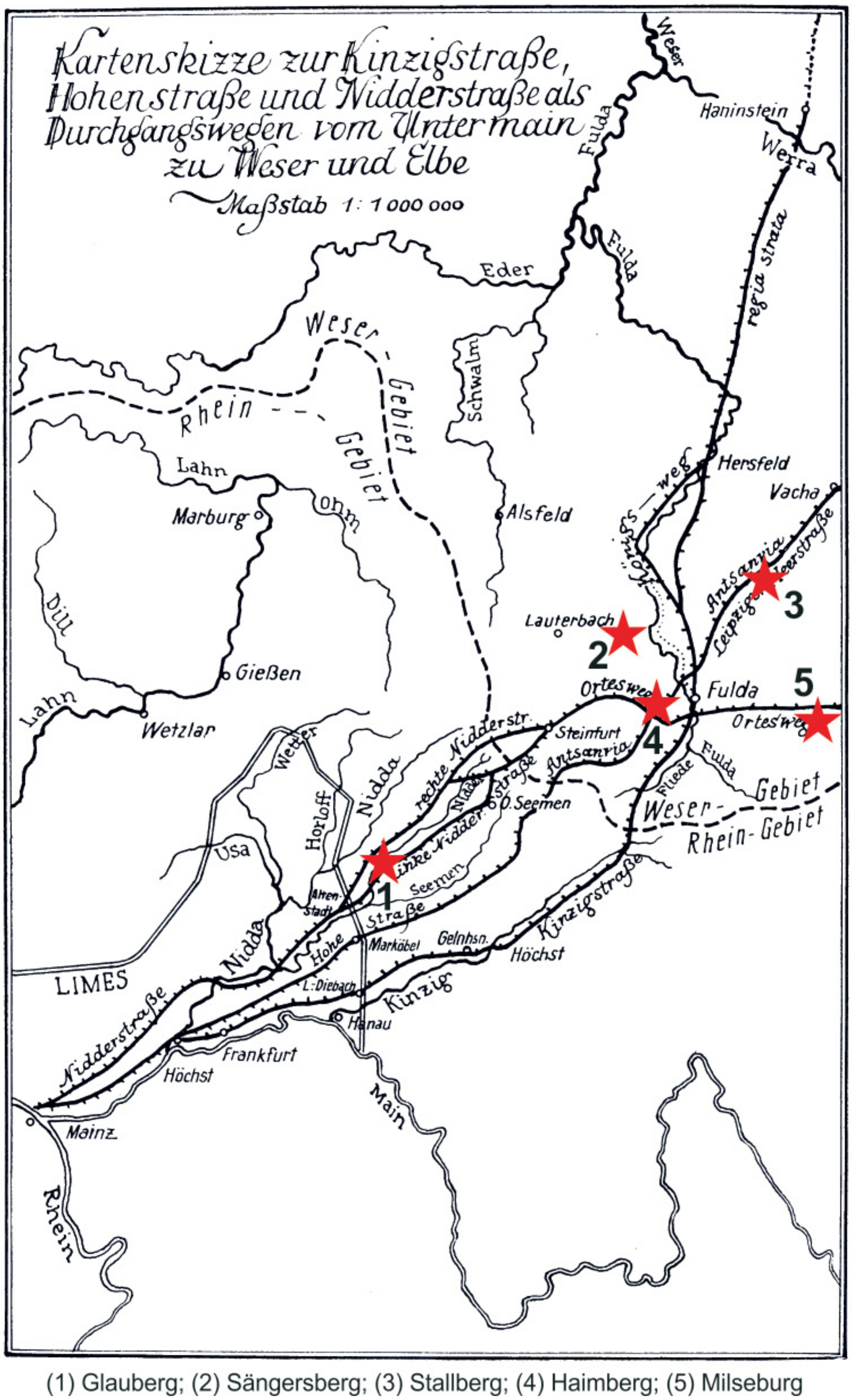

Fig. 5 Significant medieval connecting routes from Mainz and the Rhein-Main area, which likely date back to prehistoric times. The routes run over or around the Vogelsberg to the East *(Ortesweg)* and to the North *(Königsweg)* along the Weser and the Elbe rivers, which intersect in the Fulda Basin. Charted here are Late Bronze Age fortifications as well as Bronze Age evidence of Iron Age fortifications (map after Müller 1927, with additions)

Fig. 6 The salt spring *Benediktussprudel*, drilled in 1903, in Selters, Ortenberg, distr. Wetteraukreis (photo by B. Henkes)

in the Fulda Basin in the Lüder valley and the Schlitz valley. It was surely no coincidence that both of the known hill settlements of the Late Bronze Age, the Haimberg and the Sängersberg, are located in these valleys, or on their fringes (**Fig. 4**). Already in 1960, O. Uenze assumed that the numerous burial mounds in the Fulda area lie in the vicinity of salt springs, and he assumed a close relationship.[29] The oldest evidence for brine or salt exploitation derives from a document of the 9th century AD, in which the donation of a salt spring is named. Further evidence is found in the late Medieval period and the early modern age. Archaeological evidence for salt boiling in early modern times was discovered – by contrast – as late as 2013, west of Fulda in Großenlüder in the Lüder valley.[30] The extraction of salt from brine is not known in the Bronze Age, neither through archaeological findings nor through later Iron Age salt boiling sites as in Bad Nauheim.[31] Nevertheless, by comparing technical ceramics as attested by later briquetage, we may assume as already O. Uenze did, that there was a method of salt extraction from local brine during the Bronze Age, which however cannot be attested or confirmed at present. In any case, it must be assumed that small amounts of this coveted and vital substance salt could also be boiled in simple ceramic vessels (**Fig. 7**), without leaving any archaeological traces.

4. Visibility

The Fulda Basin with its wide valley of the Lüder – comparably deeply entrenched between the Rhön in the East and the Vogelsberg in the West – provides very good view axes and far-reaching visual contacts. These are illustrated in a viewshed analysis (**Fig. 8**), and otherwise can be easily noted in the terrain in a field study. The best visual

29 On the occurrence of brine and brine springs in the Fulda Basin, see Gies 2008; also on salt, see Uenze, already in 1960, 126 ff. 141-142.

30 On the history of the brine springs, see Gies 2008, 40-51; a short summary of historical sources as well as the results of excavation results presented by Funke 2018.

31 Recently with numerous references in Kull 2003.

Fig. 7 Experimental salt boiling as part of a course of the Goethe University (Frankfurt/Main) on the Glauberg in 2018. Brine is boiled in a ceramic vessel. A white residue can be recognised above the foam on the wall of the vessel. Using this simple method at least small amounts of salt can be gained (photo by A. Stobbe)

contact is between the 553-m high Sängersberg to the over 420-m high Haimberg in the East, a singular basalt cone with muschelkalk (originally much greater in height) in the Lüder valley (**Fig. 9**). Moreover, in addition to these two mountains there is a good view of the Milseburg, 835 m high, an outstanding basalt block that dominates the topography in the East of the anterior Rhön (**Fig. 10**).[32] Further, the view from the Sängerberg reaches far to the West to the Vogelsberg (773 m high). So, the visibility between both important fortifications – the Sängersberg and the Haimberg – was at hand, together with an excellent view axis. At the foothill of the Milseburg a cultural layer assigned to the Urnfield culture was discovered below the Iron Age fortification, although only on the eastern slope. Nonetheless, it may be assumed that the imposing basalt block was originally occupied in the Late Bronze Age, too, and that the evidence thereof was removed by intensive activities of the successive Iron Age settlers. From the Milseburg there is likewise a direct view axis with other fortifications to the West: an excellent long-distance view into the Fulda Basin and the surrounding landscapes.

5. Natural and cultural landscape

The reconstruction of the natural and cultural landscape is still in its beginnings. Archaeobotanical archives are for reconstruction of the history of vegetation especially important, but they are difficult to comprehend.[33] The first contexts and results indicate that a far-reaching woodland and dense forest can be assumed. One important question concerns the extent to which the valleys were treeless and with that the extent of view axes in the valleys, when considering the postulated connecting routes. The summits of mountains must have been free of trees; otherwise building a fortress there would have been senseless. On the

32 On the Milseburg, see Söder/Zeiler 2006; 2012.

33 Lisa Bringemeier M.A. is working on this in her dissertation on vegetation history, within the framework of the archaeobotanical component of the LOEWE project.

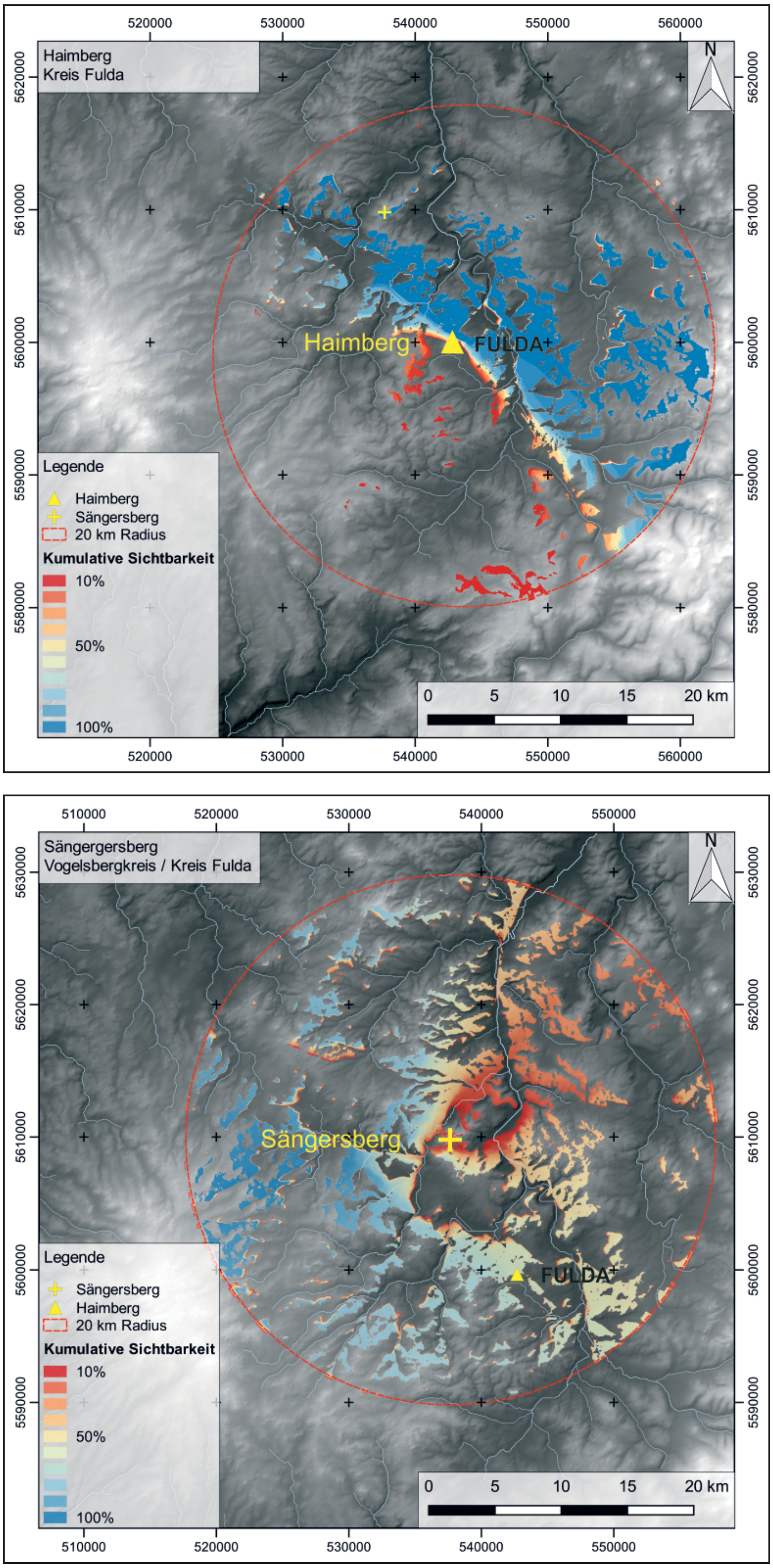

Fig. 8 Viewshed analyses of a 20-km radius around the Haimberg (above) and the Sängersberg (below). They confirm the favourable view axes between both Late Bronze Age hill settlements and in the Fulda Basin, the area where the old route axes intersect (cp. Fig. 4). Despite the forest cover, in figures 8 and 9 together the excellent view axes between the hill settlements is quite apparent (analysis by F. Becker, basing on the EU-DEMs v. 1.1)

Fig. 9 View from the 553-m high Sängersberg towards the Southeast to the Lüder valley and the Fulda Basin. In the centre lies the elongate, forested ridge of Haimberg (today still preserved to a height of 416 m) (photo by R. Krause)

one hand, timber was needed for construction of fortresses and settlement structures, while on the other hand, wood was needed for daily use. Yet, the mountain tops must have already been free of trees, so that the postulated visual connections between fortifications and a certain control over the area would have been possible. Finally, it may be assumed that the valleys in the area of the Fulda Basin were visible to a certain degree, as well, possibly to control the long-distance routes, reconstructed here.

Future Perspectives

Compared to the last large conference on castle-building in Nitra in 1980,[34] great progress has been made in evaluating the genesis, function and effect of Bronze Age fortresses. The LOEWE project in Frankfurt/Main is discussing the function and importance of fortifications in interdisciplinary dialogue with medieval studies[35] and sociology. Nowadays, the causes for erecting walls are attributed to various factors, which do not necessarily base on solely reasons of defence. Today the line of inquiry concerns far more the social representation and effect of walls – 'inwards' as well as 'outwards' –, and their function in a settlement landscape as an identity-giving element of a community. Or expressed in another way: fortifications likewise symbolise the ideology and claim to power of elites. On the other hand, we assume that fortresses of the Bronze Age were built coincident with the development of new weapons and battle techniques as preventative measures and deterrents against confrontations. They were less the expression of real conflicts, and more in anticipation of conflict, which could possibly be avoided or carried out outside of the fortified hill settlements.

34 Chropovsky/Herrmann 1982. On the Late Bronze Age hilltop settlements of the Urnfield culture, confer the works of A. Jockenhövel (*e.g.*, Jockenhövel 1975; 1990).

35 Kohl 2018.

Fig. 10 The topographically prominent basalt block of the Milseburg (835 m high) in the anterior Rhön dominates the landscape. View from the 553-m high Sängersberg towards the East, over the Fulda Basin to the Milseburg (photo by R. Krause)

Furthermore, natural environmental, cultural as well as economic factors were also responsible for fortress-building. Involved here were exchange and communication routes (pathways), the exploitation of processing of raw materials (salt), and boundaries between former territorial dominions and cultural spheres, as far as we can determine them in the material culture and in reconstructed burial customs. The visibility and dominance of fortified hilltop settlements were originally very important criteria, as shown here on example of the Fulda Basin with old communication routes between the Vogelsberg and the Rhön in eastern Hesse. Bronze Age fortresses with their different, elaborately constructed wood-earth-stone walls were certainly an impressive architecture of power, power that formed against the background of developing techniques in war and weaponry. They thus played an essential role as bases of power of (warrior) elites.

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Raphael Greenberg and Hai Ashkenazi

On the Collective Ethos of Fortification in the Levantine Bronze Age

Attributing the large-scale, but tactically suspect, south Levantine Bronze Age fortification systems a 'social' role has become an archaeological commonplace, yet it begs the crucial question of form – if a polity, a social class, or a collective wish to advertise their cohesion, power, or wealth, why choose fortifications, rather than burial monuments, temples or palaces? In other words, what social end was served by conspicuous, inefficient, military consumption? This paper aims to offer a preliminary answer to this question through three interlocking arguments: The first, that societies like that of the Levantine Bronze Age are characterized by the existence of cooperative labor obligations; the second, that this collective labor investment was, in the ancient Levant, primarily dedicated to defense; the third, that tactically imperfect fortifications were nonetheless strategically successful as defensive installations, even while promoting social cohesion and projecting elite power.

Introduction

The attribution of a primary non-defensive 'social' role to large-scale, but tactically suspect, south Levantine Early and Middle Bronze Age fortification systems was mooted in the heyday of late 20th century 'social archaeology', first with regard to 2nd millennium earthworks[1] and later, with regard to the stone walls of the 3rd millennium BCE.[2] Although these proposals did not negate the military value of the fortifications, they appeared to place a higher value on the symbolic and communicative significance of the massive earth and stone structures, thus intimating that their construction represents a form of 'false consciousness': they might look like fortifications, but in reality they are no more than vehicles of elite propaganda. While we remain fundamentally sympathetic to the 'social' position – indeed, no military investment can be contextualized outside society – its presentation as a 'mere' social fact appears to beg two important questions: First, why choose fortifications as the vehicle of civic or elite self-aggrandizement, when other options were presumably on the table (e.g., monumental temple or tomb construction), and, second, why make them tactically inferior or incomplete? What possible purpose could that serve?

This paper aims to offer a preliminary answer to these questions through three interlocking arguments: The first, that societies like those of the Levantine Bronze Age – sometimes characterized as 'intermediate', i.e., lacking full-fledged, permanent administrative institutions – are characterized by the existence of cooperative labor obligations, often embedded in ritual schedules, which could be directed toward large construction projects, including defense works. The second, that collective and cooperative labor investments in fortifications do, in fact, characterize Early and Middle Bronze Age societies in the Levant, often at the expense of other forms of conspicuous consumption, such as wealth accumulation or monumental palatial construction. The third, that *tactically* imperfect fortifications were nonetheless *strategically* successful as defensive installations, while fulfilling their equally important roles in the promotion of social cohesion and the projection of the power of polities and of their elites.

1 Bunimovitz 1992; Finkelstein 1992; Ilan 1995; Herzog 1997.
2 Philip 2001; Greenberg 2002.

Fortifications as Collective Action

In a recent volume on cooperative and collective action,[3] Charles Stanish, David Carballo, and Paul Roscoe offer complementary insights on the nature of such action in communities lacking a developed administrative hierarchy, where economic interactions rest on a foundation of mutual, constantly deferred debt and debt restitution, rather than on terminal exchanges and institutional coercion.[4] Stanish's cross-cultural study of societies without fixed hierarchical structures shifts the long-standing emphasis in anthropological literature from the political to the productive aspects of ritual gatherings, highlighting the economic role of calendric ceremonial occasions: "A very effective way to create and maintain cooperative labor organizations in intermediate societies (i.e., those without the institution of coercive force as seen in state societies) is to embed the production process in set schedules, defined by political ritual, conducted in periodic feasts and sanctioned by taboo or customary law".[5] Carballo's study of pre-Hispanic labor collectives in Mexico expands on this point: "Labor obligations such as *tequitl* are not merely how individuals get things done: they construct and continually redefine communities; they are interwoven with systems of ritualized consumption and reciprocity that set the standards for evaluating social roles and responsibilities; and they are the building blocks of more complex sociopolitical systems…".[6]

Both Stanish and Carballo document the ability of communities to mobilize large numbers of people who, in limited time, are able to carry out critical agricultural tasks or engage in public works, such as the digging of irrigation canals and the building of temples. Complementing this observation, Roscoe identifies the physical protection of communities and settlements as a primary objective of collective action in 'polities': "Polities as political communities are and were almost everywhere defensive organizations, aimed at securing the collective benefits of mutual protection against enemy attack".[7] This resonates with Otterbein's observation that warfare was inimical to the development of early political formations and that avoiding conflict was, therefore, in their interest.[8]

While temporary mobilization to thwart an attack could be carried out by groups of almost any size, mobile or sedentary, there is probably a minimum threshold for the kind of collective defensive mobilization implied by the construction of permanent fortifications. It may be assumed that the builders of such fortifications lived in proximity to them (whether inside the fortified enceintes or in the surrounding countryside) and that they felt better served by staying within the walls in times of danger than by escaping to a different place. They also had to be loyal to the polity (i.e., receptive to its legitimacy) and great enough in number to be able to pull off the task of fortification within a reasonable amount of time, without prejudice to more productive pursuits. In other words, we may expect the collective construction of fortifications to correlate with larger and more sedentary populations, and with a lower tendency to exit the system.[9] A negative population trajectory would, conversely, reduce the benefits of collective action and increase the attraction of departure. As we will suggest below, both Early and Middle Bronze Age episodes of augmented fortification in the southern Levant can be associated with population nucleation and attempts to bolster the legitimacy of the polity through centralized ritual.

Early Bronze Age Fortification Projects

The Early Bronze Age I (EB I, c. 3700–3050 BCE) began with a long period of relatively stable village existence based on an expanded Mediterranean triad (cereal/pulse agriculture, olive/vine horticulture and sheep/goat husbandry). In the latter part of the period, however, settlements grew larger and more nucleated, and several 'mega-villages' came into existence, covering 30–60 ha and boasting populations of thousands. While these large agglomerations reproduce, for the most part, village modes of domestic construction and little evidence for social articulation, there are several instances of wealth accumulation – presumably by leading families (e.g., at Tel

3 Carballo 2013a.
4 Graeber 2012.
5 Stanish 2013, 88.
6 Carballo 2013b, 261.
7 Roscoe 2013, 59.
8 Otterbein 2004, 96.
9 Blanton/Fargher 2008.

Bet Shean[10] and at Tel Erani[11]) – and of collective labor. One striking example of the latter is the 'Great Temple' of Megiddo,[12] which must have functioned as a regional ritual center, located on a hilltop adjacent to a large village. In other isolated cases, large EB I communities chose to surround themselves with fortifications, among which the massive mudbrick wall of Tel Shalem is the best-documented example.[13] Fortification became universal, however, only in the following period – the Early Bronze Age II (EB II, c. 3050–2850 BCE), when settlements of every size, from 1.5 to 30 ha, were newly designed as fortified enclosures. These settlements are marked by the uniform character of their domestic dwellings and material culture assemblages, manifesting little evidence of elite social articulation or of wealth accumulation. Chesson,[14] followed by Paz[15] have suggested the template of the 'House society' to model how social power was negotiated and deployed within these settlements. What is immediately striking in the EB II fortifications is the apparent existence and repeated use of a bare-bones template for fortifications, consisting of a relatively thin and low curtain wall, interrupted at intervals by narrow gaps or wider gates. The gaps (or posterns) either afforded passage through the wall or led to round or square towers appended to the wall. Such towers are best known from the extensively excavated site of Arad,[16] but have been found as far north as the western Galilee site of Me'ona.[17] The gates could be protected by flanking towers, as at Tell el-Far'ah and Tel Bareqet,[18] but such protection was by no means universal, and often there were adjacent posterns that circumvented the gates (e.g., at Zeraqun, 'Ai, and Tell el-Far'ah). Sites with natural protection (e.g., a ravine or a body of water) could be walled only over part of their circumference (Bet Yerah, Bab edh-Dhra', Khirbet ez-Zeraqun). By way of contrast, Tel Yarmuth exhibits casemate-like construction, buttressed tower fortifications and, in a late phase of EB II (or early EB III), the construction of a massive revetment pierced by an indirect-entry gate. This style of seemingly excessive investment in construction is relatively rare in EB II, but becomes the norm in the following period, EB III.

The uniform thickness of most EB II walls, their modest height, and especially their permeability (due to the presence of multiple gates and narrow 'posterns') suggest that they represent a strategic compromise between partially competing social objectives: the exclusionary and defensive objective, which seeks to protect and define the inhabitants of the fortified enclosure as a self-contained community; a collective or egalitarian objective, which seeks to conceal status differences within the community by collective mobilization and by the standardization of the fortification segments; and a power-distributing objective, which allows maximum freedom of movement and minimal surveillance over the comings and goings of the inhabitants of the fortified villages and towns.

South Levantine Early Bronze Age III (EB III, c. 2850–2450 BCE) is marked by the abandonment of the latter two objectives, in favor of the enhanced adoption of the first objective – the inscription of fortified towns in the landscape as centers of population and power. Towns – fewer in number but probably more densely built-up than those of the preceding period – were now surrounded by increasingly massive fortifications, with only one or two fortified gates and broad platforms (bastions) that permitted both inward and outward surveillance. In addition, the widespread construction of ritual enclosures and temples in EB III, as well as a few large buildings interpreted as elite residences,[19] suggest a power-grab by the prominent Houses, who could now more readily manipulate the ritual calendar to mobilize labor for defensive construction. Late EB III Yarmuth, where fortification gives way to the construction of a large manorial compound, provides a striking exception to the EB III 'arms race' of enhanced fortification by taking the next logical step: buttressing the status of local elites at the expense of the common interest.

There is no dominant fortification template in EB III: each town emphasized different details. For example, at Tel Dan, excavations at two points on the mound's perimeter revealed the 12-m wide and 10-m high fortification, preserved beneath the Middle Bronze Age ramparts.[20] At the northwest

10 Mazar/Rotem 2009.
11 Kempinski/Gilead 1991.
12 Adams *et al.* 2014.
13 Eisenberg 1996.
14 Chesson 2003; 2015.
15 Paz 2012.
16 Amiran/Ilan 1992.
17 Braun 1996.
18 de Vaux 1962; Paz/Paz 2007.
19 Miroschedji 2014.
20 Greenberg 2002, 30–35.

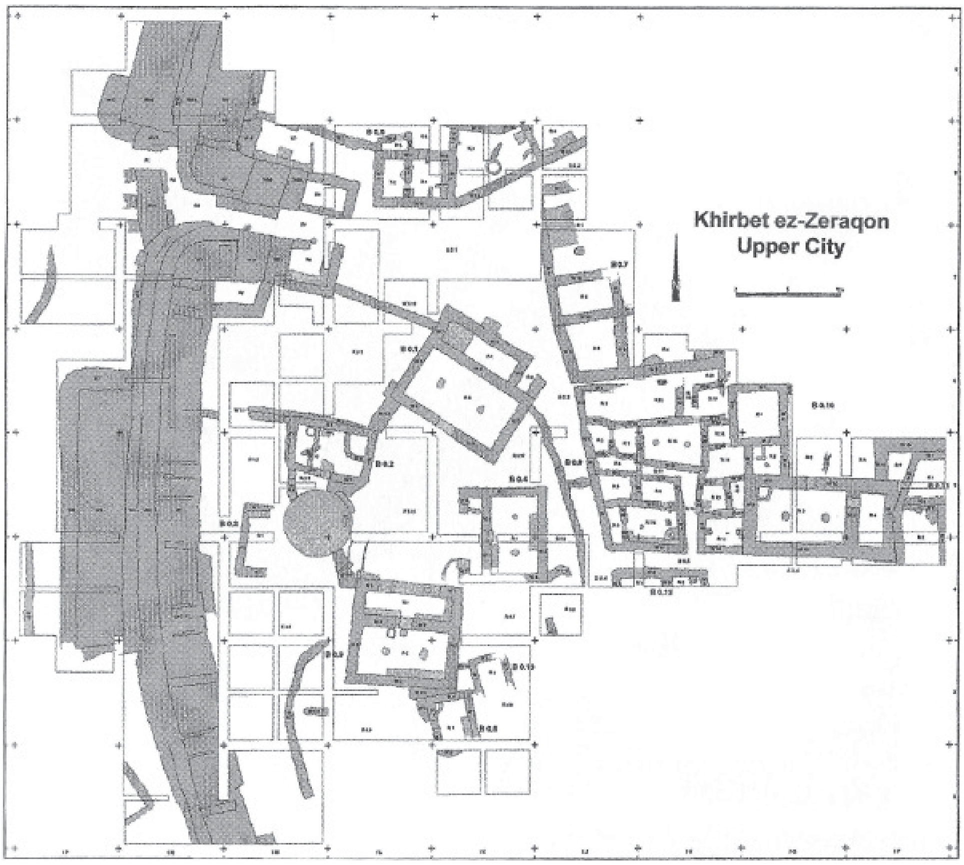

Fig. 1 Acropolis of Early Bronze Age Zeraqun (after Douglas 2011 Fig. 3)

corner, a massive stone and mudbrick wall, 4.5 m thick, was preserved, furnished with six rectangular external 2 × 3 m buttresses. The Lawieh (Leviah) enclosure, on a long, narrow ridge surrounded on three sides by precipitous cliffs, was traversed, from side to side, by three parallel walls, of which the outermost was 16 m wide and pierced by a gate protected by two square towers. A recent publication[21] attributes quantities of sling stones found near the gate to the final battle at the site. The 3–4 m wide EB II wall at Khirbet ez-Zeraqun was reinforced in EB III by the addition of an external buttress along its entire length that brought the fortification to a total width of 6–7 m.[22] A large bastion was built near the acropolis gate, which was adjoined by a large cultic complex, and the two gate passages were progressively narrowed and screened by walls and gate structures, with the adjacent posterns being blocked. The lower-town gate, near an area of domestic buildings, was also fortified by a large bastion built next to it and eventually was completely blocked, with entry to the town enabled by a flight of stairs that led up *over* the blocked gate and thence down to street level (**Fig. 1**).

The southeast gate of Tel Bet Yerah was blocked with mudbricks at the start of EB III.[23] Later, a completely new fortification line (Wall C) was built just inside the previous fortifications. It has a saw-tooth plan and was furnished with at least 15 rectangular and circular towers. At Khirbet el-Batrawy, east of Amman, an EB II town had been fortified by a 3.2-m wide wall, built in 6-m long segments, furnished with a narrow, direct-entry gate.[24] This gate was blocked in EB III and two additional belts of fortification added outside the original wall, resulting in a 7-m wide fortification, protected by a stone glacis and two rectangular towers. Two elite residences and a temple are attributed to this phase. A similar sequence of fortification enhancement and temple construction can be seen at the site of et-Tell (ʿAi), in the hills north of Jerusalem: the EB II wall was doubled, its posterns blocked, and a massive bastion was built near the main gate in EB III.

21 Paz 2011.
22 Douglas 2011.
23 Greenberg/Paz 2005.
24 Nigro 2010.

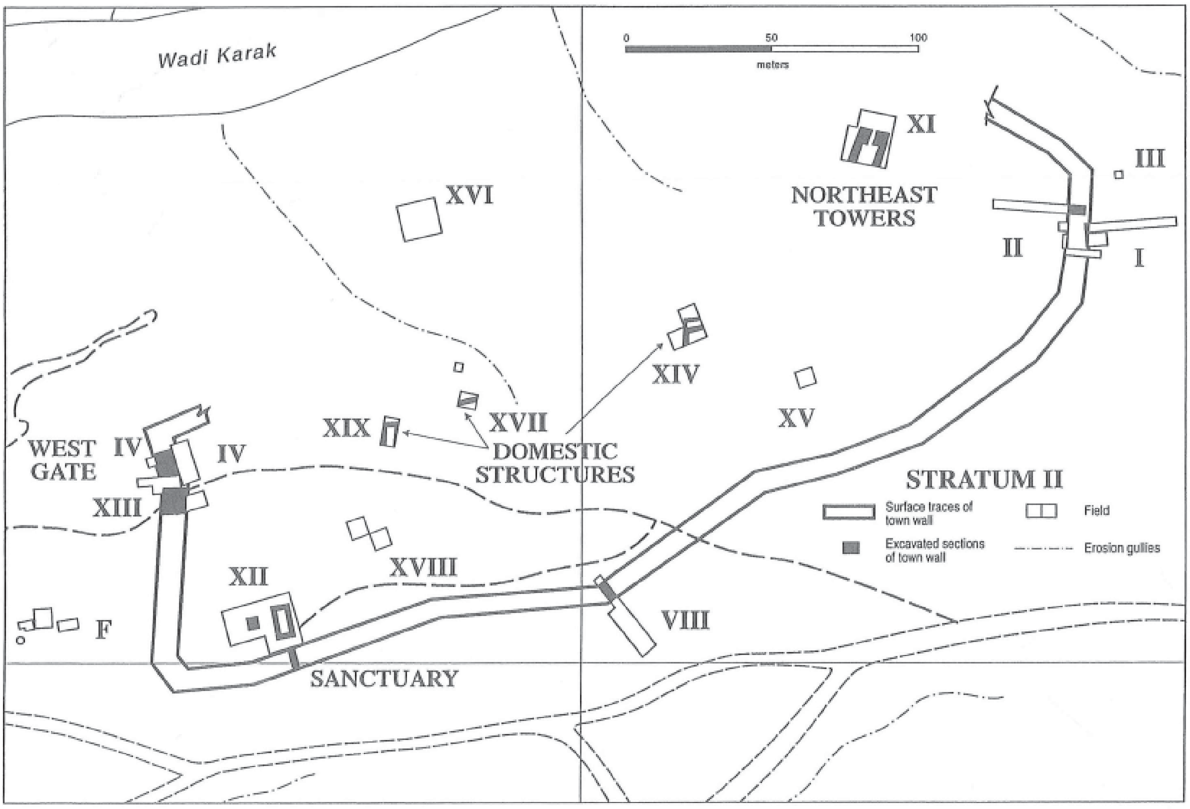

Fig. 2 Bab edh-Dhra'. Area XI includes two freestanding towers and at Area XVI only domestic houses were found (after Rast/Schaub 2003, 286 Fig. 10.1)

Despite their sheer size, EB III fortifications exhibit many tactical deficiencies.[25] At Bab edh-Dhra', Bet Yerah and Zeraqun, fortifications still did not encircle the whole site (**Fig. 2**). At Bet Yerah and Rumeida (Hebron) they occupied topographically inferior positions. Towers and bastions, though massive, often exhibit a limited field of view (either due to their location in the path of the wall or by being built facing inward, e.g. at 'Ai and Bet Yerah) and were usually separated by very large gaps, far exceeding the typical "bowshot gap" of 25–40 m. Over time, towers and bastions at some sites were allowed to fall into disrepair without being replaced ('Ai, Yarmuth). Most sites lacked a secured water source. Finally, the massive fortified enclosures could scarcely be effectively manned by the limited population of the towns (which, in any case, were not likely to have had any form of permanent military garrison): the only putative evidence for battle – at the Lawieh/Leviah enclosure – comes in the form of what could at best be termed a raid involving hand-to-hand combat within the gate passage, rather than a siege, and it appears to have been won by the attackers!

Tel Yarmuth,[26] whose massive and sophisticated late EB II fortification anticipated EB III developments, appears to buck the trend of most contemporary settlements: In the EB III, a series of large rectangular stone platforms (10–12 × 30–40 m), interpreted as foundations for internal bastions, was constructed upon the fill between the two earlier walls. Later, one of these platforms as well as the first wall (Wall A) were put out of use by the construction of Palace B1, reinforcing the sense of a change in priorities of the local leadership: instead of recruiting local labor for public works through the medium of ritual centralization, a concentrated effort was made to bolster the status of the leading family or families, leaving the rest of the inhabitants to fend for themselves without the benefit of a functioning defense system. This approach was a harbinger of the final demise of EB III, when towns were no longer able to function as communities, and the mutual obligations of the various classes of inhabitants were no longer honored.

Late EB III was marked by the progressive abandonment of large settlements – a process that almost certainly reflects a demographic decline

[25] Ashkenazi 2016.

[26] Miroschedji 1990; 2013.

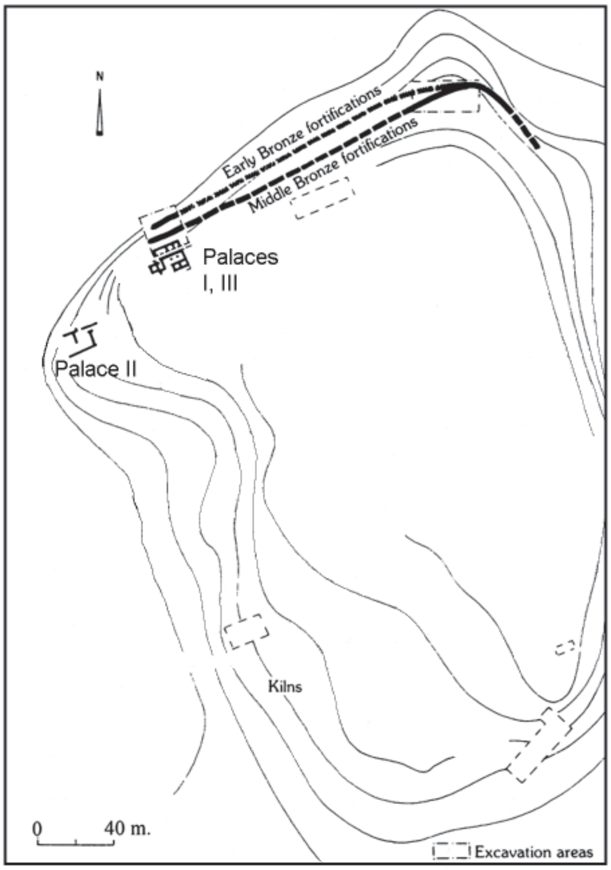

Fig. 3 Aphek (after Kochavi *et al.* 2000 Fig. 1.5)

and a concomitant increase in the attraction of 'exit options' from the collective model. The relative lack of economic specialization and integration in the Early Bronze Age system allowed most of the population to opt out of the system without endangering their subsistence base. The resultant Intermediate Bronze Age (IBA, c. 2500–1950 BCE) society was therefore characterized by a very low level of collective endeavor and the apparent rise of interpersonal violence. This can be seen, on the one hand, in the general lack of fortifications and monumental buildings at IBA sites and, on the other, in the marked increase in the number of weapons found, especially in IBA burials. The collective spirit of IBA communities was expressed primarily in the maintenance of large cemeteries, which in some cases bear evidence for short-term collective labor, such as in the periodic carving of individual or family cave-tombs and the raising of megalithic dolmen graves.[27]

Middle Bronze Age Fortification Projects

The second wave of south-Levantine fortifications, which began in the late 20th or early 19th century BCE, was distinguished by the construction of massive earthworks, either on top of earlier, Early Bronze Age fortifications or in new locations. Scores of fortified Middle Bronze Age (MB) sites have been excavated and the fortifications themselves have been repeatedly and exhaustively described.[28] The principal contrast to the earlier waves lies in the clear evidence for a top-down process: Invariably, the earthworks enclose an area much larger than that required by the extant population, an area used for different expressions of elite power: the construction of palatial manors, the appropriation of water sources – springs, wells, and reservoirs, the construction of family mausolea and the construction of temples. Massive and elaborate gateways typify the earliest Middle Bronze Age enclosures, highlighting issues of surveillance and economic control. The end of the Middle Bronze Age is marked by a general exodus, not only from fortified sites but from the entire village system that supported them. The subsequent Late Bronze Age sees an abrupt about-face: fortifications are shunned by the new elite, who invest their economic and social capital in a wealth economy focused on palatial settings, temples, and attached craft workshops.

The fortified sites of Aphek, Ashkelon and Hazor may be taken as representative of the central tendencies of Middle Bronze Age fortification. At Aphek (**Fig. 3**), an initial village phase is succeeded by a settlement characterized by a sturdy fortification (clearly identified and traced only along the northern and part of the eastern flank of the mound), consisting of a solid brick wall fronted by an earthen supplementary rampart, and a large, well-built structure dominating its acropolis, termed 'Palace I'. A coeval occupation consisted of scattered walls and a number of primary interments of all ages and genders. The fortifications of Aphek would thus have enclosed a settlement consisting of a large, central manor house surrounded by a few huts and open areas used for refuse disposal and for burials. In the following phase, still in MB I, a new 'palace' (Palace II) was built in the former open area, while the earlier mansion was

[27] Prag 2014.

[28] For the most recent, comprehensive review, see Burke 2008.

abandoned, scavenged for building materials, but not resettled or rebuilt. Several richly furnished built tombs, excavated in 1936 and situated northwest of the acropolis, have been attributed to this phase.[29] A third reversal of fortunes occurred at the end of MB I or early MB II, when 'Palace III' was constructed on the site of Palace I.[30] There is room for doubt whether Aphek ever achieved urban status in the Middle Bronze Age. Rather, a feudal-like social structure appears to be in place, with the 'palaces' surrounded by far smaller residences of dependents and retainers and, beyond the fortified enclosure, by a network of villages that served as a resource for seasonal labor.

At 60 ha, Ashkelon (**Fig. 4**) would have been by far the largest site of the south Levantine MB I; it has been interpreted as the populous center of a kingdom with up to 15,000 inhabitants,[31] but there is reason to doubt that it was ever settled to such an extent. Excavations of Middle Bronze Age remains have centered on a small stretch of fortifications abutting the north slope of a mound that dominates the northwest angle of the site (the North Tell). Here, an imposing earthen rampart faced with stone and plaster glacis has been revealed, built in several incremental stages, each associated with one of the main stages of a striking series of massive, superimposed gates built in combinations of dressed *kurkar* sandstone and mudbricks. For visitors heading eastwards, up the ramp, from the sea shore, the glare of the sun on the white sand dunes to their left and on the steep, stepped whitewashed glacis to their right would have created an instant and unnerving contrast with the gloom of the long, sloped vaulted corridor, and by the time they became accustomed to the gloom, they would have been thrust out again into sunlight, in the internal gate plaza. This manipulation of the senses was a crucial opening gambit, advertising the power of the city and of its rulers and the insignificance of the visitor. But this was very much a shallow façade, with little substance. Soundings excavated along the western flank of the rampart suggest that parts of it were more simply constructed than the gate area, and that it may have followed the contours of natural ridges that demarcated the site.[32] Excavations within the enclosure revealed some stratified remains on the south tell (the natural hill in the center of the enclosure), as well as MB I–II tombs and burials without associated structures. Detailed studies of the scarp of the mound facing the sea suggest an uneven topography and checkered settlement sequence.[33] Indeed, as far as can be made out from the preliminary reports, MB I Ashkelon was a huge, sparsely settled enclosure, undefended on the side facing the sea, that captured within it an area of multiple functions. The quick succession of gates built during MB I indicates maintenance issues of the mudbrick superstructure that could be attributed to an inadequate labor pool.

The earliest Middle Bronze Age settlement at Tel Hazor is recorded only in late MB I (Stratum Pre-XVII), but the presence on the mound of a large tomb, T. 1181, and the concomitant beginning of rampart construction on the eastern terrace of the site, nearly doubling its size,[34] indicate that something was afoot. Within a short span of time, at the start of the MB II, a huge enclosure was erected, extending north from the original hill and Early Bronze Age mound and encompassing an area of 80 ha.[35] The western flank of the enclosure consists of a massive rampart, standing 90 m wide and 30 m above the fosse that runs along its base. A deep depression lies at the south end of the rampart, where it approaches the high mound. On the north and eastern sides of the enclosure, the rampart is far less prominent, but still rises steeply above the adjacent plain. Two gates were built on the eastern flank of the lower city, one in Area P, at the junction of the mound and the enclosure, or lower city, and one near the northeast angle of the enclosure (Area K). Set into the earthen ramparts and bonded with them by means of an elaborate system of stepped casemate walls and revetments, the gates have a classic six-chambered plan that was first introduced in MB I Syria and became standard in the late MB I and MB II southern Levant. A massive retaining wall, built of cyclopean boulders, supports the entrance ramp and gate plaza facing the later phase of the Area K gate, and must have offered an imposing sight to those approaching the site from the main north-south highway.

29 Ory 1937.
30 Kochavi *et al.* 2000.
31 Stager *et al.* 2008; Burke 2008.
32 D. Master, personal communication.
33 Raban/Tur-Caspa 2008.
34 Dunayevsky/Kempinski 1990; Covello-Paran 2007.
35 Yadin 1972.

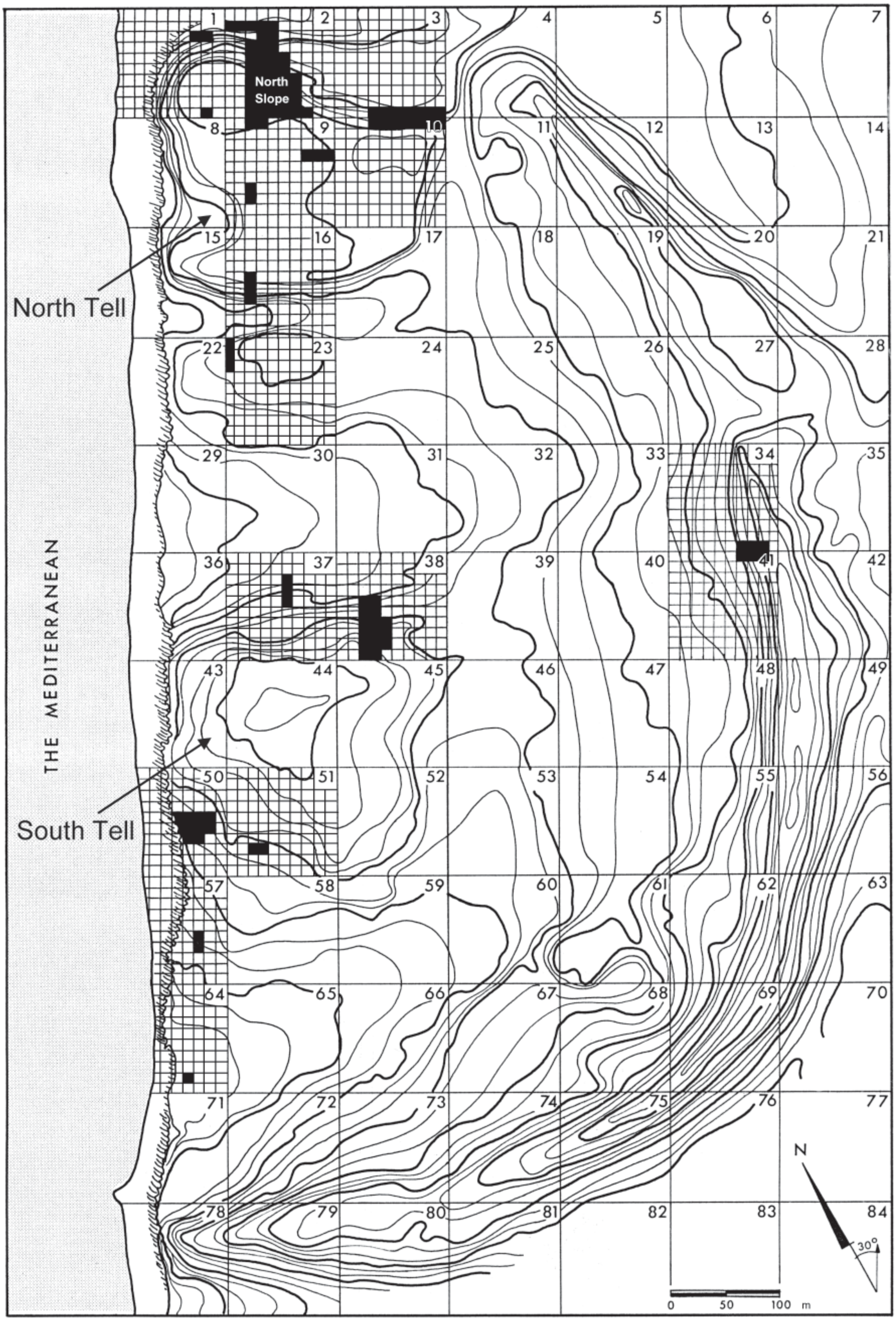

Fig. 4 Ashkelon (after Stager *et al.* 2008 Fig. 1.4)

Zuckerman has suggested that, as in other Middle Bronze Age sites, the city developed from the outside in.[36] That is, the ramparts were the first element to be constructed, accompanied by the creation of a ritual axis extending from the Area H temple in the north, through the double-temple in Area F to the ceremonial compound built on the high mound (Area A), on the south (**Fig. 5**). Domestic architecture appeared only after the ramparts were built. The large, deep depression at the south end of the western rampart might mark the location of a water reservoir or well.

Numerous additional Middle Bronze Age fortifications, whether erected as rampart enclosures on pristine ground or built as supplementary ramparts around preexisting mounds or natural hilltops, reproduce the model described above: top-down planning, multipurpose enclosures that often contain ritual centers, and relatively straightforward engineering principals that demanded a large, but unskilled, work force. Because the massive enclosures invariably precede urbanization (which is not universally attested at fortified Middle Bronze Age sites), we must assume that the mobilization of the collective labor required for their construction had to be carried out in the villages of the surrounding countryside. Some of those mobilized might have then relocated into the fortified area, but unlike the Early Bronze Age, village-town integration appears to have been strong in most regions.

Although massive and often showing advanced engineering capabilities, Middle Bronze Age fortifications were hardly more successful, in tactical terms, than their Early Bronze Age counterparts. Opportunistic in design, often utilizing preexisting natural or artificial formations, and predicated on seasonal labor and periodic, politically determined bursts of activity, Middle Bronze Age fortifications were markedly uneven, often leaving some parts of the town perimeter poorly protected in relation to other parts. The absence of a wall on top of most ramparts rendered them susceptible to easy scaling. Attackers had the benefit of being able to scale the rampart from various directions without the fear of a ladder being pushed away from the wall. Ramparts at the seaside sites of Yavneh-Yam and Ashkelon had no sea walls. Other tactical issues were the lack of towers along the flanks of the fortified enceintes, which limited the field of view

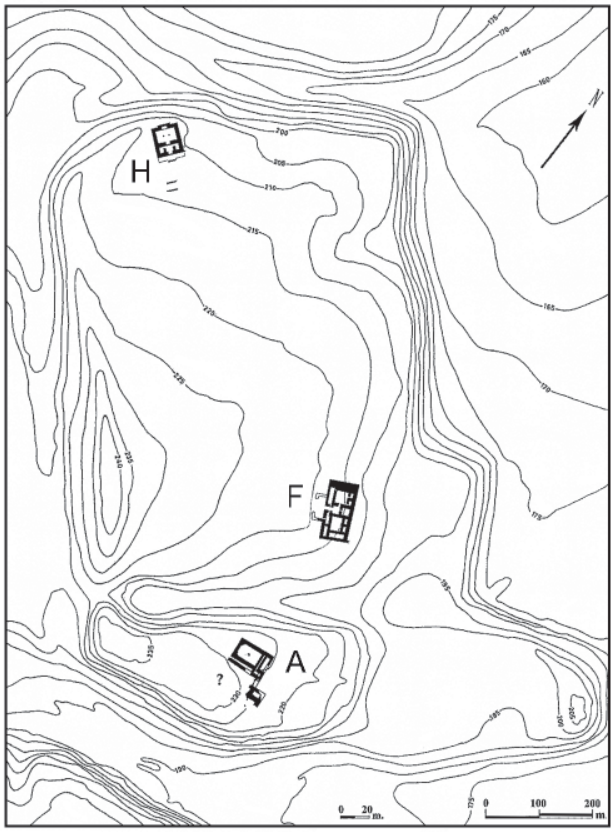

Fig. 5 Hazor ramparts and Stratum 3 (XVI) temples (after Zuckerman 2012 Fig. 5)

afforded to the defenders and deprived them of a defended firing platform. The only excavated towers were those that flanked the large gates, perhaps an indication that these complex structures functioned as small forts.[37] In some sites the ramparts encompassed large and only partially inhabited tracts of land, creating unnecessarily long fortifications that in times of war would have necessitated excessively large garrisons.

The Strategic Efficacy of Bad Fortifications

Despite the tactical shortcomings of both Early and Middle Bronze Age fortifications, the archaeological record, by and large, testifies to remarkably few instances of violent conflict in either period: there are few destruction layers, and little incidental evidence for sieges, siege-craft or mass burial. As for weaponry, the Early Bronze Age is almost devoid of military hardware (the sling stones attributed to the decisive battle at Lawieh are, at best, an illustration of how little was actually required, in terms of actual combat, to subdue a

36 Zuckerman 2012.

37 Herzog 1997, 134.

massively fortified town). In the Middle Bronze Age weapons are common in 'warrior burials', but seem to belong to the realm of individual combat rather than organized warfare.[38] Thus, despite their vulnerabilities, the massive walls and ramparts served as effective deterrents, proving to be a wise investment of collective labor. The strategic success of the 'bad' fortifications can be ascribed to several possible causes:

*They were good enough***.** The elaborate fortifications were used as strategic deterrents and were not designed in relation to a specific siege technology. During the Early Bronze Age there were no long-range weapons to speak of, nor were the extant towns populous enough to maintain standing armies, whether as attackers or defenders. During the Middle Bronze Age as well, there is little evidence for military campaigns, and both textual and artifactual evidence points to localized conflicts, determined by the outcome of battles between rival warriors. The tactical value of the fortifications was therefore less significant than it would have been in periods of organized state-sponsored warfare and of extended sieges.

*They inspired confidence and awe***.** Bronze Age fortifications in the Levant were not tested by their tactical efficiency, but by their indexical power – their ability to convey the potency of the polity that built them. In this sense, even their imperfection was a statement of power. For example, the enormous rampart that overshadowed the west side of Hazor's lower city was tangible and ample testimony to the organizational prowess of its rulers and to the collective strength of the populace, as were the cyclopic retaining walls that supported the approaches to its gates. They conveyed a message that the city is strong enough, cohesive enough, and well enough armed to protect itself, even with less than perfect defenses. The elaborate gates of the Middle Bronze Age, standing several stories high and heavily fortified, also communicated power and sophistication, and would have been an important locus of civic power (e.g. at Dan, Ashkelon or Shechem).[39]

They were statements of the collective will. While the modest EB II walls appear to have been collective projects of the inhabitants of the adjacent wards, the massive stone ramparts of the EB III and great earth and stone enclosures of the Middle Bronze Age required the input of a larger swathe of the population, recruited – presumably by the local leadership, in the context of mutual, ritually sanctioned, obligations – from the town and from outlying populations, whether sedentary or mobile. In this manner, legitimacy was conferred on the fortified centers by the very nature of the social contract – a legitimacy that served as insurance against internal conflict and that permitted the elaboration and maintenance of the defensive structures. Late Early Bronze Age and Middle Bronze Age towns, for their part, provided multiple communal institutions and functions – temples, cemeteries, and a protected water supply – for their own inhabitants as well as for those of the surrounding countryside.

By way of contrast, the absence of fortifications in the Intermediate Bronze Age as well as in the Late Bronze Age (c. 1600 to 1150 BCE) can be viewed as clear testimony to the *loss* of legitimacy of the ruling factions and to a fragmented society – a fragmentation that, in the former period, effectively prevented the creation of local polities over half a millennium and in the latter period, permitted and accompanied the three centuries of Egyptian hegemony in the southern Levant.

Conclusion

In this paper, we have proposed to identify a common template for the construction of south-Levantine Bronze Age fortifications, in which competing social and political aims are reconciled through periodic collective labor mobilization for erection of defensive walls and ramparts. The quality and magnitude of construction varied, in correspondence with the ability of local leadership – whether heterarchical or hierarchical in nature – to recruit and deploy a large labor force. Broadly speaking, however, it emerges that an important predictor of large-scale fortification work was the presence of temples, around which periodic, ritually sanctioned labor-recruitment could be organized. Despite the uneven, often inefficient appearance of south Levantine fortifications, they were efficacious insofar as their primary function was concerned: the prevention of war and the assertion of the power of the polity. Once the polity entered into demographic decline, however, fortifications could not be maintained, and surviving elites sought other avenues of demonstrating their power or wealth.

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38 Philip 2006.

39 See Biran 1993; Dever 1987; Herzog 1997; Voss 2002.

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Martin Bartelheim, Bülent Kızılduman and Uwe Müller

Bronze Age Fortifications on Cyprus

In Bronze Age Cyprus, fortifications are only known from the beginning of Late Cypriote I (17th century BC) onwards, after previously only open settlements existed. In the first phase of the construction of these fortifications they had no uniform character, while later in the 13th century BC (Late Cypriote IIC), like in the Levant, they served primarily to secure settlements with a character of economic and administrative centres. Castles as enwalled noble residences are generally unknown in the Bronze Age of Cyprus.

Early and Middle Bronze Age

In the Cypriot Bronze Age (c. 2500/2300 BC–1050 BC) fortifications are mainly a phenomenon of its second half when the island became part of the international world of the Eastern Mediterranean. Although already in the third and early second millennia BC Cyprus was surrounded by highly developed civilisations, it had remained for a long time until the mid-second millennium in a virtually prehistoric stage of development of society and economy.[1] The archaeological record of the Cypriot Early (EC, c. 2300–2000 BC) and the Middle Bronze Age (MC, c. 2000–1600 BC) is determined by small open settlements and some necropolises. Compared to the Late Cypriot Bronze Age (LC) (see below), the number of finds is much smaller. Due to a lack of modern research in the north of the island, our knowledge about settlements relies so far predominantly on sites in the central and southern parts of the island.[2] Apart from a concentration on the narrow northwest coastal strip,[3] the settlements are mostly located inland in the area of fertile soils (e.g. Alambra, Marki Alonia, Kalopsidha), suggesting that the sea as a source of food did not play a major role alongside agriculture and as a transport route. The places studied so far are usually small settlement communities with evidence of mixed farming (agriculture and livestock). However, there is no sure indication that production went significantly beyond subsistence.[4] Signs of complex social structures in the archaeological record of the settlements are unknown. There is no evidence for settlement hierarchies, public buildings or large-scale storage, which would suggest a redistributive form of economy as it is assumed for the Late Bronze Age of Cyprus.[5]

The settlement structure in Early and Middle Bronze Age Cyprus is still relatively unclear due to the rather unsatisfactory state of research. Many sites lack accurate information on datation, as only finds from surface surveys are available. Especially in the north of the island, the information often does not go beyond the Bronze Age site inventory published by H. Catling in 1962. Fine chronological differences and developments can therefore hardly be observed, and relations between individual settlements or settlement areas remain unclear. In the distribution of settlements, some concentrations can be seen that change only slightly during the prehistoric Bronze Age. They are located on the one hand in the western part of the north coast and in the hinterland beyond the Kyrenia Range, in the central area of the Mesaoria Plain and at its eastern end, and in the hinterland of the southeast coast (**Fig. 1**).[6] The identification of further agglomerations would be possible with correspondingly better knowledge of the archaeological record. Among the settlements with Early to Middle Bronze Age surface finds, are also some

1 Knapp 1994; 2013.
2 Webb 2017.
3 Webb 2016.
4 Knapp 1994, 278; Frankel/Webb 1996; Coleman *et al.* 1996, 329–330.
5 Knapp 1994; Keswani 1996, 219. 238; Coleman *et al.* 1996, 329. 344; Manning 2014.
6 Catling 1962; Webb 2017; 2018; Coleman *et al.* 1996.

from where the existence of fortifications is reported (see Catalogue Ib, nos. 7–10), however, without detailed information on their chronology or construction. In none of the cases have systematic field investigations taken place, so that the existence of these fortifications in the Early and Middle Bronze Age cannot be considered as certain.

The inventory of known graves of that time – usually rock-cut collective graves – is quite extensive: According to P. Davies[7] more than 1000 grave chambers have been excavated, with presumably many burials looted in the past. Inside the tombs there is often a high number of grave goods, especially pottery.[8] Due to the fact that graves were often repeatedly used and therefore grave goods in many cases cannot be reliably assigned to any one individual, it is also methodologically difficult to make clear statements about the social structure in Early and Middle Bronze Age Cyprus. Thus, various attempts in the last years with regard to the description of the social relations have led to rather significantly different results. Based on a detailed analysis of the pottery finds in graves, D. Frankel concluded that the variability in the material is rather low, because it is mostly made up of household items.[9] Incidentally, a similarly low degree of variability is also found in the metal-finds repertoire of that time.[10] Subsequently Frankel found confirmation for his view in settlement excavations and in the local construction and economic structure: Hardly any differences in building sizes, no extravagant pieces in the archaeological record, and a subsistence-oriented agricultural production.[11] However, A. B. Knapp,[12] P. S. Keswani,[13] S. Manning,[14] S. Swiny[15] and others, in their respective investigations of the social structure of the Early and Middle Bronze Age of Cyprus, believe to be able to identify an emerging complex society with elites, who dominated the economy (mainly copper production from the island's vast ore deposits) and politics on the island. They state that, apart from the growing consumption of metal for own needs, e.g. as a status symbol, mainly the increasing demand for copper from overseas was responsible for a steady change in production and consequently in social conditions.[16] So far, however, no metal production of a larger style can be recognized from the few findings of metallurgy, and most questions on their functioning have remained unanswered.[17]

Even if the archaeological record is still quite unsatisfactory, it is nevertheless not wrong to postulate for Cyprus, as observed in the Aegean,[18] the gradual emergence of social differences in the population since the Early Bronze Age. However, as the evidence of the necropolises suggests,[19] they appear to have been regionally variable, with an outstanding number of metal objects in the necropolises of Lapithos and Vounous on the northwest coast, where a potentially important settlement site might have been located.[20] The tombs and settlements indicate a distinction of differently wealthy communities from each other, rather than providing evidence of a significant social stratification within the settlements. Due to the poor settlement record of the Early and Middle Bronze Age, especially in the north of the island, it has not yet been possible to reliably portray the economic background of the emergence of these differences, although the existence of exchange systems between different regional settlement communities can be well spotted via the exchange of certain pottery types.[21] B. Knapp tried to explain the development by suggesting that there was a group that skimmed off the surplus product of increased agricultural production as a result of the "Secondary Products Revolution". The group had supposedly taken control of both production and trade in copper.[22] So far, however, neither graves nor settlements show obvious archaeological manifestations of this group. Furthermore, it remains unclear as to what extent metals were involved in the gradually emergent foreign trade and how their production and distribution were organised. Nevertheless, it seems safe to say that

7 Davies 1997, 12.
8 Davies 1997 Table 2.
9 Frankel 1988.
10 Swiny 1989, 27; Weinstein 1990.
11 Frankel/Webb 1996.
12 Knapp 1990; 1993; 1994; 2008; 2013.
13 Keswani 1996.
14 Manning 1993.
15 Swiny 1989.
16 Knapp 1990, 161–162.
17 Belgiorno 2000, 2; Giardino 2000, 19; Bartelheim 2007, 151–161; 2016, 37–39.
18 Broodbank 2000.
19 Davies 1997.
20 Webb 2016; 2017, 132–135; 2018.
21 See e.g. Crewe 2009; Frankel 2009; Eriksson 2009; Webb 2009; 2018.
22 Knapp 1990.

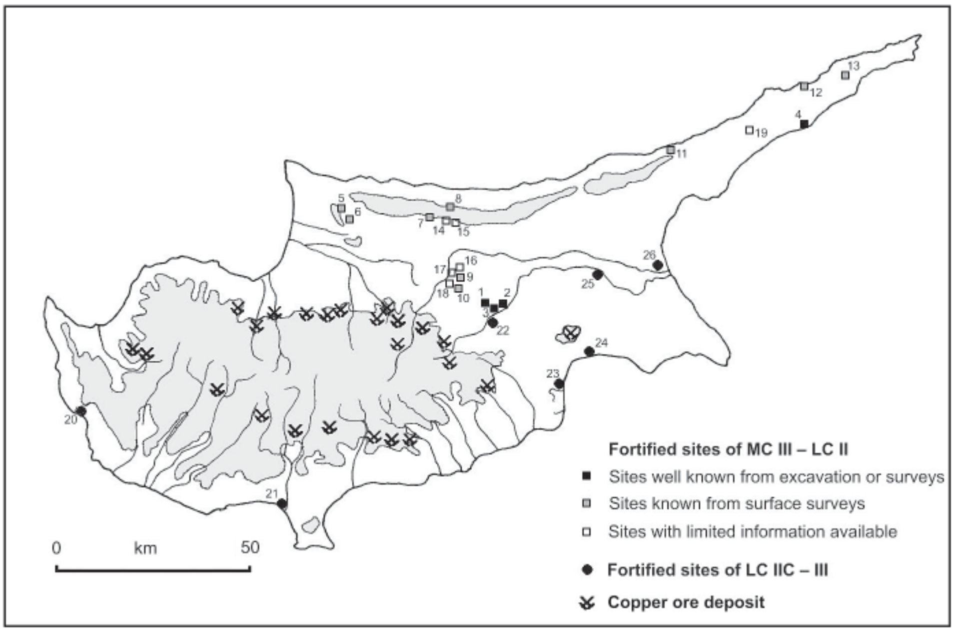

Fig. 1 Map of Bronze Age fortified sites on Cyprus. The numbers on the map correspond with those in the catalogues (map by the authors)

some metal had been produced beyond local needs, which could have been shipped overseas[23] and which had also been placed in great number in the tombs on the north coast. So far, the only question is where this production took place.

Generally, the evidence for the socioeconomic structure of the Early and Middle Bronze Ages in Cyprus is characterised by a largely rural subsistence lifestyle. Metallurgy appears to have been mostly self-sufficient on a smaller scale. Given the burgeoning interest from abroad in the island's copper resources, first indications of still limited response to them are to be seen in changes in the volume and organisation of metallurgical production as well as the increasing interest in export trade.[24] There are currently no indications of significant social and economic changes within that time period.

Beginning of the Late Bronze Age

At the transition from the Middle to Late Bronze Age, the archaeological record of the area begins to change significantly, and an increased change in the socioeconomic structure of Cyprus becomes apparent. Thus, in MC III (c. 1700–1600 BC) the rich necropolises on the north coast in Lapithos and Vounous were given up and had no local successors. Instead, Enkomi rose on the east coast, a rise that can be seen in the context of an economic restructuring of the island at the beginning of the Late Bronze Age. Overall, however, the settlement pattern is characterised by a continuity in settlement areas with a simultaneous movement into new areas, especially towards the coast (**Fig. 1**).[25]

While there are no signs of significant changes in subsistence production, there is an increase in metallurgical activity. Nonetheless, to date for the MC III only evidence from Pyrgos can be cited as an indication of copper production to an extent that could have supplied customers overseas.[26] From LC I metallurgical finds and structures exist also at Enkomi and Politiko Phorades.[27] For Enkomi, though, basing on the large number of clay nozzles, it is possible to reconstruct a volume of production that likely went far beyond self-sufficiency.[28] As a result, and because of the prominent location of the workshops within a large and solidly constructed building in Area III, it is reasonable to assume that copper metallurgy had already gained significant economic importance for the city. Concerning economic conditions Enkomi had the best strategic position of all of those coastal settlements that can be seen as dating to LC I.

23 See Kayafa *et al.* 2000, 48.
24 Crewe 2012; Manning 2014.
25 Catling 1962; Crewe 2007, 41; 2017.
26 Belgiorno 2000; Giardino 2000.
27 Knapp/Kassianidou 2008.
28 Dikaios 1969–71; Muhly 1989, 299–300; Peltenburg 1996, 29; Crewe 2007, 75–84.

The urban-based metallurgy that characterizes the organisation of production in Cyprus for the next centuries begins there. Its link to the coastal centres, which were certainly at the same time harbour sites, suggests a strong export component.

Accordingly, in this period the contact with the Near Eastern mainland, already visible during the Middle Bronze Age in some imported objects, increased significantly. An intensive mutual exchange with Egypt and the Levant developed, which had its archaeological expression especially in foreign ceramic objects from settlements and graves, but also in the form of precious metal finds, bronze shaft-hole axes, faience and cylinder seals as grave goods.[29] From the transition MC III/LC I onwards, an intensified exchange with the Aegean is also noticeable.[30] Testimonies of these external contacts are manifested above all in grave finds in necropolises of MC III and LC I date in several places on the island, thus revealing a widespread participation in external connections.[31] Overall, this period is characterised by an interplay of increasing external influences and locally varying internal responses.[32]

One of the likely responses is the construction of fortifications, for which a few excavations or intensive surveys from this period are available for the first time: Agios Sozomenos-Barsak, Agios Sozomenos-Nikolides, Dhali-Kafkalia and Korovia/Kuruova-Nitovikla (Catalogue Ia, nos. 1–4) (**Fig. 1**). However, none of them has been securely dated (there are hardly any ^{14}C dates), sufficiently researched as to their building structure, or, like all other settlements from this period, extensively excavated. Thus, essential elements for an estimation of their size, their character or for a sound interpretation of the record are lacking. While the first three fortified settlements are part of a concentration of sites that are located in the centre of the island, sometimes only a few hundred meters apart, Nitovikla is located on the Karpas peninsula on the south coast.

On his survey of the settlement structure of the Bronze Age of Cyprus, H. Catling registered a number of fortified structures.[33] Based on this, M. Fortin in his dissertation on the Bronze Age fortifications of Cyprus identified 21 such settlements,[34] the level of knowledge of which is very different (see Catalogue I, III). Likewise, it can be assumed that not all settlements existed simultaneously. Concerning the reasons for the construction of the fortifications, a wide range of explanatory approaches can be found in the literature. For example, H. Catling suspected riots over the scarcity of resources due to a combination of drought and population growth, and viewed the fortifications as a security measure against this.[35] Other authors postulated invasions from outside (especially Syria-Palestine or Egypt),[36] or they saw the uncertainty of the local population in the face of increasing contact with the mainland and the resulting interest in access to Cypriot copper ore deposits as an occasion for fortification.[37]

Further, there were speculations that the fortifications were more likely meant to serve an elite of one (Enkomi) or possibly two (Enkomi and Toumba tou Skourou) coastal settlements to ensure the control and safety of copper transportation routes.[38] They argue that only these coastal centres were able to build such fortifications on much of the island. In particular, the fortifications at Agios Sozomenos (Catalogue Ia, nos. 1–3) would be located on a route from Enkomi via the valley of the Gialias to the closest copper ore deposits. In this reference an important role is played by some architectural similarities between the two exceptionally large and massive buildings called "fortresses" in Enkomi, Area III and Agios Sozomenos-Glyka Vrysis (see Catalogue III), which the authors propose served as military facilities to secure copper transport and processing. On closer examination of the topographical position and the design of the two buildings, apart from a rectangular basic shape and similarly wide walls (1–2 m), hardly any further noteworthy features are found.[39] In addition, both have an unfavourable strategic position and a structure unsuitable for a fortress. Hence, M. Fortin excluded them from the group of installations with defensive character.[40] Instead it can be

29 Baurain 1984, 27–105; Courtois 1986, 71–75; Keswani 1996, 219.
30 Knapp 1988, 152.
31 Keswani 2004.
32 Merrillees 1971, 74–75.
33 Catling 1962.
34 Fortin 1981; 1989; 1995.
35 Catling 1962.
36 Sjöqvist 1940; Baurain 1984; Hult 1992.
37 Fortin 1981.
38 Peltenburg 1996; Knapp 2015.
39 Peltenburg 1996 Fig. 6.
40 Fortin 1995.

assumed that the two probable monumental buildings had rather representative functions. Whereas little is known about the inventory of the building in Glyka Vrysis, except for ceramic finds,[41] the aforementioned metallurgical remains were recorded in Enkomi, which is why probably copper was also temporarily processed and possibly stored there.

Among the comparatively well-studied fortifications, the concentration of three in the area of Agios Sozomenos (Barsak, Nikolides and Kafkallia) (Catalogue Ia, nos. 1–3) is remarkable. According to the recent state of knowledge[42] and the published results of the current ongoing research there,[43] the fortifications located upon rock spurs, in addition to strong walls, have yielded only relatively few finds. Internal architectural structures are still largely unknown. Only in Kafkallia are some floor plans known from surface investigations, including a walled-off, almost square courtyard area, possibly with the function of a bastion.[44] According to our present knowledge on the datation of these complexes that are only 0.5 to 2 km apart, there is a temporal overlap of their use which suggests a replacement of Barsak by Kafkallia and Nikolides. Below the fortifications in the Gialias Valley, Gjerstad's investigations in 1924 as well as recent research have revealed intense settlement and also the existence of necropolises.[45] Accordingly, the building excavated by Gjerstad in Glyka Vrysis is located directly below Nikolides and is largely contemporaneous. This raises another argument for doubting its fortification character (see above), especially since surface surveys show that the building apparently belongs to a larger settlement complex there.[46] Underneath the Barsak settlement, remains are currently excavated in the areas of Dzirpoulos and Ampelia, which in addition to abundant settlement architecture have provided also extensive remnants of storage vessels and other economic activities.[47] The clear contrast in the range of finds between the apparently open settlements in the Gialias Valley and the fortifications on the heights above, where only scant finds and no pottery came to light, suggests that these fortified sites had primarily a protective character for the valley settlements. Insignia of power, which are interpretable as such, have not been found there.

Korovia/Kuruova-Nitovikla on the southern coast of the Karpas Peninsula (Catalogue Ia, no. 4) was the only other excavated fortified settlement site from the early Late Bronze Age period. These investigations comprising three trenches took place as early as 1929 in a walled area at the southwest corner of a larger sea-facing plateau, with three major usage phases from MC III to LC IIB documented.[48] The structure with an approximately square area of 40 x 36 m and a courtyard was interpreted as a "fortress". During the excavations, it became clear that the entire plateau was surrounded by a wall, the course of which, however, remained unclear in the East. In the course of surface surveys, no building structures were identified in the interior, which is why the site was interpreted as having been a refuge.[49] However, in view of the widespread occurrence of Bronze Age ceramics and other finds on the plateau, a very convenient location by the sea, flanked by two potential landing points for boats or ships on the west and on the east side, as well as the plateau's total height of only c. 30 m above the surrounding landscape, the interpretation as 'refuge' seems unlikely. For such a function, there would have been much more suitable places in the direct surroundings. Instead, the site should be considered a fortified settlement with maritime connections, whose character and life span are yet to be determined by further investigations. With this Nitovikla to some extent anticipates the location model of the coastal centres that had their heyday in the 13th–12th centuries. The "fortress" on the southwest corner of the plateau, so far mostly considered in isolation, could have had the role of a particularly fortified bastion within the overall structure. The frequent emphasis on the allegedly isolated position of Nitovikla[50] is surprising in light of the site maps published by H. Catling, in which some finds are recorded on the Karpas peninsula in the immediate vicinity of Nitovikla.[51] Supposedly with more intensive exploration of the region this notion can be further relativized.[52]

41 Gjerstad 1926, 37–47.
42 Fortin 1989.
43 Pilides 2016; 2017.
44 Fortin 1995 Fig. 14.
45 Gjerstad 1926, 6. 37–47; Pilides 2016; 2017.
46 Pilides 2016, 5.
47 Pilides 2016; 2017.

48 Sjöqvist 1940; Hult 1992; Crewe 2007, 53–55.
49 Sjöqvist 1940.
50 E.g. Hult 1992, 76.
51 Catling 1962.
52 See Kizilduman 2008, 162.

Of the other fortifications identified by H. Catling and M. Fortin as belonging to the Bronze Age,[53] only 9 have provided datable find material (Catalogue Ib) – which, incidentally, does not give a chronologically consistent picture – and for 6 others there is no information on this (Catalogue Ic). As far as their exact location can be traced, they are hill-top sites where the fortification supplements or reinforces the natural protection offered by the topography. As a rule, these locations are in the range of concentrations of Bronze Age settlement, which is manifested primarily by open settlements and/or necropolises.[54] Only on the Karpas peninsula are there some fortifications in seemingly isolated locations; however, the relatively poor state of research might be responsible for this impression.

During LC I, there is no archaeological evidence for the existence of institutionalised power in Cyprus. The detailed study of the Cypriot pottery from the end of the Middle Bronze Age and the beginning of the Late Bronze Age by L. Crewe revealed that ceramic production was still structured on a very small regional scale during this time period.[55] The distribution patterns of ceramic types as well as imported objects suggest rather a large diversity of production units and independent actors in external relations.[56] The fortifications thus appear less as manifestations of the power of coastal elites moving into the interior of the island in the course of an economic and political change;[57] instead they seem rather as local reactions to changes in that period. This could simply reflect the need for protection of local populations against internal island conflicts or external dangers, but also an architectural manifestation of the power claim of local social leadership groups. Overall, there is no convincing evidence in the archaeological record that the construction of fortifications was initiated and controlled from a central location, nor that they stood in any direct relation to each other. Likewise, it remains unclear as to whether the fortifications were directed against potential opponents from outside the island or against those within, or whether their construction should primarily display power.

Settlement structure in the Late Bronze Age

In the course of the Late Bronze Age, the implications of the economic restructuring of Cyprus become increasingly obvious in the archaeological record. Accordingly, during LC I the settlement focus shifted from the inland to the coast.[58] In several places near the coast new settlements with urban characteristics emerged, such as the construction of complex street systems with orthogonal layout[59] and the concentration of economic activities. Examples for this are Morphou/Güzelyurt-Toumba tou Skourou,[60] Kourion-Bamboula,[61] Maroni-Vournes,[62] Hala Sultan Tekke-Vyzakia,[63] Kalavassos-Ayios Dimitrios,[64] Alassa-Palaeotaverna[65] and Kouklia-Palaeopaphos.[66] They differ noticeably in their structure and especially in terms of their size from the small domestic villages of the Middle Bronze Age, some of which still existed.[67] However, since hardly any systematic field surveys have taken place in the vicinity of the settlement centres and farther afield, the relationship between the centres and the surrounding areas is still largely unknown. Settlement centres continued to develop during the following centuries, until they reached a first major island-wide heyday in LC IIC (c. 1350/1300–1200 BC). For the first time architectural features appeared, which hint at a differentiated use of parts of the settlement: Larger buildings with ashlar masonry that due to the elaborate character of their architecture might reveal residences of socially prominent individuals or might have had a special public function were found in Enkomi, Kalavasos-Ayios Dimitrios, Maa-Palaeokastro and Maroni-Vournes and Palaepaphos.[68]

The fact that differentiation could be reflected in the social structure of the inhabitants is also indicated in grave finds with obvious differences in quality.[69] From LC I (c. 1650/1600–1450/1400 BC)

53 Catling 1962; Fortin 1981; 1989.
54 Catling 1962; Fortin 1989 Pl. LV.
55 Crewe 2007.
56 Crewe 2007, 149–151. 158.
57 Peltenburg 1996.

58 Catling 1979, 199; Andreou 2016 Fig. 1.
59 Negbi 1986.
60 Vermeule/Wolsky 1990.
61 Weinberg 1983.
62 Cadogan 1984.
63 Åström 1993; Fischer/Bürge 2017a.
64 South 1997.
65 Hadjisavvas 1986.
66 Maier/von Wartburg 1985.
67 Andreou 2016.
68 Negbi 1986; Knapp 1988, 152; Webb 1999.
69 Keswani 1996 Table 2.

some outstandingly rich graves with high-quality and exotic offerings are built in coastal centres; their number increased in the course of the Late Bronze Age. There are also necropolises *extra muros*.[70] Among the rich burials are graves 8 and 21, found during the Swedish excavations in Enkomi,[71] tombs 6 and 8 in Nicosia-Ayia Paraskevi,[72] and tombs in Toumba tou Skourou[73] and Hala Sultan Tekke.[74] In LC II (c. 14th–13th century), more are added, as in Enkomi,[75] Kition,[76] Maroni-Vournes,[77] Kourion-Bamboula[78] and tombs 11, 13 and 14 in Kalavassos-Ayios Dimitrios.[79]

It seems likely to consider these in part richly decorated and lavishly erected burial places as those of socially prominent families. Since all of them are collective burials, it is impossible to identify individual persons as outstanding political figures. However, the existence of such rich graves, whose number is nevertheless too small to represent the entire population of a village, suggests that vertical social differentiation had indeed existed. Nevertheless, the political structure within the settlement centres and beyond across Cyprus remains unclear, as there are no significant archaeological findings, and no information can be obtained from the few Cypro-Minoan written records.[80] There is controversy about the extent to which literary sources from Egypt can provide further information on this. These sources are passages from the so-called El Amarna letters.[81] In this archive of the correspondence of Egyptian pharaohs from the reign of Amenhotep III (1388–1365 BC), Akhenaten (1351–1334 BC) to the first year of Tutankhamen´s rule – a total period of maximally 30 years – there is correspondence with a king of 'Alašia', whose identification with Cyprus is largely accepted.[82] For some time there has been some controversy as to whether the name 'Alašia' in the Late Bronze Age refers to a single place (due to its early acquired size and rich archaeological record, one would think first of all of Enkomi), and/or the entire island of Cyprus. While the latter (the entire island) is partly considered to be the case by some researchers,[83] P. S. Keswani states that the island was divided into regional sovereign units with their own settlement centres. She bases this on various details in the structure of Late Bronze Age settlements on Cyprus (differences in the public architecture between settlements; the absence of obvious administrative centres, e.g. in Enkomi or Kition, which evidently existed elsewhere, e.g. in Kalavassos-Ayios Dimitrios or in Alassa-Palaeotaverna,[84] and the diversity of import finds in the tombs).[85] In the archaeological record there is currently no indication as to the relationship between the fortified settlements on the coasts. At least for the social structure within settlement centres, however, the wording in the letters gives the impression that apparently Alašia's society in the 14th century BC was clearly hierarchically structured.

From an economic point of view, Enkomi also provides the main source of metallurgical evidence for the production of copper in the period LC IIA–B (c. 1450/1400–1300 BC), demonstrating its continued dominant position in this sector. From the 13th century BC on, when metallurgical production in Enkomi experienced a significant increase,[86] copper was also produced in other coastal centres, such as in Hala Sultan Tekke,[87] Kition,[88] Maroni-Vournes,[89] Kalavassos-Ayios Dimitrios,[90] as well as in smaller places farther from the coast, like Atheniou,[91] Alassa-Paliotaverna,[92] Myrtou-Pigadhes[93] and Apliki.[94] It is striking that in most of these places the evidence of copper metallurgy was found in the middle of the settlements, sometimes scattered over wide areas.[95]

70 Keswani 1996; 2004.
71 Gjerstad *et al.* 1934, 569–573.
72 Kromholz 1982, 306–314.
73 Vermeule 1974, 8–9; Vermeule/Wolsky 1990.
74 Bailey 1972; Keswani 1996 Table 3; Fischer/Bürge 2017b.
75 Johnstone 1971; Keswani 1996 Table 2.
76 Karageorghis 1974.
77 Cadogan 1996; Keswani 1996, 229–230.
78 Benson 1970.
79 South 1989; Keswani 1996, 229–230.
80 Ferrara 2012.
81 Knudtzon 1915; Knapp 1996, 21–25.
82 Catling 1980; Knapp 1996, 3–11; but see Gilbert 2017.
83 Knapp 1996; 2008, 335–336; Karageorghis 2002, 30.
84 South 1997; Hadjisavvas 1986.
85 Keswani 1996, 234–239.
86 Courtois 1982.
87 Åström 1982.
88 Stech *et al.* 1985.
89 Cadogan 1984.
90 South 1989; 1992.
91 Stech 1982, 106–107.
92 Hadjissavas 1986.
93 Stech 1982.
94 Muhly 1989, 302.
95 Bartelheim 2007, 407–416.

This underlines the obviously generally high economic importance of copper.[96]

As can be shown by the many references to Cyprus (Alašia) at that time in external sources (mostly in the context of copper),[97] the island was then an integral part of the economic area in the eastern Mediterranean.[98] This is manifested archaeologically above all in a continuing great number of imported objects from the entire eastern Mediterranean region, which, just like its Cypriot counterparts abroad, demonstrate an intensive supra-regional economic exchange. In addition to copper, Cyprus seems to have exported spices, perfumes, opium, oils and wood, especially to Egypt, but also to the Aegean and the Near East. Literary evidence in letters like those from El-Amarna and production remains in the settlement centres speak for the treatment and shipping of these goods there.[99]

This expansion of economic activity in the 13th century BC (LC IIC) was accompanied by the construction of mighty fortifications, as seen in the coastal centres of Enkomi, Kition and Kourion-Bamboula, but also inland in Sinda/İnönü-Sira Dash/Sıra Taş (Catalogue II, nos. 21. 23. 25–26). In these places, which were already inhabited before, fortifications were detectable for the first time. On the other hand, a continued use of the fortifications until LC IIC at the sites that had already been fortified at the beginning of the Late Bronze Age is not documented anywhere. In Maa-Palaeokastro and Pyla-Kokkinokremos (Catalogue II, nos. 20. 24) the settlements were established only at the end of LC IIC and immediately fortified. In some other settlement centres that had flourished during LC IIC, no fortifications could be detected so far, e.g. in Kalavasos-Ayios Dimitrios,[100] Maroni-Vournes,[101] Hala Sultan Tekke-Vyzakia,[102] Morphou/Güzelyurt-Toumba tou Skourou,[103] Myrtou/Çamlıbel-Pigadhes,[104] Galinoporni/Kaleburnu-Vasili/Kral Tepesi,[105] Alassa-Paliotaverna[106] or Kouklia-Palaepaphos.[107] It is unclear whether they did not need protection, or whether existing defensive structures have not yet been discovered in such expansive areas. Solely Dali-Ambelleri (Idalion) is known as being a new settlement (Catalogue II, no. 22) from the last part of the Cypriot Bronze Age LC III, presumably following the settlement concentration in the area of Dali/Agios Sozomenos.[108] New fortifications were not built and many places were abandoned in the course of or at the end of LC III.[109]

Of the five settlement centres in which LC IIC and LC III fortifications have been detected (Enkomi, Kition, Kourion, Sinda and Idalion), the course of the walls is known only in Enkomi to a large extent. A section of wall has been documented in Kition and Idalion each, while only small segments were found in Kourion-Bamboula and Sinda. The known wall segments include (except for Idalion) the previously established settlements, whose position was apparently not chosen primarily for reasons of defence strategy. Maa-Palaeokastro and Pyla-Kokkinokremos, on the other hand, were established in places that were well defended: Maa-Palaeokastro is situated upon a rocky peninsula in the sea and separated from the hinterland by a wall, while Pyla-Kokkinokremos is on a coastal plateau with steep flanks and a casemate-like fortification, about which very little is known so far.[110] Both places had no possibility for their own water supply, apart from cisterns. In both cases there are potential landing places for ships or boats, but no easy access to the hinterland. It seems as though the settlements, in addition to the use of storage facilities, were created primarily for the sake of protection, which apparently did not prove to be a favourable long-term location-factor, as they were abandoned relatively soon after a few decades.[111] The assumption expressed in earlier decades that these were settlements of Aegean refugees[112] now appears to be obsolete, given that the local find material hardly

96 Bartelheim 2016.
97 Knapp 1996, 26–51.
98 Baurain 1984; Courtois 1986; Karageorghis 1996; 2002, 57–71.
99 Aravatinos 1991; Knapp 1991; Hadjisavvas 1996; Karageorghis 1996; Muhly 1996.
100 South 1997.
101 Cadogan 1996.
102 Fischer/Bürge 2017a.
103 Vermeule 1974.
104 du Plat Taylor 1957.
105 Bartelheim *et al.* 2008; Kızılduman/Müller 2016; Kızılduman 2017.
106 Hadjisavvas 1986.
107 Maier/von Wartburg 1985.
108 Hadjicosti 1999.
109 Georgiou 2011; Iacovou 2013.
110 Georgiou 2012; Bretschneider *et al.* 2015.
111 Georgiou 2015, 133–135.
112 Karageorghis/Demas 1988, 266.

differs from that of other contemporary settlements.[113]

The exact reasons for the fortification of the settlement centres as of LC IIC are difficult to determine. As they are generally located near the coast, the increased volume of international traffic and the apparent accumulation of wealth during this period made the construction of massive walls seem an adequate answer to the greater dangers due to desires from inside and outside Cyprus. This might have included rivalries between different Cypriot settlement centres, whose relationship to each other is largely unknown so far (see above). Whether or not, and if so, why there were also undefended centres cannot be answered according to the current state of research. The extent to which evidence of destruction in Late Bronze Age settlements in Cyprus can actually provide clues to belligerent threats is controversial. The archaeological evidence of destruction, especially destruction as the outcome of military force, is difficult and has not yet been achieved beyond doubt.[114] It is conceivable that in addition to deterrence, the known fortifications also served as a demonstration of power and as a symbol of prestige. They could also show the take-over of ideas from the continent, where monumental fortifications of entire settlements had long been known,[115] and with which Cyprus came into closer contact through intensified maritime exchange. It is only possible to speculate about possible further reasons, such as an intended demarcation from the surrounding area by means of defensive architecture or the strengthening of communal sense among the inhabitants, since usable written sources with own statements of the inhabitants are missing.

Conclusions

The current archaeological record speaks for two important periods of fortification during the Bronze Age after a long period of only open settlements: at the beginning of the Late Bronze Age and during the 13th century BC (LC IIC). Whereas in MC III/LC I the variety of models for the construction of fortifications is more heterogeneous, the picture in LC IIC and LC III looks rather uniform, since most of the fortifications are built around settlement centres. In both periods the defence systems are oriented towards important traffic routes, either on the sea, crossing mountains or linking important economic zones with coastal areas. Generally, fortresses in the sense of castles as walled residences of a nobility are unknown in the Bronze Age of Cyprus. However, in the sense of fortified residential and defensive structures for the protection of settlement communities, property and buildings as well as the hinterland, they are well represented in the archaeological record. The reasons for the building of fortifications remain largely unknown. Evidence for violent destructions is highly disputed, but in general the number is low. In how far this is due to the existence of the defence structures remains to be verified.

Catalogue I. Fortified sites of MC III–LC II

a. Sites well known from excavation and/or intense survey

1. Dali-Kafkallia (Figs. 2-3)
Size: 350 × 50 m.
Small triangular plateau (4 ha) c. 500 m northwest of Nikolides surrounded by a fortification with massive foundations. The northeast corner is formed by an almost square bastion (25 × 28 m) built with shell-walls, but no documented entrance. It is not directly linked to the enclosure wall, and the two open spaces are interpreted as gateways. A large number of inner building structures were documented during an intense survey by J. Overbeck and S. Swiny.
Finds: MC III: Red Polished III and IV; LC I: White Slip II, Plain White Handmade, Pithos, LH IIIB pottery.
Lit.: Gjerstad 1926, 6; Catling 1962, 149 (27). 155 (40); Overbeck/Swiny 1972, 25–28; Fortin 1983; 1989, 246; 1995, 94–97.

2. Agios Sozomenos-Barsak (Fig. 2)
Size: c. 230 × 230 m.
Section of a large flat rocky plateau confined towards the east and to the south by a 40–50-m high steep cliff. To the west and north the area is encompassed by a massive enclosure with polygonal shape. Recent excavations revealed two limestone

[113] Karageorghis 2011, 24; Georgiou 2015, 134.
[114] Georgiou 2015, Millek, in print.
[115] See, e.g. Burke 2008.

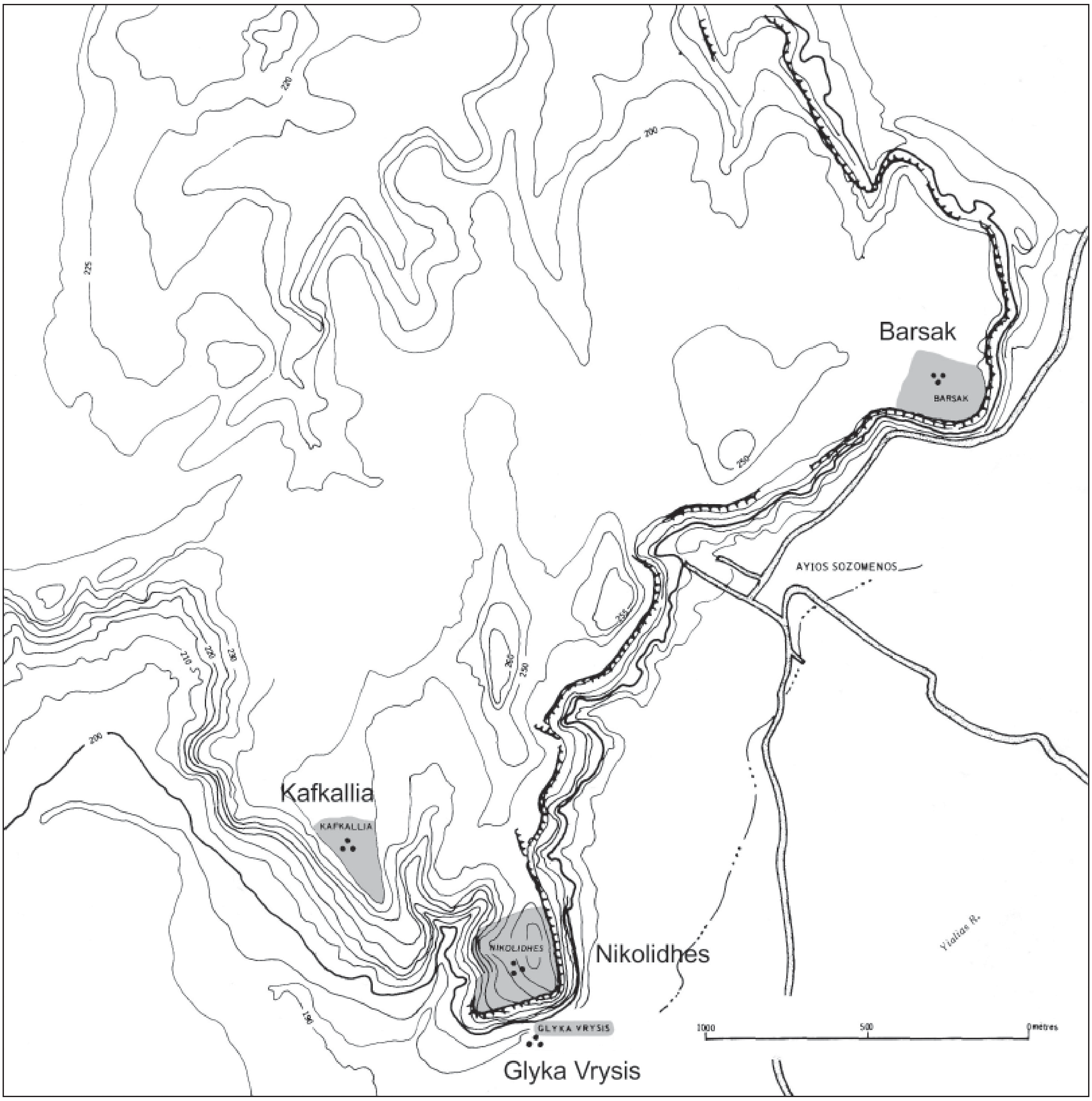

Fig. 2 Map of sites in the Dali/Agios Sozomenos area (after Fortin 1995 Fig. 1)

walls, 2 m wide each with a deep ditch on the outside of the outer wall. At the east corner of the northern enclosure section the substructure of a tower with massive blocks was identified. Recent small-scale excavations within the enclosure did not reveal any architecture.
Finds: MC: Red Polished, Red Slip and Black Slip sherds, only small vessels.
Lit.: Gjerstad 1926, 6, 37; Catling 1962, 149 (No. 20). 155 (No. 26); Fortin 1989, 246; 1995, 90–92. 100–102; Pilides 2016.

3. Agios Sozomenos-Nikolides (Fig. 2)
Size: 250 × 250 m.
Fortified settlement on top of a steep rocky hillock c. 30 m above the surrounding valley and encircled by a more than 900 m long enclosure wall of rough ashlar blocks, 2 to 3.20 m wide. At its northeast corner the foundations of an adjoining rectangular tower (15 × 7.5 m) built with regular ashlar blocks have been unearthed during recent excavations. The existence of internal building structures is unclear, although along the eastern and southern section of the enclosure several perpendicular walls that run parallel to each other have been detected. The site is located c. 2 km southwest of Barsak.

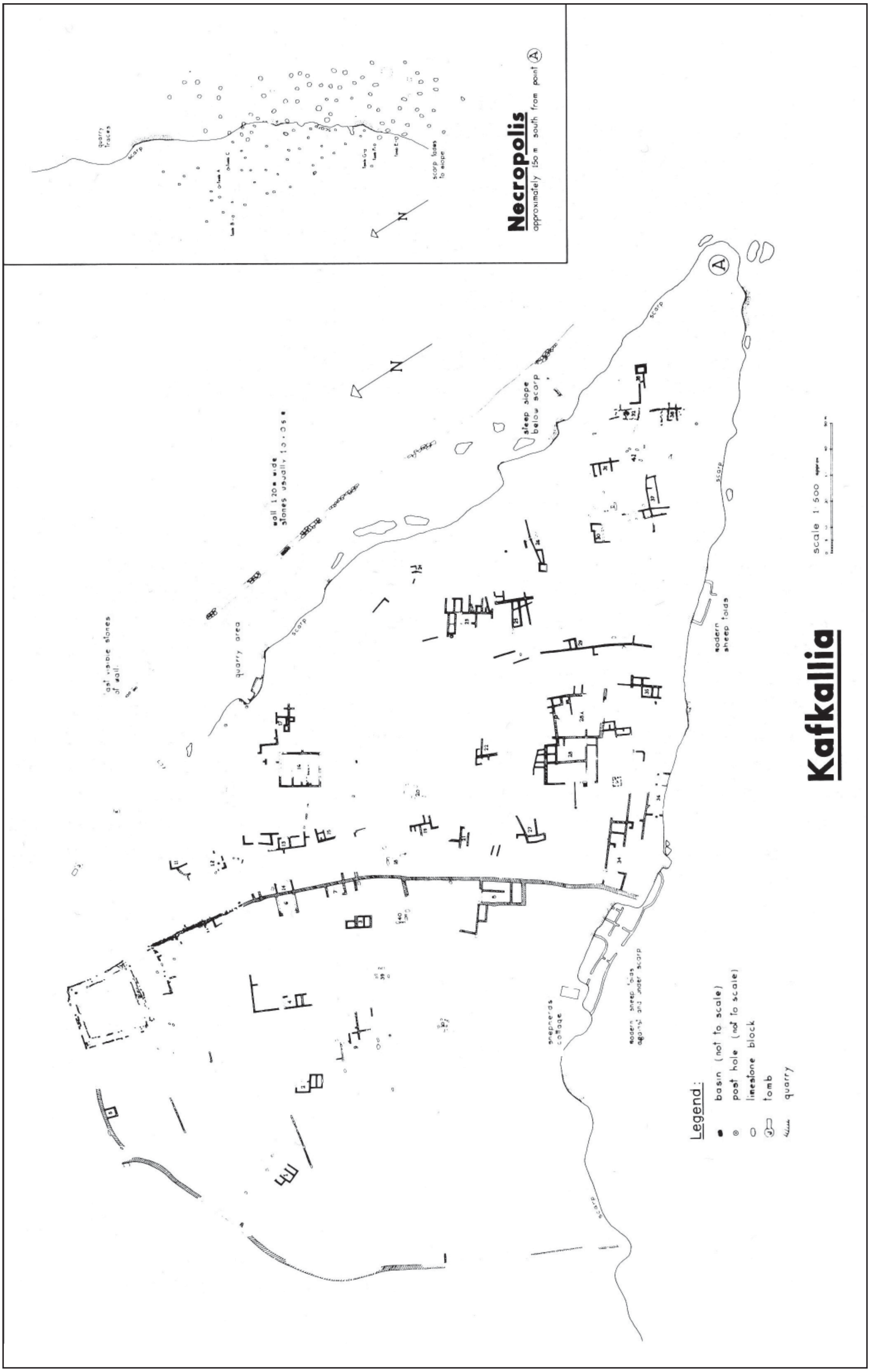

Fig. 3 Plan of Kafkallia (after Fortin 1995 Fig. 14)

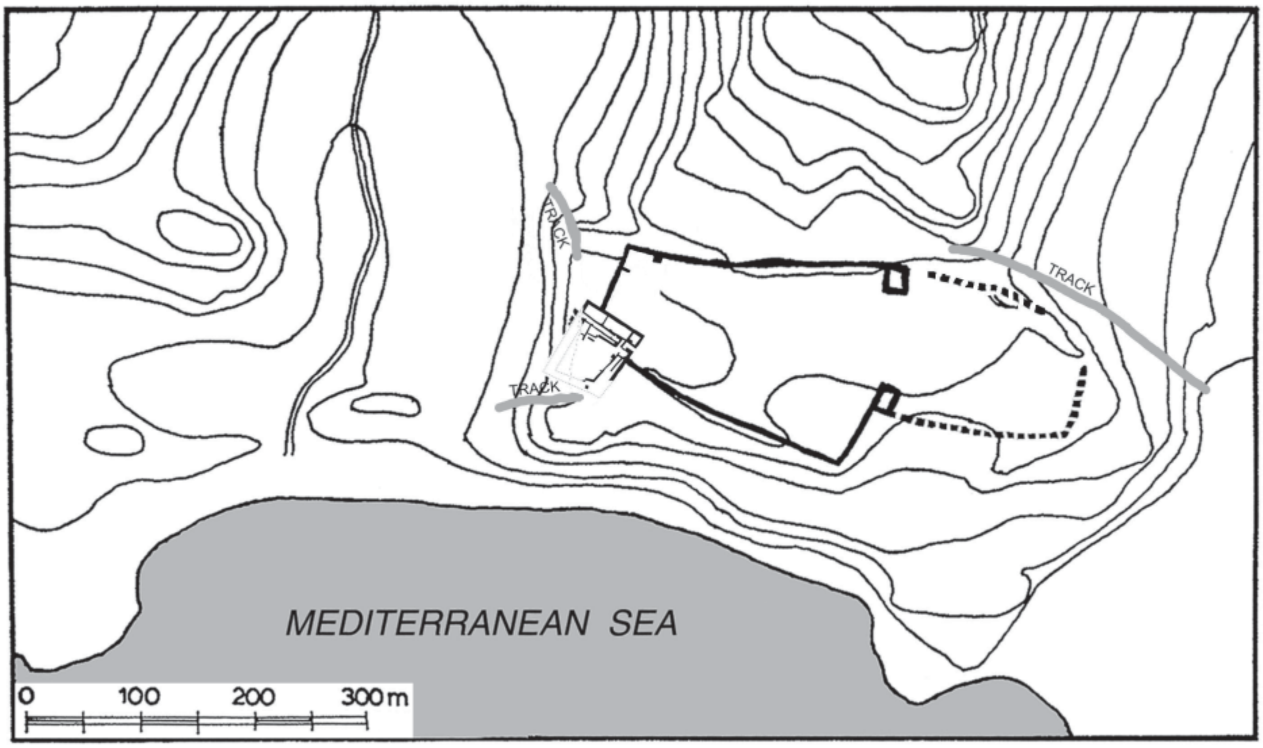

Fig. 4 Nitovikla walled plateau and fortress (after Gjerstad *et al.* 1934 Pl. IV,2 and Peltenburg 2008, Fig. 2)

Finds: LC I-II: White Slip I and II, Plain White, White Painted VI, Red Slip, Red Lustrous Wheel-made, pithos sherds and Mycenaean pottery.
Lit.: Gjerstad 1926, 6, 37; Catling 1962, 155 (32). 162 (42); Fortin 1989, 246; 1995, 92-94; Pilides 2017.

4. Korovia/Kuruova-Nitovikla (Figs. 4-6)
Size: c. 400 × 150 m.
Fortified area, almost rectangular, on a low terrace (c. 30 m asl) overlooking the sea and flanked by two possible inlets (**Fig. 6**), now sedimented, from where tracks lead up to the terrace (**Fig. 4**). In the eastern part of the terrace the course of the walls is not entirely clear. Although in the interior pottery has been found almost everywhere, no building structures are known there as yet (**Fig. 5**). In the southwestern corner a small almost quadrangular fortress/bastion (40 × 36 m) with a central court-yard was excavated by the Swedish Cyprus Expedition in 1929. The excavation recovered material dating from MC III to LC IIB. Finds from MC III were also found in three tombs excavated by the Swedish Cyprus Expedition at the eastern end of the fortified terrace.
Lit.: Gjerstad *et al.* 1934, 371–407; Catling 1962, 157 (97). 165 (134); Fortin 1989, 246; Hult 1992; Merrillees 1994; Crewe 2007, 53–55.

b. Sites known from surface surveys

5. Karpaseia/Karpaşa-Styllomenos
Size: 100 × 100 m.
Finds: MC; LC.
Lit.: Catling 1962, 157 (85). 164 (107); Fortin 1989, 246.

6. Asomatos/Özhan-Potimata
Size: 100 × 130 m.
Finds: EC: Red Polished; MC; LC: pithos sherds.
Lit.: Catling 1962, 149 (16). 154 (16), 161 (21); Åström 1972b, 41; Fortin 1989, 246

7. Krini/Pınarbaşı-Merra (Fig. 7)
Size: 160 × 90 m.
Strategically located plateau on top of a steep hill overlooking the Mesaoria plain, naturally defended on three sides by a steep slope and to the north by two parallel massive stone walls, the outer one with bastions.
Finds: MC.
Lit.: Catling 1962, 158 (102); Karageorghis 1960, 298 Fig. 76; Fortin 1983, 214; 1989, 246.

Fig. 5 Korovia/Kuruova-Nitovikla. Aerial view of the walled plateau (image: Apollo Mapping)

Fig. 6 Korovia/Kuruova-Nitovikla and surroundings. Aerial view (image: Apollo Mapping)

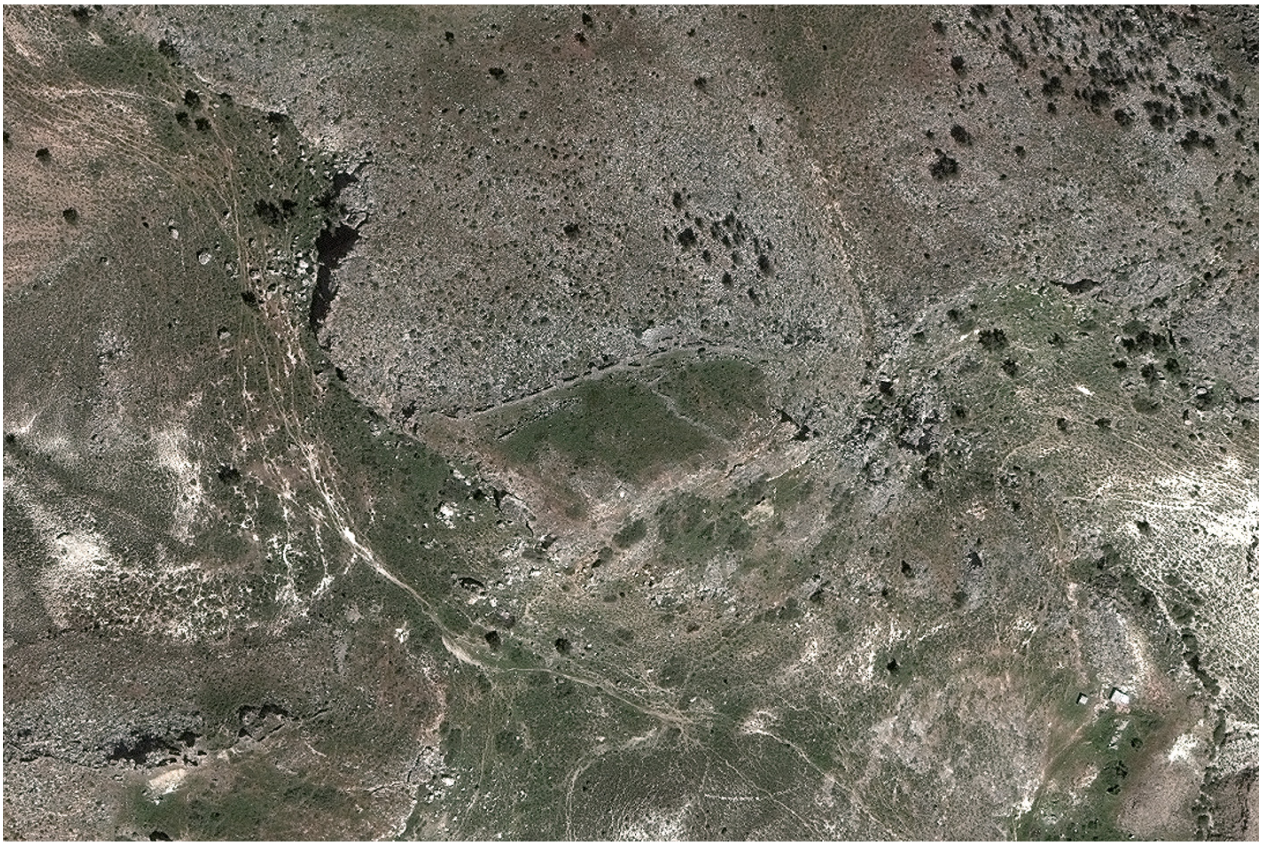

Fig. 7 Krini/Pınarbaşı-Merra. Aerial view of the fortifications (image: Apollo Mapping)

8. Bellapais/Beylerbeyi-Kapa Kaya
Size: 100 × 100 m.
Finds: EC; MC.
Lit.: Catling 1962, 149 (23). 154 (36); Fortin 1989, 246.

9. Aglangia/Eylenja-Kafizin
Size: 32 × 41 m.
Encircling defense wall.
Finds: EC: Red Polished sherds.
Lit.: Catling 1962, 150 (48); Fortin 1989, 246.

10. Yeri-Phoinikes/Yeri-Vrysi tis Pantelous
Size: 60 × 90 m.
Rectangular enclosure wall.
Finds: EC: Red Polished; MC: Red Polished IV.
Lit.: Catling 1962, 154 (167). 160 (168); Fortin 1989, 246.

11. Davlos/Kaplıca-Pyrgos
Rock-cut water channels, orthostat blocks.
Finds: LC: Base Ring, White Slip II, Mycenaean IIIB, pithos sherds.
Lit.: Catling 1962, 162 (58).

12. Agios Thyrsos-Vikla (Fig. 8-9)
Massive wall.
"1 km north of the monastery and east of the river Postani is a site called Vikla with an ancient acropolis on a small hillock (**Fig. 9**), surrounded by an enclosing wall of rather large, rough-hewn stones. At the north side the wall is entirely missing; on the other sides it reaches an average height of about 1.5m (**Fig. 8**). The necropolis is situated on the hillside east of the acropolis. Here I found Middle and Late Bronze Age pottery: Red polished, White painted, Black slip and Red-on-black ware" (Gjerstad 1926, 11).
Finds: LC: Mycenaean IIIB, pithos sherds.
Lit.: Gjerstad 1926, 11; Catling 1962, 162 (52).

13. Rizokarpaso/Dipkarpaz-Sylla
Defense walls.
Finds: MC: Red Polished IV, Black Slip sherds; LC: pithos sherds, stone querns and tools.
Lit.: Catling 1962, 159 (150). 168 (225).

Fig. 8 Agios Thyrsos-Vikla. Aerial view of the fortified site (image: Apollo Mapping)

Fig. 9 Agios Thyrsos-Vikla and surroundings. Aerial view (image: Apollo Mapping)

c. Sites with limited information available

14. Dhikomo/Dikmen-Onicheia
Size: 80 × 80 m.
Lit.: Fortin 1989, 246.

15. Dhikomo/Dikmen-Pampoules
Size: 300 × 200 m.
Lit.: Fortin 1989, 246.

16. Aglangia/Eylenja-Nifkia
Size: 20 × 15 m.
Lit.: Fortin 1989, 246.

17. Aglangia/Eylenja-Leondari Vouno
Size: 250 × 100 m.
Lit.: Fortin 1989, 246.

18. Yeri-Ftelia
Size: 4 × 7 m.
Lit.: Fortin 1989, 246.

19. Lythragkomi/Boltaşlı-Troullia
Size: 130 × 60 m
Lit.: Fortin 1989, 246.

Catalogue II. Fortified sites of LC IIC–LC III

20. Maa-Palaeokastro
Size: c. 5 ha.
Settlement located on the coast on a promontory surrounded by the sea from three sides. The landward side is closed off by a wall consisting of a double row of Cyclopean rocks with rubble in the middle and two gates. Another fortification wall was found on the opposite side towards the sea in a low rocky area. Inside the settlement two major building complexes grouped along a street were detected. According to the excavation results the site was founded at the transition from LC IIC to LC IIIA and abandoned already within LC IIIA.
Lit.: Karageorghis/Demas 1988; Georgiou 2011; 2012.

21. Kourion-Bamboula
Settlement excavated only in small parts with a surrounding wall built of Cyclopean rocks that was apparently erected in LC IIC and used until the abandonment of the site in LC IIIA.
Lit.: Benson 1970, 26; Åström 1972b, 38.

22. Dali-Ambelleri (Fig. 10)
This settlement, later known as "Idalion", was founded in LC IIIA, perhaps in succession of settlements in the region of Agios Sozomenos (see above Catalogue Ia, nos. 1-3). In its western part the fortification wall, consisting of a foundation of large stone blocks with mud-bricks built on top, is preserved. According to the excavation results, it was first erected in LC IIIA, rebuilt twice in LC IIIB and continuously used until the Iron Age. The excavated section of the fortification included two gates, one of which was secured with two bastions. Inside the town area a series of building complexes could be identified.
Lit.: Gjerstad *et al.* 1935, 460–628, Åström 1972b, 35. 38; Hadjicosti 1999.

23. Kition-Kathari
Size: c. 200 ha.
Settlement excavated only in small parts which revealed building structures and finds dating from LC IIC until the Iron Age. In the northern sector (Area II) close to a sanctuary complex a fortification wall with bastions was detected, whose first phase was built of mud-bricks in LC IIC and renewed with Cyclopean rocks in LC IIIA.
Lit.: Åström 1972b, 40–41; Karageorghis 1974; 1976; Karageorghis/Demas 1985; Negbi 1986, 101–105.

24. Pyla-Kokkinokremos
Size: c. 6 ha.
Settlement founded at the end of LC IIC on top of a c. 80-m high plateau with steep rocky flanks overlooking the bay of Larnaca. The excavations revealed a series of houses built attached to each other alongside the edges of the plateau, thus forming a casemate-like fortification with their thickened outer walls. According to the find material the site was abandoned already in LC IIIA.
Lit.: Karageorghis/Demas 1984; Karageorghis/Kanta 2014; Georgiou 2011; 2012; Bretschneider *et al.* 2015.

25. Sinda/İnönü-Sira Dash
Size: c. 67 ha.
Settlement only partly excavated by A. Furumark in 1947/48. A surrounding wall consisting of two rows of Cyclopean blocks with a superstructure of mud-bricks was excavated. A potential outer wall was detected via aerial photographs. The north gate

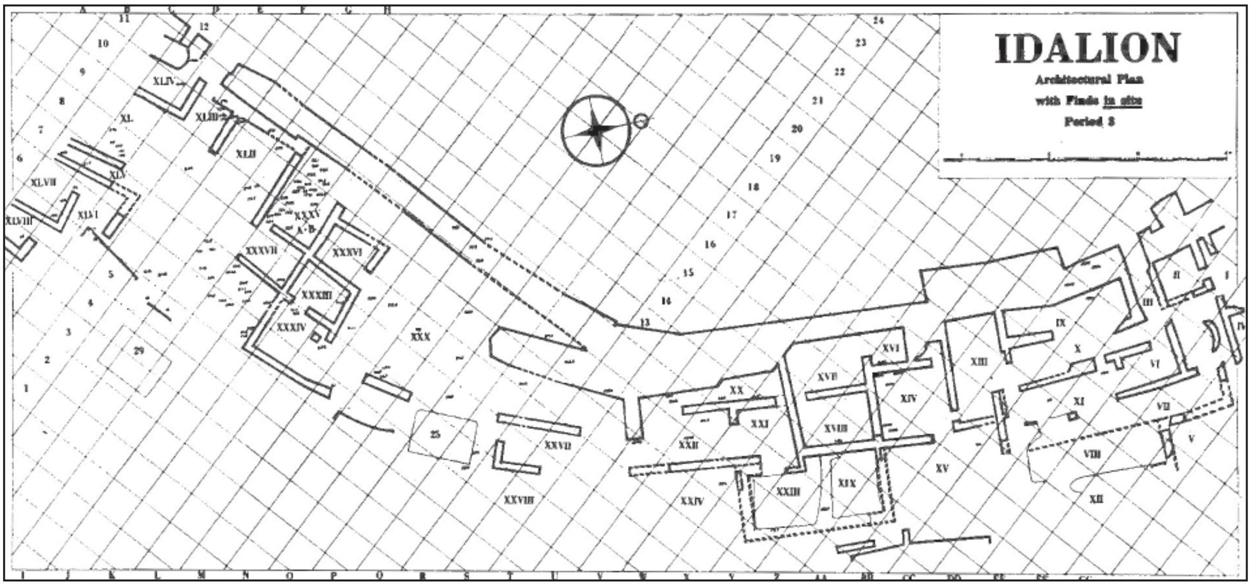

Fig. 10 Dali-Ambelleri (Idalion), Period 3 (LC IIIB) (after Åström 1972b, Fig. 7c)

consisted of a massive construction with a tower and bastions. Like the entire settlement, the walls were erected in LC IIC and used until LC IIIA.
Lit.: Furumark/Adelman 2003.

26. Enkomi/Tuzla-Agios Iakovos (Fig. 11)
Size: c. 200 ha.
The urban area is surrounded by a wall (2.5–3 m wide) built of two rows of Cyclopean rocks with a superstructure of mud-bricks; it was traced in the north, west and south sides. The walls were strengthened by towers. A gate in the west and in the north have been excavated. The northern gate is accompanied by a massive (20 × 16.5 m) bastion. According to the French excavations led by C. F. R. Schaeffer, its construction dates to LC IIC (Courtois/Lagarce 1986, 2-4) and lasted until the abandonment of the town in LC IIIB. The town layout consists of an orthogonal street system with houses grouped in quarters, ashlar masonry and a number of tombs underneath the houses. According to the find material Enkomi was founded already in MC III and was settled uninterruptedly until its abandonment in LC IIIB.
Lit.: Dikaios 1969–1971; Åström 1972b, 40–41; Courtois *et al.* 1986, 2–5; Negbi 1986, 101–105; Crewe 2007.

Catalogue III. Sites with disputed defensive character

27. Agios Sozomenos-Glyka Vrysi
Size: 8 × 19 m.
Large settlement underneath Agios Sozomenos-Nikolides with a building complex excavated by E. Gjerstad in 1924. It was interpreted by him as a fortress (19 × 8.3 m) with an estimated height of c. 5 m and walls with a width between 2 m (east wall) and 1–1.2 m. M. Fortin doubts the characterisation as a fortress due to its proximity to the other fortresses, its small size and its strategically unfavourable position.
Finds: LC IA–B: Base Ring I, Red Lustrous Wheel-made, LH IIIB bird on a bell krater, Plain White Handmade, pithos sherds, stone querns identified by Fortin. Base Ring II, White Slip II reported by H. Catling.
Lit.: Gjerstad 1926, 6, 37–47; Catling 1962, 155 (25). 161 (40); Åström 1972b, 30–32; Fortin 1989, 246–247; 1995, 97–100.

28. Phlamoudi/Mersinlik-Vounari
H. Catling regarded this site as a fortified settlement. However, the results of the Columbia University excavations there did not reveal any defensive structures.
Finds: MC III – LC IIA.
Lit.: Catling 1962, 154 (138). 168 (208); Åström 1972b, 43; Al-Radi 1983; Smith 2008.

Fig. 11 Plan of the excavations in Enkomi (after Courtois *et al.* 1986 Fig. 1)

29. Enkomi/Tuzla-Agios Iakovos
Size: 45 × 13 m.
Area III Building, Levels A – IA (MCIII – LCIA): Characterised by P. Dikaios as a fortress due to the width and solidity of its walls. M. Fortin questions this because of its disadvantageous strategic location and its diverseness from the contemporary military architecture of the island. He reckons the building might have served rather as an industrial workshop, especially for metallurgy, which needed to be secured from external attacks.
Lit.: Dikaios 1969–1971; Fortin 1989; Crewe 2007.

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Walter Gauß

Considerations on Aegean Bronze Age Fortifications

The current paper summarizes the development of Bronze Age Aegean fortifications with a special focus on the Aegean Early and Middle Bronze Age. In order to get a better understanding of Aegean fortifications for each period, their numbers are set into relation with the number of known sites and other features. The impressive multi-phased fortifications of sites such as Troy or Kolonna on the island of Aegina will be used as case studies to explain the development of Early to Middle Bronze Age sites in the central Aegean. The final part of the paper gives a preview on the development of Late Bronze Age (Mycenaean palatial and postpalatial) fortifications.

Introduction

This paper[1] stems from the author's interest in Aegean Bronze Age fortifications, their chronological and spatial distribution, as well as their significance. Some preliminary and general considerations will be presented here with a special focus on the later Early and Middle Bronze Age,[2] that is, in absolute dating, c. 2600 BCE to 1650 BCE.[3] Although throughout the Bronze Age in the Aegean (c. 3100 BCE to 1050 BCE)[4] it has been attempted to search for fortifications, the amount of information about them varies. Comfortable compilations and gazetteers of prehistoric sites cover mainly the central and western part of the Aegean, today's modern Greece,[5] whereas in the eastern most part of the Aegean, today's modern Turkey, the situation seems less easy.[6] In spite of these limitations, a comprehensive (as far as possible) record of sites and settlements is necessary for an in-depth understanding of fortifications.[7]

1 An earlier version of this paper was presented at the LOEWE conference in Alba Iulia in fall 2017, and I would like to thank the organizers of this conference, S. Hansen and R. Krause, for their kind invitation and hospitality, as well as their patience. Furthermore, I would like to thank P. Matsouka and Anavasi editions © (http://www.anavasi.gr) for compiling the distribution maps as well as for important support regarding the compilation of the relevant GIS-information. As to the compilation of GIS-information many thanks go also to B. Consoli and his Mycenaean Atlas Project, which aims to provide reliable GIS-information for Mycenaean sites in the Aegean (http://www.helladic.info/). H. Birk provided important support for compiling the plans of the fortifications at Kolonna on Aegina, and J. Heiden (DAI Athens) provided the photos of the Lion Gate at Mycenae and the entrance to the citadel at Tiryns and the permission to publish them here; I owe many thanks to both.
Some general thoughts on Early and Middle Bronze Age Aegean fortifications have been published more recently by the author (Gauß 2017) and are in part repeated here.

2 Sites and fortifications on Bronze Age Crete are not dealt within this paper. For an overview of fortifications at Crete see, e.g., Hayden 1988; Nowicki 1992; 1999; 2000; Alusik 2007; Betancourt 2013; Alusik 2016.

3 For an overview on the Early and Middle Bronze Age fortifications, see also Gauß 2017. In regard to the architectural development and fortifications from Early Bronze Age III to the Late Bronze Age I, see also Wiersma 2014.

4 On absolute Aegean chronology, see e.g., Manning 2010.

5 E.g. Hope Simpson 1965; Hope Simpson/Dickinson 1979; Hope Simpson 1981; Renfrew 1972, 507–525 (Gazetteer of Neolithic and Early Bronze Age Sites in the Cyclades); Syriopoulos 1995; Kouka 2002 (North-East Aegean islands); Alram-Stern 2004 (Early Bronze Age); Salavoura 2015 (Mycenaean Arcadia); Smith 2017 (Early Bronze Age Southern Greece).

6 For compilations with a chronological, thematic and/or regional focus, see e.g., Özdoğan 1986 (Dardanelles); French 1997 (Early Bronze Age); Kouka 2002 (North-East Aegean islands); Ivanova 2008; Schwall 2018, 29–40 (5th and 4th millennium). – For a collection of archaeological sites in Turkey, see http://tayproject.org/.

7 For the site distribution in the north-eastern Peloponnese, see e.g., Wright 2008, 232 Fig. 10.2.

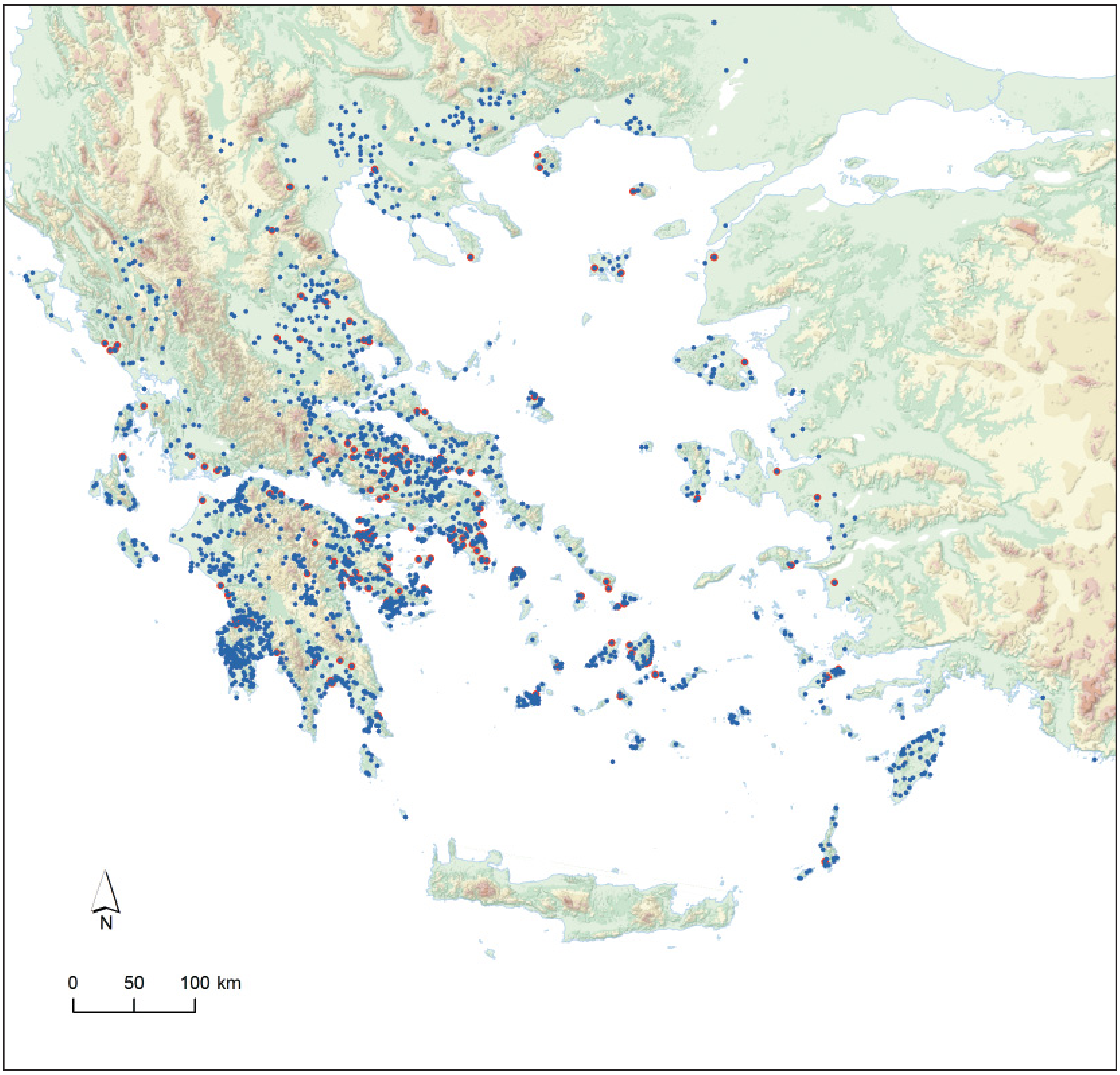


Fig. 1 Distribution of Bronze Age sites (blue) and possible/certain fortifications (red) (map by author and P. Matsouka, Anavasi)

The number of Bronze Age sites now known numbers about 2,900 in the central Aegean; very few of these sites (c. 140) are fortified (**Fig. 1**).[8] If those sites with fortifications are considered according to the main chronological periods (that is, whether each site dates to the Early, Middle, or Late Bronze Age), the distribution is uneven (**Fig. 2**).[9] Furthermore, because fortifications are rare when compared to contemporary sites, it is difficult to discuss long-term developments and changes in defensive systems. Sites with a long, ideally continuous sequence of fortifications, as attested throughout the Early, Middle, and Late Bronze Age, are exceptional

8 For local or regional compilations, see e.g. Kouka 2002 (North-East Aegean islands) and Ivanova 2008. As a comparison to illustrate the exceptional situation: At least some 1,200 castles are known within the limits of today's Austria (83,878 km²), whereas modern Greece is 131,957 km² in area and covers only one part of the Aegean. Within the limits of Salzburg (7,156 km²), one of the nine states of Austria, at least some 200 fortified Middle Age sites are known (I owe this information to P. Höglinger, Bundesdenkmalamt Salzburg; on fortifications within Salzburg, see e.g., Zaisberger/Schlegel 1978; 1992).

9 The numbers given in the table refer to the number of sites attested so far per period, fortifications per period (including theoretical ones, after Hope Simpson/Dickinson 1979, 426; Hope Simpson 1981, 245; Hope Simpson/Hagel 2006, 33–122), as well as the approximate duration of the Early, Middle, and Late Bronze Age (for absolute chronology, see e.g., Manning 2010).

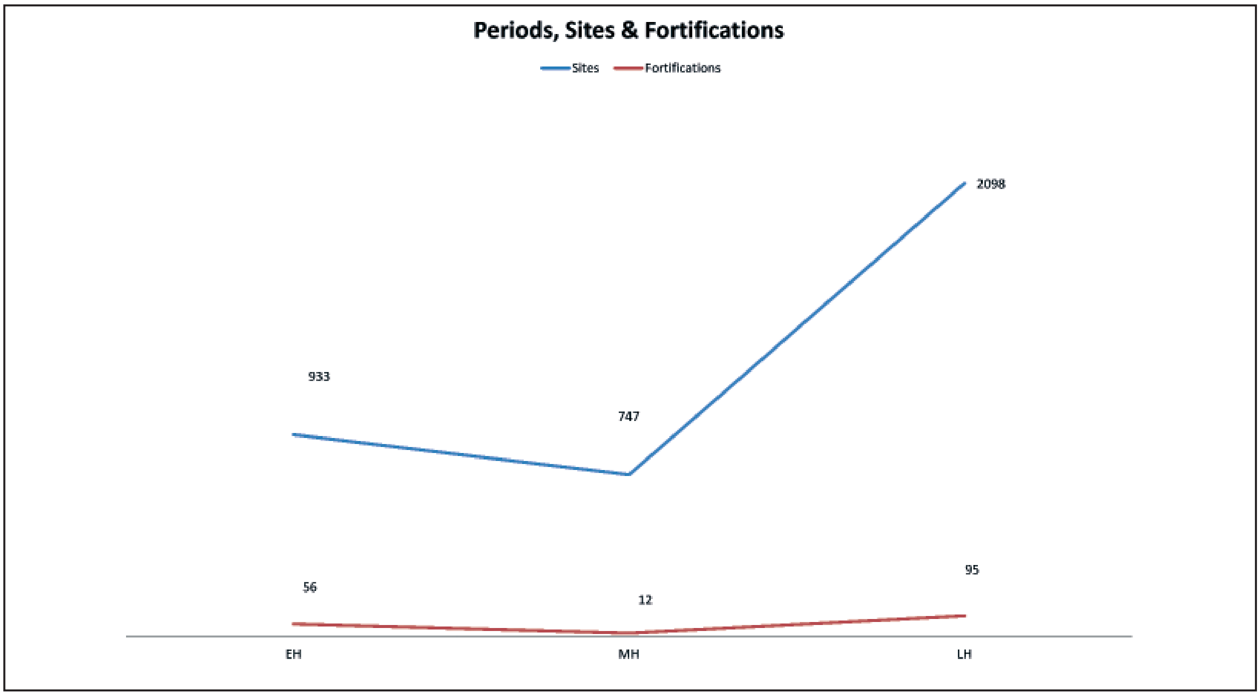


Fig. 2 Chronological distribution of Early, Middle and Late Bronze Age sites and possible/certain fortifications (chart by author)

and limited to very few sites: Troy, the Heraion at Samos, and Kolonna on Aegina (**Fig. 3**).

Despite these limitations, defensive structures are amongst the most impressive perceptible archaeological remains, and the monumentality of the Late Bronze Age Mycenaean fortifications at the palatial centers of Mycenae and Tiryns is breathtaking even today (**Fig. 4a-b**).[10] Earlier, pre-Mycenaean fortifications, however, mostly lack this monumentality and are often far less well known or preserved. Even if the fortifications vary in spatial and chronological distribution, their defensive structures are similarly the products of communal work.[11] The construction of a defensive structure requires labor and certain degrees of organization, specialization and hierarchy.[12] Defensive systems are complex and must accommodate many factors: the natural landscape and its resources, the time, technical and technological skill of the builders, the social and historical context, the level of threat to the settlement, and current defensive and offensive weaponry.[13] Very often, the purpose of a fortification included more than fulfilling mere protective requirements.[14] It was equally important to display power, to express the individual or group character of the principal builders, and to demonstrate the community's ability to undertake sometimes monumental building programs. Finally, the planning and execution of this communal project likely strengthened the group's common identity.[15]

Early Bronze Age

Recent research has contributed greatly to the understanding of Final Neolithic and Chalcolithic fortifications.[16] It is very interesting to note that several Early Bronze Age centers include early phases (4th millennium) that lack fortifications.[17] An impressive number of sites date to the Early Bronze Age

10 For the relief crowning the Lion Gate at Mycenae, see e.g., Blackwell 2014.

11 E.g., Kouka 2002, 5. 295; Betancourt 2013, 117; Alram-Stern 2014, 310; Gauß 2017, 48. 52.

12 For the energetics of Late Bronze Age fortifications, see e.g., Cook 2014.

13 Ivanova 2008; Lull *et al.* 2015, 161; Gauß 2017, 43.

14 E.g., Tsipopoulou 1999, 181; McEnroe 2010, 22; Betancourt 2013, 118–122; Müth 2016; Müth *et al.* 2016; Philippa-Touchais 2016, 657; Gauß 2017, 43.

15 E.g., Maran 2006a; 2006b; Wright 2006; Fitzsimons 2007; Brysbaert 2013; 2015; Gauß 2017, 43.

16 For overview of the Aegean in the 4th millennium BC, see e.g., Alram-Stern 1996, 111–112; Ivanova 2008; Alram-Stern 2014; Dietz *et al.* 2018.

17 E.g., Kouka 2014, 57; Gauß 2017, 44.

Fig. 3 General distribution of possible/certain Bronze Age fortifications (blue) and sites with continuous, multi-period fortifications attested in the Early, Middle and Late Bronze Age (red) (map by author and P. Matsouka, Anavasi)

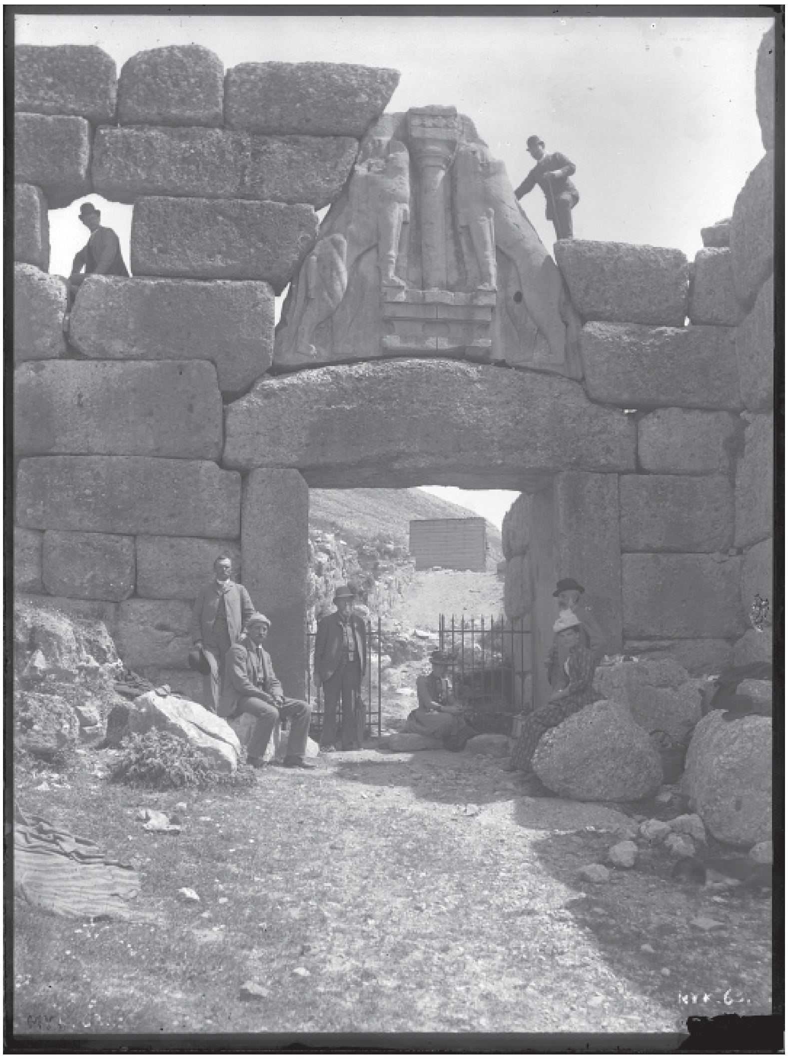
Aegean (c. 3100 BCE to 2150/2100 BCE).[18] Further subdivisions are (if possible) necessary to create a more detailed view of settlement patterns (**Fig. 5**).[19]

In the eastern Aegean, several settlements include massive fortifications; Troy is the best known example.[20] The earliest fortification of Troy I (Troy I Early to Middle, EB I) were modified soon after their construction. The walls were reinforced and

[18] For the absolute chronology of the Aegean Early Bronze Age, see e.g., Manning 2010 (with references); Smith 2017, 116.

[19] In his monumental study, K. Syriopoulos (1995, 335–597) classified 927 Early Bronze Age sites without further subdivision. See also Wright 2004 for a detailed comparative study of settlement patterns in the north-eastern Peloponnese, and Wright 2008, 232 Fig. 10.2 for site distribution in the north-eastern Peloponnese, Laconia and south-western Messenia.

[20] Gauß 2017, 44 (with references). For Troy, see e.g., Korfmann 2006; Jablonka 2010; Ivanova 2008, 319–332; 2013, 23–24 Fig. 5. Regarding the fortifications and material culture remains from the site of Kanligeçit (today's Turkish Thrace) with remarkable resemblances to Troy, see e.g., Ivanova 2008, 286; Özdoğan/Parzinger 2012; Özdoğan 2016. Regarding the fortifications of Thermi on Lesbos, see e.g., Lamb 1936; Kouka 2002, 171–172. 182–183. 213. 226–229 Pls. 15. 18. 21. 27. 30. For the Early Bronze Age Heraion on Samos and its fortifications and stratigraphy, see e.g., Kouka 2002, 213. 226–229; Ivanova 2008, 284; Kouka 2014; 2015.



a

b

Fig. 4 a The Lion Gate at Mycenae; **b** The entrance to the citadel of Tiryns (photos DAI Athens, D-DAI-ATH-Mykene-0063; D-DAI-ATH-Tiryns-0050)

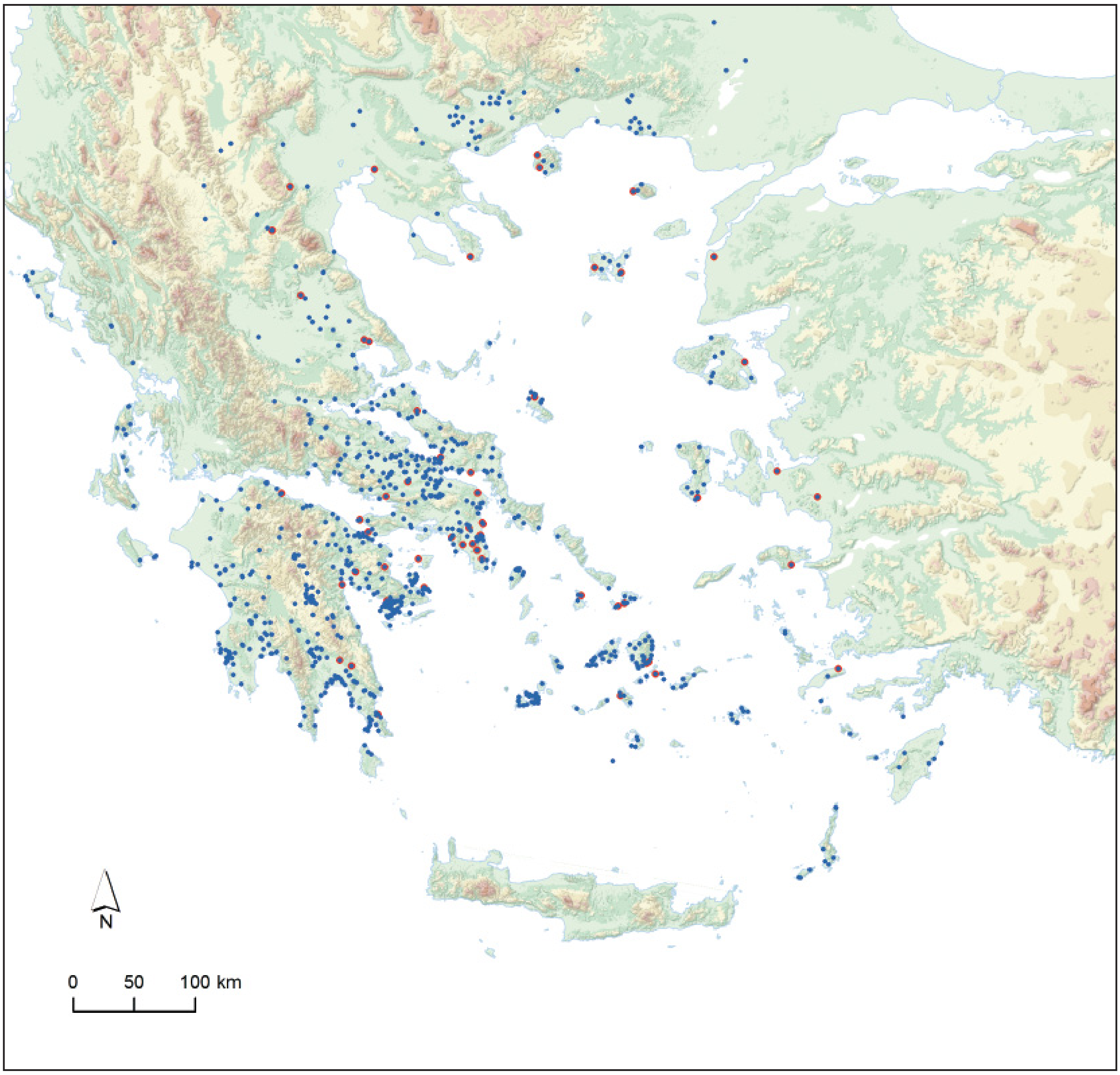


Fig. 5 Distribution of Early Bronze Age sites (blue) and possible/certain fortifications (red) (map by author and P. Matsouka, Anavasi)

exhibited all features typical in later phases. Rather than a freestanding wall, the fortifications included a sloping monumental stone revetment ('glacis'), a distinctive feature of north-eastern Aegean fortifications.[21] Wide gates are protected by massive rectangular bastions of monumental dimensions. Later, a steep monumental stone-paved ramp about 21 m long and 7.5 m wide led to one of the gates. Several phases of destruction can be identified in Early Bronze Age Troy. However, the fortifications did not fundamentally change, but rather were gently modified.[22] The large c. 90,000-m² large lower settlement of Troy I/II with its protection by a separate rampart makes Troy I/II exceptional.[23] Two reconstructions of the rampart have been suggested: either a wooden palisade with wattle and daub between posts or a more substantial construction of wooden posts and mud bricks.[24]

21 E.g., Korfmann 1989, 309; Ivanova 2008, 221–222. 323; 2013, 24 with references; Gauß 2017, 44.

22 E.g., Dörpfeld 1902, 49–98; Korfmann 2001; Ünlüsoy 2006; Ivanova 2008, 325–330; Ünlüsoy 2010, 129–136; Gauß 2017, 46.

23 Jablonka 2001, 394. A ditch cut into bedrock (approximately 40 m long, c. 0.4 m wide, and about 1 m deep) was uncovered some 200 m away from the acropolis. The ditch preserved a line of postholes (diam. c. 0.3 m) located every 2.5–2.7 m and a second line of postholes parallel to the first one some 2.5 m behind it.

24 E.g., Jablonka 2001; 2006, 172–174; Hueber 2004; Ivanova 2008, 330; Ünlüsoy 2010, 128–129; Gauß 2017, 46.

In the central and western regions, Early Bronze Age settlements (such as on the Cyclades and the Greek mainland) are mostly smaller than their eastern Aegean counterparts.[25] On the Cycladic island of Syros, the hilltop site of Kastri[26] was protected by two sectional fortification walls encompassing an area of 6,500 m². The fortified site of Palamari[27] on the island of Skyros was slightly larger, c. 10,000 m². At Kastri, only one narrow tangential gate permitted entrance through the freestanding outer wall. Six horseshoe-shaped towers/bastions strengthened the much wider main wall, situated immediately behind the outer one. Similar double wall fortifications with bastions have been identified at numerous Early Bronze Age sites in the eastern and particularly in the western Mediterranean[28] and have been recently labelled as 'Los Millares/Kastri type' fortifications.[29] Other fortified Cycladic sites, such as Mount Kythnos on Delos[30] and Panormos on Naxos,[31] are smaller than Kastri. At these sites defensive works protected only a few houses.[32] Any comparisons with the large eastern Aegean fortifications are almost impossible.

The Greek mainland includes a noteworthy, yet hardly surprising concentration of monumental architecture and special items at fortified Early Bronze II sites (**Fig. 6**). The first category consists of so-called corridor houses and related structures,[33] and large buildings covered with roof tiles.[34] The second category consists of special items, such as stone weights,[35] bone tubes[36] and roller stamp impressions.[37] Only through future in-depth studies will we be able to test whether a concentration of the abovementioned special features or additional ones (e.g., the existence of nearby tumuli) justifies the assumption of fortifications at the site.

One of the major Early Bronze II centers on the Greek mainland is Lerna in the Argolid.[38] The site with its two successive corridor houses was protected with a massive fortification wall (Lerna III, latest phase B? and phase C).[39] The wall consisted of a stone socle with a superstructure of mudbrick and projecting bastions/towers.[40] During major modifications, the horseshoe-shaped tower/bastion was replaced by a massive rectangular one located near the new gate. At a late stage of Lerna III phase C, the fortifications seem to have been abandoned. In the following phase (phase D), the time of the well-known 'House of Tiles' corridor house "the status of the fortification is an open question".[41] Several other sites in the Argolid in addition to Lerna provide important new evidence for Early Bronze II fortifications, and further research will show how these sites interacted within their regional and interregional networks.[42] Similarly, in Corinthia several Early Bronze II sites (e.g. Korakou, Corinth and Cheliotomylos) with the aforementioned special find categories as well as roof tiles[43] suggest that it is necessary to consider the connections among the sites and whether any might have had fortifications.

25 In general, e.g., Angelopoulou 2017; Gauß 2017, 46–47.

26 See e.g., Ivanova 2008, 290–291 (with references); Lull *et al.* 2015, 161; Angelopoulou 2017, 46.

27 See e.g., Parlama *et al.* 2015 (with references); Romanou 2015; also Alram-Stern 2004, 728–732; Ivanova 2008, 305–307; Gauß 2017, 47. Regarding the absolute chronology of this site, see Maniatis/Aravaniti 2015.

28 Lull *et al.* 2015, 160–162 Fig. 4.

29 Lull *et al.* 2015, 160–161.

30 Ivanova 2008, 294 (with references); Angelopoulou 2017, 139. 141.

31 Ivanova 2008, 306 (with references); Angelopoulou 2014; 2017, 141–142.

32 In general, e.g., Doumas 1990; Branigan 1999; Hubert 2011; Lull *et al.* 2015; Angelopoulou 2017.

33 For the "Rundbau at Tiryns", see e.g., Marzolff 2004; 2009; Maran 2016.

34 E.g., Shaw 1987; 2007. Regarding the distribution of Early Bronze II roof tiles and corridor houses, see also Rutter 1993, 762 Fig. 3. See also Jazwa 2018 on Early Bronze II roof tiles. Also Smith 2017 in general and on newly-found large buildings. For the recently discovered monumental Early Bronze II building at Keryneia/Aigio, see Kolia/Spiroulias 2017. The building is somewhat similar to the Rundbau at Tiryns and is situated in an extended settlement.

35 For the distribution of stone weights, see Kilian-Dirlmeier 2005, 167–169; Rahmstorf 2006, 87 appendix 5.

36 For the distribution of bone tubes, see Kilian-Dirlmeier 2005, 167; Rahmstorf 2006, 85 appendix 3.

37 For the distribution of roller stamps and roller stamp impressions weights, see Rahmstorf 2006, 86 appendix 4. For new roller stamps from Asine and specialized itinerant craftsmen in the Early Bronze II, see Lindblom *et al.* 2018.

38 E.g., Wiencke 2010 (with references).

39 Wiencke 2000, 89–149. 649 (with references) plans 5–7. 18–24.

40 Wiencke 2000, 93–94 Fig. I.12.

41 Wiencke 2000, 213.

42 E.g., D. M. Smith stressed the regionalism and the abundance of cross-scale networks in the Early Bronze Age in southern Greece (Smith 2017, 106). For additional fortified sites, see Smith 2017, 116.

43 For roof tiles in Corinth, see Smith 2017, 118.

Fig. 6 Distribution of possible/certain Early Bronze II fortifications (red) and corridor houses/roof-tiles/incised bone-tubes and weights (blue) (map by author and P. Matsouka, Anavasi)

The final part of the Bronze Age (Early Bronze III, c. 2250 to 2150/2100 BCE)[44] included major changes,[45] and a number of sites were abandoned.[46] Fortified sites and in particular newly fortified sites are almost unknown,[47] especially in the central Aegean and on the Greek mainland (**Fig. 7**). Kolonna on the island of Aegina,[48] where the c. 600-year history of successive fortification walls began in this final stage of the Early Bronze Age, seems exceptional.[49] The settlement (Kolonna V) was protected at its eastern side by a sectional wall that blocked the critical access point from the land to the peninsula (**Fig. 8**). At the steep scarp to the north no fortification walls have been detected, and it is likely that the backs of houses provided protection there, similar to Thermi on Lesbos. The Kolonna V for-

44 For absolute chronology, see Manning 2010; Smith 2017, 116.

45 In general on the "Wendezeit FH II/FH III", see Maran 1998; also Weiberg/Lindblom 2014; Smith 2017, 116.

46 E.g., Wright 2004, 119; 2008, 232 Fig. 10.2.

47 At Troy and at Seraglio on the island of Kos fortifications were built in the late Early Bronze as well. For Troy, see e.g., Easton 2002, 310; Ivanova 2008, 331–332; Blum 2012, 352 (on the regional context). For Seraglio, see e.g., Marketou 1997; Alram-Stern 2004, 94; Marketou 2004, 25–27 Fig. 7b.

48 E.g., Walter/Felten 1981; Ivanova 2008, 271–272; Gauß 2010; 2017, 48.

49 For tentatively Early Bronze II fortifications, see Walter/Felten 1981, 22 plan 5.

Fig. 7 Distribution of Early Bronze III sites (blue) and possible/certain fortifications (red) (map by author and P. Matsouka, Anavasi)

tification is a freestanding, vertical and wide stone wall with mudbricks above; it may already have included a rampart.[50] Two gates, presumably curved bastions/towers, formed a double gate and a 'bailey' similar to Kastri on Syros. After a fire completely destroyed the site, the fortifications were newly built.[51] A new massive stone wall with a battered front and a mudbrick superstructure was built on top of the destroyed houses of the Kolonna V settlement. This wall is situated immediately behind the Kolonna V fortifications,[52] which were repaired and served as an outer line of defense (**Fig. 9**).[53] Two massive rectangular bastions flanked the axial entrance; the door opening was rather narrow, permitting access to only one person at a time.[54]

Considering the almost c. 950-year timespan of the Aegean Early Bronze Age, as well as the various geographical regions, differences in settlement patterns, and the rareness of fortifica-

50 Walter/Felten 1981, 28–33. 35 Fig. 26 plan 7; Gauß 2017, 48.

51 E.g., Walter/Felten 1981, 28–42; Gauß 2010, 743–744. For the absolute chronology at Kolonna, see Wild *et al.* 2010. The fiery destruction and end of the Kolonna V settlement phase are dated with 95.4 % likelihood to 2196–2111 BCE (Wild *et al.* 2010, 1020 Table 3).

52 Walter/Felten 1981, 43–46; Gauß 2017, 48.

53 Walter/Felten 1981, 48–49. 30 Figs. 24–25; the proposed Kolonna V rampart was abandoned.

54 Walter/Felten 1981, 43–47 Fig. 38.

Fig. 8 Kolonna on Aegina, settlement with fortifications of Kolonna phase V (red); the late Archaic/Classical temple of Apollo is symbolized by the light gray area (figure based on Walter/Felten 1981, with additions by the author and H. Birk)

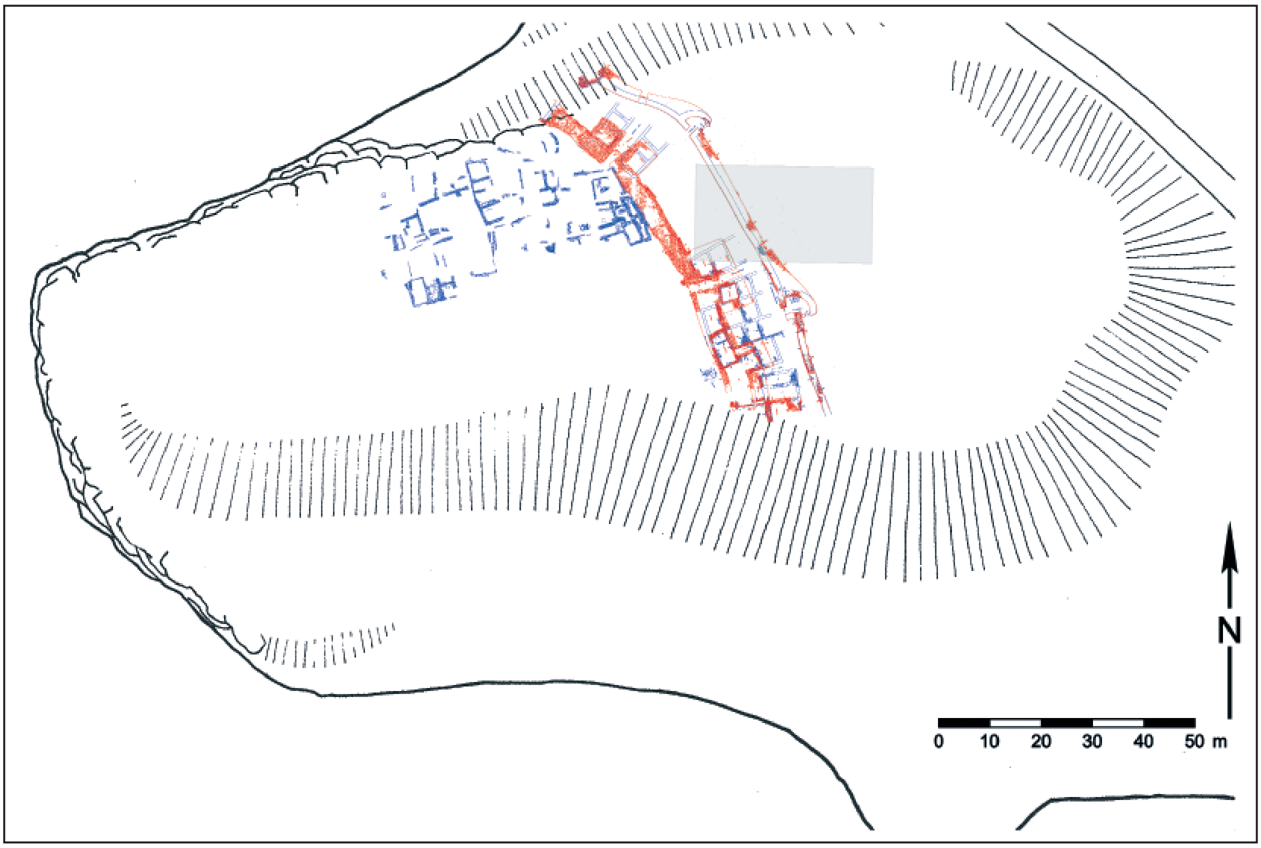


Fig. 9 Kolonna on Aegina, settlement with fortifications of Kolonna phase V (blue) and VI (red); the late Archaic/Classical temple of Apollo is symbolized by the light gray area (figure based on Walter/Felten 1981, with additions by the author and H. Birk)

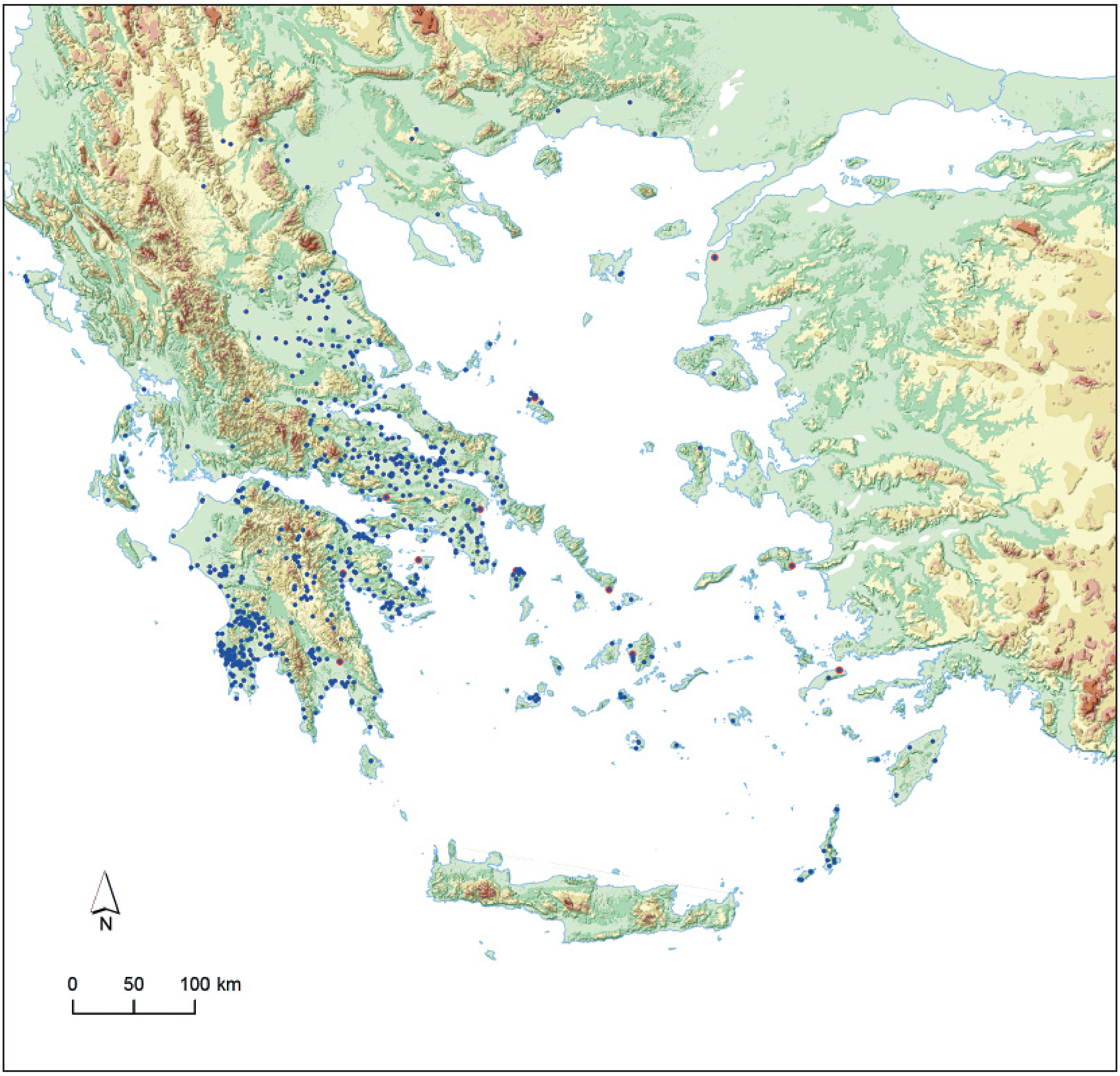


Fig. 10 Distribution of Middle Bronze Age sites (blue) and possible/certain fortifications (red) (map by author and P. Matsouka, Anavasi)

tions, only general comparisons seem possible.[55] Very important factors for defensive strategies are clearly the location and natural conditions.[56] Most fortifications are located immediately at or in close proximity to coastlines,[57] even if situated on rather inaccessible hilltop locations. However, the assumption that only coastal sites may have been fortified or that the greatest threat came mainly from the sea is an oversimplification, and the growing number of fortified or potentially fortified inland sites urges caution.

One primary difference between eastern and central/western Aegean fortifications may be the form and dimensions of fortifications. Troy, with its massive fortification of the acropolis and a defensive system for the lower settlement, is exceptional. In the central and western Aegean, the Cycladic islands and the Greek mainland, fortifications are commonly of much smaller scale, sometimes protecting only a few houses. The walls are either free-standing or have buildings abutting them; stone revetments ('glacis') of the settlement mound seem more common in the eastern Aegean.[58]

55 For a more detailed summary, see Gauß 2017, 48.

56 E.g., Ivanova 2008, 193. Further GIS analysis may provide additional common features, e.g., the proximity to other contemporary settlements, or the inclination of the slopes.

57 E.g., Renfrew 1972, 399; Tartaron *et al.* 2006, 157–158. Also D. Pullen (2008, 32), who stresses the correlation of fortifications and harbor sites.

58 E.g., Ivanova 2008, 221–222.

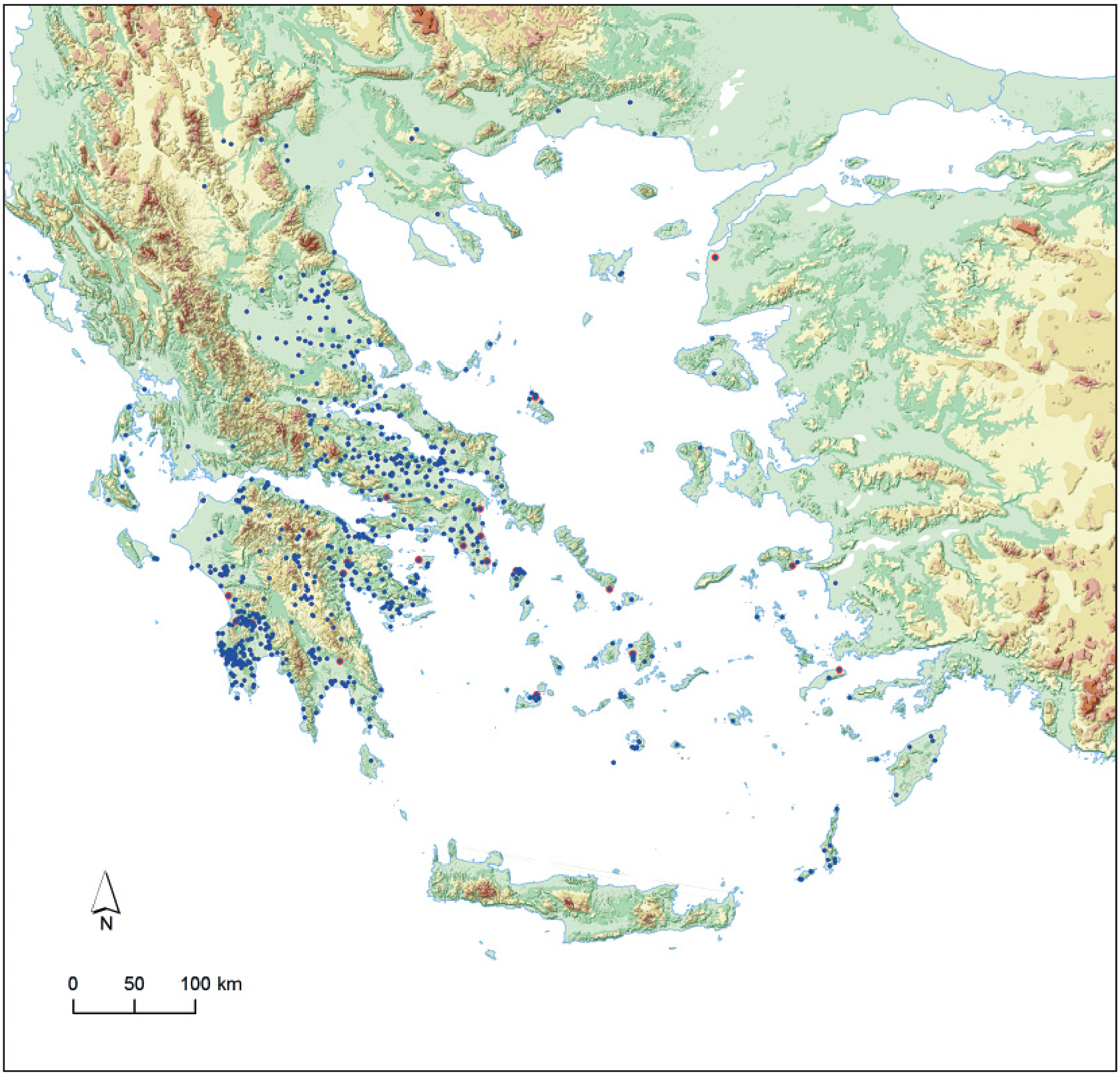


Fig. 11 Distribution of later Middle Bronze Age and early Late Bronze Age sites (blue) and possible/certain fortifications (red) (map by author and P. Matsouka, Anavasi)

Middle Bronze Age

The number of sites in the Middle Bronze Age Aegean (c. 2150/2100 BCE to 1650 BCE)[59] is smaller than in the preceding Early Bronze Age. A clear, unambiguous subphasing of the Middle Bronze Ages is still tricky, but must be attempted for a better understanding of long-term developments of settlement patterns and fortifications (**Fig. 10**).[60]

In the central Aegean area relatively few fortified sites are known, especially in the first half of the Middle Bronze Age. Current evidence indicates an increase in fortifications in the second half or the late phase of the Middle Bronze Age, or at the beginning of the Late Bronze Age (**Fig. 11**).[61] When comparing the distribution of Middle Bronze Age

59 For absolute chronology of the Aegean Middle Bronze Age, see e.g. Manning 2010 (with references).

60 K. Syriopoulos (1995, 605–771) classified 773 Middle Bronze Age sites without further subdivision. See also Wright 2004 for a comparison of settlement patterns in the northeastern Peloponnese with a clear rise in the numbers of Middle Bronze Age sites compared to relatively few Early Bronze III ones.

61 Davis 1986, 104–105 referring also to Howell 1973, 75 and Hope Simpson/Dickinson 1979, 426 with list of Bronze Age fortifications; see also Papadimitriou 2010, 257 Fig. 1; Philippa-Touchais 2016, 647.

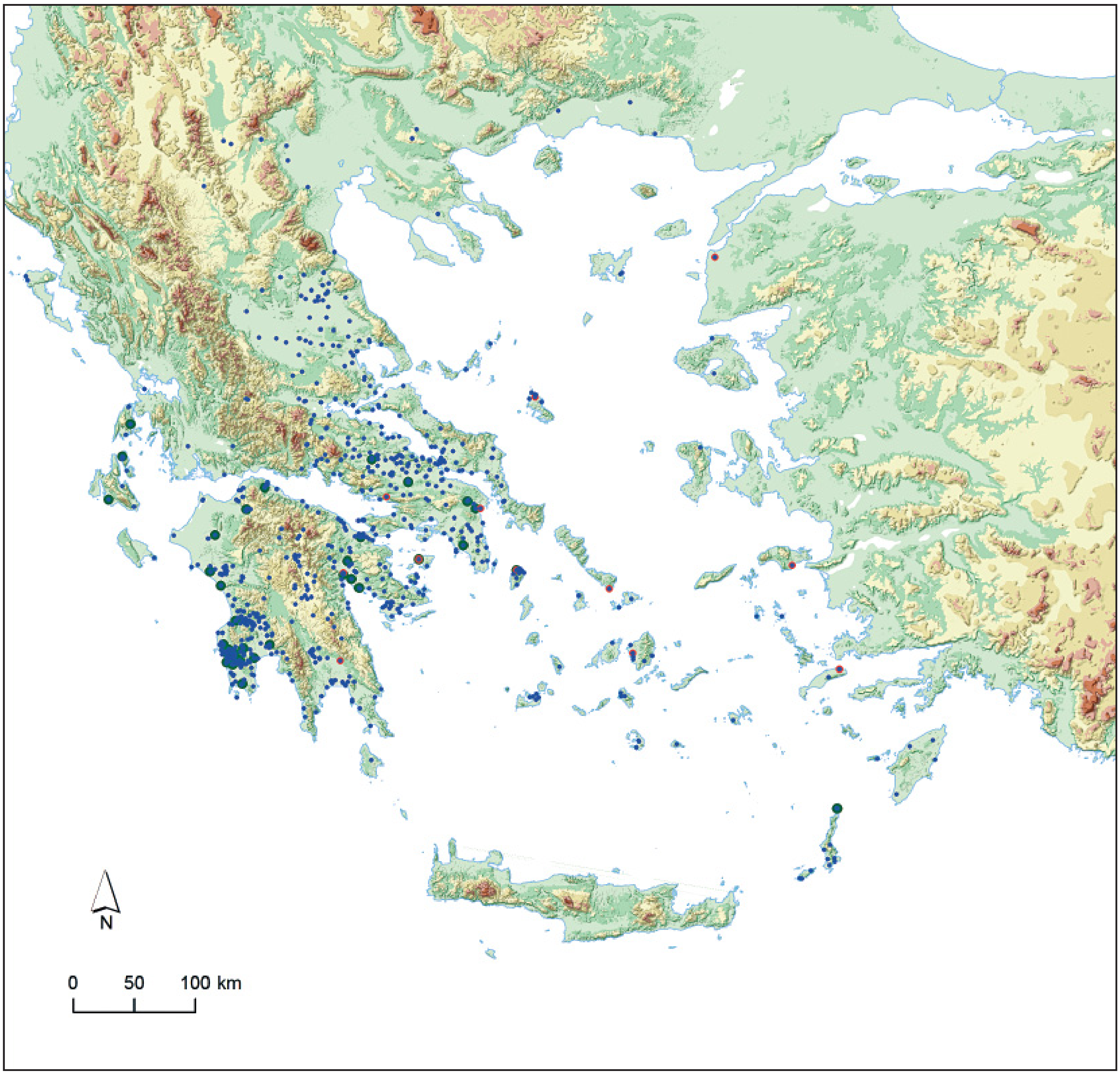


Fig. 12 Distribution of Middle Bronze Age sites (blue), possible/certain fortifications (red) and tumuli/elite burials and mansions (green) (map by author and P. Matsouka, Anavasi)

tumuli and the earliest tholos tombs[62] as well as other indications for emerging elites (e.g., special structures[63] or mansions like the 'Large Building Complex' at Kolonna[64]), an interesting picture develops: Only at a few fortified sites can emerging elites be detected in exceptional burials or special structures (e.g. mansions). Likewise, only a few sites with the aforementioned features preserve evidence of fortifications (**Fig. 12**).

Middle Bronze Age fortifications are likewise not well attested in the eastern Aegean and on the western Anatolian coast.[65] At Troy, there is so far scanty evidence for fortifications at the Troy V settlement, which covers most of the Middle Bronze Age.[66] The prehistoric site at the Heraion on the island of Samos seems exceptional for the eastern Aegean. Three successive phases of Middle

62 For the distribution of tholoi, see e.g. Pelon 1976. On tumuli and their distribution, see e.g., Boyd 2002; Merkouri/Kouli 2011.

63 Wright 2008, 249.

64 Gauß *et al.* 2011.

65 For Çeşme-Bağlararası in the Izmir region and its fortifications, see Şahoğlu 2007.

66 Easton 2002, 309–310 Fig. 202; Blum 2012, 50. 77. 124 with references. In general on Troy V, see e.g., Blegen 1963, 105–110; Blum 2006; 2012. Regarding Troy VI, see now Pavúk 2014.

Bronze Age fortifications have been attested, but only small stretches have yet been uncovered.[67]

Aghia Irini on the island of Kea is thus far the best known example of Middle Bronze Age fortifications in the Cyclades,[68] but other fortified sites may have existed as well.[69] Aghia Irini was fortified after its reoccupation in the Middle Bronze Age.[70] The location of the settlement on a peninsula and the preserved fortifications indicate a sectional rather than circumferential defensive wall, with housing limited to within the fortifications.[71] After a complete destruction, the site seems to have been unfortified until the construction of a new massive wall, the 'Great Fortification',[72] in the advanced to late Middle Bronze Age.[73] The new fortified area increased the size of the settlement by one-third,[74] and, as with the earlier phases, no signs of habitation were identified outside the fortifications.[75] Several modifications altered the 'Great Fortifications' over time, and at the end of the Middle Bronze Age it suffered severe damage, presumably due to an earthquake.[76] Following this event it is not clear if repairs at the wall were made before the beginning of the Late Bronze Age.[77]

The fortifications at Kolonna on Aegina are one of the best known examples from the Greek mainland and its adjacent islands. In this geographical area, Kolonna is so far the only site with a continuous sequence of fortifications from the late Early Bronze to the Late Bronze Age.[78] The fortifications of the Kolonna VII settlement at the beginning of the Middle Bronze Age fundamentally changed the form of the defensive wall, with new tangential and partly bent gateways protected by massive bastions (**Fig. 13**). The fortifications were reinforced during the Kolonna VIII settlement, when both gateways were extended and a massive bastion near the northern entrance was built (**Fig. 14**). In Kolonna VIII for the first time there is also clear evidence for housing outside the fortifications.[79] In the advanced Middle Bronze Age, the time of the Kolonna IX settlement, dramatic changes occurred in the design and form of the defensive system (**Fig. 15**). The eastern extension was fortified separately, and a new massive fortification wall was built to protect the center of the settlement. This new wall was unique in two aspects: it comprised three individual parts[80] and used a combination of stone and mudbrick in the lower zone and half-timber and mudbrick in the upper zone.[81] The fortifications of Kolonna X at the end of the Middle Bronze and the beginning of the Late Bronze Age are less clear and seem to comprise reinforcements of Kolonna IX walls and major changes in the access to the inner settlement.[82]

Current evidence indicates that the number of newly fortified sites on the Greek mainland increased during the Middle Bronze Age. Among the best known examples are the fortifications on the Aspis hill at Argos[83] in the Argolid and Kiapha Thiti in Attica,[84] but more sites are likely to have been fortified.[85] At the Aspis hill, multiple phases of fortifications have been traced. An inner enceinte seems to have been fortified during the middle part of the Middle Bronze Age,[86] and an outer one in the middle/advanced and late

67 Kouka 2015, 228–229 Figs. 1–2. 4–5; on the continuous sequence, see also Kouka 2013.

68 Davis 1977; 1986; Overbeck 1989; Rutter 1993, 776 and note 135.

69 Sotirakopoulou 2010, 829 and notes 21 and 22. For Palamari on Skyros in the Sporades, see Parlama *et al.* 2015; Romanou 2015.

70 Overbeck 1989, 6. 8. 119. 175–177 pls. 3–4; Davis 1992, 709; Kilian-Dirlmeier 1997, 86 Fig. 47 (tentative reconstruction of fortifications). For the reoccupation, see Overbeck 2007; Overbeck/Crego 2008; Schofield 2011, 191.

71 Overbeck 1989, 6.

72 Davis 1986.

73 Construction of the new wall marks the beginning of period V, in Minoan chronological terms MM IIB/MM IIIA; Davis 1986, 1. 8–15; Overbeck 1989, 120; Davis 1992, 709; Schofield 2011, 53.

74 E.g., Davis 1986, 8. 102.

75 Davis 1986.

76 Davis 1986, 1. 106 (in Minoan terms before the end of MM IIIB).

77 Davis 1986, 1 (in period VI, when Cretan LM IA pottery reached the site).

78 On Middle Bronze Age Kolonna with references, see e.g., Walter/Felten 1981; Rutter 1993, 775–780; Gauß 2010; Gauß/Smetana 2010; Gauß *et al.* 2011; Gauß 2017, 52–56.

79 Walter/Felten 1981, 70.

80 Walter/Felten 1981, 76 Fig. 60.

81 Walter/Felten 1981, 76. 81 Figs. 60–61. 65 Pl. 64.2; in general on this technique, see Naumann 1971, 91–117; Küpper 1996, 67–69.

82 Walter/Felten 1981, 83.

83 Philippa-Touchais 2016 with references.

84 E.g., Lauter 1989; 1995; Gauß 2017, 56

85 E.g., for Attica, see Papadimitriou 2010; for new evidence at Plasi in eastern Attica, see Polychronakou-Sgouritsa *et al.* 2016.

86 Philippa-Touchais 2016, 649–651.

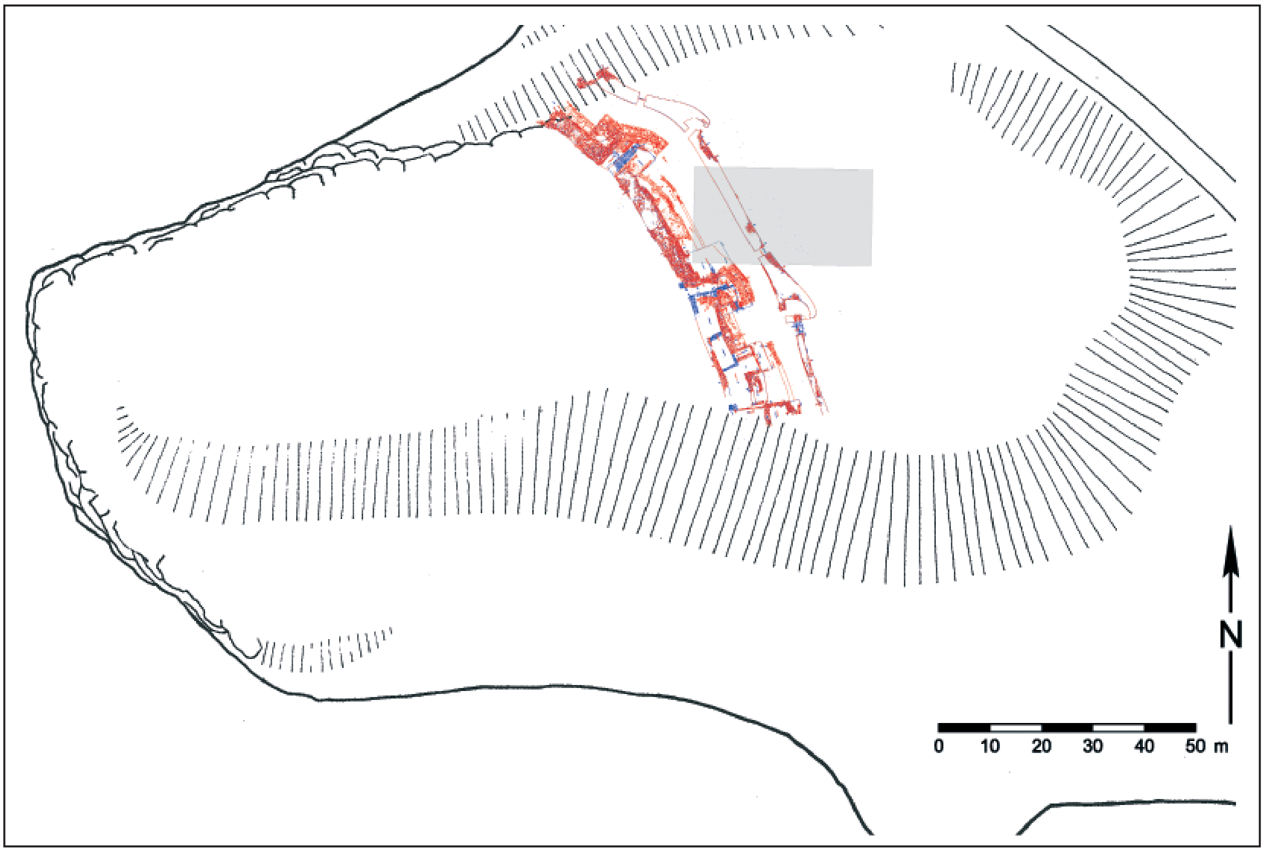


Fig. 13 Kolonna on Aegina, settlement with fortifications of Kolonna phase VI (blue) and VII (red); the late Archaic/Classical temple of Apollo is symbolized by the light gray area (figure based on Walter/Felten 1981, with additions by the author and H. Birk)

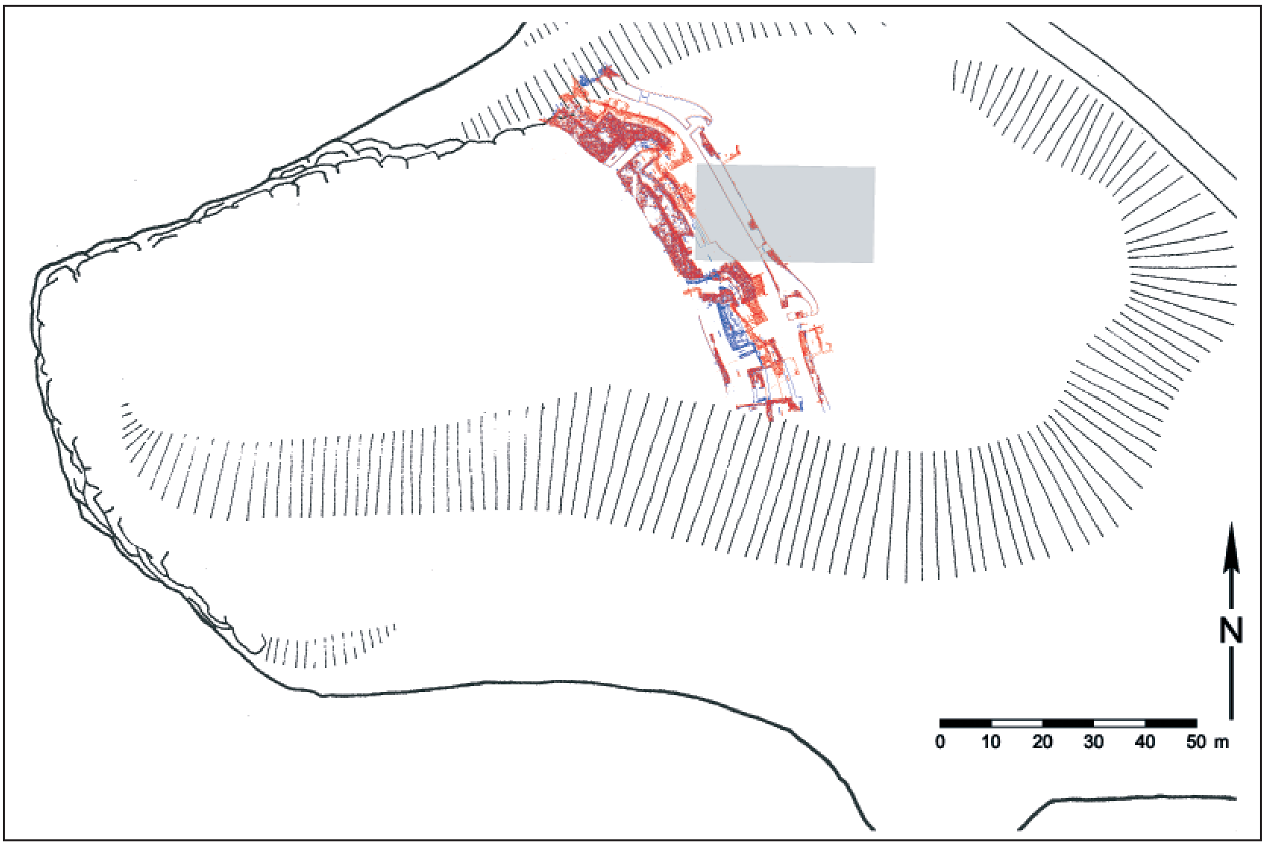


Fig. 14 Kolonna on Aegina, settlement with fortifications of Kolonna phase VII (blue) and VIII (red); the late Archaic/Classical temple of Apollo is symbolized by the light gray area (figure based on Walter/Felten 1981, with additions by the author and H. Birk)

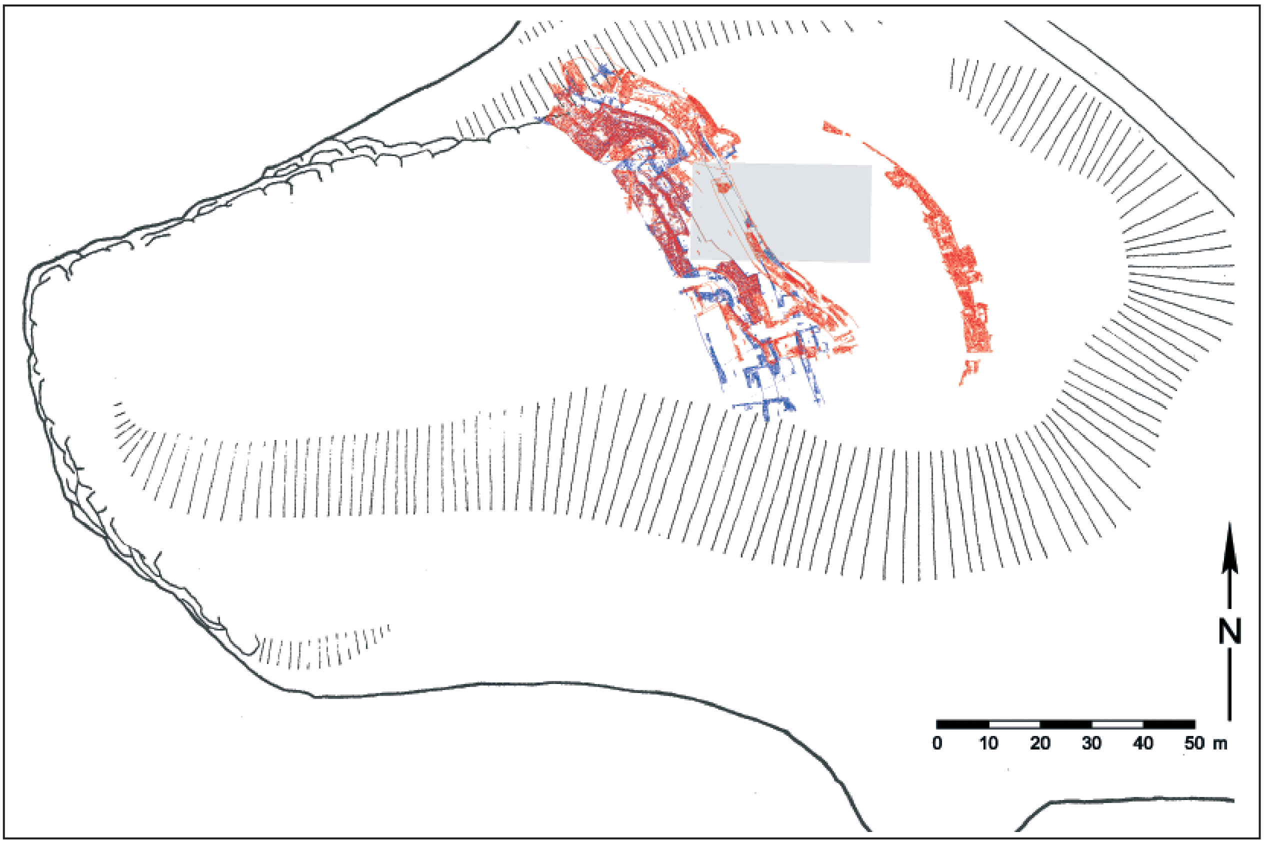


Fig. 15 Kolonna on Aegina, settlement with fortifications of Kolonna phase VIII (blue) IX (red) ; the late Archaic/Classical temple of Apollo is symbolized by the light gray area (figure based on Walter/Felten 1981, with additions by the author and H. Birk)

stages.[87] The newly built sectional fortifications at Kiapha Thiti[88] are remarkable, as they mark the re-emergence of fortified regional centers in the area of the Saronic Gulf, aside from Kolonna on Aegina.[89] The walls at Kiapha Thiti followed the natural topography and protected an area of c. 10,000 m². No substantial changes or extensions have been traced; the fortifications were destroyed presumably by a landslide in the early Late Bronze Age, and the site was subsequently abandoned.[90]

Because of the limited evidence, it is difficult to generalize Middle Bronze Age fortifications. Thus far the continuous sequence of fortifications at Kolonna seems unique, but other sites, such as the Heraion of Samos, may also have similarly unbroken sequences of fortifications. Other sites became fortified during the Middle Bronze Age, such as Argos, Kiapha Thiti, or Aghia Irini on Kea. Fortifications in that period seem to be located immediately at or in close proximity to coastlines (e.g., Kolonna, Samos, Plasi) or on hilltops (e.g., Argos, Kiapha Thiti). The number of known fortified sites increased in the later stages of the Middle and early Late Bronze Age.[91] This trend is most likely related to the major changes in the Aegean that occurred in the Shaft Grave era and early Mycenaean period.[92]

87 Philippa-Touchais 2016, 651.

88 E.g., Lauter 1995; Kalogeroudis 2008, 190–192; Lohmann 2010, 38–41; Vonhoff 2015, 488–489. On finds, see Maran 1992.

89 On the role of Kolonna, see Pullen/Tartaron 2007, 155–157 Fig. 14,4–5. The tumuli at Vrana and new research at Plasi attest an important Middle Bronze Age center in the Marathon bay area in eastern Attica, see e.g., Pantelidou Gofa *et al.* 2016; Polychronakou-Sgouritsa *et al.* 2016.

90 E.g., Lauter 1995, 21. 49.

91 E.g., Kiapha Thiti, Malthi – for early Late Bronze Age fortifications, see e.g., Rutter 1993, 788 note 176; Vonhoff 2015. For Malthi, see now Worsham *et al.* 2018.

92 E.g., Rutter 1993, 785–794; Voutsaki 2005; Wright 2008; Shelton 2010, 139–143; Voutsaki 2010.

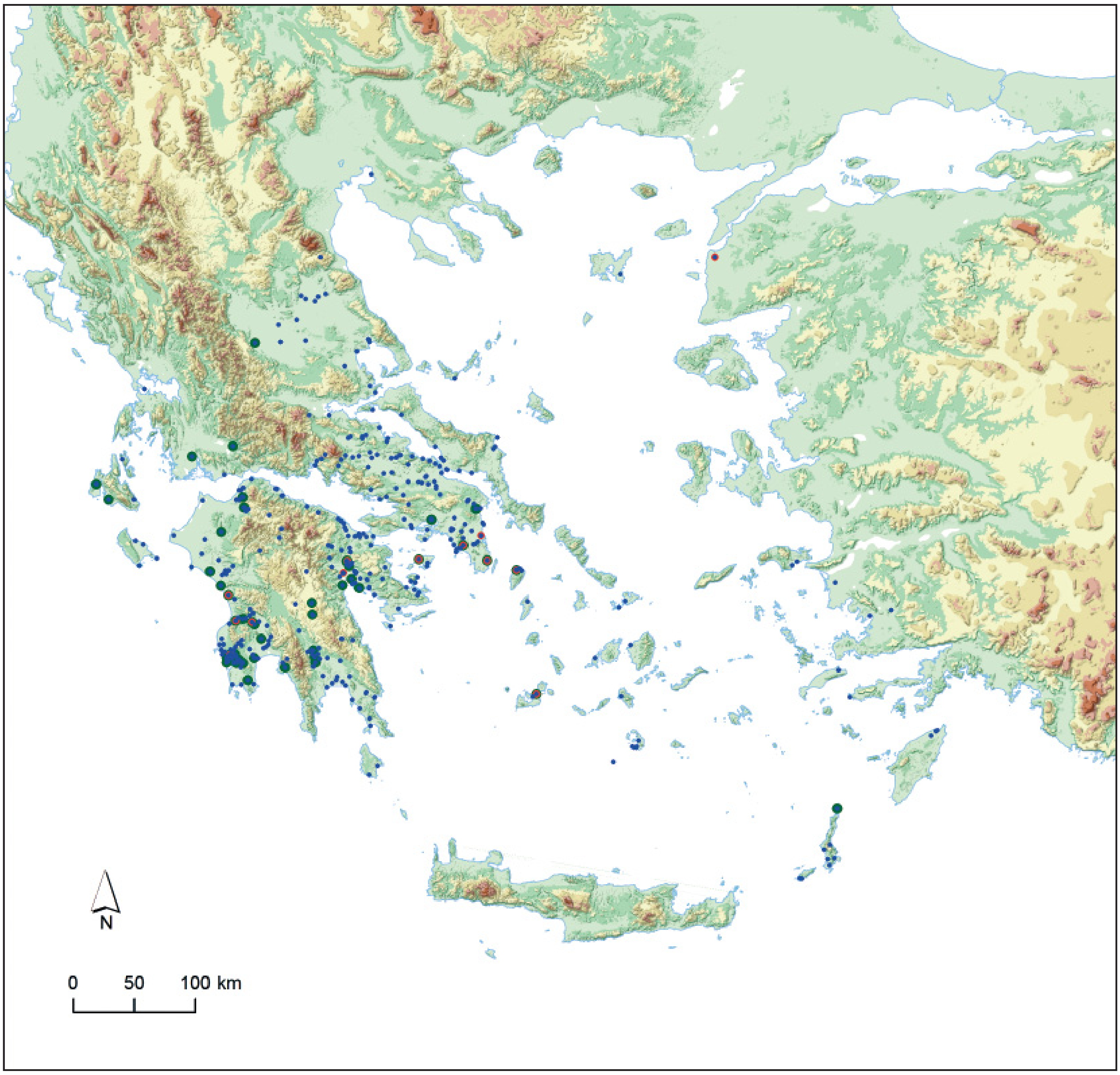


Fig. 16 Distribution of Late Bronze Age (Early Mycenaean) sites (blue) and possible/certain fortifications (red) and tumuli/tholoi/elite burials and mansions (green) (map by author and P. Matsouka, Anavasi)

Late Bronze Age – A Preview

The sheer number of Late Bronze Age Aegean (c. 1650 BCE to 1050 BCE[93]) sites is impressive,[94] and likewise the number of fortified or presumably fortified sites (**Fig. 16**).[95] In the first part of the Late Bronze Age, the early Mycenaean or so-called pre-palatial period[96] (c. 1650/1600 BCE to 1420/1410 BCE),[97] a picture similar to that of the Middle Bronze Age (**Fig. 12**) emerges. The number of sites where special structures (mansions, '*maisons de Chef*')[98] are attested and/or with associated

93 For absolute chronology, see, e.g., Weninger/Jung 2009; Manning 2010.

94 Syriopoulos 1995, 777–1271, classified 1312 Late Bronze Age sites.

95 E.g., Iakovides 1983; 1999; Hope Simpson/Hagel 2006; Cook 2014; Papadopoulos 2017.

96 Sites such as Aghios Vasileios/Xerocambi in Laconia and Pylos in Messenia indicate that both sites could have been "palatial" already in the early Mycenaean period. On the situation in Early Mycenaean Greece, see, e.g., Wright 2008, 249–250. For Pylos see, e.g., Nelson 2001; Rutter 2005, 21–26; Davis 2010, 683. For Aghios Vasileios/Xerocambi, see, e.g., Vasilogambrou 2010; 2011; 2012; 2013; Vasilogambrou/Kardamaki in press.

97 For absolute chronology, e.g., Manning 2010, 23 table 2.2.

98 E.g., Kilian 1987; 1988; Barber 1992; Vonhoff 2015; Maran 2015, 278–280. See also J. Wright (2008, 249):

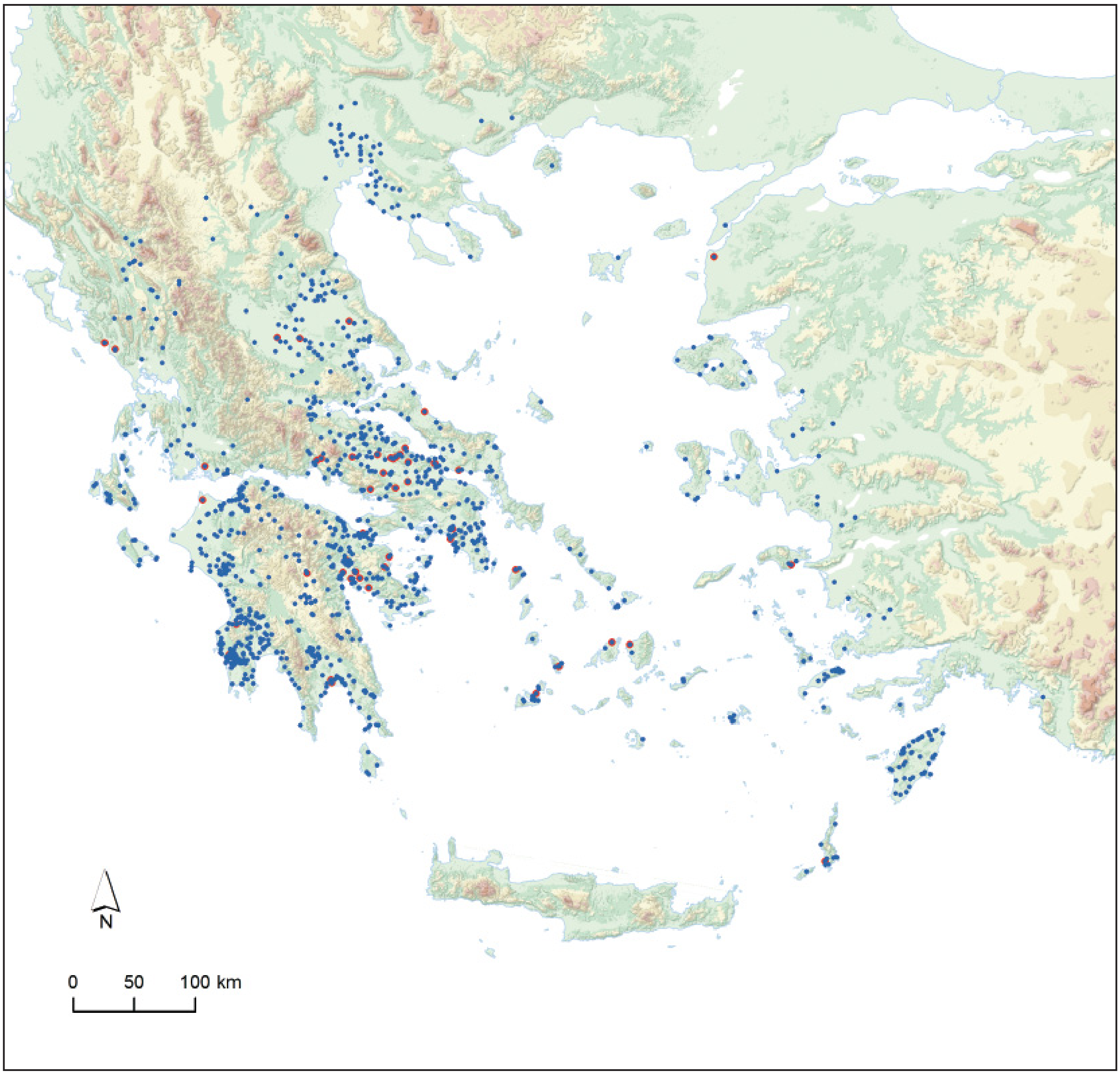


Fig. 17 Distribution of Late Bronze Age (Palatial) sites (blue) and possible/certain fortifications (red) (map by author and P. Matsouka, Anavasi)

tholos tombs far outnumbers fortified sites.[99] Likewise, only a few fortified places have clear evidence for mansions and/or exceptional burials.[100]

The following Mycenaean palatial period (c. 1420/1410 BCE to 1210/1190 BCE)[101] may be characterized by the decline of local/regional centers and the emergence of palaces, often massively fortified, e.g., Mycenae, Tiryns, Midea, and Thebes.[102] Fortified sites apart from the palaces are concentrated in the Argolid and Boeotia. Athens[103] seems to be the only fortified site in Attica, and no fortifications of the palatial period are known in Messenia.[104] The reason for this heterogeneous pattern has not been explained (**Fig. 17**). Most fortified sites seem relatively small, and even at Mycenae and Tiryns only the palatial center was fortified, while the lower

"At most of the palace sites, special structures were constructed, perhaps as early as LH II."

99 For the distribution of tholoi, see e.g., Pelon 1976. On tumuli and their distribution, see e.g. Boyd 2002; Merkouri/Kouli 2011; Zavadil 2013.

100 See also Vonhoff 2015.

101 For absolute chronology, e.g., Manning 2010, 23 table 2.2.

102 On the fortifications of the palatial centers, see, e.g., Iakovides 1983; 1999. For Midea, see also, e.g., Demakopoulou/Divari-Valakou 1999; Demakopoulou 2015. For Thebes, see Dakouri-Hild 2010, 699 with references.

103 On the Mycenaean fortifications of Athens, see, e.g., Iakovides 2006.

104 See also Rutter 2012.

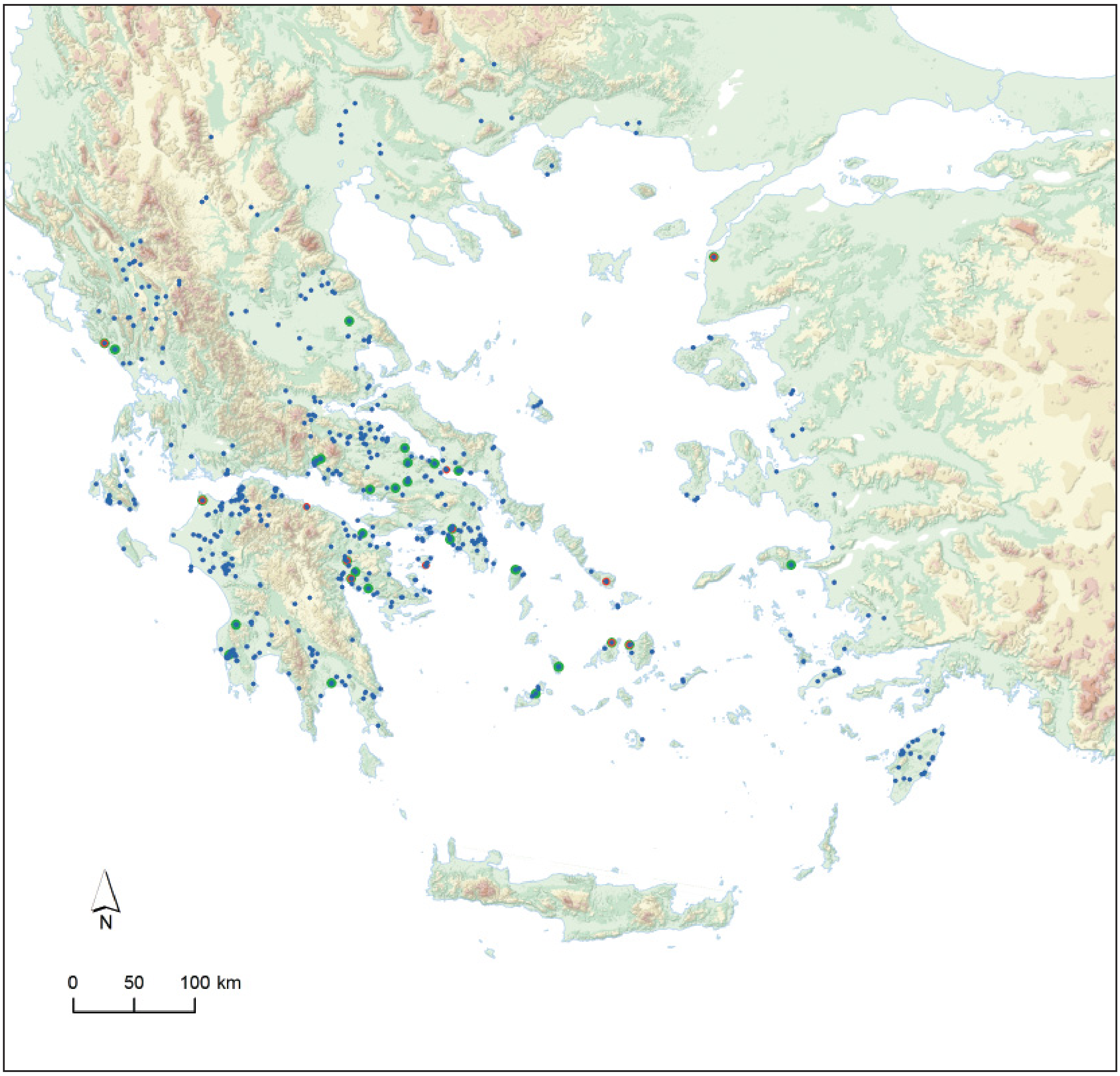


Fig. 18 Distribution of Late Bronze Age (Post-palatial) sites (blue) and possible/certain fortifications (red) and fortified palatial sites occupied in post-palatial times (green) (map by author and P. Matsouka, Anavasi)

towns seem to have been unprotected. However, Troy (Troy VI and VII), with its massively fortified acropolis and the separately protected lower settlement, is once more exceptional.[105]

In the following post-palatial period (c. 1210/1190 BCE to 1050 BCE),[106] newly built fortifications are rare and limited to a few sites, e.g. Aigeira in Achaia[107] and possibly Lefkandi,[108] Grotta on Naxos,[109] Xoburgo on Tinos[110] and Koukounaries on Paros[111] and Megali Koryphi on Aegina[112] (**Fig. 18**). However, a number of sites with fortifications, including e.g. the former palatial centers of Mycenae and Tiryns or the Athenian acropolis, continued to be used in post-palatial times. It is therefore very likely that existing fortifications stayed in use through the latest stages of the Bronze Age and even beyond.[113]

105 On the fortifications of Troy VI and VII, see, e.g. Klinkott/Becks 2001; Klinkott 2004.
106 For absolute chronology, e.g., Manning 2010, 23 table 2.2.
107 Gauß 2015.
108 See http://lefkandi.classics.ox.ac.uk/2008regionII.html (visited on 18.11.2018)
109 E.g., Lambrinoudakis/Philanotou-Hadjianastasiou 2001.
110 E.g., Kourou 2001; 2011.
111 E.g., Schilardi 1981; 1984; 2016.
112 See Vokotopoulos/Michalopoulou 2018.
113 For example, on the repair and modifications of the Late Bronze Age fortifications at Aghios Andreas on Siphnos in the Late Geometric period, see Hope Simpson/Hagel 2006, 113. On Early Iron Age fortified sites, see e.g. Kourou 2009, 112–116.

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Giulia Recchia and Alberto Cazzella

Coppa Nevigata in the Wider Context of Bronze Age Fortified Settlements of South-eastern Italy and the Adriatic Area

The paper presents a reconsideration of settlement pattern and defensive systems in south-eastern Italy during the Bronze Age, on the ground of the archaeological data coming from the excavations at Coppa Nevigata. In particular, the transformations of the defensive lines of the settlement are discussed, which were strictly linked to both defensive and offensive strategies and their changes. Moreover, the paper seeks to examine some related problems, such as the possible origin for the model of complex fortification lines in southern Italy, the pattern(s) of fortified settlement in the Eastern Adriatic and matters related to the social organisation of the Bronze Age southern Italian communities that built the fortification lines.

Introduction

Copper Age funerary contexts and rock art indicate that throughout the 4th and 3rd millennia BC warfare gained a significant socio-ideological dimension in Italy.[1] The vast majority of Copper Age grave goods accompanying adult males include arrowheads that, needless to say, can be related to both hunting and fighting.[2] Yet, in several cases the assemblages also included maceheads and hammer-axes, which were more likely martial in tone. Indeed, such weapons are frequently portrayed with both statue-stele and rock-art figures belonging to this period.[3] From the late Early Bronze Age/beginning of the Middle Bronze Age onwards (c. 1800–1700 BC) the organisation and strategy of warfare in south-eastern Italy became increasingly complex, the major evidence for that being the construction of massive and intricate fortification lines at several settlements.[4]

Settlement pattern(s) in Bronze Age south-eastern Italy

The phenomenon of fortified settlements develops in south-eastern Italy from the 18th century BC onwards. These settlements, generally long-lasting, were established in particular along the Adriatic and Ionian coasts, but also in sub-coastal and inland key-spots controlling exchange routes (**Figs. 1-2**). Although a large number of Bronze Age coastal settlements are known, most of them have been only partially explored. A number of them lie under modern cities, such as Giovinazzo, Bari, Mola. Monopoli and Brindisi,[5] and urban environments have allowed only small trial trenches. Moreover, some important sites were explored in the late 19th to mid-20th centuries, such as Scoglio del Tonno and Torre Castelluccia,[6] often not following modern archaeological standards. Therefore, except for a few cases, defensive walls are either scantly documented or have not been detected at all, and the exact chronology of the known cases often remains undefined. Nonetheless, a sizable number of sites appear to be provided with defensive lines that mostly consist of massive dry-stone walls, which in all likelihood were built before the mid-2nd millennium BC.[7] In the most intensively explored areas of the region, the common distance between coastal fortified sites is around 10 km. If we consider a hypo-

1 Cazzella/Guidi 2011, 28.
2 Recchia *et al.* 2018.
3 Cocchi Genick 2012.
4 This paper presents the views held by the two authors. In particular, G. Recchia has written the following sections: Settlement pattern(s) in Bronze Age south-eastern Italy; Models of inspiration for defensive lines in south-eastern Italy and parallels across the Adriatic; Demography, work force and social organisation behind the building of defensive walls; Concluding remarks. A. Cazzella has written the rest: The fortified settlement of Coppa Nevigata.

5 Radina 2010.
6 Quagliati 1900; Gorgoglione 2002.
7 See also Scarano 2017.

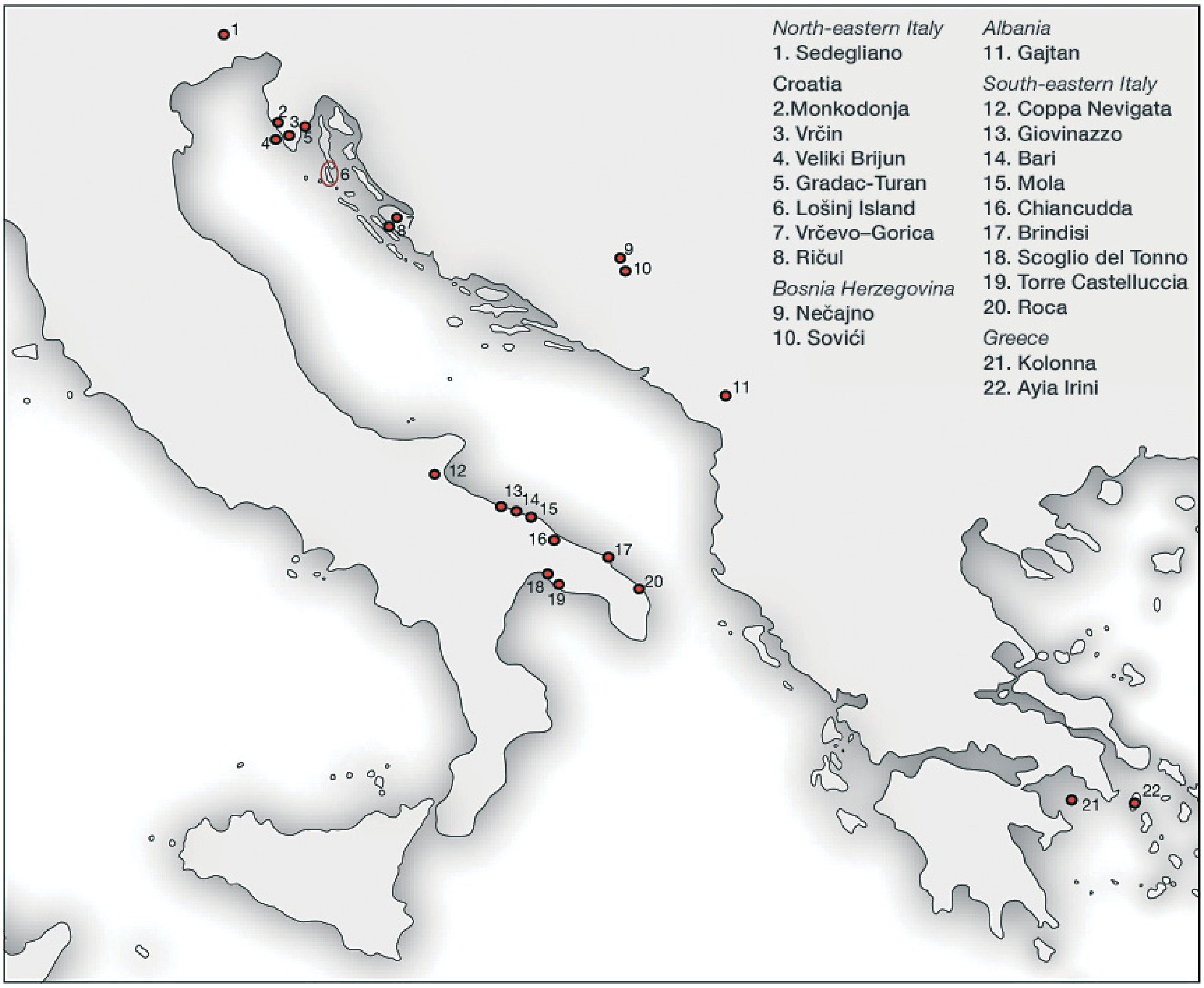


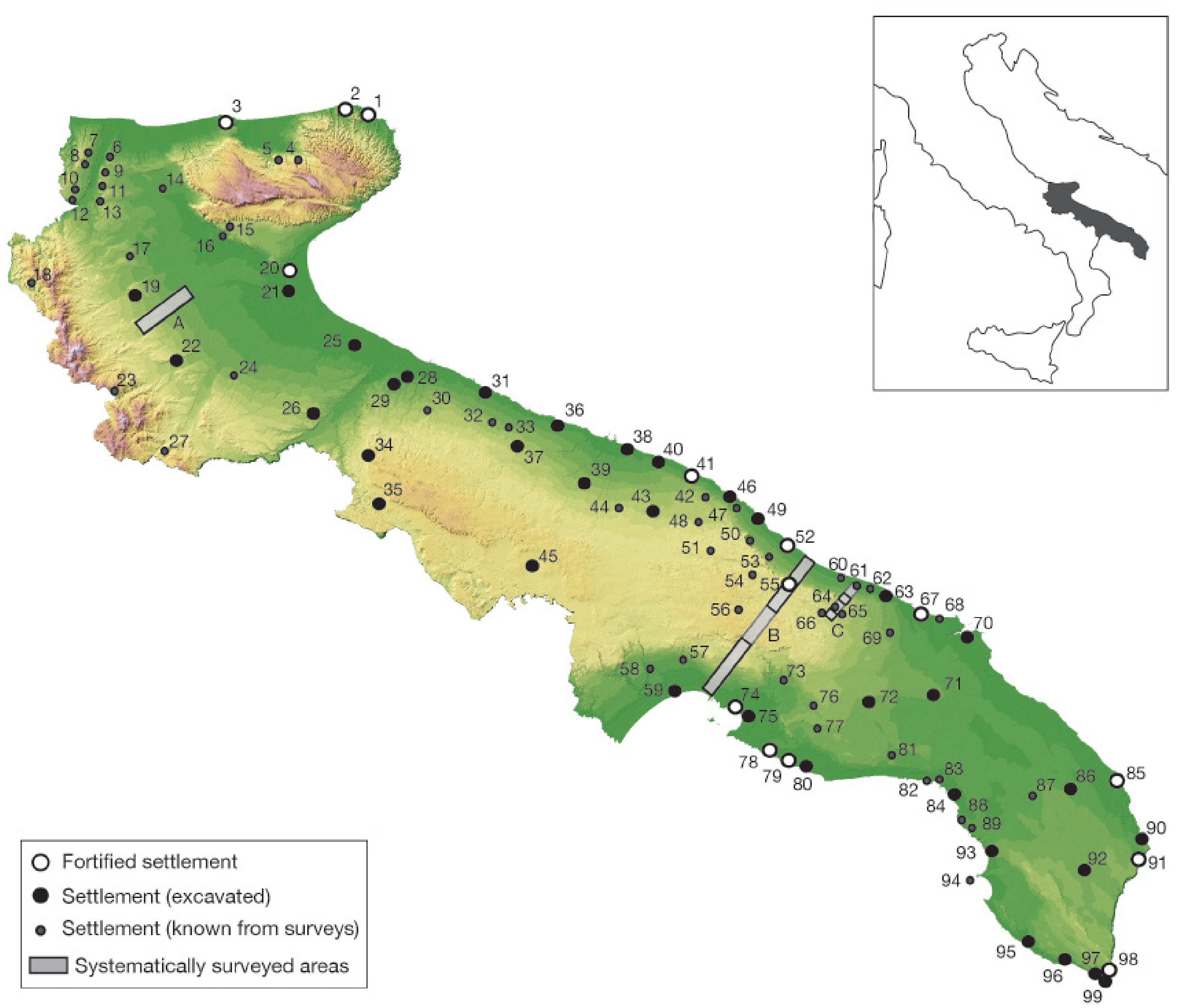
Fig. 1 Bronze Age settlements in south-eastern Italy, the eastern Adriatic and the Aegean mentioned in the text (map elaborated by G. Recchia)

thetical semi-circular shaped territory (given the presence of the sea on one side) for each site, the resulting resource area – without any overlapping – is approximately 40 km² for each.[8]

Apart from the southernmost part of Apulia, both the Adriatic and Ionian coastlines of the region are mostly flat and hence coastal fortified settlements, being located on level promontories, were not actual 'hillforts'. Defensive lines commonly protect the sites on the side facing inland. In contrast, both sub-coastal and inland fortified sites occupied hilltops that were partially naturally defended. Although our knowledge of the general nature of the southern Italian fortification walls is scarce, it seems that they do differ in size, complexity and defence strategy. In some cases, such as Coppa Nevigata and Roca (phase 2),[9] the defences appear to be rather elaborate and massive from the earliest phases of construction, while others are possibly simpler, such as the sub-coastal site of Masseria Chiancudda.[10] Does this evidence reflect a lesser need for sophisticated artificial fortifications at some sites, especially those occupying naturally defended locations? Or, to what extent do these differences stem from socio-cultural factors?

Fortification systems in southern Italian Bronze Age settlements doubtlessly had a purely practical and defensive dimension, as is clearly illustrated by cases such as Coppa Nevigata and Roca, which we will discuss below. Nonetheless, in all likelihood these defensive lines also had a symbolic function, linked to processes of emulation and competition between neighbouring fortified centres. This does not necessarily imply, however, that any given centre exercised suprema-

8 Cazzella 1991; Radina 2010.
9 Scarano 2012.
10 Cinquepalmi/Recchia 2009.



1. Molinella; 2. Punta Manaccora; 3. Torre Mileto; 4. Vallone S. Giovanni ; 5. Coppa Castedda; 6. Brecciara; 7. Colle Malchieuti; 8. Piano Navuccio; 9. Coppa di Rose; 10. Colle di Breccia; 11. Piani di Lauria; 12. Colle Arsano; 13. Pezze della Chiesa; 14. Le Cave; 15. Monte Granata; 16. Ciccalento; 17. Mass. Faralla ; 18. Monte Rullo; 19. Lucera; 20. Coppa Nevigata; 21. Cupola Beccarini; 22. Posta Rivolta; 23. Serra Forcella; 24. Ordona; 25. Vasche Napoletane; 26. Ripalta; 27. Calcara; 28. Madonna del Petto; 29. Canne; 30. Macchia di Rose; 31. Capo Colonna; 32. La Chianca; 33. Punta Marasca; 34. Minervino Murge; 35. Spinazzola; 36. Giovinazzo; 37. Tre Fontane; 38. Bari; 39. Bitetto; 40. Punta della Penna; 41. Mola di Bari; 42. Monte S. Michele; 43. L'Annunziata; 44. Dannetta; 45. La Croce; 46. Polignano a Mare; 47. Torre del Trullo; 48. Agnano; 49. Monopoli; 50. Monte S. Nicola; 51. Monte Tauro; 52. Egnazia; 53. Mass. S. Francesco; 54. Monte Gianecchia; 55. Mass. Chiancudda; 56. Badessa; 57. Porcile Caramazza; 58. Mass. Minerva; 59. Cozzo Marziotta; 60. Monticelli; 61. Puntore; 62. Fosso Montanaro; 63. Torre S. Sabina; 64. Rissieddi; 65. Ostuni; 66. Carestia; 67. Torre Guaceto - Apani; 68. Torre Testa; 69. Mass. Jannuzzo; 70. Punta le Terrare; 71. Muro Maurizio; 72. Oria; 73. Riggio; 74. Scoglio del Tonno; 75. Taranto S. Domenico; 76. Mass. Lo Noce; 77. S. Sofia; 78. Porto Perone - Satyrion; 79. Torre Castelluccia; 80. Bagnara; 81. Manduria; 82. Punta Presutti; 83. Torre Castiglione; 84. Scalo di Furno; 85. Roca; 86. Cavallino; 87. S. Donato; 88. Torre dell'Alto; 89. Punta dell'Aspide; 90. Otranto; 91. Portorusso; 92. Muro Leccese; 93. S. Maria al Bagno; 94. Isola S. Andrea; 95. Le Pazze; 96. Fano - Salve; 97. Punta Ristola; 98. S. Maria di Leuca; 99. Punta Meliso. A. Celone valley survey; B. Murge Tableland project; C. Ostuni field survey.

Fig. 2 Distribution map of Bronze Age settlements in Apulia. The label 'fortified site' refers to those sites where defensive lines pertaining to the Bronze Age have been brought to light (map elaborated by G. Recchia)

cy over others.[11] As we shall see, the settlements were likely to have been of a limited demographic size that therefore would have hindered their abilities to impose political control over territories of other settlements. Although it is difficult to obtain a reliable estimate of the population of these settlements, we can acquire an approximate picture by correlating the information on the settlement size with that of the population density in comparable ethnographic contexts. Demographic estimates are also helpful in evaluating the amount of labour involved in the construction of the defensive lines and the extent to which each community could have built its fortifications autonomously.

[11] Cazzella/Recchia 2013a.

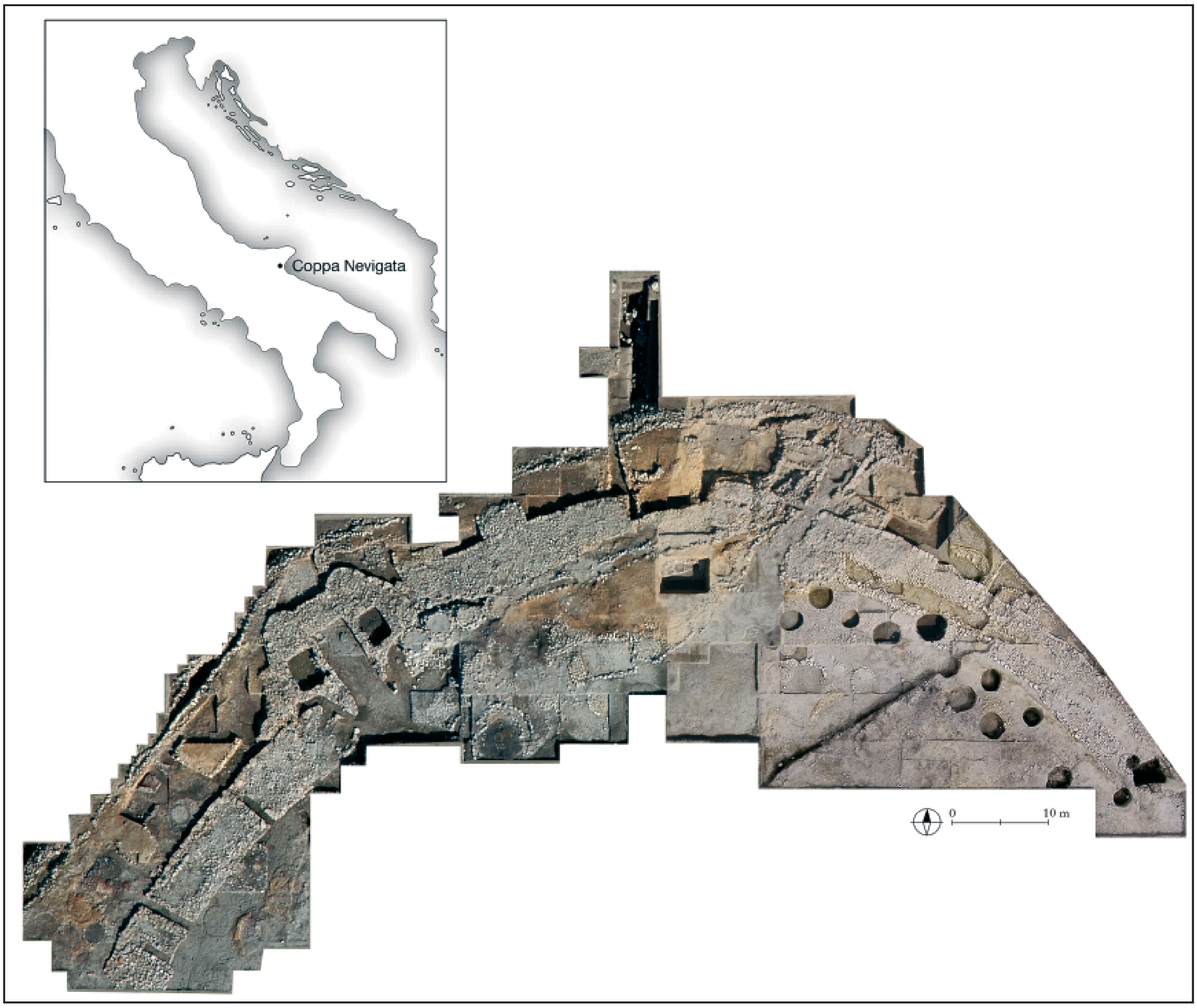


Fig. 3 Coppa Nevigata (northern Apulia). Aerial photo of the archaeological site, excavations 1983–2015 (archive of the Coppa Nevigata Research Project; aerial photos by A.V. Romano 2006, F. Nomi 2010 and B. Mandelli 2015)

Indeed, not all the settlements were fortified. In contrast with the coastal pattern of fortified sites, the occupation of inland areas is mostly characterised by small hamlets that in some cases formed specific clusters.[12] This 'hamlet' pattern is mainly known from systematic survey projects and amateur surveys, and only a handful of these small inland sites have been stratigraphically explored. In any case, unlike the long-lasting fortified sites these appear to be short-term villages that possibly moved about across the landscape throughout time.

Assuming that fortified centres did not play a hegemonic territorial role, or at least not until the Final Bronze Age, what are the reasons behind the diverse settlement patterns coexisting in adjacent and connected areas? We are inclined to think that some communities oriented their economy towards exchange activities and settled in favourable locations; then perhaps they developed some craftsmanship directed towards the exchange network.[13] Thus, these communities will have particularly felt the need of maintaining their territorial position, protecting the central dwellings from organised attacks, clearly demarking the settlement space and making it easily recognisable. As they developed specialised functions, fortified centres possibly became economic points of reference on a more regional scale. On the other hand, inland small hamlets basically focussed their economy on farming and herding and did not have the need to maintain a given territorial position. These were not politically dependent on the fortified centres. On the contrary, they might have been in competition with them and could have formed (tempo-

[12] Recchia 2009.

[13] Cazzella 2009; Cazzella/Recchia 2013a.

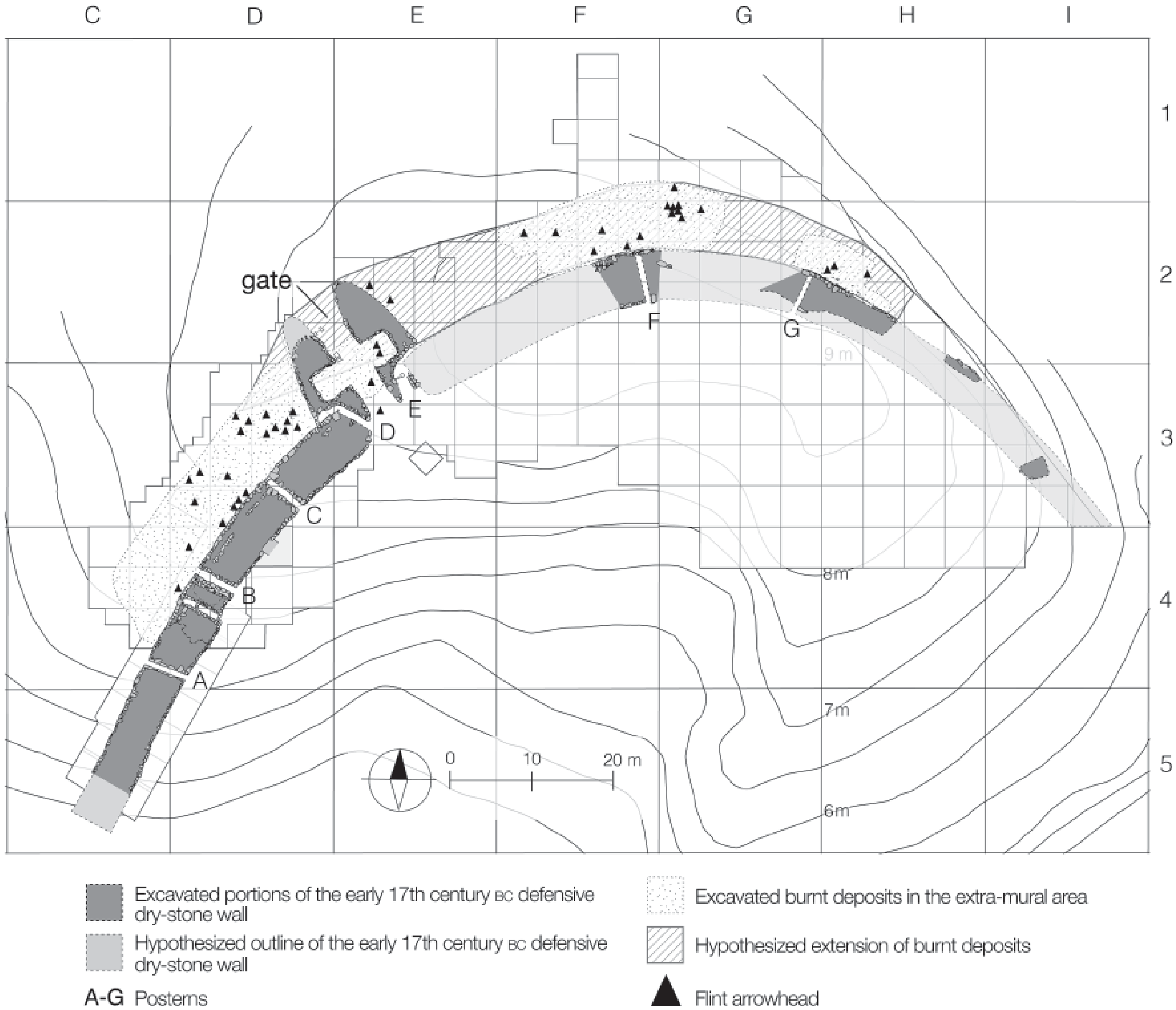


Fig. 4 Coppa Nevigata (northern Apulia). Map of the 17th century BC defensive wall and of the burnt deposits outside the wall, dating to late 16th century BC, possibly resulting from an assault. The distribution of the flint arrowheads from the burnt deposits is also shown (archive of the Coppa Nevigata Research Project; drawing and elaboration by G. Recchia)

rary) alliances with each other to launch attacks on the fortified centres, but they probably needed the goods that the specialised fortified centres produced or acquired through exchange networks.

We will briefly discuss the Coppa Nevigata settlement, particularly focussing on the transformations of the fortification lines over time in relation to possible parallel transformations in poliorcetics and warfare techniques. Then we will attempt to examine some related problems, such as the possible origin for the model of complex fortification lines, the pattern(s) of fortified settlement in the Eastern Adriatic (an area that had close relationships with northern Apulia) and matters related to the social organisation of the Bronze Age southern Italian communities that built the fortification lines.

The fortified settlement of Coppa Nevigata

The fortified settlement of Coppa Nevigata (**Fig. 3**), located in northern Apulia just south of the Gargano promontory, is one of the most extensively excavated Bronze Age sites in Italy.[14] It was continuously settled for roughly one millennium, up to the Early Iron Age (c. 18th–8th centuries BC), and a wide series of 14C dates provides a detailed chronology for the various phases of occupation and the transformation of the fortification lines through time.[15] Unlike the vast majority of the coastal fortified sites in south-eastern Italy, the settlement of Coppa Nevigata did not directly front the sea. In fact, it was located on the inland shoreline of an

[14] Cazzella/Recchia 2012.
[15] Calderoni *et al.* 2012.

ancient navigable lagoon, now reclaimed, which at the same time connected the site to the sea and provided protection against maritime attacks.

The earliest fortification line (c. 1700–1500 BC)

The earliest fortification wall at Coppa Nevigata dates to c. 1700 BC and represents one of the most ancient dry-stone defensive walls in southern Italy. Its rather complex outline (**Fig. 4**) testifies to the high capability of this community to organise an effective defence and at the same time indirectly indicates the high offensive potential of the neighbouring communities. This massive wall (5 m in width and possibly 5 m in height) protected the settlement on the side facing inland. It features at least one main gate flanked by twin towers and a series of narrow posterns arranged at close intervals, namely one every 12–13 m in the extensively unearthed portion of the wall. A couple of them have been found walled up on the exterior by a thin screen of stones, suggesting that the posterns might have been easily concealed from the outside, possibly for military purposes. The estimated overall length of the wall is approximately 360 m, of which 70 m (c. 20 %) have been extensively explored.[16] The eastern part in particular lies under a subsequent defensive wall, but some portions of it have been brought to light, so providing a degree of evidence for 40 % of the entire first circuit. The opening of the main gate is 3.5 m in width, while that of the posterns is 0.80 m on the average (with a height of c. 1.2 m).[17] The horseshoe-shaped towers flanking the gate protrude some 10 m from the external face of the wall and are provided each with an inner chamber that opens onto the entrance road.

Defensive walls featuring several posterns seem to occur but rarely in coeval southern Italian settlements. However, as mentioned above, in the vast majority of these sites only a limited portion of the defensive lines has been unearthed and, therefore, we know very little about their actual configuration. At present, the only Bronze Age defensive wall in the region provided with several posterns is that of the coastal settlement of Roca (phase 3)[18] in southern Apulia, an example which is slightly younger than the one at Coppa Nevigata. The very well-preserved wall at Roca has been extensively explored and shows one architecturally complex main gate and five posterns over a length of 190 m. On the contrary, the defensive wall at the sub-coastal hilltop settlement of Masseria Chiancudda, whose earliest phase of construction possibly even slightly predates the Coppa Nevigata wall, appears to be architecturally simpler and less wide.[19] It has been explored over a length of c. 70 m, but neither a gate nor any posterns have been detected.

Turning our attention back to Coppa Nevigata, by the 16th century BC the settlement appears to have expanded beyond the earliest wall, which in all likelihood was still standing.[20] However, owing to the later construction of a large ditch, it remains difficult to assess whether a further defensive line encircling the former one was built at that point, or whether these external structures were left undefended. Whatever the case, at the end of the 16th century BC the site suffered a severe attack, which resulted in the destruction of this settled area outside the earliest wall.[21] Traces of what it is likely to have been an organised assault consist of noticeable burnt levels that extend across the entire extramural area excavated so far (**Fig. 4**; more than 100 m in length). These deposits have yielded a considerable number of flint arrowheads (some 50 or so), one of which was embedded in the wall, while the rest were scattered all across this area (**Fig. 5**). This pattern of distribution suggests that these are evidence for shot arrows rather than the products of a flint atelier located in this area.[22]

16 Following a program of core-borings at the site, which have demonstrated that the Bronze Age settlement extended towards the lagoon more than previously thought, both the estimated length of the wall and size of the settlement have increased. The estimations that we present in this paper, including those regarding the demographic size of the population at Coppa Nevigata, are accordingly updated and slightly differ from those previously published. The resultant estimates for the labour/time involved in the construction of the walls have not, however, changed significantly.

17 Two posterns (F and G), located in the best preserved portion of the wall, still have the roofing, which consists of a series of slabs supported by the postern's walls and covered by the rubble filling of the wall.

18 Scarano 2012.

19 Cinquepalmi/Recchia 2009.

20 Cazzella/Recchia 2012, 263-271.

21 Recchia 2010; in press.

22 This assemblage includes arrowheads of different types – barbed and tanged, tangless and with a small tang - and made of various qualities of flint. Archaeometrical analyses aimed at determining the source of

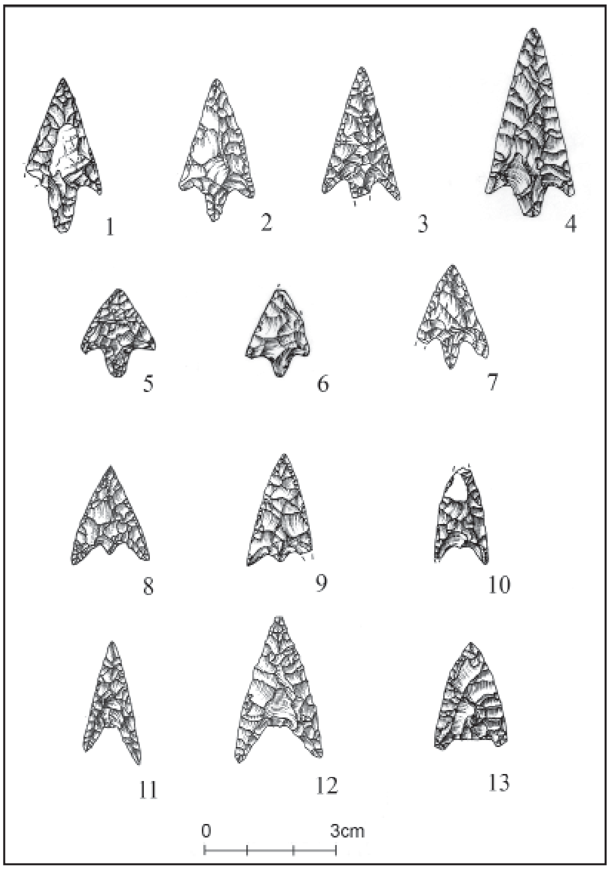


Fig. 5 Coppa Nevigata (northern Apulia). Flint arrowheads from the burnt deposits dating to late 16th century BC, possibly evidence for shot arrows: **1–7** barbed and tanged arrowheads; **8–10** arrowheads with a small tang; **11–13** tangless arrowheads (archive of the Coppa Nevigata Research Project; drawings by E. Santucci)

Warfare techniques

What can we learn from the Coppa Nevigata possible battlefield – and more in general from the earliest defensive lines in term of warfare techniques? It is clear that offensive strategies must have required a certain degree of coordination. The arrowheads found at Coppa Nevigata were scattered across the entire unearthed length of the wall; therefore, we may assume that the opponents doubtlessly numbered several dozens of individuals in order to cover such a span. In fact, it is unlikely that a few attacking archers would have been able to move fast along the entire perimeter of the wall, unless they were riding horses. Yet there is little archaeological evidence of a widespread use of horses in Middle Bronze Age southern Italy. Large volleys of arrows must have been employed particularly in the first stage of an assault, and they may have been combined with the throwing of burning projectiles. Battering rams, although of rudimentary kind, might well have been used at least to splinter the wooden gates. According to historic sources, the introduction of battering rams would have occurred after the Bronze Age. Yet, these sources may just refer to more perfected and complex types (i.e. shielded battering rams) that enabled longer-lasting assaults. Indeed, the focus of the defensive strategy at Coppa Nevigata in the first half of the 2nd millennium BC seems to be the gate, protected as it was by the jutting towers that formed a corridor of some 10 m in length. Assailants trying to get at the gate could have easily been shot at from the towers. This strategy was probably coupled with the military use of the posterns, which, as mentioned above, could have been concealed and thus allowed the defendants to stealthily exit the wall and take the assailants by surprise.

Rebuilding and transformations of the defensive lines (c. 1500–1300 BC)

Data about the defensive line of the 15th century BC at Coppa Nevigata are scanty. The earliest wall of the 17th century BC was partially dismantled and a very different kind of defensive line was built that ran parallel to the former one. This consisted of a string of wall segments of different lengths, leaving a series of wide openings between one segment and the next one.[23] How this system worked – assuming that this actually was a kind of defensive system – is very puzzling. What is interesting, however, is that in this period the area of the enclosures (including both the former and the new one) was given a particular symbolic meaning, as it was used for complex funerary practices.[24] This evidence does not have parallels in

provenance of the raw material are ongoing in collaboration with G. Eramo (University of Bari), I. Muntoni (Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Foggia e Barletta-Andria-Trani), V. Mironti (PhD).

23 Unlike the most common Bronze Age walls in southern Italy that are filled up by stone rubble, these wall segments were filled by crushed yellow limestone, mixed with soil.

24 These included both the formal burial of male individuals in the posterns of the earliest wall and the deliberate deposition of selected human bones in the filling of the new wall segments, besides complex practices entailing first the exposure of corpses and then the retrieval of skeletal parts (Recchia 2012).

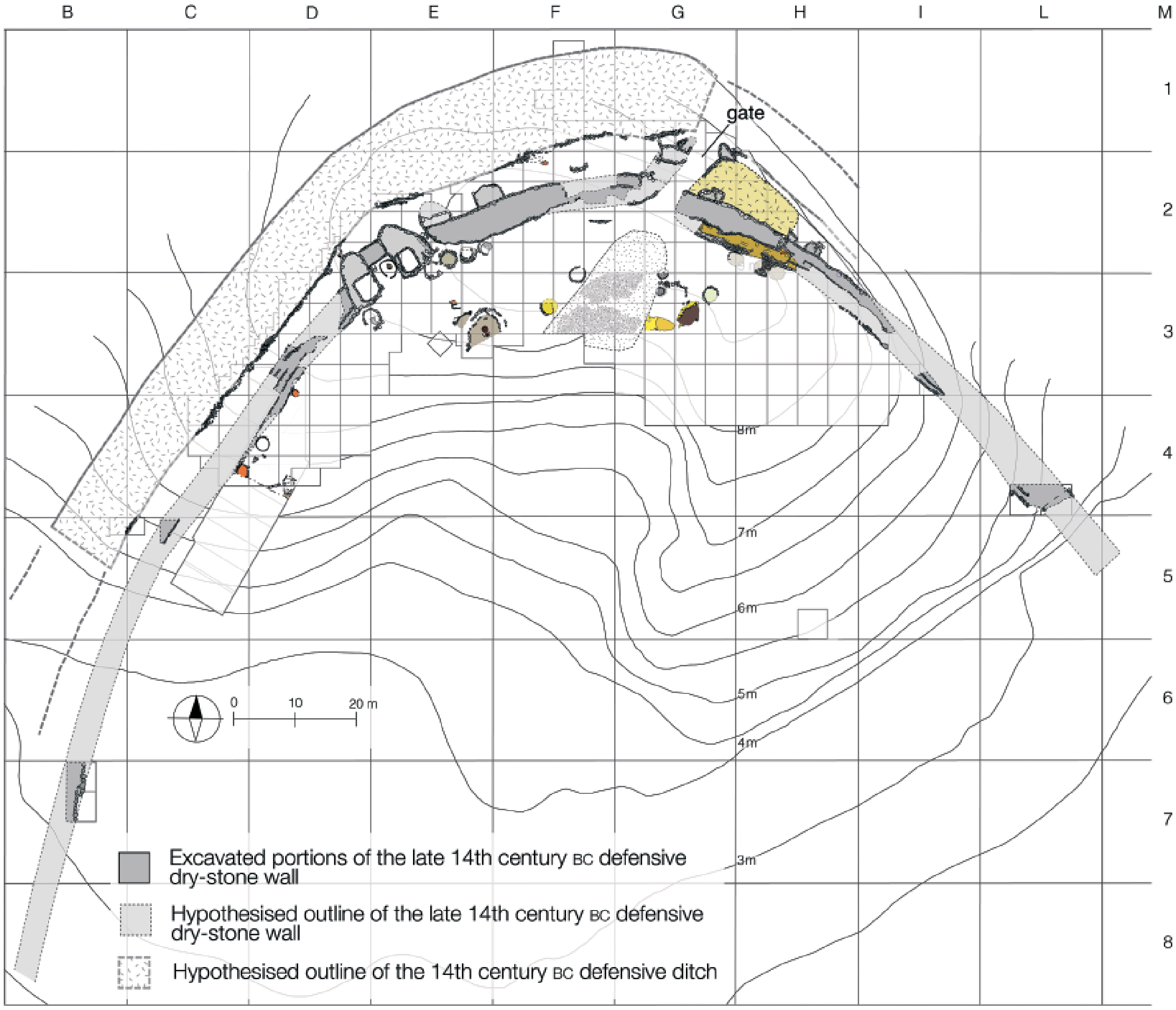


Fig. 6 Coppa Nevigata (northern Apulia). Map of the 14th century BC fortification lines (archive of the Coppa Nevigata Research Project; drawing and elaboration by G. Recchia)

coeval sites in southern Italy, although the practice of burying distinct individuals near or inside the enclosures is attested at Bronze Age fortified sites in north-eastern Italy and Istria, such as Sedegliano, Monkodonja and Vrčin.[25] Direct contacts between Istria and northern Apulia during the Bronze Age are suggested by shared stylistic pottery features,[26] and therefore it is possible that a link also existed in these socio-ideological practices.

Not until the early 14th century BC was a new massive dry-stone wall built at Coppa Nevigata. This partially incorporated the surviving remains of the earliest one.[27] Up to 35 % (c. 140 m) of the entire estimated extent of the wall has been explored (**Fig. 6**). The former gate of the predating wall was closed, but the foreparts of the towers were maintained and reshaped, constituting now just modest jutting parts. The new gate, whose entrance was protected by two small horseshoe-shaped towers, was placed to the east of the first. The contemporary wall featured at least two narrow posterns, which were both protected on the two sides by jutting extensions that made their access funnel-shaped. Unlike the posterns of the earliest wall, these two were consequently plainly visible from the outside, as were the posterns of the dry-stone wall at Roca (phase 2).[28] At Coppa Nevigata by the late 14th century BC, the posterns

25 Cassola/Corazza 2009; Hänsel *et al.* 2015; Cupitò *et al.* 2018.

26 Arena *et al.* 2018; Cazzella/Recchia 2018; Recchia *et al.* 2016.

27 Cazzella/Recchia 2012, 280-287.

28 Scarano 2012, 58-59.

appear to have been rendered unserviceable, while a wide ditch (12 m in width and 4 m in depth) was dug, running parallel to the wall. Furthermore, several modest projecting dry-stone towers were added at different points along the wall.

Changing warfare techniques?

One of the purposes of the ditch was possibly to weaken the impact of any initial volleys of arrows by increasing the distance between the assailants and the settlement itself. To reach targets standing on the wall, the arrows must have travelled more than 15 m, and more than 20 m to reach any dwellings inside the wall. The modest projecting towers along the wall were probably intended to provide a lateral defence (enfilading) against enemies climbing the wall. Their number suggests the need to protect the entire length of the wall. Thus, a crucial aspect of the battle could have been that of a direct assault upon the wall, probably now directed against a certain length of the wall rather than focussing on the gate(s). Maybe this is also why the use of posterns as sally ports had lost their effectiveness. The assailants possibly employed ladders to climb the wall. Notched log ladders are known from Middle Bronze Age sites not only in the British Isles,[29] but also in central Italy, such as the ladder in San Lorenzo a Greve (**Fig. 7**; mid-2nd millennium BC).[30] Archaeobotanical studies at Coppa Nevigata show that different kinds of timber trees suitable for making into tall ladders grew in the surrounding environment of the site.[31] Close-quarter combat, a pivotal and decisive moment in several types of fighting strategies, possibly took place on the top of the wall, as suggested by the archaeologically recorded assault that the settlement of Roca underwent around 1400 BC. Here, the skeleton of a male individual has been found in the area of the gate; this is interpreted as a warrior who fell from the top of the wall after being stabbed in the back.[32]

The funerary ritual of the 15th–14th centuries BC in the area under scrutiny, consisting of collective burials both in hypogea and caves with rich grave goods, provides us with a good picture of the bronze weaponry that was in use and on which ideological emphasis was placed (**Fig. 8,1–6. 12–19**).[33] This panoply mostly comprises daggers and short swords, while long swords are rarely attested in this period in entire southern Italy. Thus, it seems that weapons for close-quarter combat had gained prominence, exalting the bravery of single individuals. These individuals appear to have been fully integrated in kinship groups, but possibly distinguished themselves in battle or played the role of military chiefs. In any case, it is highly likely that all the adult males actively participated in the battles, owing to the still limited demography of these fortified centres. For instance, as we shall discuss below, we hypothesise that Coppa Nevigata had a population of approximately 300 inhabitants, of which only 60–75 males were of any military value.[34]

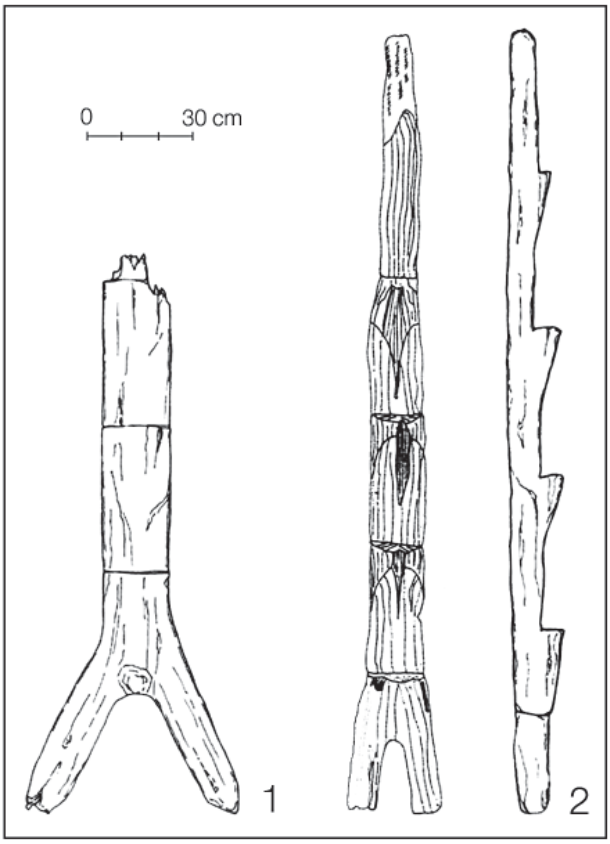


Fig. 7 Middle Bronze Age wooden ladders coming from S. Lorenzo a Greve (Tuscany) (after Aranguren/Perazzi 2007)

29 Powell *et al.* 2015, 221 Fig. 8.5.

30 Aranguren/Perazzi 2007 Fig. XX.

31 Fiorentino/D'Oronzo 2012.

32 Scarano 2012, 102-104.

33 Recchia 2010; in press.

34 Cazzella *et al.* in press, footn. 4.

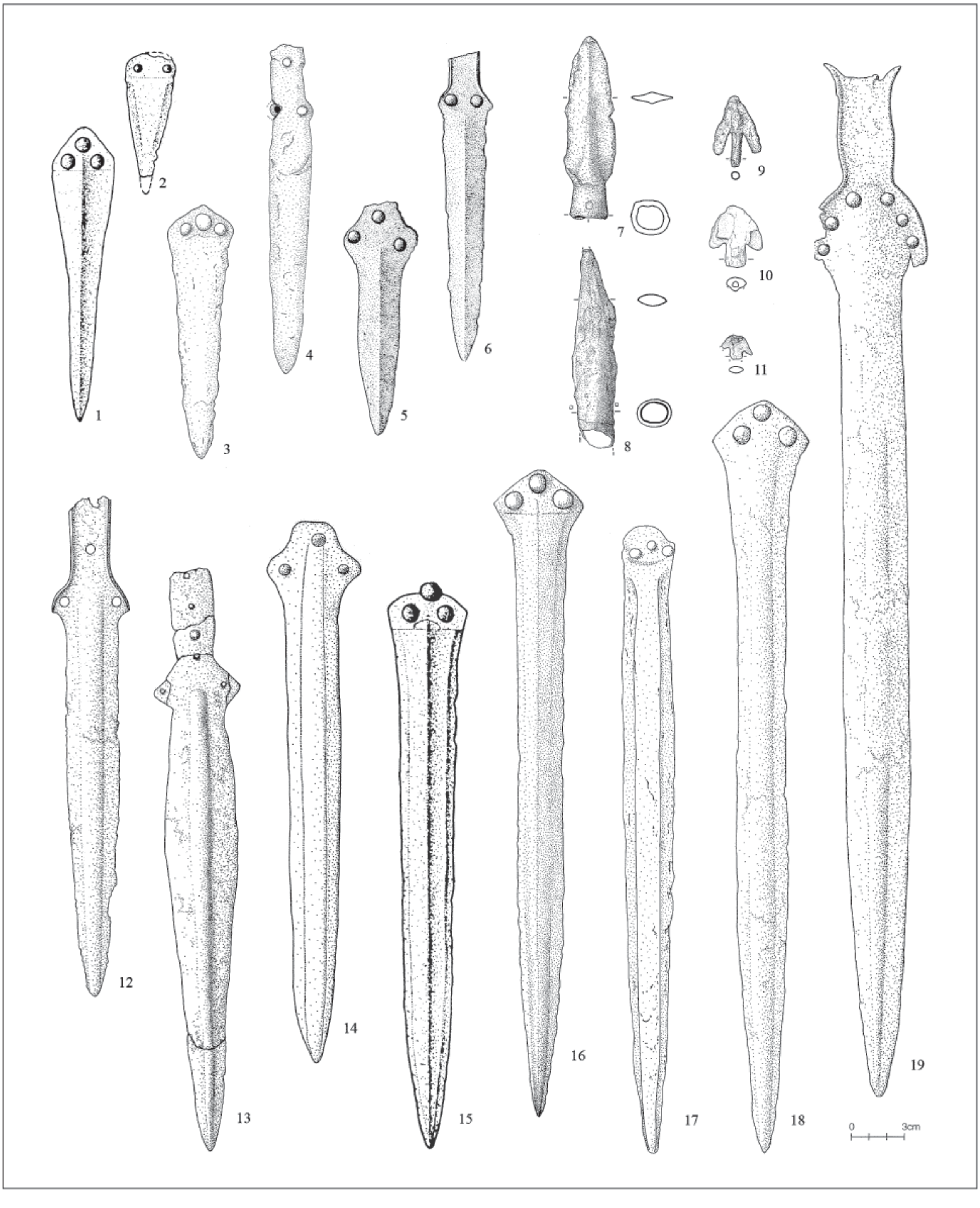


Fig. 8 Bronze weaponry from south-eastern Italy Bronze Age contexts: **1–6** daggers; **7–8** spearheads/javelins; **9–11** arrowheads; **12–19** swords (1–2. 15: from Toppo Daguzzo tomb 3 (Middle Bronze Age); 3–4. 14. 16–17: from funerary hypogea at Trinitapoli (Middle Bronze Age); 5–6. 12–13. 18–19 from Manaccora Cave funerary contexts (Middle Bronze Age); 7–11: from Coppa Nevigata (Late Bronze Age layers) (12–13. 18–19: after Bianco Peroni 1970; 5–6: after Bianco Peroni 1994; 1–2. 15: after Cipolloni Sampò 1986; 14: after Peroni *et al.* 2003; 7–9: after Recchia 2010; 3–4. 16–17: after Tunzi 1999; 10–11: authors' drawing)

New patterns of defence strategy at Coppa Nevigata in the Late Bronze Age – Early Iron Age (c. 1300–800 BC)

In the Late Bronze Age, the defence strategy at Coppa Nevigata appears to have changed once more. From the 13th century BC onwards, the massive defensive dry-stone wall of the previous century seems to have lost most of its functionality, while the large ditch remained in use.[35] The entrance gate (the settlement's only gate that we know of for these periods) was rebuilt just above the preceding one: now it consisted of a narrowing sloping walkway that led to a doorway located on the top of the 14th century BC wall's remains (at about 2 m above the ground surface outside the wall). It is probable that a new type of enclosure was built on the top of the wall's remains, as is also suggested by the pair of stone door sockets discovered at the sides of the doorway, meaning that the gate was inserted in a fence of some sort (either of wood and earth or of dry-stone).

Indeed, Coppa Nevigata in this period was prospering. The organisation of the settlement underwent major changes and specialised craft production increased, now encompassing metallurgy, the manufacture of antler and bone objects (possibly including ivory), the flourishing of a locally-based production of Aegean-Mycenaean type pottery and the differentiated management of primary resources. These pieces of evidence point to the emergence of an elite during this period, which was possibly responsible for the reshaping of the settlement's organisation.[36] Yet, it appears that only a minor amount of work and resources was devoted to the building of defensive lines at the site. May this evidence be related somehow to a transformation of warfare techniques?

Bronze spearheads (or javelins) become widespread in southern Italy, starting from the Late Bronze Age (**Fig. 8,7–8**),[37] possibly meaning that a transformation in the way of waging war was actually on the way and that now open field battles were more common. Besides that, a further complication is that of the rise of different social statuses among the warriors, i.e. a socially recognised difference between swordsmen and spearmen, with the former playing a prominent role. In south-eastern Italy the evidence for long swords – perhaps related to socially differentiated individuals – during the Late Bronze Age is thin. It should be remembered, however, that in this period weapons are only rarely included among the grave goods. It could be that differentiated social roles have been finally established and that there was accordingly no further need to socially negotiate premiership through funerary display.[38] In northern Apulia, a long sword has been found, folded over, at the site of Molinella,[39] but whether it was a funerary gift or a ritual deposition is still unclear. From Coppa Nevigata (excavations of the early 1900s) comes the handle-grip of a probable long sword of Cetona type.[40]

Finally, it is worth mentioning that an innovative type of defensive feature is attested at Coppa Nevigata in the Early Iron Age (8th century BC), the so-called *chevaux de Frise* (or 'dragon's teeth'), a kind of defensive line that was in use in several European settlements at that time.[41] This defensive feature, which comprises a series of closely set, upright stones scattered in a clearing, was intended to hinder the enemy's approach, especially in the situations in which cavalry had become significant. While *chevaux de Frise* remain unrecognised in other south Italian contexts, they have been identified at some Istrian '*castellieri*' (hillforts), such as Monkodonja, Vrčin, Gradac-Turan, Veliki Brijun,[42] and probably date to the Middle/Late Bronze Age. Since there is good evidence that contacts between Coppa Nevigata and Istria continuously occur during the Bronze Age, the hypothesis that Istrian sites provided models of inspiration for Coppa Nevigata is tempting.

Models of inspiration for defensive lines in south-eastern Italy and parallels across the Adriatic

Models of inspiration

The architectural complexity of the earliest wall at Coppa Nevigata as well as of those at other sites, such as Roca,[43] raises the question as to whether

35 Cazzella/Recchia 2012, 293.
36 Cazzella/Recchia 2013b, 203-205; 2017, 470.
37 Recchia 2010; in press.
38 Bietti Sestieri 2010, 56-59.
39 Nava 1981.
40 Belardelli 2004 Fig. 34,9.
41 Cazzella/Recchia 2012, 313.
42 Mihovilić *et al.* 2013; Cupitò *et al.* 2018.
43 Guglielmino/Pagliara 2017.

these defensive walls were inspired by coeval well-established prototypes. At present, the nearest region where complex fortification lines have an established tradition already by the Early Bronze Age is the Aegean. It is highly possible that in some Middle Helladic Aegean settlements, such as Kolonna on the island of Aegina[44] and Ayia Irini on Kea,[45] bulwarks featuring horseshoe-shaped towers of Early Helladic III tradition were in use at least until the end of the Middle Helladic. Did these fortifications represent a reference model for the central Mediterranean communities? On the one hand, no affinities in pottery production or pottery exchanges between the Aegean and south-eastern Italy have been found that might support this hypothesis. But, on the other hand, innovating processes such as the production of purple-dye and that of olive oil, both activities attested at Coppa Nevigata starting from the 18th century BC, may well testify some earlier interactions between Apulia and the Aegean regions before the Mycenaean connection. These early interactions might have conveyed the idea of erecting elaborate dry-stone defensive structures to southern Italy.[46]

Parallels across the Adriatic

The karstic landscape of the western Balkans is strongly characterised by a large number of hillforts that were established in late Prehistory, whose nature and detailed chronology however remains to be understood in the vast majority of the cases. As mentioned above, northern Apulia in particular was closely involved in cultural interactions and exchanges with the opposite eastern Adriatic coast. Moreover, parallels can be drawn, especially between Coppa Nevigata and some hillforts in Istria, for some structural features of the fortification lines, such as the complex architecture of the gates, and peculiar funerary costumes emphasising the symbolic value of the defensive enclosures, such as the interment of distinct individuals in the enclosures.

A settlement pattern characterised by long-lasting hillforts enclosed by dry-stone walls (*castellieri*) appears to have been established in Istria in the Early Bronze Age. Among these hillforts, that of Monkodonja has been widely explored and extensively published.[47] The earliest defensive line at this site, belonging to the 19th–18th centuries BC, appears to be rather ancient, but is quite simple, without towers and architecturally elaborate entrance gates. It was only in phases 3 and 4, around the 16th century BC, that a high degree of complexity was attained,[48] thus after the emergence of complex fortifications in Apulia.

Aside from Istria, hillforts (*gradine*) in the western Balkans have been scarcely explored, and the outline and chronology of the defensive structures at these sites remains barely known. Therefore, it is difficult to recognise specific settlement patterns and to trace similarities and differences throughout time and across the Adriatic. Generally speaking these settlements occupy naturally defended hilltops, from the Croatian islands to the interior of Bosnia and Herzegovina (e.g. the hillforts of Nečajno and Sovići).[49] Hillforts appear to be densely distributed in the territory, as recent surveys and excavations have shown, but the problem remains as to whether these were in use simultaneously and/or may have different functions. In this respect, an interesting case study is that of the Lošinj Island in the Kvarner Gulf.[50]

The notion that most of the Dalmatian hillforts date to the Late Bronze Age–Early Iron Age is likely biased. Early Bronze Age and Middle Bronze Age pottery occur in many of them[51] and recent excavations, such as that at the Vrčevo–Gorica Hillfort near Zadar,[52] are providing 14C dates substantiating the hypothesis that at least some of them were extensively occupied already in the Middle Bronze Age. In all likelihood also the hillforts in the Shkodra region,[53] such as Gajtan, were in fact established well before the Early Iron Age.[54]

44 Walter 2001; see Gauß in this volume.

45 Davis 1986.

46 Cazzella/Recchia 2013a.

47 Hänsel *et al.* 2015; see Hänsel *et al.* in this volume.

48 Hänsel *et al.* 2015, 155 Fig. 102. – Layers related to the earliest phase have provided a C14 date of 1910–1740 cal 94.5% BC (Kia 33502, 3495 +/-30 BP), while deposits related to an advanced building phase have given a C14 date of 1615–1491 cal. 90% BC (Kia 33497, 3265+/-30 BP) (Hänsel *et al.* 2015, 435-436).

49 Čović 1989.

50 Čučković 2017.

51 Mihovilić *et al.* 2013; Čučković 2017.

52 Čelhar 2012/2013.

53 A recent overview in Shpuza 2014, although the author considers these settlements as pertaining to the Early Iron Age, but without offering a critical review of the chronological data.

54 Govedarica 1989, 191; Gjyshia/Mara 2013.

The question remains, however, as to whether artificial defensive lines were built at these sites right from their early phases of occupation. Moreover, dry-stone structures (even in the same regional district) significantly vary in shape, size and possibly in function, ranging from defensive walls (that in many cases protected just the exposed parts of the hill), to cairns and to terraces.[55] It is possible, therefore, that the purpose itself of these sites might vary: the label 'hillfort' may not apply to all of them.

Thus, at present many questions remain open and in need of answers, but the advancement of research might rapidly change this picture. For instance, to what extent were the phenomena of the rise of hillforts/fortified settlements in the two Adriatic coasts linked? Did the western Balkans play a role in the process of cultural transmission westwards of complex defensive systems? Or rather, did southern Italian communities somehow convey elaborate architectural models to their north-eastern Adriatic counterparts?

Although the scarcity of data for the eastern Adriatic regions does not allow for a valid comparison, it would seem that the reasons and historic trajectories underlying the emergence of (naturally and artificially) fortified centres in the two Adriatic coasts differ. The array of hillforts/hilltop settlements located on the islands, sub-coastal and inland ridges of the western Balkans possibly indicates a response to the need for defence, triggered by conflicts between local communities. However, it must be taken into account that, apart from the settlements in the Dalmatian islands, coastal settlements in Dalmatia, Montenegro and northern Albania are virtually unknown, but may well have existed. Likewise in Apulia, Bronze Age coastal centres might lie under historical and modern cities occupying favourable locations. Moreover, marine transgression has probably affected a number of Bronze Age coastal settlements, as recent research in northern Dalmatia has been indicating.[56]

Demography, work force and social organisation behind the building of defensive walls

As mentioned above, obtaining a figure for the demographic size of the communities inhabiting fortified settlements, even if in the nature of rough estimates, is useful to any detailed investigation of socio-political interactions on a regional scale as well as inside a given community. Assuming that the settlement fabric of fortified centres was relatively dense, a demographic index of 125 inhabitants per hectar is reasonable.[57] For instance, Coppa Nevigata was 2.5 ha in size and, therefore, the resulting demographic estimate is some 300 inhabitants, but both smaller (i.e. Scoglio del Tonno, despite is importance as a port of call for the Mycenaeans) and larger fortified centres (i.e. Chiancudda and Roca) did occur. In any case, no settlements would have reached a population of one thousand residents.

As regards the Coppa Nevigata settlement, we have tried to make an estimation of the labour involved in the construction of the 14th century BC defensive wall and the days of work this required (**Fig. 9**).[58] Assuming that most of the building material was previously amassed and ready for use,[59] and given a total of 60–75 adult males for carrying out the job, the building of the wall would have required approximately 100 work-days. Thus, it would have taken a certain effort for the community to build their defensive enclosure in a relatively short span of time (a couple of years?), but they could have done it without appealing to or demanding neighbouring communities for help. The digging of the ditch, undertaken at some time after the wall was built, would have involved a higher amount of work, requiring approximately 150 work-days, but again, it could have been done by the residents themselves in a few years. Thus, in our opinion the building of the defensive lines at Coppa Nevigata, as well as at other fortified settlements, is likely to have been the result of internal cooperation, without imposing the job on adjacent (subordinated) communities.

55 Ocelić *et al.* 2014.

56 Čelhar *et al.* 2017. – For instance, the recently excavated underwater settlement of Ričul, near Zadar, has given three ^{14}C dates that fall between 1500–1300 cal BC (Čelhar *et al.* 2017 Fig. 6).

57 Kramer 1982.

58 The estimation proposed in Cazzella/Recchia 2013a has been updated, see also footn. 2.

59 In any case women and children probably cooperated by carrying soil and small-size rubble-filling.

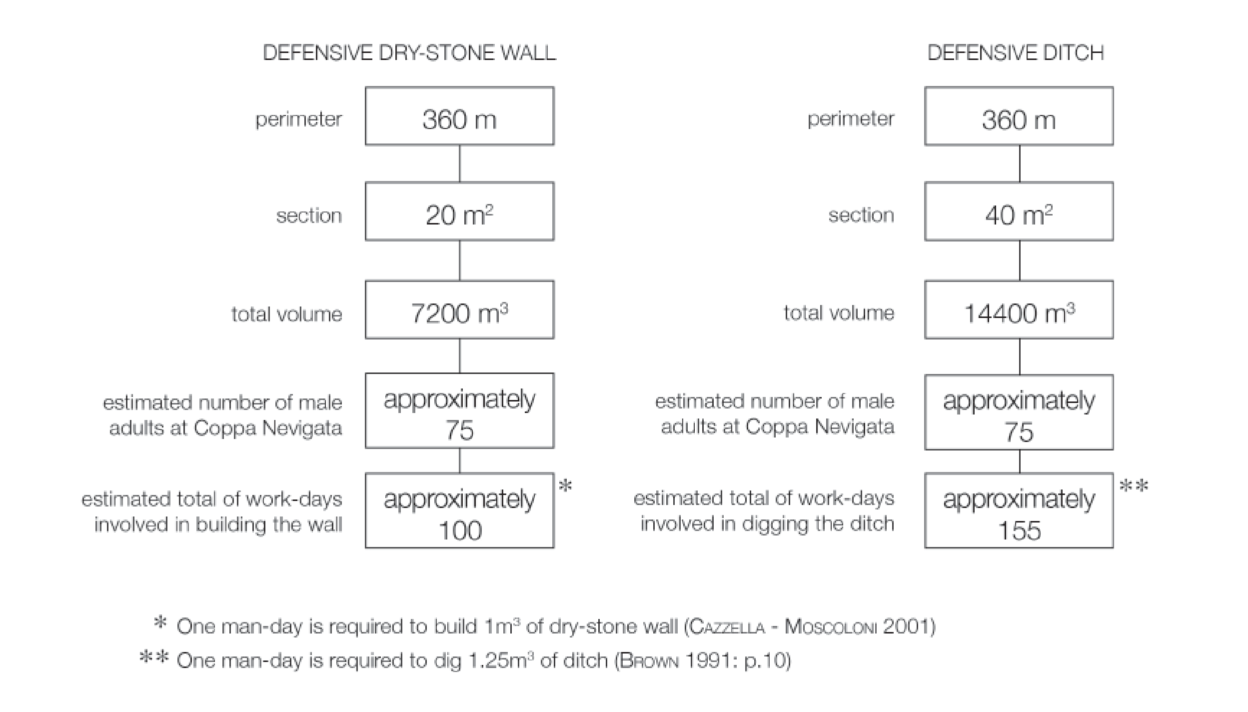


Fig. 9 Estimation of the amount of labour involved in building the defensive dry-stone wall and digging the defensive ditch at Coppa Nevigata (14th century BC) (graphics by G. Recchia).

Moreover, evidence suggests that no fixed elites or political inequality had been established at Coppa Nevigata by the mid-2nd millennium BC. The construction of the defensive lines might have been jointly coordinated by temporary leaders of the kinship groups that formed the Coppa Nevigata community, without a single central management. As regards both the 17th century BC wall and the 14th century BC one, some small structural differences have been noted between the various segments constituting the enclosure, as if these have been built following slightly different architectural approaches. This might well be the result of different teams, based on kinship relationships, working all at once in the building project.

Concluding remarks

The concept and physical archetype for elaborate defensive systems in Bronze Age southern Italy possibly had an external origin, perhaps coming from the Aegean, but it was then locally developed and adapted to specific warfare strategies and defence needs. At present data is lacking to compare settlement patterns across the Adriatic, but it would seem that the various regions, although involved in cross-cultural interrelations and exchange networks, were characterised by different settlement patterns, possibly stemming from local phenomena of socio-economic interactions.

Aside from their possible symbolic/ideological meaning, the practical defensive function of Bronze Age fortifications in southern Italy is undeniable. Competition and organised violence among local communities increased from the early 2nd millennium BC onwards, possibly owing to the functional divide between centres that specialised in exchange activities and those whose economy was hinged on traditional subsistence activities, which brought about a growing imbalance in the system of circulating goods. Long-lasting fortified centres emerged especially along the coasts and in key-spots controlling exchange routes, while a more mobile settlement pattern, in some cases consisting in small clusters of hamlets, characterised inland areas.

In southern Italy, organised combats and assaults against fortified centres were possibly conducted on the basis of temporary alliances among small hamlets, but it is highly unlikely that these communities, even the larger ones, had the political strength (or even the willingness) to both conduct long-lasting sieges and exercise political control over other communities or large territories. The same applies to the communities settling in the fortified centres, which are likely to have numbered but a few hundred individuals at most, about a quarter being males able to engage in martial activities.

Although warfare patterns changed during the 2nd millennium BC, the scenario of competition among the fortified centres and between these and the (coalition of) small hamlets probably did not vary too much over the Bronze Age. It is possible that in time assaults coming from external 'enemies' added to this endemic belligerency, such as from eastern Mediterranean sailors[60] and perhaps even trans-Adriatic communities, with whom exchange might have sometimes given way to sporadic conflict. Not until the beginning of the Early Iron Age did communities of a larger demographic size and so larger military capability arise in southern Italy. At that point long-lasting but small settlements such as Coppa Nevigata are likely to have either become satellites of larger centres or simply to have disappeared.

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Fortification Concepts of the Bronze Age Hillforts in Istria

The hillfort settlement of Monkodonja, located in the vicinity of the town Rovinj, is representative of the Bronze Age Castellieri culture in Istria. Twelve years of excavations that lasted one month each year revealed a proto-urban settlement with extensive fortification system, and a tripartite division of its interior that could well reflect the hierarchical social structure of its inhabitants. Remarkably, a change in the fortification concept during the time of the settlement's existence could also be observed. With regard to bronze objects and ceramic finds the settlement is dated generally between the developed Early Bronze Age and the beginning of the Middle Bronze Age, or in Br A2 and Br B1 periods according to the chronology of Paul Reinecke. Moreover, about 40 radiocarbon dates from the Monkodonja settlement have also been analysed. The foundation of the settlement is dated to around 1800 cal BC. The second extensive building phase, including the rebuilding of the fortification system according to new defensive concepts, is dated approximately to 1600 cal BC, while the destruction of the settlement occurred around 1500 cal BC or in the middle of the 15th century BC at the latest.

Introduction

The hillfort of Monkodonja,[1] located in the vicinity of Rovinj, represents one of the best preserved and most important settlements of the Bronze Age Castellieri culture in Istria.[2] As such it has been the subject of systematic archaeological excavations, which continued for twelve years from 1997 to 2008, although each excavation season lasted only four weeks. It should be mentioned that the research was conducted as an international project, based on the collaboration between the Free University of Berlin (Freie Universität Berlin) and the Archaeological Museum of Istria in Pula (Arheološki muzej Istre) together with associated institutions of the Heritage Museum of Rovinj (Zavičajni muzej Grada Rovinja) and the Department of Archaeology at the Faculty of Arts, University of Ljubljana (Arheološki oddelek Filozofske fakultete Univerze v Ljubljani). So far, the results are presented in the volume discussing architectural remains of the Monkodonja settlement,[3] whereas the second volume presents the ceramic finds.[4] The last volume, discussing metal, bone and stone finds is to be published in 2019.[5]

The principal aim of this paper is to present the fortification system of the Monkodonja settlement and to point out the changes in its concept, which occurred in the period of transition from the Early to the Middle Bronze Age. Remarkably, such changes in the construction of fortifications can be observed not only at Monkodonja, but also at several other Bronze Age hillforts as well and also known by the name of *castellieri* or *gradine* in the territory of Istria. This means that the change in the fortification concept should be understood as the result of a historical process, most probably as a consequence of perpetual armed conflict and introduction of new methods in conducting battle.

The hillfort of Monkodonja can best be described as a central settlement in the region to the

1 The article was translated into English by Miha Kunstelj (Vrhnika). Figs.1-5a. 6-7. 11a were taken from the publication Monkodonja I, 2015; therefore, for their authors see that publication, p. 588. To them and to Ida Murgelj (Ljubljana), Vesna Svetličič (Ljubljana) and Damir Matošević (Rovinj) we would like to express our sincere thanks for drawings and photographs.

2 Mihovilić 2013.

3 As in the present article we mostly refer to this publication, it will be further cited in the abridged form as Monkodonja I.

4 Monkodonja II.

5 Monkodonja III in press.

Fig. 1 Monkodonja hillfort with surroundings and coastline in the background (after Monkodonja I)

south of the Lim Channel/Limski Kanal.[6] It was surrounded by several smaller settlements, which were situated on dominant hilltops and likewise frequently fortified.[7] Due to their elevated position, some of the settlements also had good visibility, allowing a kind of visual communication between each other, as for example with smoke signals or the like. The location of the Monkodonja settlement enabled, in addition, control over the important Adriatic maritime route along the Istrian coast (**Fig. 1**).[8]

General Layout and Building Technique

The founding of the settlement was clearly an act of colonization. The area of the settlement was well planned in advance, as is evidenced by its oval outline, consisting of several clearly distinct and enclosed areas that are separated by broad stone walls, which thus form a complex defensive system (**Fig. 2b**). The construction of fortifications as well as buildings required extensive stonemasonry work, which was obviously conducted on the site and also included the targeted hewing of stone blocks (**Fig. 2a**). In this respect, the first settlers reshaped the stony ground of the future settlement according to their needs and wishes.[9]

The entire settlement was enclosed with defensive walls, representing the main fortification, which stretched around the oval-shaped plateau for more than 800 m (**Figs. 2b. 3**). The dry-stone walls were erected in the so-called *emplekton* technique, with two parallel walls and a filled core between them. The settlement had at least two, but most probably as many as three entrance gates. The northern entrance features a zigzag-shaped

6 Hänsel *et al.* 2007-2008, 87-91 Fig. 5; 2009, 154-158 Fig. 5; Monkodonja I, 52-59. 496-500 Figs. 15. 17. 20. 331.

7 Here we should mention the recent archaeological excavations at the nearby hilltop-settlement of Monbrodo, located directly on the coastline, where besides the fortification from the Late Iron Age period, also walls of the Bronze Age fortification have been discovered, which can be assigned to the same period as the fortifications in Monkodonja basing on associated ceramic finds (see Müller *et al.* 2016).

8 Monkodonja I, 49-50 Figs. 14. 22.

9 Monkodonja I, 61-67 Figs. 24. 29.

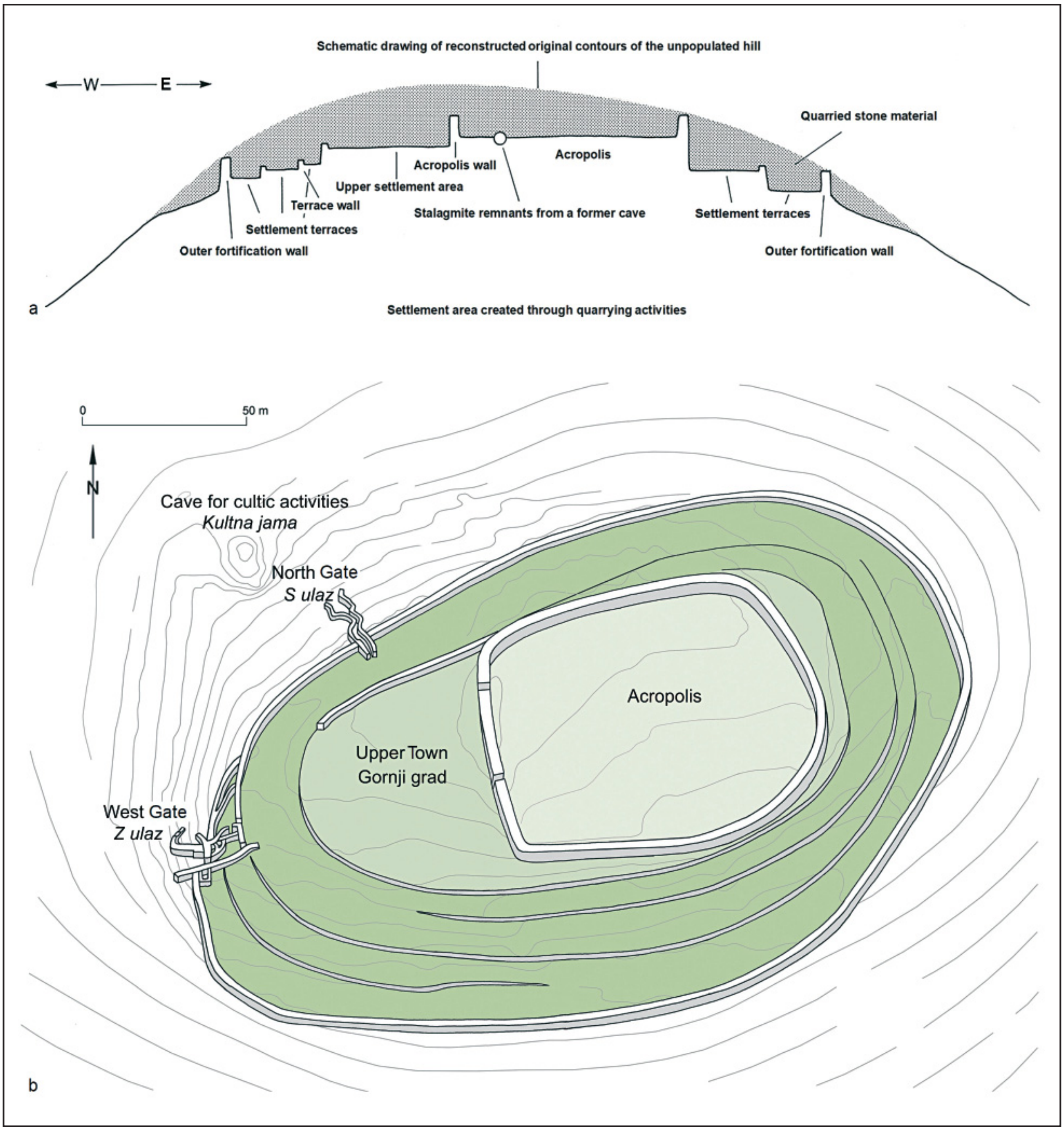

Fig. 2 Monkodonja. **a** Schematic drawing of reconstructed original contours of the hill in cross-section, which was changed with stonecutting during the settlement's construction; **b** Schematic drawing of the settlement ground plan with tripartite division, consisting of the acropolis area, the Upper and the Lower Town (a-b: after Monkodonja I, altered)

gateway, leading out to a large cave, possibly connected with cult activities, and farther towards the hinterland. The most important entrance was located to the west, facing the seashore side and can be considered as the main gate. Throughout time the gates underwent repeated improvement work, which consequently resulted in a kind of a labyrinth-like entrance structure.[10]

The central part of the settlement was additionally fortified with massive walls delimiting the so-called acropolis area.[11] This central section is surrounded by more or less concentric terraces, forming the areas of the Upper and the Lower Town, which were further separated by a somewhat less monumental wall (**Figs. 2b. 3**).[12]

[10] Monkodonja I, 111-193. 462-469 Appendix 2.

[11] Monkodonja I, 273-307. 469-472 Appendix 4.

[12] Monkodonja I, 342-372.

Fig. 3 Monkodonja. Aerial view of the excavated and restored areas of the settlement in 2007 (after Monkodonja I)

It is obvious that a building concept with a tripartite division had been used for the settlement construction from its very beginning. As a result, the settlement was erected on three different levels that were separated from one another by an enclosing wall. Such a tripartite division of the settlement represents a complex defensive system and most probably also reflects the social structure of its inhabitants, which was hierarchical in nature.

The long-term excavations enabled systematic exploration of the fortifications as well as of larger areas within the settlement, such as the western and northern gates together with the inner settlement area along the fortification wall located between them, the north-western part of the acropolis area as well as two considerably large trenches on the western and three on the southern terraces of the Lower Town (**Fig. 3**). During the course of this research, remains of a large number of various structures were unearthed together with enormous amounts of pottery[13] and bone finds. The bronze and stone finds were not as numerous, but are nonetheless very interesting, as they point to

13 Cf. Monkodonja II.

the various activities conducted there or even indicate specific events occurring in the settlement.[14]

Several building phases of the settlement could be established, yet two of them are particularly important for the understanding of the period in which the hillfort was occupied. The first building phase represents the founding of the settlement and the construction of the entire fortification system. The second major phase, which is also the last, encompasses the large-scale renovations both on the main fortification structures as well as in the acropolis area.

West Gate Area

The best insights into the various building activities can be gained at the main gate to the settlement, which was positioned on the west side of the main fortification. Its complex structure revealed several construction phases, which are the result of successive building stages that can partly be discerned also in a chronological sense and which resulted in a labyrinth-like entrance structure by the latest phase of the gate construction (**Fig. 4a-b**).[15]

In the first fortification phase the gate had a rather simple design without any special structures and with a width of not more than one meter. The entrance was placed exactly at the point at which the fortification wall changed its course in a right angle and continued some ten meters farther towards the west only to make another right angle turn and delineate the corner in which a tower was constructed (**Fig. 4a,** stage 1). Special attention should be drawn also to the fact that two graves had been located in the vicinity of the gate, which were subsequently integrated in the fortification system.

We discovered namely two meticulously constructed stone cists – the so-called graves A and B – which represent a prominent burial place, not least because of their relation to the main gate structures of Monkodonja.[16] The small mound above the grave B presumably preceded the construction of the main defensive walls within the West Gate area, although most probably it cannot be much earlier. It seems that the position of the grave B functioned as a kind of marker in the landscape for the location of the entrance area and conditioned the orientation of the fortification wall in its southern section, forming a corner directly around the grave cist, above which a bastion was built. On the other hand, the position of the grave also determined the location of the main gateway in the right angle of the fortification wall (**Fig. 4a-b,** in the right corner of the figures). Thus, it can be stated that the erection of the grave-cist B together with its first interment had obviously been connected with the founding of the settlement and the initial construction of the hillfort.

In a similar manner, the stone grave-cist A, placed in a rectangular, stone-built structure, also seems to be conceptually integrated into the gate architecture, rather than being erected in an already finished gateway. In the first construction phase the grave monument A had been a free-standing structure (**Fig. 4a**, stage 1), placed in front of the gate, whereas later it was covered and obscured by the fortification wall, which can be ascribed to the second construction phase of the main walls (**Fig. 4a**, stages 2–4). Actually, the grave-cist A provides the best *terminus post quem* for the large-scale renovations of the entire fortification system of the Monkodonja settlement.

The schematic drawing of different construction phases in the area of the main gate (**Fig. 4a**) clearly demonstrates how dramatically the fortification concept changed throughout time. The right-angle corners, characteristic of the initial construction phase (stage 1), were subsequently omitted and a slightly curved wall was built instead, connecting the former corner of the tower and the main fortification wall placed more to the back (stage 2). Such modifications resulted in an entrance with no obvious corners, which, as it seems, was easier to defend. Moreover, the same rebuilding also included the construction of additional gates in front of the already existing one and the construction of further walls delineating spaces or rooms between the former and newly erected fortification wall (stages 3–4). Outside of the newly-built curved wall two tower-like constructions were erected on both sides of the entrance (stages 3–4). The entire structure of the main gate gained the impression of a labyrinth-like entrance, which could ensure better protection and defence against potential attackers.

[14] Monkodonja III in press.

[15] Monkodonja I, 148-177. 464-469.

[16] Hänsel *et al.* 2007-2008, 95-117 Figs. 9-23; 2009, 161-175 Figs. 9-23; Monkodonja I, 194-224 Appendix 2.

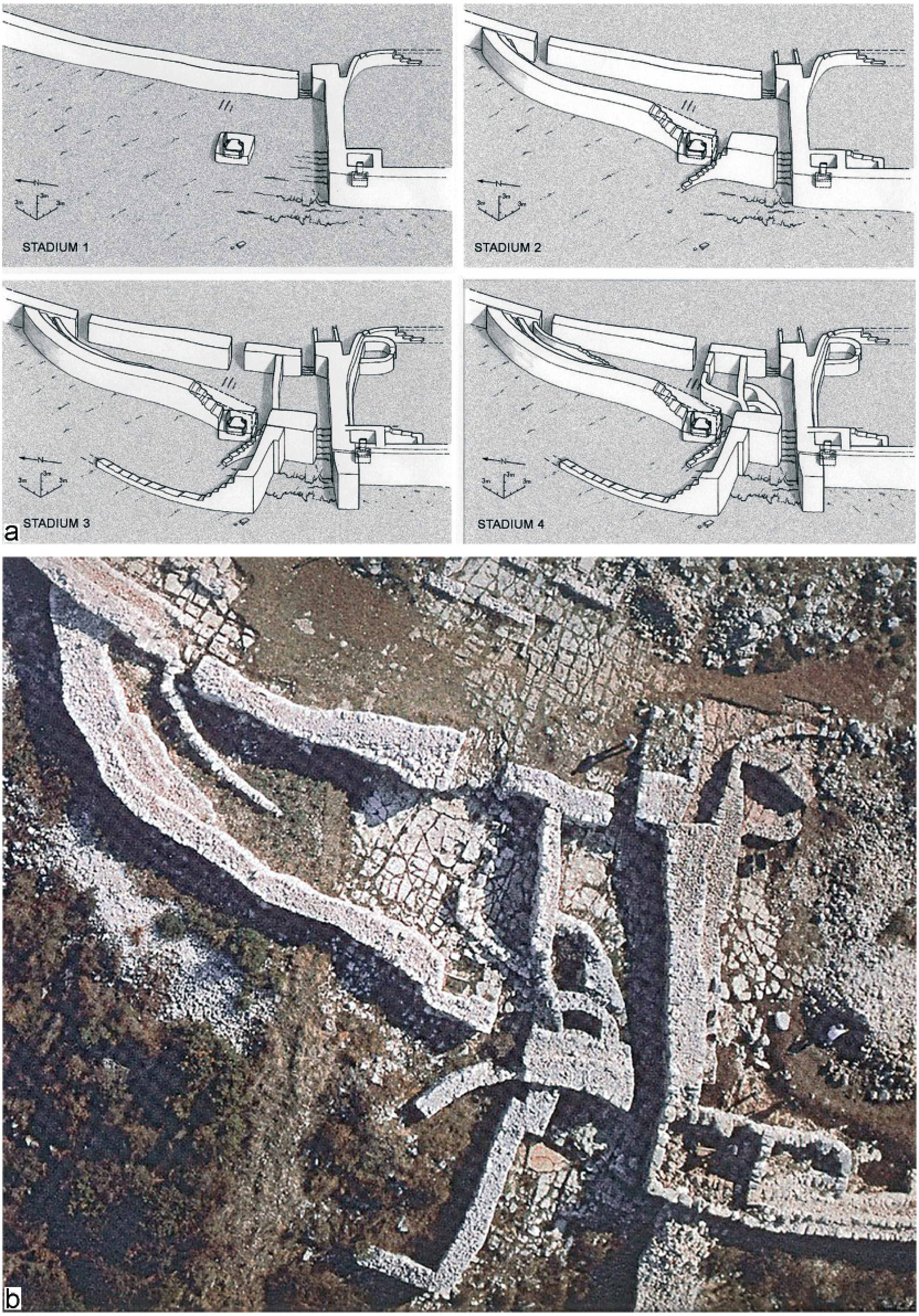

Fig. 4 Monkodonja. The West Gate in the main fortification wall: **a** Schematic drawing of the four main building phases of the principal gateway to the settlement; **b** Aerial photograph of the West Gate after the conclusion of archaeological excavations and restoration work on the walls (a-b: after Monkodonja I)

Acropolis fortification

Comparable constructions and rebuilding of the walls with right-angle corners into the curved walls without angles have been ascertained also at the western side of the acropolis fortification of Monkodonja, which was the main and the most representative front of the acropolis fortification wall (**Fig. 5a-b**). Through constant constructional additions, the initial, relatively narrow fortification wall was considerably reinforced and widened during several building phases, of which particularly the first and the last one should be pointed out.[17]

In the first building phase the western wall was divided into three sections, what gave the front a symmetrical outline. The middle section of the wall, about 30 m long, protruded for a few meters towards the west and was flanked on both sides by a recessed entrance. These two gates were positioned in the right-angle of the wall exactly in the same manner as the western gateway in the main fortification and were also equally narrow, their width amounting to just about one meter. To the side of both entrances the wall continued for about 15 m or more to form corners both with the northern and southern section of the fortification wall (**Fig. 5b. 6a**, red phase). Both gates thus formed the right-angle corners in the acropolis west fortification wall, identically as in the case of the West Gate in the main fortification. This enabled us to propose that such constructional elements were typical for the building concept in the foundation phase of the settlement.

The last rebuilding thoroughly changed the character of the acropolis fortification. All of the corners and angles of the western wall were omitted and the front of the wall now had a continuous, slightly curved line, stretching from the northern corner of the fortification towards the southern one (**Fig. 5b. 6b**, blue phase). In this construction phase, only the gate in the southern section of the acropolis western front wall were preserved, thus staying in function throughout the entire period of the settlement occupation. In contrast, the gate in the northern section of the west front wall were completely eliminated. The entrance was walled up and in its place a newly constructed, solid fortification wall was built, which featured exactly in this area additional reinforcements with perpendicular walls forming cassette- or box-like structures between the outer and the inner front of the wall, filled with stones (**Fig. 5b**, blue phase). Similar reinforcements and remodelling of the front could be observed also south from the entrance gates in the southern section, while in the middle section of the west front wall the renewal was conducted on the inner side of the existing wall. This manner of construction made fortification structures solid and stable, while the imposing wall-width of up to 5 m also indicates their enviable height, which in our estimation could have reached up to 4–5 m. From the top of the defensive wall there was now an unhindered view of the entire western side of the acropolis fortification and consequently its defence was much easier.

After the renovation of the western acropolis wall and the remodelling of its front, the position of the only remaining gate in the southern section became much more obscured from the view than before. As a whole, the acropolis fortification now emerged as an insurmountable obstacle and practically unconquerable. As such, it must have offered greater safety to its inhabitants, even though it did not prevent its final violent destruction.

The constructional similarities observed in the continuous line of the wall fronts, both at the main fortification and at the fortification of the acropolis area, as well as the improved protection of the gateways provide clear evidence for a new conceptual undertaking, which was carefully planned and obviously also urgently needed in order to guarantee greater security and better defence to the inhabitants.

North Gate Area

On the northern side of the main fortification there was yet another gate,[18] which displays a somewhat different entrance passage in comparison with the West Gate of the main fortification or the gates of the acropolis area (**Fig. 7a-b**). On their inner side it was flanked with rectangular structures, forming bastion-like or so-called pincer gate *(Zangentor)*, which narrowed the passage to the settlement. The approach to the gate from outside was channelled through a zigzag corridor, built of huge stone blocks. The corridor passed the area with artificially hewn stone terraces and led

[17] Monkodonja I, 273-307 Appendix 4.

[18] Monkodonja I, 178-193.

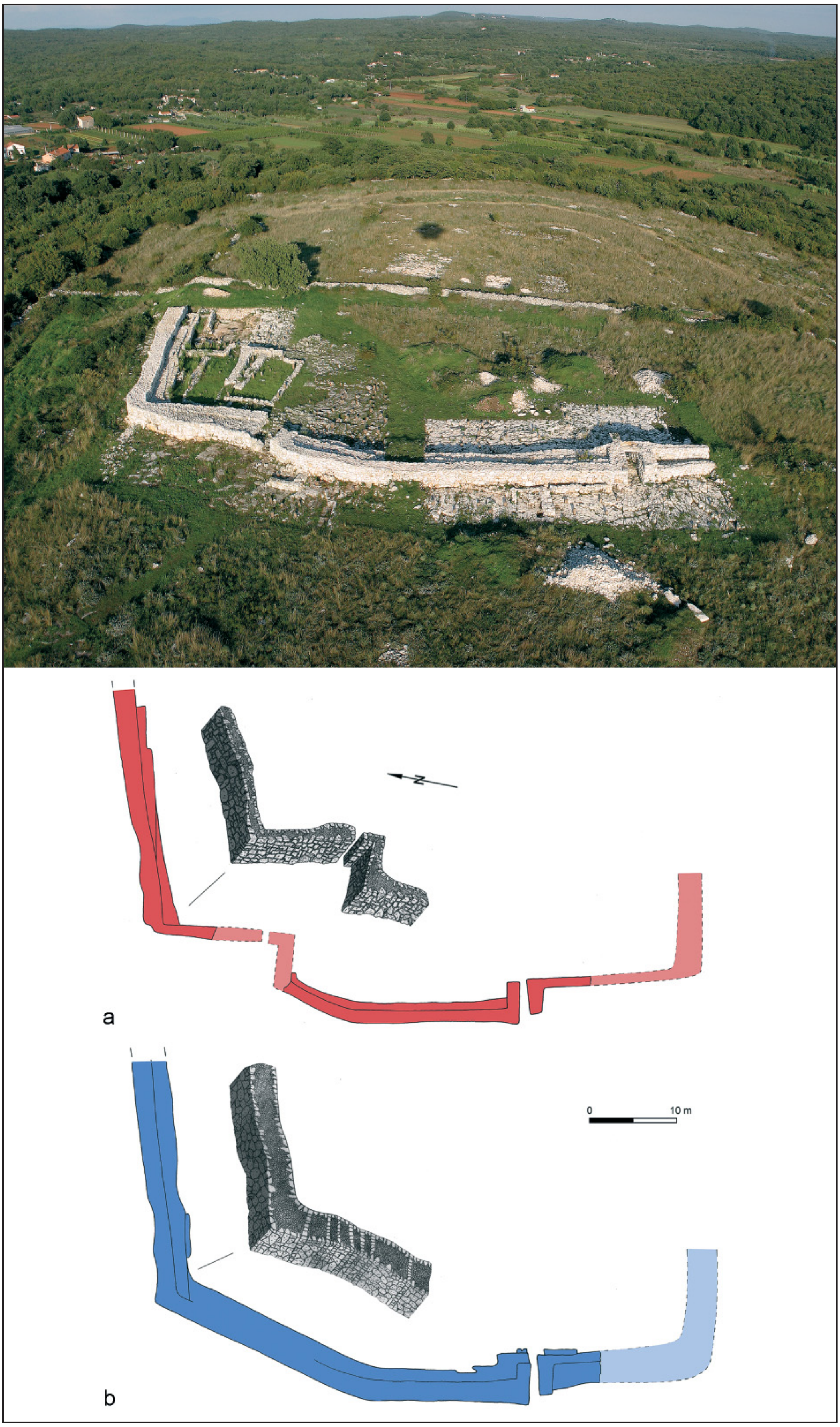

Fig. 5 Monkodonja. **a** Aerial view of the acropolis area after the conclusion of archaeological excavations and restoration work on the fortification; **b** Schematic drawing with the fortification line on the western side of the acropolis area (red colour - first stage; blue colour - second stage) with drawings of its reconstruction (a: after Monkodonja I; b: drawing by I. Murgelj and M. Schnelle)

Fig. 6 Monkodonja. **a** Ground plan of the excavated northwest area of the acropolis with the first building phases of the fortification (red colour); **b** Ground plan of the younger building phase with the last rebuilding of fortification (blue colour) (a-b: after Monkodonja I, altered)

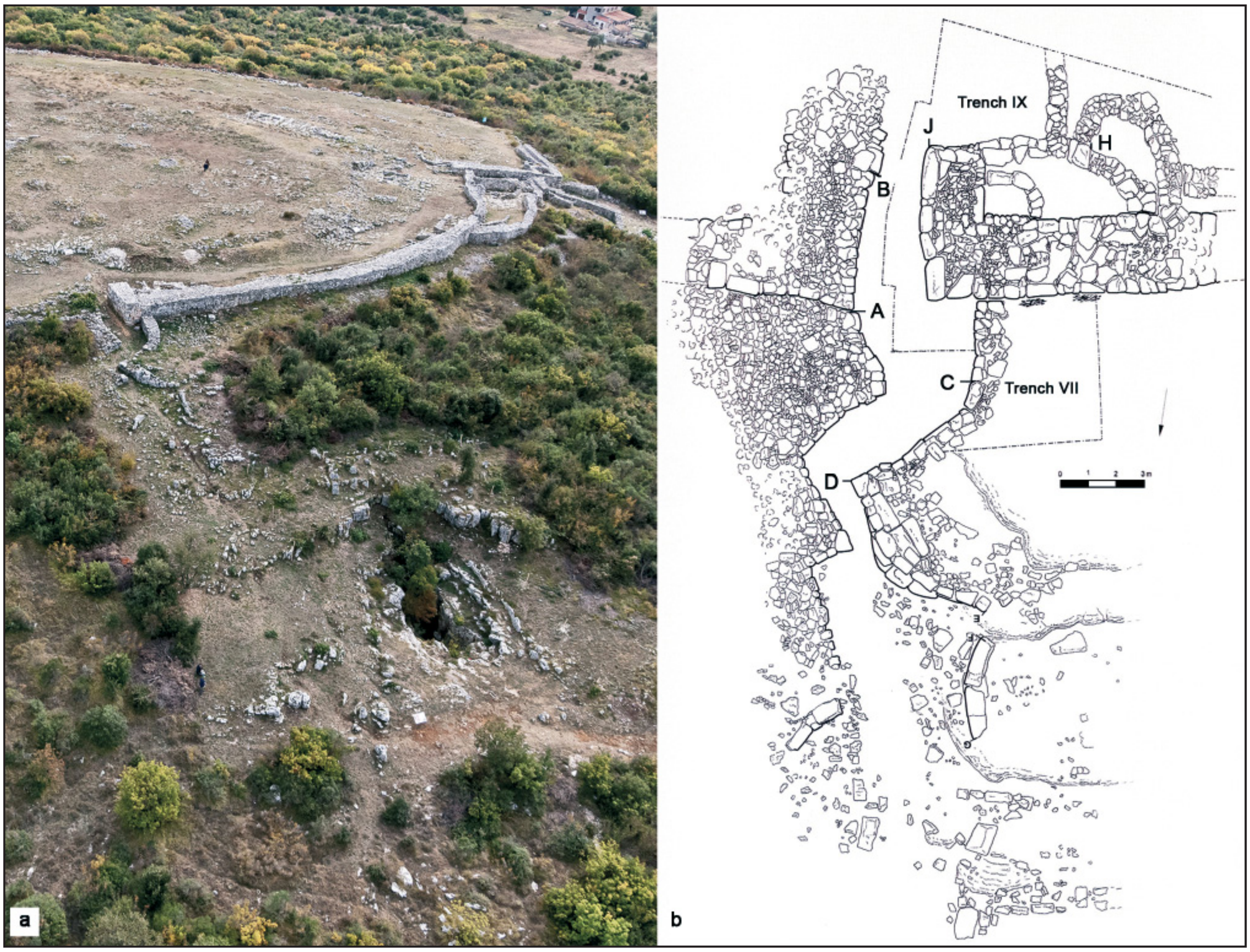

Fig. 7 Monkodonja. North Gate of the main fortification wall: **a** Aerial view; **b** Drawing (a-b: after Monkodonja I)

to the precipitous hole of a vertical cave – an area, which in all probability functioned as a specific cult place. A rather particular construction of this northern entrance, the position of which was obviously dependent upon the location of the cave in the slope of Monkodonja hill, could possibly be interpreted as a hidden and fairly safe pathway, used for particular ritual practices.

Additional defensive features for the protection of the Monkodonja settlement have been discovered on the slopes of the hill, especially between the northern and western gates of the main fortification and to the south of the latter. Here we documented several groupings of stone obstacles in pillar-like shapes, which were up to one meter high.[19] Such obstacles are typical of a specific type of defensive structures, which can be paralleled with the so-called “*chevaux de frise*” or “Spanish rider” of the early modern period. Such defensive structures are known also from other hillfort settlements in Istria such as at Vrčin and Gradac-Turan near Koromačno, and also elsewhere, such as in Apulia at Coppa Nevigata[20] and some sites in Greece. Their function is generally associated with protection against mounted attackers.

Change of the Defensive Concept: Monkodonja in Context of the Castellieri Culture

Due to our extensive research at the settlement of Monkodonja it is now possible to discern nearly the same kind of defensive constructions as well as conceptual changes and renewals of fortification systems, especially of gates, in several other Castellieri settlements in Istria and in the Karst Region.[21] Here we wish to present only some of the fortification examples that have been either discovered in the past or can still be seen, and

[19] Mihovilić *et al.* 2013, 69-71 Figs. 12-14; Monkodonja I, 238-243 Figs. 181-188.

[20] See Recchia/Cazzella in this volume.

[21] Monkodonja I, 168-174. 464-466 Figs. 117-121. 323.

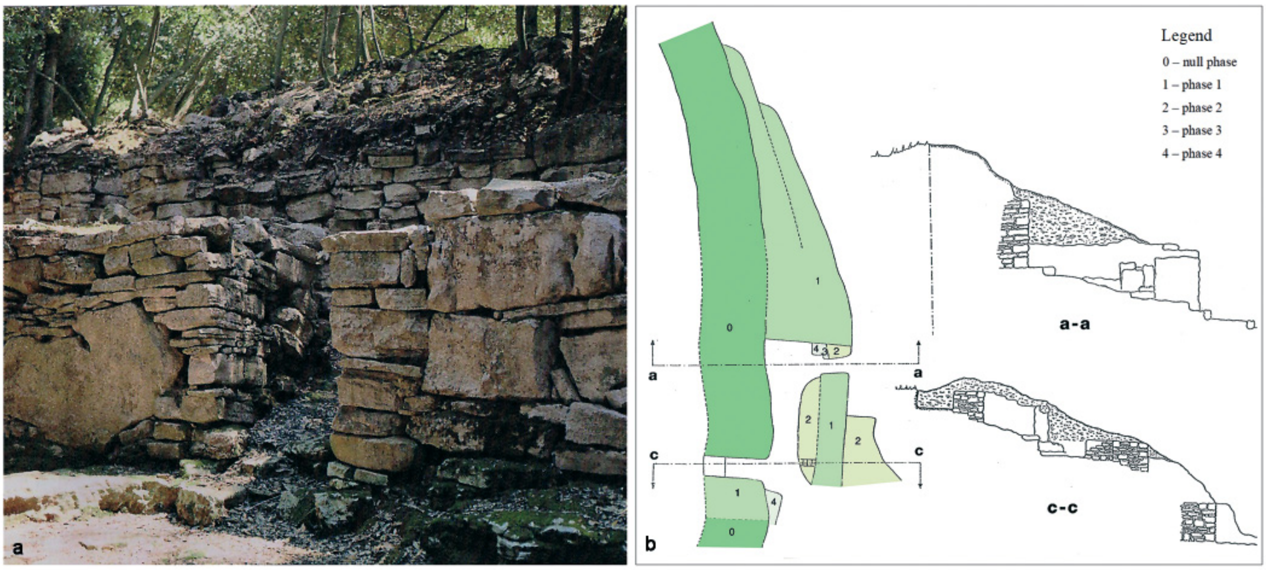

Fig. 8 Gradina on the Veliki Brijun/Brioni Island. **a** View of the gate from outside of the settlement; **b** Ground plan and cross-sections of the excavated area of the gate, leading to the settlement (the numbers indicate various building phases; according to Vitasović 2000) (a: photo by K. Mihovilić; b: drawing by I. Murgelj)

which offer further considerations or support for our observations and research at Monkodonja.

The relatively comprehensible case of the gates at the settlement of Gradina on the Veliki Brijun/Brioni Island[22] demonstrates features, built throughout several construction or rebuilding phases, which are almost identical to the examples discovered at the West Gate of the main fortification at Monkodonja (**Fig. 8a-b**). Overall, the first building phase of the gateway at Gradina still shows rather simple gates, which by the last construction phase were doubled and integrated within a curved course of the fortification wall. Likewise, the settlement of Karaštak,[23] located to the east of Rovinj and characterised by its fortification walls made of large stone blocks and slabs or orthostats, also features gates with several construction phases (**Fig. 9a-c**), comparable to the examples at Monkodonja and on the Veliki Brijun/Brioni Island. Further fortified settlements with similar complete examples of gateway structures, which had been rebuilt several times and display identical fortification concepts as in the case of Monkodonja, are known from the hillfort of Vrčin,[24] where archaeological excavations took place already in the early 20th century, and from Monvi near Rovinj,[25] where the first excavations were conducted only in the last year.[26]

In general, it can be stated that the four examples of excavated gates at the settlements of Monkodonja, Veliki Brijun/Brioni Island, Karaštak and Vrčin differ in details, but nevertheless demonstrate clear similarities in their constructional concepts. In the first building phase, during the settlement foundation, the fortification walls had been still relatively narrow (about 1.5 to 2 m), while the gateways were rather simple constructions, obscured by the angles or corners of the projecting fortification walls in order to safeguard the settlement entrances. Throughout the period of the settlement occupation the fortification walls and the gates were repaired and renewed several times, so that in the last phase the width of the fortification walls in the case of the Monkodonja settlement reached about 5 m and more, whereas its height is estimated to have been 5 m or possibly even more. In the final rebuilding of the fortifications the defensive concept was changed, the walls now had a continuous line without angles and corners, and the gates were much better forti-

22 Vitasović 2000; Monkodonja I, 169-170. 464-466 Figs. 118. 323,9-10.

23 Baćić 1970; Mihovilić *et al.* 2001, 58-59; Monkodonja I, 169-170 Fig. 117.

24 Monkodonja I, 170-172. 464-466 Figs. 119-120. 323,7-8; Mihovilić 2015, 14-31 Figs. 1-2. 4. 8.

25 Kaspar/Kaspar 2014, 147-149.

26 For the information about the excavations, led by S. Müller and M. Čuka, we wish to thank our colleague A. Hellmuth Kramberger, who also informed us that the ceramic discovered during the excavations contains the same types that can be found at Monkodonja as well; cf. Monkodonja II.

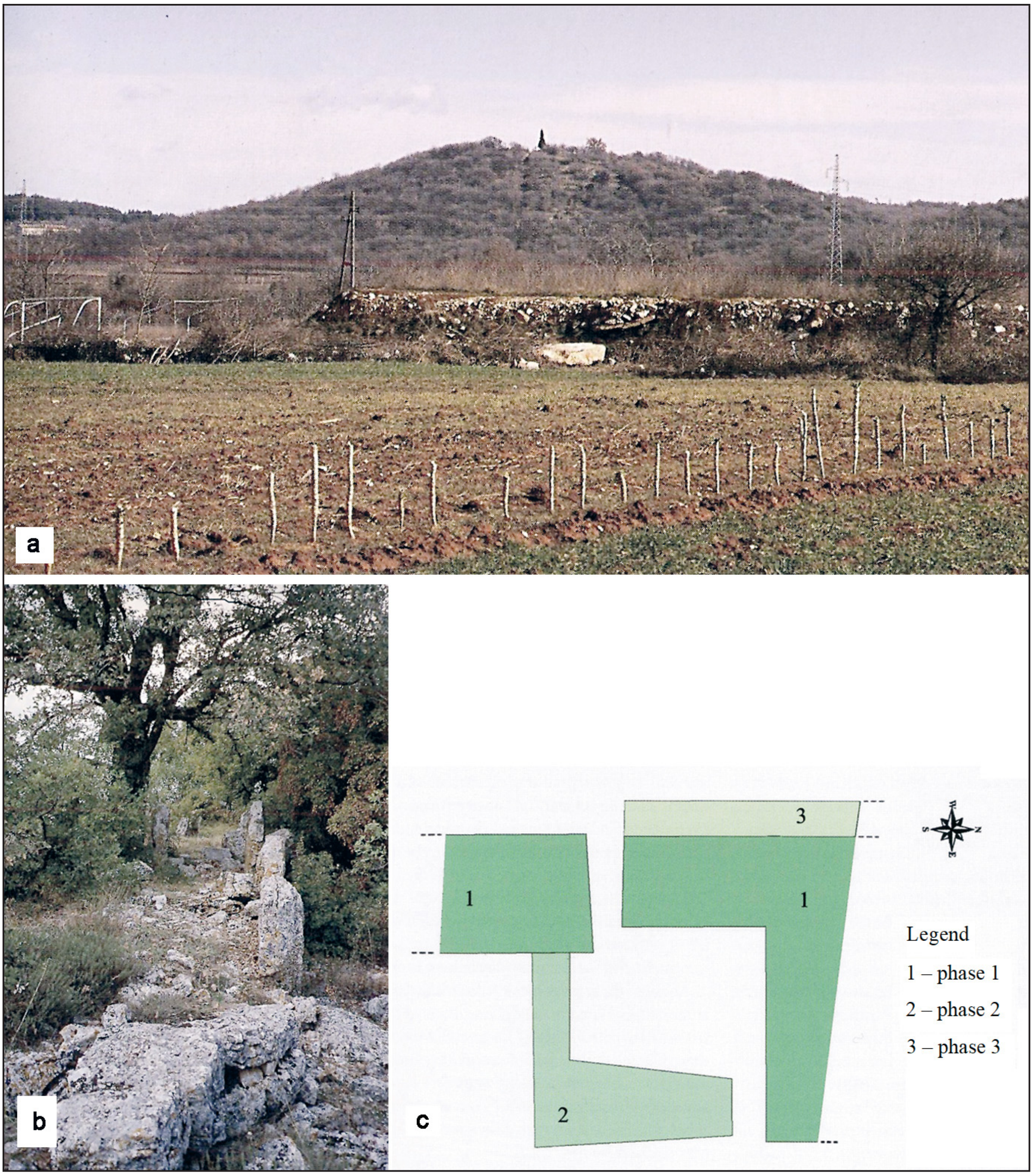

Fig. 9 Karaštak hillfort near Rovinj, eastern gate in the main fortification wall. **a** View of the hill Karaštak with the hillfort; **b** View of the fortification wall remains, built with orthostats; **c** Ground plan of the gateway to the settlement (the numbers indicate different construction stages) (a-b: photographs by D. Matošević; c: drawing by I. Murgelj)

fied. Such a defensive strategy thus became a new feature of the entire Castellieri culture. Unfortunately, we still lack reliable information regarding the construction of the so-called "*chevaux de frise*" or "Spanish rider", that is, whether we could connect them with the first or the second building phase of the fortification at Monkodonja.

The question arises as to when the discussed concept of defence strategy had been changed? The chronological framework of the fortification re-buildings at Monkodonja could be established on the basis of approx. 40 radiocarbon dates, which were analysed in the Kiel laboratory and wiggle-matched by Bernhard Weninger in Cologne.[27] At present we have rather reliable data regarding the foundation and first fortification constructions at the Monkodonja hillfort. The building works started around 1800 cal BC or even a bit earlier, the settlement underwent large-scale renovations

[27] Hänsel *et al.* 2005; 2007; Monkodonja I, 424-425. 504-509 Figs. 318-320.

about 1600 cal BC or during the 16th century BC at the very latest and was destroyed around 1500 cal BC or no later than in the middle of the 15th century BC. In the relative chronological sense this lifespan of the Monkodonja settlement corresponds to the Early Bronze Age A2 period and to the Middle Bronze Age B–C1 period (according to the chronological scheme of Paul Reinecke).

It is reasonable to suppose that the validity of the results from our research go beyond the example of the Monkodonja hillfort, as they also affect the entire chronology of the Early and the beginning of the Middle Bronze Age in the Istrian Peninsula and beyond, that is, in the region along the Adriatic coast and its hinterland. This means that the conceptual changes in the construction of fortifications and in defensive strategy occurred both at the Monkodonja settlement as well as at several other hillforts in Istria around 1600 BC or during the transition period between Early Bronze Age A2 and Middle Bronze Age B1.

Causes for the Change in the Fortification Concept and Defensive Strategy

On the whole, it seems that the new fortification concept was introduced, because the defensive measures were not efficient enough anymore and the inhabitants felt their security was in danger. What was the cause for such conceptual changes? It is difficult to offer a proper answer to this question only on the basis of our excavations and subsequent research, but we nevertheless assume that the reasons were not simple, but instead manifold.

Possibly, we could see in these changes the introduction of new defensive concepts following the fortification systems in the Aegean or the Eastern Mediterranean area, which are known for example at Kolonna on the island of Aegina or in Troy. At the multiphase settlement on Aegina, the origins of which can be placed as early as the beginning of the third millennium BC, additional constructions of a mighty fortification wall had been erected in the phase VII–VIII (around 2000 BC). In this phase they completed the outer perimeter fortification wall together with complicatedly structured gateways, which were protected with curvilinear walls and towers or bastions.[28]

Although the comparison with Troy might seem at first as too distant and daring, the conceptual similarities in the fortification system between the latter and the Monkodonja hillfort are striking. At the settlement of Troy fundamental changes can be observed in the construction of the fortification walls between the phases of Troy II and Troy VI (**Fig. 10**). The course of the fortification walls in the time of Troy II changed in orientation through a series of corners with either right or obtuse angles in a manner similar to that established for the defensive wall in the Monkodonja settlement in its first building phase. A completely different principle is offered by the fortification of phase Troy VI, with which the area of the protected city was enlarged. The fortification walls now encircled the city in a gentle curve, which again resembles the circuit of defensive walls at the Monkodonja settlement in its second building phase. The only obvious difference are two or three additional defensive towers at Troy, two of which are located however in the immediate vicinity of the entrances or gates. The conception of the latter allows us to draw further comparisons between the settlements of Troy and Monkodonja. Both in the period of Troy II and Troy VI we can observe several gates leading to the settlement, all of which differed from one another in their construction. This fact probably points to a carefully considered and sophisticated defensive strategy. The same also holds true for the Monkodonja settlement, where the western, principal gateway differs in construction from that of the northern gates in the main fortification wall, both in the initial and the last phase of the settlement (**Figs. 4. 7**). Furthermore, one of the entrances to the acropolis was deleted and walled up, while the other was additionally fortified and consequently better protected (**Figs. 5-6**). It should be emphasised that Troy VI is fairly contemporaneous with Monkodonja and that the rebuilding of its fortification can be placed in the period of the 17th century BC;[29] therefore, the renovation had not begun much earlier than in Monkodonja. At Troy conceptual solutions and changes in the construction of its fortification wall can thus be observed, which do not seem to be completely unlike those in Monkodonja and some other hillforts in Istria.

[28] Walter/Felten 1981; Monkodonja I, 174-177 Figs. 122-123; see Gauß in this volume.

[29] Korfmann/Mannsperger 1998 Abb. 41. 45. 48 Appendix 1; Korfmann 2001, 347-349 Figs. 368. 403; Klinkott/Becks 2001, 407-414 Fig. 461.

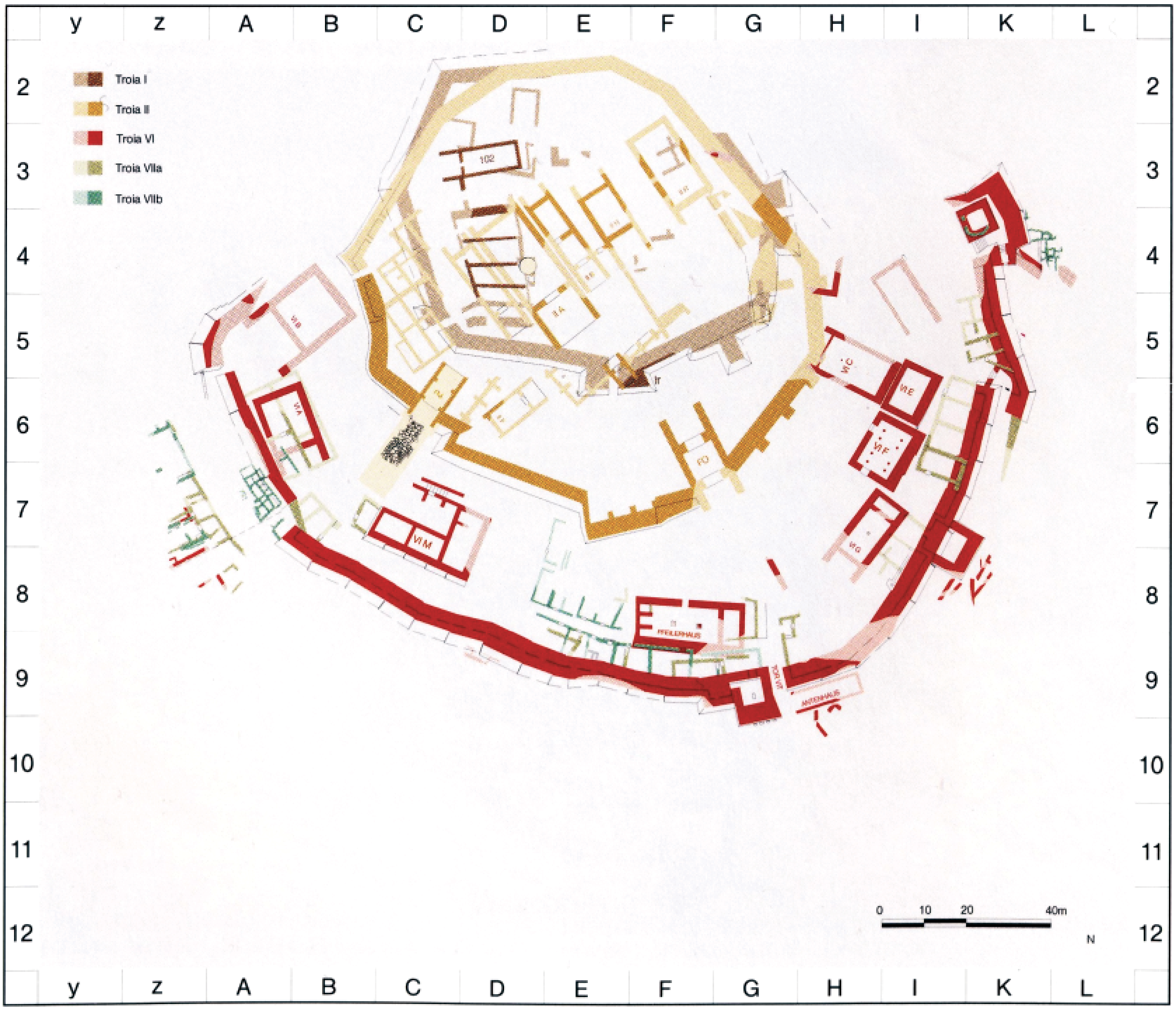

Fig. 10 Troy. Schematic plan with different phases of city fortification; important for our discussion here are especially the phases Troy II (ochre) and Troy VI (red) (according to Korfmann/Mannsperger 1998)

At the same time one further astonishing construction detail should be pointed out: a similar use of cassette- or box-like structures for the construction of the fortification walls was employed both on the northern section of the western side of the acropolis fortification at Monkodonja (**Fig. 5b. 6b**, blue phase)[30] as well as for the oldest fortification at the Hittite capital of Hattusa. The only structural difference lies in the fact that at Hattusa these "interior rooms" of the so-called casemate walls had been packed full of earth, while at Monkodonja they were filled with middle- and small-sized stones. Such a construction of cassette-like walls is dated at Hattusa in the 16th or more likely as early as in the late 17th century BC.[31] Curiously enough, this dating completely accords with our dating of the last rebuilding of the acropolis fortification at Monkodonja. Either these similarities in constructional technique are indeed purely coincidental, or they point to the transmission of knowledge through paths yet to be resolved.

Another cause for the change in the defensive strategy of the Istrian hillforts should possibly be sought in the new techniques of warfare.[32] As is well known, in the European territory a new type of offensive weapons asserted itself at the transition to the Middle Bronze Age period (B1), such

[30] Monkodonja I, 296-299 Figs. 231. 234-235 Appendix 4.

[31] For information about the construction mode of the fortification walls in Hattusha and regarding the publications we thank the colleague Andreas Schachner (DAI, Istanbul Department); cf. Seeher 2006a; 2006b, 37; Schachner 2015, 72-73.

[32] The changes in the style of warfare and defence in the Late Bronze Age have been discussed recently in a special study; cf. Heeb *et al.* 2014 Fig. 29.

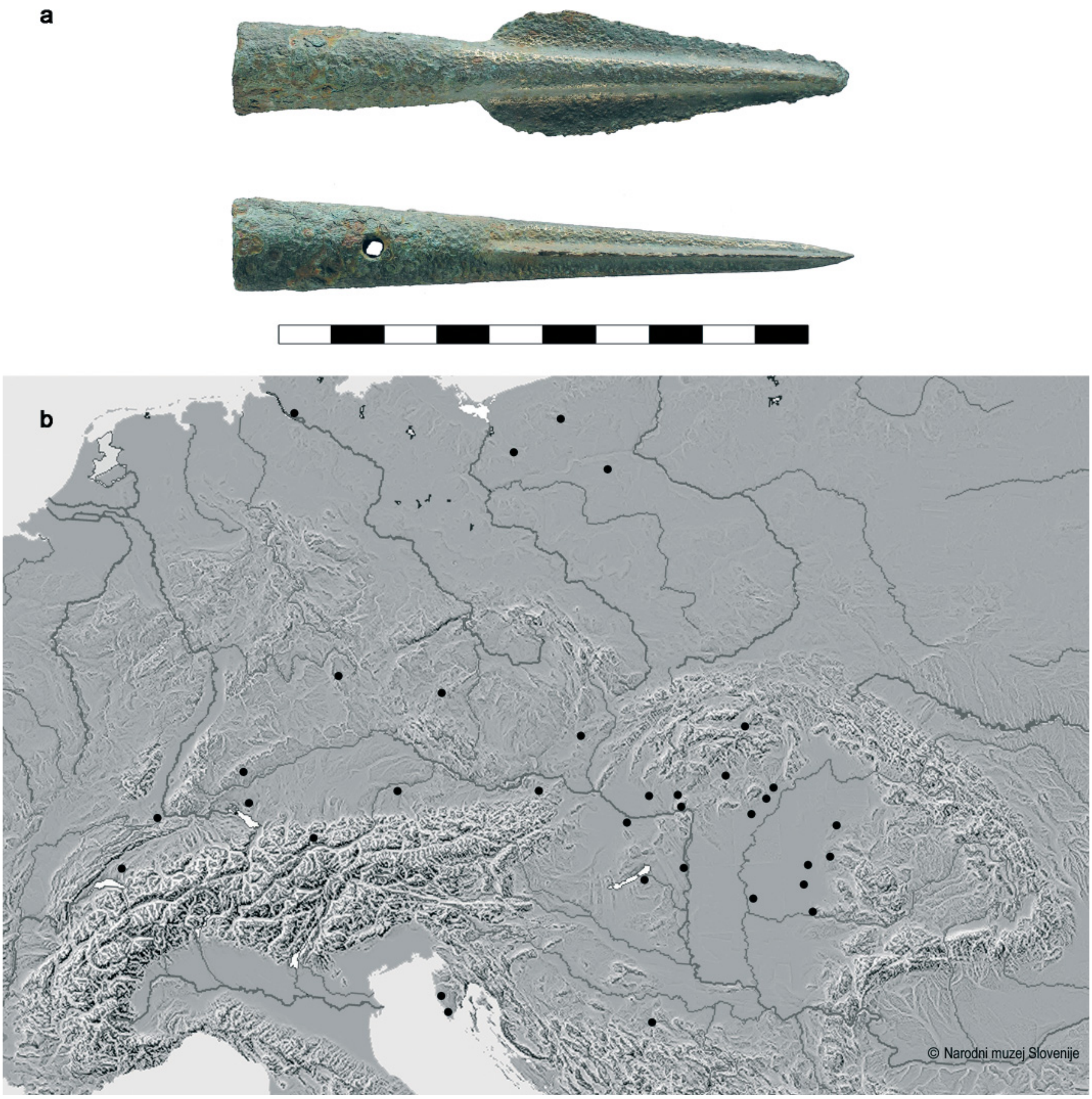

Fig. 11 Monkodonja. **a** Bronze spearhead, which was discovered under the stone rubble of the acropolis fortification; **b** Distribution map of this type of bronze spearhead, which was also discovered in Monkodonja (a: after Monkodonja I; b: map by V. Svetličič)

as bronze spears and swords,[33] as well as protective armour (helmets,[34] shields[35]) and perhaps also cavalry.[36] These innovations resulted in a new style of warfare, which most probably provoked more recurrent conquering expeditions and looting. The response came in the new strategies of settlement defence and consequently in the renovation of fortifications. As already mentioned, at the settlement of Monkodonja we found no remains that would help us to explain the conceptual change in the fortification walls around 1600 BC. Nonetheless, several pieces of weaponry (spear, axes, dagger, stone slingshots)[37] have been discovered in find circumstances or contexts, which clearly indicate that the cause for the end of the settle-

33 In the last years a lot has been written about this topic, therefore we mention here only the overviews, such as Harding 2007 and Hänsel 2009 as well as the volumes of "Archaeologia Homerica" dedicated to warfare; cf. Buchholz/Wiesner 1977; Buchholz *et al.* 1980; 2010. Cf. Hansen in this volume.

34 Hänsel 2003; Buchholz *et al.* 2010.

35 Borchhardt 1977, 6-12 Fig. 8, I-II.

36 Hüttel 1981; 1982, 58-60; Cotterel 2004; Metzner-Nebelsick 2013, 336-337 Fig. 1.

37 Monkodonja I, 144-146. 303-305 Figs. 93-94. 240-242.

ment around 1500 BC had been a military defeat and that the fortification system evidently was not able to withstand the assault of the aggressors. On the basis of typological characteristics of both the spearpoint and axes from Monkodonja, which belong to the Middle European weapon types, we should search the place of origin for the assailants of Monkodonja in the territory between the Carpathian Basin and the Rhineland (**Fig. 11a-b**).[38]

Conclusions

To summarise, we can conclude that the fortification system at Monkodonja reflects the changes, which were related to two, if not even three important historical developments: the first phase represents the founding colonization act, which is directly connected with the formative phase of the Castellieri culture; the second phase comprises a new fortification concept which led to a thorough rebuilding of the fortification as a response to the challenges of the new modes of warfare; and finally, with the demise of the settlement starts a turbulent period of "agitation" and migrations as well as the formation of new military elites,[39] culminating a century or two later with the transition of the Middle to the Late Bronze Age.

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38 Monkodonja III in press.

39 As are attested for example in the numerous warrior graves containing swords in the necropolis of Olmo di Nogara in the Veneto region; see Salzani 2005.

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Daniel Hlásek

Bronze Age Hillforts in South Bohemia. The Current State of Knowledge

Until now 33 hilltop settlements that might represent Bronze Age hillforts have been registered in South Bohemia. However, only four sites have been distinguished and designated with certainty as Bronze Age fortifications through modern archaeological excavations. As for the other sites, the probability is smaller. The main chronological horizons of the preference for hillforts are the turn of the Early to the Middle Bronze Age (Br A2/B1–B1; c. 1800–1500 BC) and the turn of the Late and Final Bronze Age (Ha A2–B1 and Ha B; c. 1050–800 BC). Enclosed areas of rather small dimensions existed throughout the Bronze Age. There are several Bronze Age hillforts, about which we have gained a fairly clear idea about the construction of their fortifications.

Introduction

South Bohemia is a geographically delimited area. The borders were also respected by prehistoric settlements. The rugged landscape, the mosaics of foothills, basins and uplands provided many geomorphological forms, which were suitable for building hilltop enclosure components (**Fig. 1**). Still existing extensive forests in the area have preserved the relics of some prehistoric fortifications. In the study area, a relatively large number of the sites has been preserved. With varying levels of certainty, some of them are dated back to the Bronze Age. Although the main interest in South Bohemian hillforts began in the 19th century, the interest is growing more and more intensive now. However, general knowledge about them is still not satisfactory. The main aim of this work is to introduce the current state of research and the materials of the Bronze Age hillforts in South Bohemia. A historical synthesis and explanations of reasons for the increase, use and decline of the sites are not part of this study. This is a pilot study for the postdoctoral project on the same subject, in which field activities and mainly theoretical studies will be developed further.

The History of Research on Hillforts

From written sources the regional place names associated with fortifications are proof that the South Bohemian hillforts were certainly known in the Middle Ages. Prehistoric fortifications were denoted on maps of the wider area in 18th century (Brloh and Hluboká nad Vltavou–Baba).[1] The first professional interest in them appeared during the second half of the 19th century, when many hillforts there were registered. The first geodetic plans and excavations of sites were implemented at that time.[2] B. Dubský, an important South Bohemian archaeologist of the first half of the 20th century, explored many hillforts (including the Bronze Age ones) and conducted relatively small-scale excavations.[3]

Professional archaeologists began their work in South Bohemia during the second half of the 20th century. Their work was also concerned with improvement of research on hillforts. A. Beneš led systematic excavations on the hillfort of Vrcovice[4] and rescue excavations in Bechyně. He also carried out the reconnaissance of all hillforts that were known at that time. J. Poláček carried out long-term research on the hillfort of Křemže–Dívčí kámen;[5] he also directed small-scale excavations in Chřešťovice, Skočice and Třebanice. A problem connected with his excavations concerns the insufficient documentation and publication. Two stratigraphic sections of a fortification and many trenches were realized by L. Smejtek in Voltýřov in

1 Chvojka *et al.* 2013b, 147.
2 E.g. Woldřich 1883.
3 Dubský 1949.
4 Beneš 1966; Hlásek *et al.* 2015a.
5 Poláček 1966.

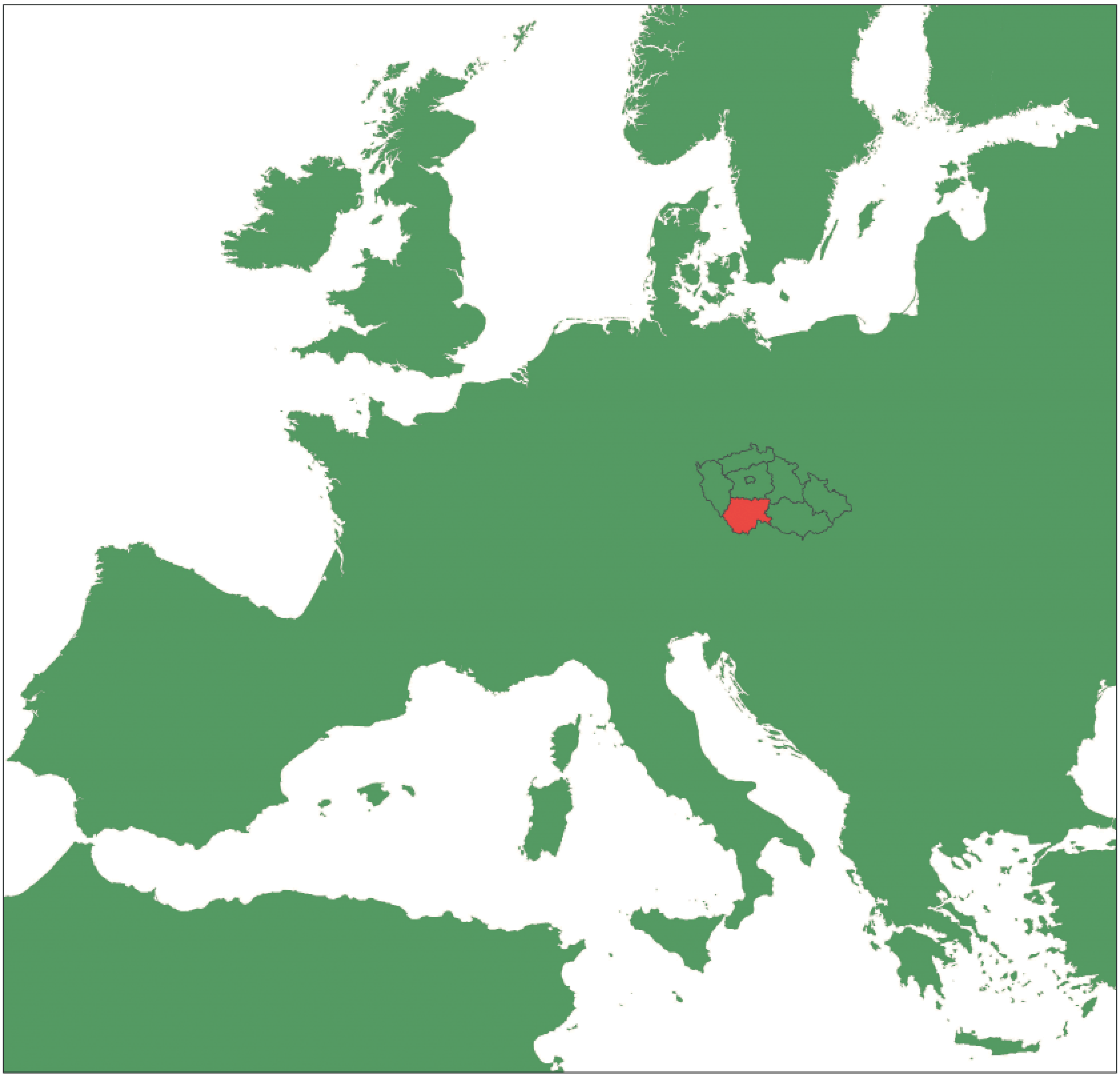

Fig. 1 Localization of South Bohemia within Europe (map by the author)

the 1980s.[6] At the end of the 20th century, rescue excavations on hilltop sites began to appear on a large scale, e.g. in Bechyně,[7] Český Krumlov,[8] Hradiště u Písku,[9] Nevězice,[10] Strakonice[11] and Všemyslice.[12] At the turn of the millennia, the interest in these Bronze Age sites intensified, especially thanks to P. Hrubý.[13] The beginning of the new millennium was marked by the creation of digital models of the terrain of hillforts from the collection of data by total stations. At the same time, metal detectors were finally used by archaeologists, e.g. in Hluboká nad Vltavou,[14] Dobřejovice,[15] and Opalice.[16] Nowadays, hillforts are documented by airborne laser scanning, which is available all over the Czech Republic.[17] New publications of the hillforts are also usually associated with trial trenches (e.g. Brloh, Týn nad Vltavou and Skočice).

6 Smejtek 2003a.
7 Militký 1996; Krajíc 2007.
8 Ernée/Militký 1996.
9 Braun 1982.
10 Drda 1987.
11 Michálek 2008.
12 Jiráň 1985.
13 See Havlice/Hrubý 2002; Hrubý/Chvojka 2002; 2007.
14 Chvojka/John 2006.
15 Chvojka *et al.* 2008.
16 Chvojka/John 2009.
17 The LiDAR data used in this work was provided by the Czech Office of Land Surveying and Cadastre (www.cuzk.cz).

In recent years the author of this article performed several research projects concerning hillforts in South Bohemia (Vrcovice,[18] Všemyslice[19] and Milenovice). He carried out his excavations using the same methodology, with emphasis on multidisciplinary research, on minimal damage to intact archaeological situations, and on the maximum gain of information. The main goal of his research was to clarify the following: the construction and manner of termination of fortifications, the character of the use of the enclosed area, the subsistence activities of its users, the natural environment of hillforts, and the dating.

Hillforts: Definition, Transformation and Classifications

In this study Bronze Age hillforts are understood as sites on elevated, geomorphologically suitable places, which were enclosed by stable fortifications built in the Bronze Age. In the South Bohemia region, we do not know of any Bronze Age enclosures that are located in lowland areas. We consider fragments of pottery or debris from other settlement activities as sufficient proof of the residential use of hillforts. On the other hand, isolated finds of metal objects are not considered as evidence for the (intensive) settlement of an area. Such sites are not included in this work (e.g. Litoradlice).[20] Although we have many preserved hillforts (mostly in forest environments), there is a problem with their chronological classification. Basically, it is impossible to classify them without some professional archaeological research. The determination of the age of fortifications basing only on a few unstratified finds from enclosed areas is questionable, especially in the case of multi-period sites. The problems associated with identifying and dating potential fortified hilltop settlements are frequent.[21]

There are also sites whose position or finds fully correspond to certain hillforts, but they have no fortifications (in the preserved terrain). Some fortifications were dismantled later to gain building material (Hradiště u Písku), some were destroyed by later development (e.g. Český Krumlov, Bechyně, Křemže, etc.), or they disappeared in different ways. In some cases these sites did not have to be fortified at all. Considering these consequences, we can divide potential hillforts into four categories – according to the probability that they were indeed Bronze Age hillforts:

Type A: Bronze Age sites without preserved fortification. It is possible that some of the sites were not enclosed at all, and this means that such sites are not hillforts (12 sites).

Type B: Bronze Age sites with preserved fortifications, but of unknown age (11 sites).

Type C: Sites with proven settlement only from the Bronze Age, preserved relics and undated fortifications (6 sites).

Type D: Sites with preserved fortifications that undoubtedly date to the period of the Bronze Age (4 sites).

In South Bohemia there are registered 33 sites, but only four of them belong undoubtedly to Type D – definite Bronze Age hillforts (Milenovice, Voltýřov, Vrcovice and Všemyslice; **Fig. 2A**). To extend the list, it is necessary to carry out other targeted archaeological excavations. It is possible to divide the hillforts according to their geomorphology. This division is important for the study of requirements of their prehistoric communities as well as for the predictions of other unknown archaeological sites. The typology of geomorphological types of the South Bohemia hilltop settlements was defined by P. Hrubý[22] (**Fig. 2B**):

A. The promontory is a geomorphological feature, which is naturally bordered from three sides by a natural elevation. The comfortable access to the promontory is possible only from one side. In South Bohemia, the promontories are usually formed by watercourses (20 sites).
B. The peak of a hill is a feature with a rounded or flattened top. These hillforts usually have fortifications that run symmetrically around the top (9 sites).
   B1. The forepeak of a hill is a reduced platform or a lower peak of a hill. It can by separated from the main peak by a lower saddle (1 site).
C. The ridge is an elongated and narrow geomorphological feature, which is part of some larger massif or a separate hill or a massif with a long axis (2 sites).

[18] Hlásek *et al.* 2014a; 2015a.
[19] Hlásek *et al.* 2015b.
[20] Chvojka/Zavřel 2012.
[21] E.g. Weinberger 2008, 59.
[22] E.g. Hrubý/Chvojka 2002, 583–584.

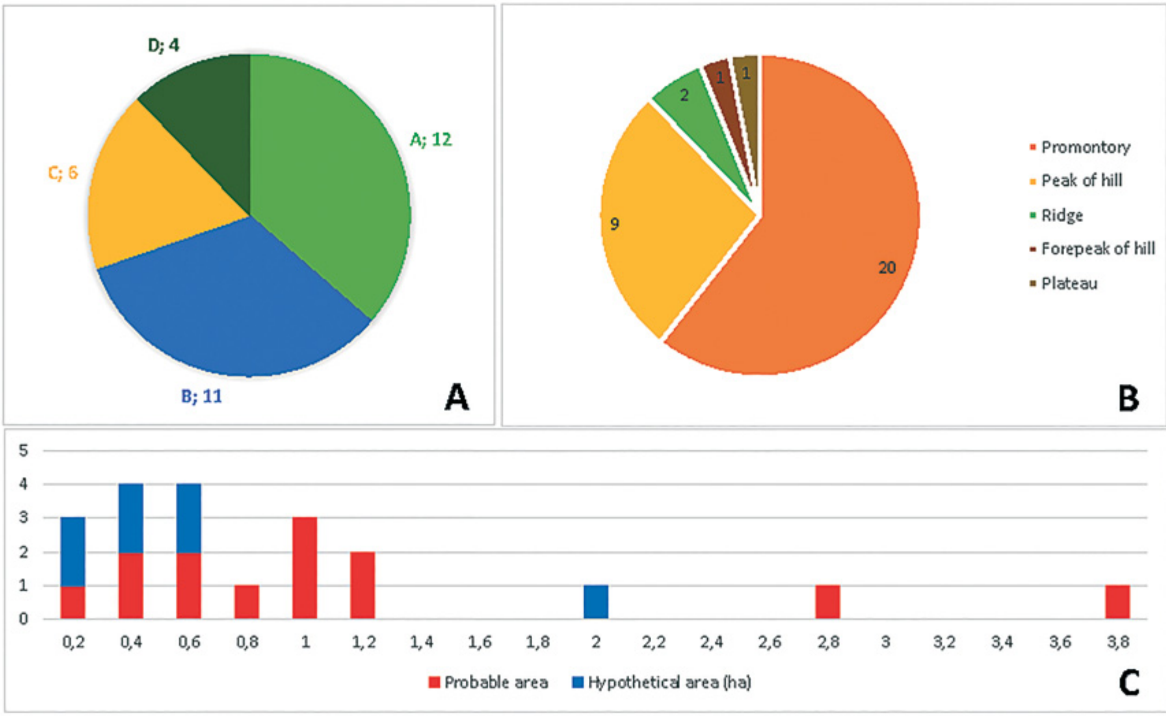

Fig. 2 A Representation of types according to transformation; **B** morphological types; **C** histogram of the size of hillforts (graphs by the author)

D. The plateau is a geomorphological feature that usually covers a larger area and is elevated above its surroundings (1 site).

The most important character of hillforts is the size of the enclosed area, which also has a high interpretation potential. To measure the enclosed area is very problematic, so problematic that it was not possible to measure the size of all sites. For this reason we have to take the size data only as an orientation (**Fig. 3C**). It is evident that in South Bohemia there are no huge hillforts extending over several tens of hectares, as are known in neighbouring regions. On the contrary, there are small enclosed components of an approximate size of up to one hectare. This size is very typical for hillforts dated to the turn of the Early Bronze Age to the Middle Bronze Age. Probably, it is the evidence that smaller communities implemented such fortified settlements.

The state of research does not allow a generalisation of the knowledge about the inner division of fortified areas of hillforts. It is not clear if all of the divisions originate from the Bronze Age. Most hillforts were one-part hillforts without any permanent inner divisions. The hypothesis of a 'transverse rampart' in the area of the hillfort Voltýřov could be excluded through excavation. In Skočice and in Všemyslice the elevated areas are divided from other fortified space by a ditch. There is a transverse rampart in Hradiště u Písku. The relation of the two neighbouring fortifications in Brloh is unclear.

Chronology

The chronological classification of most sites is based mainly on the typo-chronological analysis of the pottery and metal industry. Most of these finds come from unstratified contexts from the inner fortified areas or from cones of debris on the slopes of hillforts. So far, we have radiocarbon data from only four sites. Nevertheless, these data reflect the main construction periods of the hillforts. The context dated by radiocarbon analysis originates from the beginning of the Middle Bronze Age (Vrcovice and Všemyslice) and at the end of the Bronze Age (Brloh and Voltýřov). In Vrcovice, the first radiocarbon date relates to the construction of walls (1611–1453 BC),[23] and the second date comes from the intact layer in the in-

[23] The calibration of radiocarbon data for the entire paper was performed with the OxCal v 4.3 program, using the IntCal 13 calibration curve (Reimer *et al.* 2013). Calibrated ranges with the probability of 2 sigma, i.e., 95.4%, are included.

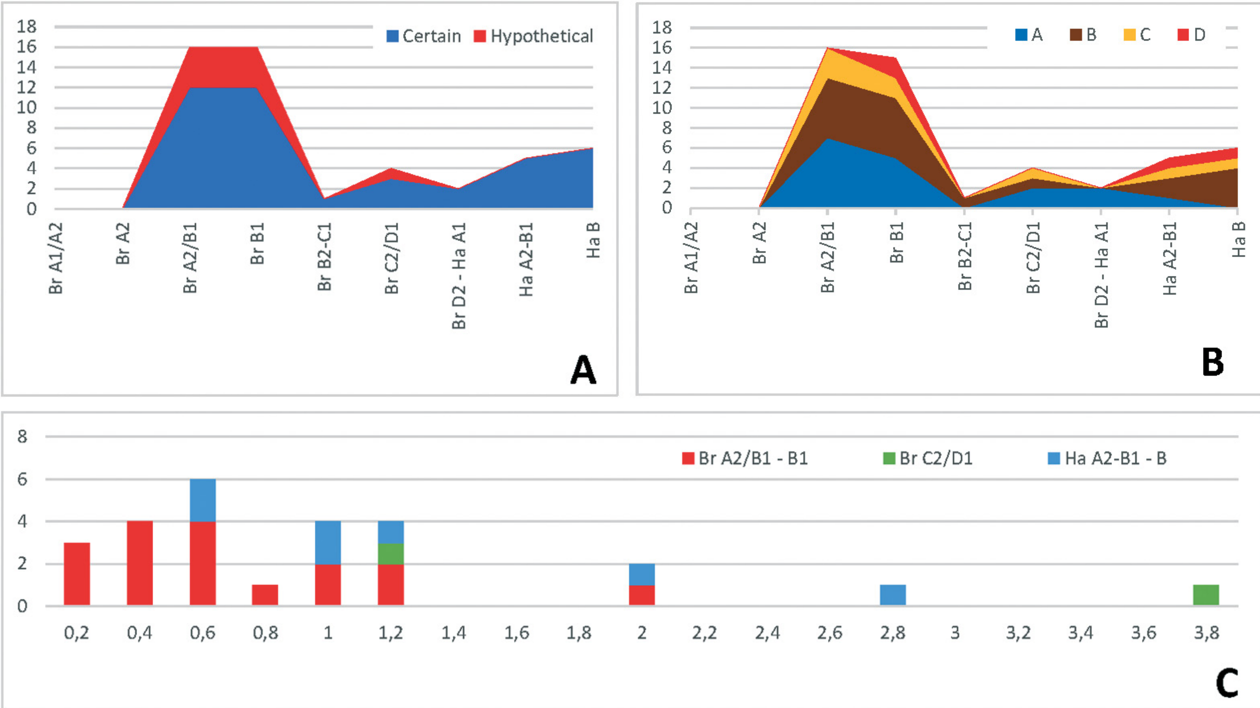

Fig. 3 **A** Representation of types according to chronology; **B** relation between chronology and transformation types; **C** histogram of the size of dated hillforts (graphs by the author)

ner area of the hillfort (1631–1509 BC).[24] The first date in Všemyslice is from the base of the destruction at the edge of the acropolis (1731–1614 BC), while the second date is from the intact layer on the acropolis (1607–1446 BC).[25] Two radiocarbon data were also taken from the carbonised wooden construction of the older phase of the wall in Voltýřov (1107–814 and 1084–828 BC).[26] The last radiocarbon figure is from the layer underneath the clay rampart of the first fortification in Brloh (1010–890 BC). The chronological classification of the rampart is questionable because of its atypical character.[27] It is possible to specify the age of the wall in Milenovice. The stratified pottery was produced during the Late Bronze Age (Ha A1/B1). The oldest radiocarbon figure (c. 2000 BC) comes from a hoard found in the hillfort at Opalice, but its connection to the fortification is unclear.[28] The other sites are dated only through finds found in context, but without any connection to fortifications. Some data are taken over from older documents and might be incorrect. Finds from some sites are not available, or typologically unclear, or they were found at a very early time and their present storage place is unknown. For these reasons some sites known in archaeological studies are not included in this work (Boudy, Boletice, Orlík nad Vltavou, Písek, Svatý Ján nad Malší, Vyšný and Záluží).[29]

The popularity of building hillforts changed during the Bronze Age. There are two main periods (**Fig. 3**). Most of the sites were settled at the turn of the Early Bronze Age to the Middle Bronze Age, which includes two phases (Br A2/B1 and B1). Some sites could have existed during both of these phases (e.g. Bechyně, Chřešťovice, Křemže, Skočice). The other sites (also with proven fortifications) were founded at the beginning of the Middle Bronze Age (Br B1; e.g. Vrcovice, Všemyslice). The next hilltop/fort period appeared at the turn of the Middle Bronze Age and the Late Bronze Age (Br C2/D1), when only four sites were settled. The fortification of the hillfort Hradiště u Písku probably belongs to that period. The second main period is the turn of the Late Bronze Age and the Final Bronze Age; again, there are two phases (Ha A2–B1 and Ha B). The continuity of settlement in the hillforts in these phases has not been proven yet. The Brloh and Milenovice fortifications were probably built at the end of the Late Bronze Age.

24 Hlásek *et al.* 2014a.
25 Hlásek *et al.* 2015b.
26 Smejtek 2003b.
27 Fröhlich *et al.* 2014, tab. 2.
28 Hlásek/Chvojka, in press.

29 See Havlice/Hrubý 2002; Hrubý/Chvojka 2002.

The older phase of the wall in Voltýřov is undoubtedly from the Final Bronze Age. All of the Final Bronze Age hillforts were abandoned before the end of the Bronze Age. There is no continuity into the following Hallstatt period.[30]

Regional Context: Settlements and Society

Knowledge about the beginning of the Bronze Age in South Bohemia is still very sparse. Aeneolithic finds are very sporadic, and sites of Late Aeneolithic cultures (Corded Ware and Bell Beaker cultures) are missing. The hiatus between radiocarbon dates for the Late Aeneolithic and the first Early Bronze Age dates is more than 500 years. The increase in the exploitation of copper in the Alps and its distribution were probably among the main stimuli for the increase of settlements in South Bohemia. This region, situated in a strategic place between the Alpine mining areas and the main central Bohemia area of the Únětice culture, became a significant transit area of interregional importance. The geographical layout of the oldest sites suggests that the initial extent of settlement had apparent links to the South – to the Danube region. After that the extent of settlement gradually expanded towards the North. The principal cultural orientation of the South Bohemian region towards the South also continued during the subsequent phases of the Bronze Age, as is apparent in some metal or pottery elements. The first hillforts were built after the expansion of settlement (Br A2/B1), roughly 300 years after the appearance of Bronze Age innovations.[31] In South Bohemia the development of Bronze Age settlement continued without a hiatus.

In the course of time, the centre of the extent of settlement moved from the southern to the northern region of South Bohemia. The southern part of the region (districts of Český Krumlov and České Budějovice) was preferred in the Early Bronze Age, while in the northern part settlement is not documented. In the Final Bronze Age the situation became the opposite. Intensive settlements appeared along the Otava and the Vltava rivers, whereas in the southern part settlement was almost absent. This process was probably related to social changes (e.g. changes in the course and importance of trade routes, respectively changes in orientation to other regional neighbours, exploitation of raw materials, etc.), and for environmental reasons. In the Final Bronze Age there was probably a decline in settlement as is evidenced by the few known sites. Our ideas about the transition to the Hallstatt period are very vague; there is no direct evidence for continuity.

The study of social organization is difficult owing to the state of research on burial sites. Relatively few burial sites have been excavated, and the documentation is often incomplete (e.g. unburned bones were not preserved due to the acidity of the soil). Further, there is also the problem with the reconstruction of find complexes from earlier excavations. For some phases, we do not know of any burial sites at all (by coincidence [?] the burial sites of the main period of hillfort construction are missing). For other phases, the vertical differentiation in society does not seem to be significant. Direct evidence of nobility, as for example in the Hallstatt period, is lacking. But the fortifications around settlements are real proof of the deepening social stratification process and of the growing complexity of settlement hierarchy. However, the small fortified areas are eloquent enough. Bronze Age society in South Bohemia can be considered rather more egalitarian than socially stratified.[32]

Fortifications

Fortifications are the main features that are materialized in the hillforts. Some of them have remained preserved until present times in an altered form. Fortifications included walls (ramparts were their transformed forms) and ditches. The best example of the construction of a wall is seen in Vrcovice (**Fig. 4**). The fortification in Vrcovice belongs to the most important sources of information about fortifications dating to the turn of the Early Bronze Age to the Middle Bronze Age in Bohemia. This is because of the preservation of the above-ground relics, the single-phased settlement and the extensive archaeological research that has been conducted at the site. The construction of the inner wall is complicated. The wall itself was delimited on both sides by a stone shell. In front of the outer shell was a berm, which was about one

30 Hrubý/Chvojka 2002, 612.

31 Hlásek/Chvojka, in press.

32 See Müller 2015.

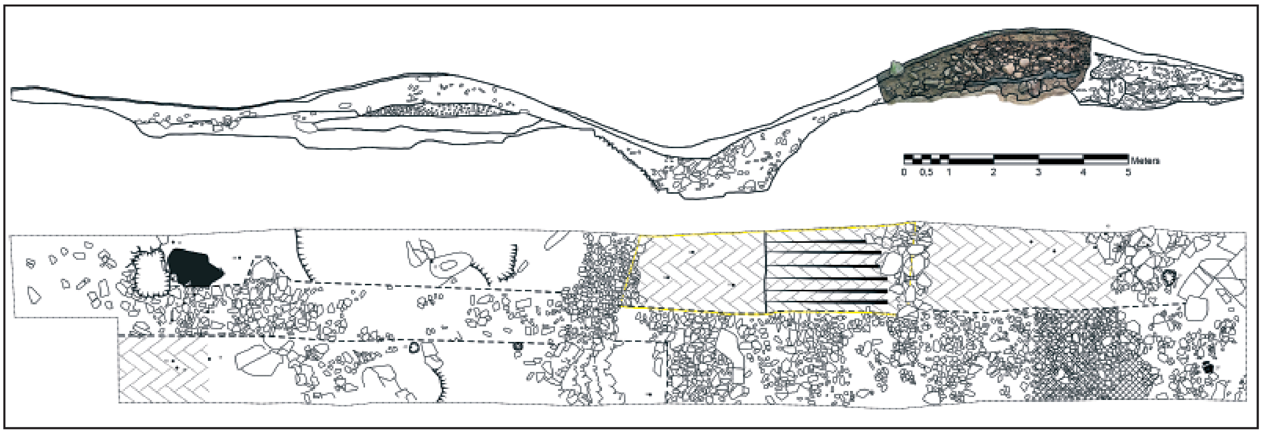

Fig 4 Vrcovice. Cross-section of the fortification (after Hlásek *et al.* 2014a)

meter wide. The bottom part of the outer shell was formed by a row of stones. The basis of the inner shell was likewise formed by a row of large stones. There were also holes for the supporting posts situated behind them. In the interior rampart foundations, the black layer on the overlying rock base was preserved and could be radiocarbon dated. As a result, this layer can be considered the remains of burned pine grade. The rampart armature itself was formed of stones with a minimum portion of soil. The original internal timber construction (later destroyed by fire) was proven by the measurement of its magnetic susceptibility. Oak charcoals can be considered the remains of the timber rampart construction. Abundant daub with impressions found on the destroyed rampart on the inner slope of the wall implies that the upper part of the rampart was formed by a wicker frame, which was precisely covered with clay. To provide longer life of the fill, the wicker frame must have been roofed. The outer rampart was formed by two supportive parallel palisades with irregularly placed poles. The inner space between the palisades (about 2.5 m) was filled with loose earthen material.[33]

Archaeologists have long believed that a very similar situation was excavated in Všemyslice, which is chronologically coeval with Vrcovice (**Fig. 5**). In 1983 L. Jiráň carried out a cross-section trench in the edge of the acropolis. He presupposed that it was a low rampart.[34] There was an incentive for new archaeological research in 2014, which was influenced by the fact that the acropolis had been recently disturbed: the place of the former excavation trench from 1983 had been used as a shelter. The disturbance revealed some complicated stratigraphy, which had been documented earlier, as well as many new finds. The trench provided results, which however, did not enable a reconstruction of the original shape of the construction. There are some indications of complicated architecture, such as stone elements and the wood-clay construction. The construction was destroyed by fire; this fact was proven by the magnetic susceptibility in two horizons. The construction was built after the place had been settled, because there are prehistoric finds in a few layers. The current state of knowledge does not allow a clear interpretation of the destruction documented at the edge of the acropolis as being the remains of the fortification.[35]

The next example of the construction of the wall is in the Late Bronze Age hillfort of Milenovice. Excavation was carried out there in 2016 (**Fig. 6**). The rampart, probably the base of the previous wall, is 6 m wide and built of stones with some wooden elements. There are postholes and a stone facing of timber, which represents the remains of the wooden construction. No evidence of fire was found there. The wall itself was built in the Late Bronze Age, which was proven by stratified finds. Radiocarbon dates are still not available (unpublished). Further, the age of the rampart of the first fortification in Brloh is unknown, but there is one Late/Final Bronze Age radiocarbon date from the layer under the rampart. However, the clay structure of the rampart is atypical, and the shape of the fortification might also be associated with modern times.[36]

[33] Hlásek *et al.* 2014a; 2015a.
[34] Jiráň 1985; Alušík 2012; Hlásek *et al.* 2014b.
[35] Hlásek *et al.* 2015b.
[36] Fröhlich *et al.* 2014.

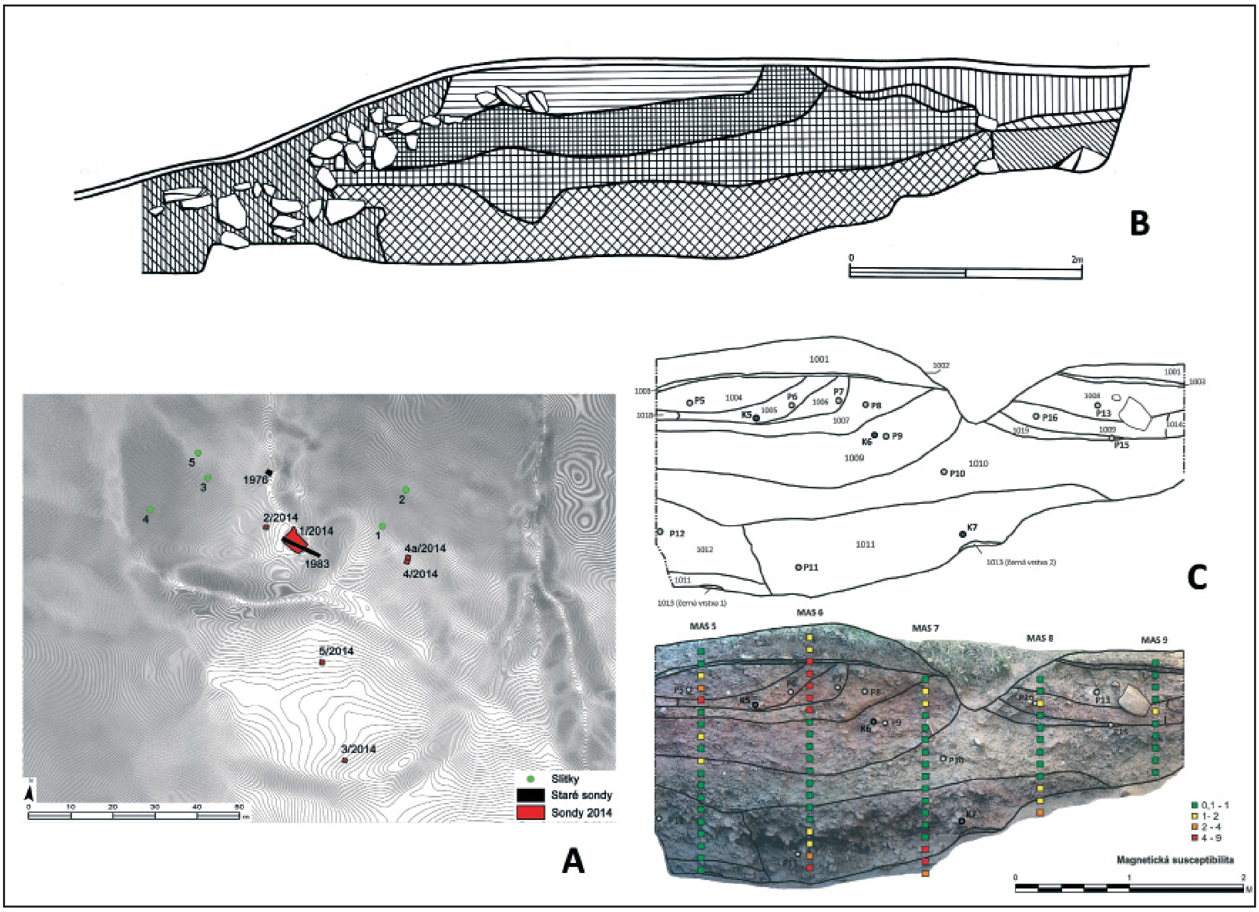

Fig. 5 Všemyslice. **A** Map of the site; **B** cross-section of the edge of acropolis made by L. Jiráň; **C** cross-section of the edge of acropolis made by author (A after Hlásek *et al.* 2015b; B after Hlásek *et al.* 2014b; C after Hlásek *et al.* 2015b)

Two phases of the Final Bronze Age wall have been registered in Voltýřov. The oldest wall was made of wood and clay with an outer stone facing built of huge stones; the wall was finally destroyed by fire. A radiocarbon date was obtained from the carbonized oak construction; it was built approximately in the 10th century BC. On the ruins of the first wall was built a new stone and clay wall, which has both an inner and an outer stone facing.[37]

We also have reports about older excavations of fortification hillforts that cannot be classified with certainty as Bronze Age structures. Layers of large stones and sandy clay material were uncovered in the rampart in Dobřejovice in 1890.[38] The ramparts in Hluboká nad Vltavou and in Hradiště u Písku are constructed of stones, too.[39] In Skočice, J. Poláček noted that the stony rampart in the foreground had a stone shell with clay filling.[40]

It may be possible to define a specific group of promontory hillforts on the basis of the typically very high and relatively short rampart (wall) of the Early Bronze Age. Unfortunately, the chronological classification of these hillforts is not precise. They are known in Opalice (**Fig. 9,5**), Týn nad Vltavou (**Fig. 10,3**) and perhaps in Velešín. In every case, hillforts of this group are located upon a promontory, and they have a stone rampart partition, one narrow side for access, and ditches in front of ramparts. The difference in altitude between the top of the rampart and the bottom of the (filled) ditch in Týn nad Vltavou is 6 m; in Opalice it is also 6 m, and in Velešín about 4 m. Hypothetically, the rampart Velešín is considered to be ruins of a medieval castle "Kamenná věž" ("Stone Tower"); however, no medieval wall was found there during archaeological excavations. Medieval pottery was found only in surface layers. The rampart is made of stones, and a burnt layer was registered there as well.

The second characteristic feature of fortifications is the ditch. Ditches are often preserved in the terrain, although they are usually partially filled.

37 Smejtek 2003a; 2003b.
38 Woldřich 1893, 9–10.
39 Dubský 1949, 125–126. 143.
40 Chvojka *et al.* 2013a, 26 Fig. 3–4.

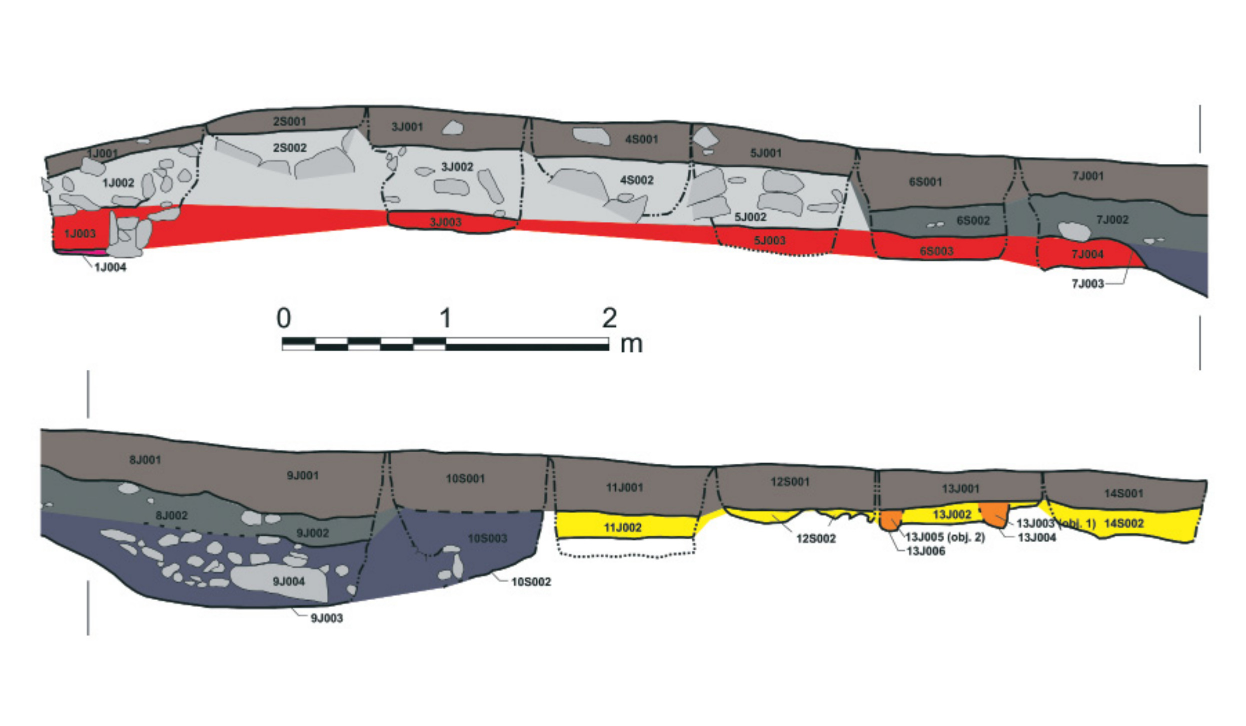

Fig. 6 Milenovice. Cross-section of the fortification (drawing by the author)

Archaeologically examined ditches are present in Vrcovice (**Fig. 4**) and in Milenovice (**Fig. 6**). The ditch in Vrcovice with its sloping sides and flat bottom was carved into the rocky ground between the inner and the outer wall. In the cross-section, the width of the upper part of the ditch was 6.5 m; the width of the bottom of the ditch was about 2.5 m; the depth of ditch in the presumed original terrain was about 2 m. In Milenovice, the relatively shallow ditch was approximately 3 m wide and its depth only 1 m in the contemporary terrain. The ditch was partly covered with the debris from the stone wall. Some fragments of Late Bronze Age pottery were found at the bottom of the ditch. We date the entire fortification to the Late Bronze Age period. Ditches are always situated in front of ramparts; in the case of more than one wall, ditches are present between them. Material from the ditches was probably used for building adjacent walls.

There are also groundplan structures of fortifications. The usual promontory hillforts have preserved fortifications only on access sides. The question is whether this corresponds to the original situation. It is also possible that the rest of the hypothetical circumferential fortifications on the edges of slopes might have completely disappeared due to erosion.

Similar hillforts are also documented in Dobřejovice (**Fig. 8,4**) and in Třebanice (**Fig. 10,2**). These sites are situated on the elongated peaks of hills, and they are enclosed by circumferential fortifications. Although the specific semi-circular fortification of the hillfort Hluboká nad Vltavou does not have analogies in South Bohemia, formally similar Early Bronze Age sites are known in Moravia, Slovakia and Hungary.[41] Probably, the fortification in Hluboká nad Vltavou originated in the Early Bronze Age, too. Its arrangement can be considered as an import of ideas.[42]

Relatively little is known about the "life span" of South Bohemian fortifications in the past. The chronological analyses suggest that any securely dated wall did not exceed one typological phase (circa 150 years). Their lifetime was probably even shorter. We only have evidence for a repaired wall and that was in Voltýřov. However, it is not entirely certain that the younger phase of wall is from the Final Bronze Age, too. Traces of fire were often found during excavations of ramparts. Fire was certainly the cause of the destruction of fortifications. Examples of hillforts destroyed by fire are Hradiště u Písku, Velešín, Vrcovice and Všemyslice. Most information about the destruction

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41 E.g. Hlatavá *et al.* 2015, 199–213 Fig. 3; Bátora *et al.* 2015, 123–138 Fig. 1; Kovárník 2015, 105–122 Fig. 11–13.

42 Chvojka *et al.* 2017, 141–143 Fig. 6.

of inner walls is found in Vrcovice. The wall was destroyed by fire, and the maximum burning temperature varied. Some stones were nearly molten through the intense temperature of the fire. The rampart collapsed mainly towards the settlement area, probably because of the loosening of the internal load-bearing poles. The direction of the slide of the inner rampart is evidenced by the boundary of the rampart destruction, which was captured in the trench situated at the inner foot of the wall, and by the noticeably askew position of the stones of the exterior shell. The determination of the position in which the selected stones moved during fire is based on the measurement of conserved magnetism.[43]

Evidence for Subsistence Strategies and Warfare

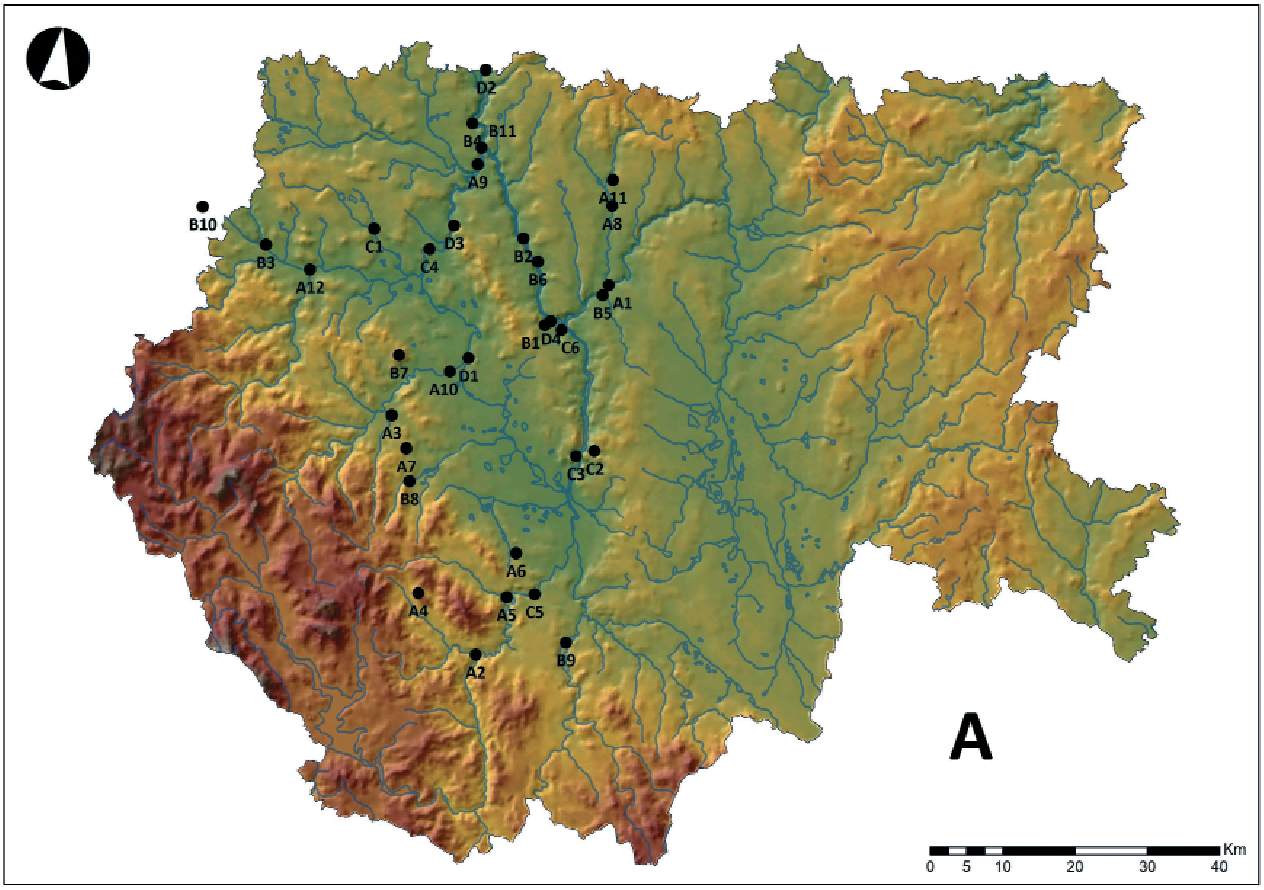
Especially new research on hillforts has provided remains of agriculture in the form of plant macroremains and of the consumption of bred animals.[44] The spectrum of consumed plants and animals is very similar to that in contemporary lowland settlements. There is a lack of information about other activities. The production of textile is documented by finds of loom weights (e.g. in Skočice, Vrcovice, Všemyslice, Oslov) and whorls (in Všemyslice). The traditional theory about hillforts as being centres of metallurgy in Bohemia is rejected.[45] Yet, the evidence for metallurgy in the examined sites is scarce: the mould for a dagger was found in Skočice,[46] the fragment of a nozzle was recently found in Velešín (unpublished), and finds of copper ingots are relatively frequent (in Albrechtice, Všemyslice and Nuzice).

We believe in the connection between the hillforts and the exploitation of typical South Bohemian mineral resources, such as gold or graphite. These materials were probably used in South Bohemia throughout the entire Bronze Age. However, we do not have any direct proof of regional prehistoric exploitations. The use of gold is documented by the find of a gold hair ring in Vrcovice. Some hillforts are found close to later (medieval or post-medieval) mining areas of primary or secondary deposits of gold (e.g. in Albrechtice nad Vltavou, Bechyně, Skočice, Voltýřov, Vrcovice and Všemyslice). Graphite occurs at the examined sites as raw material (in Křemže, Milenovice, Oslov) and above all as the application on the surface of pottery during the entire Bronze Age. Further, graphite deposits are closely related to some hillforts, for example in Opalice: there is a vein of graphite in the site. Other sites are situated in their proximity.

Gold and graphite could also have been important trade articles. Trade was a very important aspect of the Bronze Age, and hillforts were probably integral parts of the trade network.[47] A large number of South Bohemian hillforts are positioned on major natural routes.[48] Their deployment within the region indicates the main interregional trade orientation of the population: the South-North axis is closely linked with the Vltyva River at the turn of the Early Bronze Age to the Middle Bronze Age;[49] at the end of the Bronze Age there was an obvious connection along the Otava River with West Bohemia and South Bavaria (in Brloh, Katovice, Velké Hydčice–Prácheň; **Fig. 7B**).[50] The bread-loaf idol (*Brotlaibidol*) found in the Bechyně hillfort was undoubtedly associated with the trade.[51] The most striking import found in South Bohemian hillforts is a large set of amber beads found in Křemže-Dívčí Kámen.[52] Other archaeologically visible imports are some artefact types of the bronze industry or raw copper and tin, or artefacts of the chipped stone industry.

The traditional interpretation of prehistoric hillforts is connected with their defensive function in warfare.[53] However, some opinions about their exclusively symbolic purpose have appeared recently.[54] Generally speaking, the evidence of prehistoric warfare is ambiguous. Because of acid soils in South Bohemia, unburned human bones are usually not preserved, and bones could have been important evidence for warfare. The first main period of building hillforts could be an indication of dangerous times: the turn of the Early

43 Hlásek *et al.* 2014a.
44 Hlásek *et al.* 2014a; 2015b.
45 Blažek *et al.* 1998, 34.
46 Militký 1995.
47 Neustupný 2006.
48 Hrubý/Chvojka 2007; Chvojka 2015.
49 Hlásek 2017.
50 Hrubý/Chvojka 2002, 612.
51 Krajíc 2007 Fig. 47; Chvojka *et al.* 2011a, Fig. 6,3.
52 Poláček 1966 Fig. VIII; Chvojka *et al.* 2017 Fig. 6 D.
53 Osgood *et al.* 2000.
54 Cf. Armit 2007.



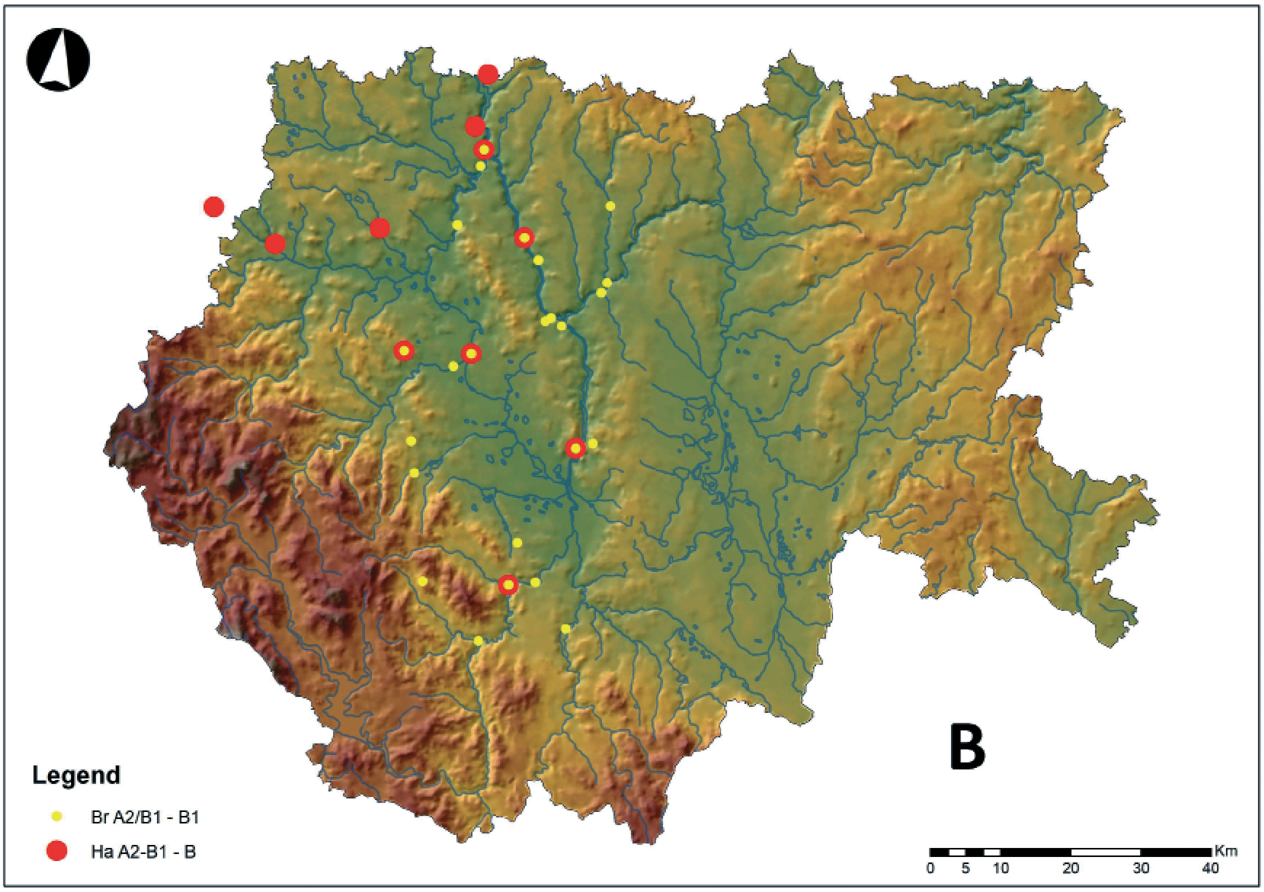


Fig. 7 Maps of South Bohemian hillforts. Labels refer to the catalogue of sites (maps by the author)

and Middle Bronze Age when the first swords and spearheads arrived in Central Europe.[55] For instance, one of the oldest spearheads comes from the hillfort in Dobřejovice.[56] As already mentioned above, many fortifications were destroyed by fire, which is also associated with the violent extinction of fortifications. The reasons for fires may be different; they were not necessarily related to warfare.[57] What is more, in some hillforts there may not have been any conflicts, despite the fact that the expectation of conflict could have been the main reason for building hillforts. Artefacts that are interpreted as weapons are relatively rare in hillforts. Only finds of miniature triangular daggers are common (in Albrechtice nad Vltavou, Dobřejovice, Křemže, Skočice). These rather symbolic weapons could be considered attributes of rank.[58] Finds of spearheads are also known (e.g. in Dobřejovice, Zvíkovské Podhradí). It is obvious that many metal artefacts, including Bronze Age weapons, have disappeared due to illegal metal-detecting activities. In conclusion, the set of small stones in Chřešťovice, Hradiště u Písku, Křemže or Voltýřov might be considered as hoards of sling-stones.[59]

Conclusion

The relics of the Bronze Age fortifications are the oldest preserved monumental architecture in South Bohemia. However, the quality of research is not satisfactory; therefore, it can influence the possibilities of their interpretation. The main time horizons of preference for hillforts are the same as in the surrounding regions. This is evidence for activities that are closely related with the more general Bronze Age social system. South Bohemian hillforts can be regarded as areas of collective communities, whose portable artefacts do not differ from those common to agricultural settlements. Yet, we are not able to consider their mutual hierarchy because of their similar archaeological picture. We suppose that individual hillforts had only local importance; however, they were part of the large-scale European network of similar sites. No South Bohemian hillfort displays aspects of having been an interregional central site. Their purpose is still unclear. We must work with wide scale of interpretation, which can include areas of military functions, social-economic roles, and places of symbolic or religious significance.

Catalogue of Sites (Figs. 8-10)

Type A

A1 Bechyně (Fig. 8,2)
Geomorphology: promontory.
BA period(s): A2/B1 – Br B1, Br D2-Ha A1; Other period(s): Hallstatt period, La Tène culture, Middle Ages – present day.
Excavations: 1975 (T. Durdík), 1976 (A. Beneš, P. Braun), 1987 (J. Militký), 2006 (R. Krajíc); ETRS89: B=49°17′27″; L=14°28′03″.
The hypothetical fortification was covered by later medieval buildings. Registered there was a thick layer dated to the end of the Early Bronze Age, which is situated in the area of the current chateau. The most significant find is the fragment of the loaf idol (*Brotlaibidol*). It is only the second known exemplar found in South Bohemia.
Hypothetical area: 0.2 ha.
Ref.: Militký 1993; 1996; Krajíc 2007; Chvojka *et al.* 2011a.

A2 Český Krumlov
Geomorphology: promontory.
BA period(s): Br B1; Other period(s): Hallstatt period, La Tène culture, Middle Ages – present day.
Excavations: 1994-1995 (M. Ernée).
ETRS89: B=48°48′46″; L=14°18′52″.
The potential hillfort was constructed at the beginning of the South Bohemia Bronze Age; it is situated on a promontory in Český Krumlov. The place was also used for building the medieval castle, which was rebuilt later to the famous chateau. Hypothetical relics of fortifications are covered by later developments. During the small excavation only a limited number of prehistoric finds was recovered.
Hypothetical area: 0.5 ha.
Ref.: Ernée/Militký 1996.

A3 Čichtice-Hnojnice
Geomorphology: forepeak of hill.
BA period(s): Br C2/D1; Other period(s): –.

55 See S. Hansen in this volume.
56 Chvojka *et al.* 2008 Fig. 5,7.
57 O´Brien *et al.* 2018, 75–76.
58 Weinberger 2008, 55.
59 Cf. Robertson 2016, 4–25 Fig. 2.

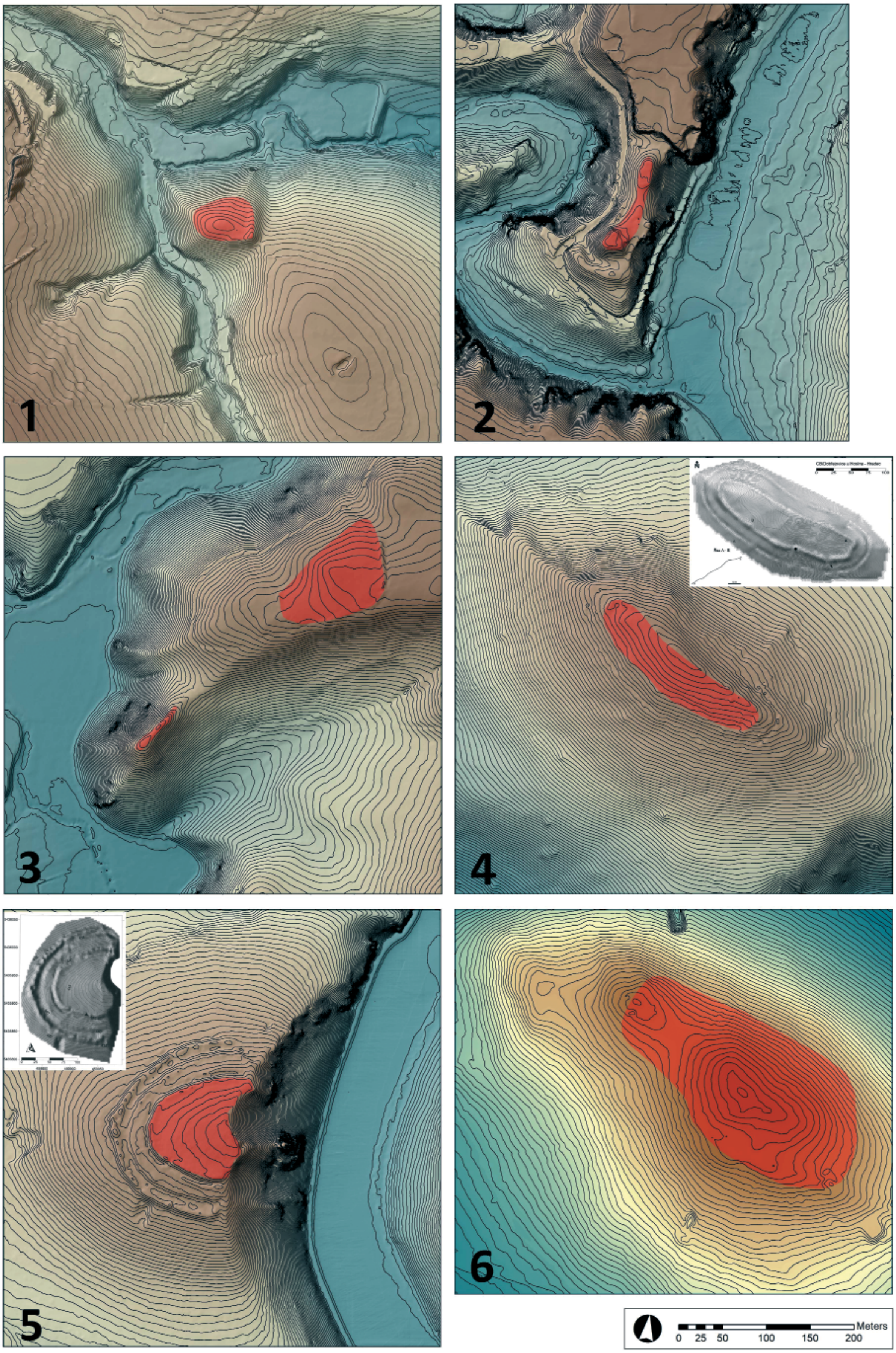


Fig. 8 Plans of South Bohemian hillforts made by airborne laser scanning (ALS): **1** Albrechtice nad Vltavou; **2** Bechyně; **3** Brloh; **4** Dobřejovice; **5** Hluboká nad Vltavou; **6** Hradiště u Písku (ALS plans by the author; 4 other plan after Chvojka *et al.* 2008; 5 other plan after Chvojka/John 2006)

Excavations: (only surface-artefact survey).
ETRS89: B=49°05′35″; L=14°05′36″.
The site is situated on a dominant hill. Finds come only from the southeast forepeak of the hill. Relics of fortifications have not been identified in the terrain. However, they are mentioned in regional place names (Pod hradci – "Under hillforts", Na příkopech – "On the ditches")
Ref.: Parkman 2004 Figs. 7–9.

A4 Chvalšiny–Mlýnské vrchy
Geomorphology**:** ridge.
BA period(s): Br A2/B1; Other period(s): –.
Excavations: (only surface-artefact survey and trial trenches).
ETRS89: B=48°52′43″; L=14°11′25″.
Only pottery has been found on the peak of the hill (814 m asl) and on the adjacent ridge. It is the highest placed site constructed at the beginning of the Bronze Age in South Bohemia. From the top of the hill there is a very good view over both river valleys. The site is linked to the control of trade routes across the Bohemian Forest.
Ref.: Fröhlich/Parkman 2003.

A5 Křemže–Dívčí kámen (Fig. 9,2)
Geomorphology**:** promontory.
BA period(s): Br A2/B1, Br B1, Ha A2–B1; Other period(s): Hallstatt period, La Tène culture, Middle Ages.
Excavations: 1962–1971 (J. Poláček).
ETRS89: B=48°53′21″; L=14°21′25″.
The site was excavated in 1960s. Unfortunately, most of the intact situations of the site were destroyed by the construction of the medieval castle. However, a lot of archaeological material, including the bronze and stone industries from the turn of the Early Bronze Age and the Middle Bronze Age were found in secondary positions of the slopes. One very important find is the hoard of amber beads. The prehistoric fortification has not dependably confirmed.
Hypothetical area: 0.5 ha.
Ref.: Poláček 1966; Chvojka 2004.

A6 Lipí–Travní cesty
Geomorphology: plateau.
BA period(s): Br B1; Other period(s): Ha D/La Tène A.
Excavations: (only surface-artefact survey).
ETRS89: B=48°56′48″; L=14°21′44″.
The finds were found in the field on the plateau. No traces of fortifications have been registered.
Ref.: Zavřel 2001.

A7 Obora u Hracholusk
Geomorphology**:** ridge.
BA period(s): Br A2/B1; Other period(s): –.
Excavations: 2003 (M. Parkman).
ETRS89: B=49°03′18″; L=14°07′54″.
Many finds of fragmented pottery have proven the intensive usage of the area. Indisputable relics of fortifications were not registered.
Ref.: Parkman 2004.

A8 Opařany
Geomorphology: promontory.
BA period(s): Br A2/B1; Other period(s): Hallstatt period.
Excavations: (only surface-artefact survey and trial trenches).
ETRS89: B=49°23′22″; L=14°27′12″.
The significant promontory formed at the confluence of two streams. Prehistoric finds come from the top platform. A sizable part of the promontory was disturbed by the local quarry.
Ref.: Chvojka *et al.* 2011b.

A9 Oslov
Geomorphology: promontory.
BA period(s): Br A2/B1; Other period(s): Middle Ages – present day.
Excavations: 2017 (D. Hlásek).
ETRS89: B=49°25′02″; L=14°11′21″.
The long promontory is above the Otava River. The prominent feature of the place was diminished by the Orlík dam. No traces of fortifications are perceptible. Suitable places have been destroyed by recent developments and a road.
Ref.: unpublished

A10 Radčice-Vrch Kulovatý
Geomorphology: peak of hill.
BA period(s): Br A2/B1–B1; Other period(s): La Tène culture.
Excavations: 1996 (J. Michálek).
ETRS89: B=49°09′26″; L=14°11′29″.
The dominant hill juts above the Budějovice Basin. The area has been disturbed by terracing and quarries.
Ref.: Michálek 2000; Chvojka/Michálek 2004.

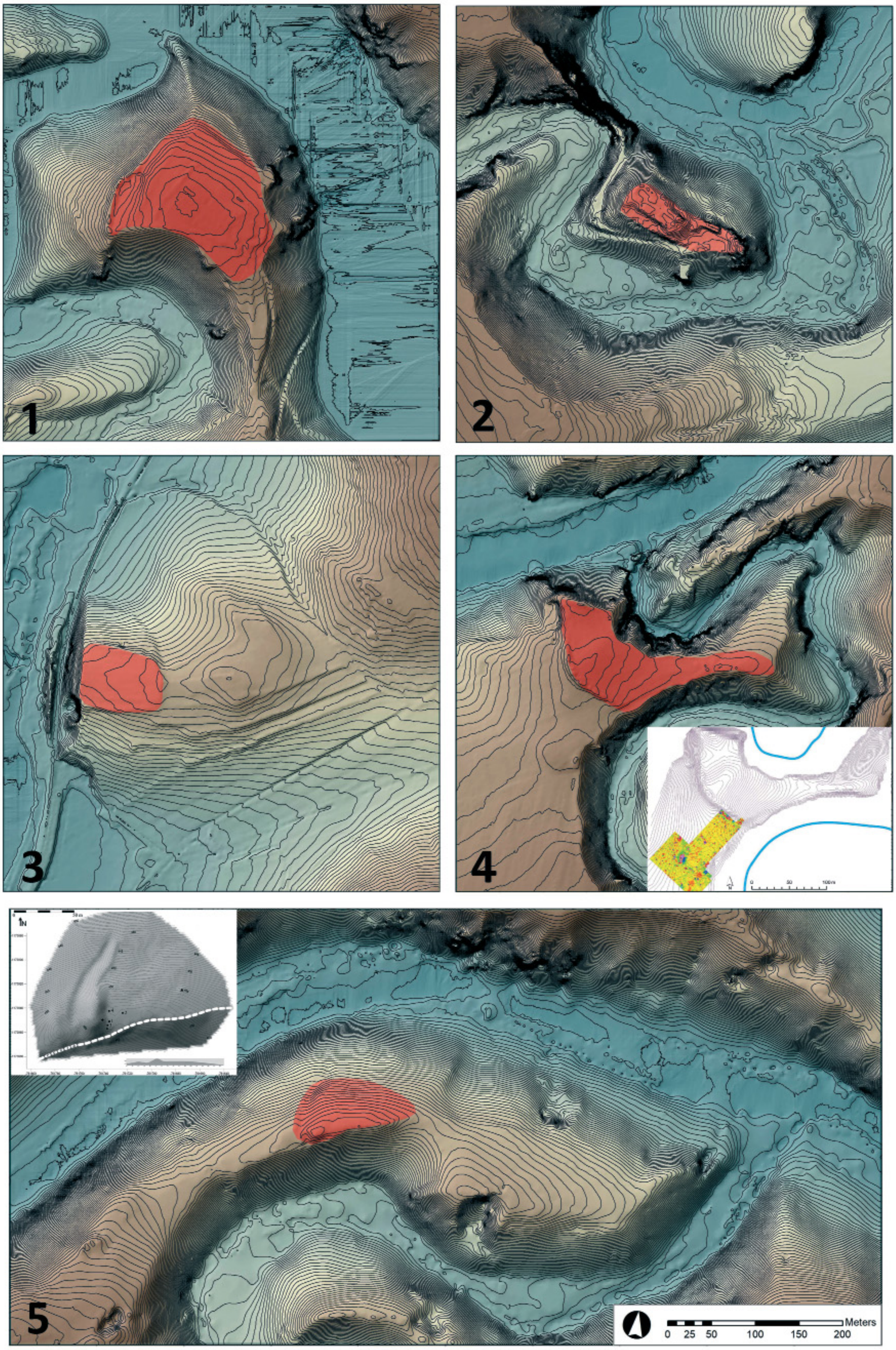


Fig. 9 Plans of South Bohemian hillforts made by airborne laser scanning (ALS): **1** Chřešťovice; **2** Křemže; **3** Milenovice; **4** Nuzice; **5** Opalice (ALS plans by the author; 4 other plan after Chvojka *et al.* 2010; 5 other plan after Chvojka/John 2009)

A11 Sepekov–Chlum
Geomorphology: peak of hill.
BA period(s): Br D–Ha A; Other period(s): –.
Excavations: (only surface-artefact survey and trial trenches).
ETRS89: B=49°25′16″; L=14°26′55″.
A bronze axe and a set of fragmented pottery were found on the site. The hill is rich in mineral resources: graphite, milk opal (material used for chipped industry) and gold, but there is no evidence for prehistoric exploitation. Chronologically synchronic burial mounds are situated not far from there.
Ref.: Fröhlich/Chvojka 2003.

A12 Strakonice–Hrad
Geomorphology: promontory.
BA period(s): Br C2/D1; Other period(s): Aeneolithic, Hallstatt period, Middle Ages to present-day.
Excavations: 1937 (B. Dubský), 1975–1976 (A. Hejna), 1977, 1982 (J. Michálek), 2006 (K. Kašák, J. Valkony).
ETRS89: B=49°15′29″; L=13°54′06″.
The site is situated above the confluence of the Otava and the Volyňka rivers. The area has been destroyed by the medieval castle. Prehistoric finds were found in secondary position.
Ref.: Michálek 2008.

Type B

B1 Albrechtice nad Vltavou (Fig. 8,1)
Geomorphology: promontory.
BA period(s): Br A2/B1, Br B1; Other period(s): Middle Ages.
Excavations: 2003 (J. Havlice).
ETRS89: B=49°13′51″; L=14°21′27″.
Fortification: the arched rampart (preserved in the length of 40 m) and the outer ditch are situated on the accessible (SE) side.
Area: 0.2 ha.
This small promontory hillfort is one of three (the others are Týn nad Vltavou and Všemyslice) in the close hinterland of the inter-regionally important Early Bronze Age settlement Hosty.
Ref.: Havlice 2004.

B2 Chřešťovice–Sv. Jan (Fig. 9,1)
Geomorphology: promontory.
BA period(s): Br A2/B1, Br B1, Ha A2–B1; Other period(s): Hallstatt period, Early Middle Ages – present day (cemetery).
Excavations: 1928–1929 (B. Dubský), 1963–1965, 1975 (J. Poláček).
ETRS89: B=49°20′01″ L=14°17′44″
Fortification: the undated double rampart and a ditch are preserved on the NW side. Three lines of fortification on the access side are mentioned in older literature, but today are not noticeable.
Area: 2 ha (?).
A dominant kidney-shaped promontory. Comfortable access is possible only from the narrow ridge in the south. The site was elevated c. 80 m above the river Vltava before the construction of Orlík dam. Many finds, mostly from the Bronze Age, come from excavations and the surface-artefact survey.
Ref.: Dubský 1949; Fröhlich 1997; Chvojka 2009.

B3 Katovice–Kněží hora
Geomorphology: peak of hill.
BA period(s): Ha B; Other period(s): Aeneolithic, Early Middle Ages.
Excavations: 1946 (B. Dubský), 2016–2017 (V. Král, P. Menšík)
ETRS89: B=49°16′52″; L=13°48′39″.
Fortification: The preserved fortification is undoubtedly from the Early Medieval period.
Located there is a large Early Medieval hillfort. A small assemblage of the Final Bronze Age pottery was found on the top of the hill during excavations.
Ref.: Dubský 1949; Menšík/Král 2017.

B4 Nevězice
Geomorphology: promontory.
BA period(s): Ha B; Other period(s): La Tène culture.
Excavations: 1948 (B. Dubský), 1948 (J. Maličký), 1949–1951 (B. Svoboda), 1980 (P. Drda)
ETRS89: B=49°28′05″; L=14°10′03″.
Fortification: Located there is a preserved fortification, undoubtedly of the La Tène period. However, excavations in the NW corner of the fortification have uncovered part of the Final Bronze Age palisade trench.
The site is known as a La Téne *oppidum*, but there are also finds from the Bronze Age.
Ref.: Dubský 1949; Drda 1987; Chvojka 2009.

B5 Nuzice (Fig. 9,4)
Geomorphology: promontory.
BA period(s): Br A2/B1–B1 (?); Other period(s): Middle Ages.
Excavations: (only surface-artefact survey).
ETRS89: B=49°16′39″; L=14°27′35″.
Fortification: The curve-shaped rampart (130 m long) separates the entire promontory. A filled ditch was found in front of the rampart through geomagnetic surveys.
Area: 0.5 ha.
The hillfort is situated on a significant promontory, which was shaped by the meander of stream "Židova strouha".
Ref.: Chvojka *et al.* 2010.

B6 Písecká Smoleč
Geomorphology: promontory.
BA period(s): Br A2/B1; Other period(s): Middle Ages.
Excavations: 1919 (J. Švehla), 1940 (B. Dubský).
ETRS89: B=49°18′26″; L=14°19′40″.
Fortification: The outer curve-shaped fortification was constructed in the Early Medieval period.
Hypothetical area: 0.4 ha.
The hillfort is situated upon a dominant promontory above the Vltava River. Prehistoric finds were found only on the slopes of the promontory, so it has not been possible to specify the extent of the Bronze Age settlement yet.
Ref.: Hlásek 2017.

B7 Skočice (Fig. 10,1)
Geomorphology: peak of hill.
BA period(s): Br A2/B1, Br C2/D1 (?), Ha B; Other period(s): Hallstatt period, La Tène culture, Early Middle Ages.
Excavations: 1914 (B. Dubský), 1963–1974 (J. Poláček).
ETRS89: B=49°10′06″; L=14°05′30″.
Fortification: stone rampart which is the border of the foreground.
Area: 1.1 ha.
The hillfort with prehistoric and Early Medieval finds is located upon a significant hillock near Skočice. This hillfort was formed by a rock elevation called an acropolis and a 330-m long rampart formed by debris of wall. Relics of the fortification have not been dated.
Ref.: Chvojka *et al.* 2013a.

B8 Třebanice–Velký hrádeček (Fig. 10,2)
Geomorphology: peak of hill.
BA period(s): Br A2/B1; Other period(s): Hallstatt period, Early medieval period.
Excavations: 1961 (Poláček), 2001 (Parkman).
ETRS89: B=49°00′55″; L=14°08′43″.
Fortification: a circumferential stone rampart (395 m long). The outer ramparts are situated only on the east and southeastern sides.
Area: 0.8 ha.
Multi-period site: most of the finds are connected with the Early Bronze Age. The building of fortifications is typical for all present chronological components. Right angles in the corners of the inner rampart on the east side of the hillfort are atypical for the Bronze Age.
Ref.: Parkman 2003.

B9 Velešín–Kamenná věž
Geomorphology: promontory.
BA period(s): Br A2/B1; Other period(s): Aeneolithic, Hallstatt period, Middle Ages.
Excavations: 1975 (Hejna).
ETRS89: B=48°50′31″; L=14°28′39″.
Fortification: Three fortification lines of ramparts and ditches and a huge high rampart.
Hypothetical area: 0.4 ha.
The narrow promontory is elevated above the flooded valley of the Malše River. Early Bronze Age objects were found there in surface-artefact survey. The huge rampart is considered to be the ruin of the medieval castle "Kamenná věž ("Stone Tower"). No medieval wall has been registered by archaeological excavations. The medieval pottery was found only in the surface layers. The rampart is composed of stone debris; the burnt layer was registered there. It is possible that the huge rampart caused the destruction of the prehistoric, probably Early Bronze Age, wall.
Ref.: Hejna 1985; Ernée 1998.

B10 Velké Hydčice-Prácheň
Geomorphology: peak of hill.
BA period(s): Ha B; Other period(s): Early Middle Ages (hillfort), Middle Ages (castle).
Excavations: 1920 (B. Dubský), 1976 (P. Braun, J. Klápště).
ETRS89: B=49°18′58″; L=13°40′54″.
Fortification: preserved relics of fortification belong to the Early Medieval hillfort or to the medieval castle.

Traces of the Final Bronze Age activities were covered over the important Early Medieval hillfort and later medieval castle.
Ref.: Pták/Ptáková 2018.

B11 Zvíkovské Podhradí
Geomorphology: promontory.
BA period(s): Br B1 (?), Br B2–C1, Ha A2–B1; Other period(s): Neolithic, Aeneolithic, Hallstatt period, La Téne culture, Roman period, Middle Ages.
Excavations: 1955 (K. Reichertová), 1956 (A. Hejna), 1959 (L. Jansová), 1973 (J. Michálek).
ETRS89: B=49°26′19″; L=14°11′31″.
Fortification: Two undated ramparts and a ditch are situated in the southern access side. A stone facing of the outer rampart was also registered there. Another rampart, probably of La Téne date, was located in the northern part of the hillfort.
The long dominant promontory was shaped by the confluence of two upper South Bohemian rivers: the Otava and the Vltava. This is a multi-period site covering almost all prehistoric periods in South Bohemia. The dominant feature of the site was diminished by the Orlík dam.
Ref.: Dubský 1949; Fröhlich 1997; Chvojka 2009.

Type C

C1 Brloh–Žižkův Vrch (Fig. 8,3)
Geomorphology: promontory.
BA period(s): Ha A2–B1; Other period(s): –.
Excavations: (only surface-artefact survey and trial trenches).
ETRS89: B=49°19′15″; L=14°00′42″.
Fortification: 1 – a bank enclosure in the shape of an irregular heptagon; in front of it is a shallow ditch on the access side; 2 – short rampart (15 m long, 1 m high) with a shallow ditch.
Area: 0.9 and 0.1 ha.
There is no clear connection between the two fortifications, which are situated next to each other. The first one has an irregular shape with a rampart and a ditch. The dating of the fortification is very problematic. There is one Final Bronze Age radiocarbon date from the layer under the rampart, but the shape of the fortification can be also connected with modern times. The second fortification, with a rampart and a shallow ditch, is situated on a narrow rocky promontory. The archaeological finds found in this fortification belong solely to the Final Bronze Age; they probably correspond with the age of the fortification.
Ref.: Fröhlich *et al.* 2014.

C2 Dobřejovice-Hradec (Fig. 8,4)
Geomorphology: peak of hill.
BA period(s): Br A2/B1; Other period(s): –.
Excavations: 1890 (J. N. Woldřich), 1985 (P. Zavřel).
ETRS89: B=49°05′02″; L=14°28′57″.
Fortification: Two lines of circumference enclosures are preserved. The inner fortification line is the formation of the stone rampart (480 m long). At a distance of 15–20 m from the inner fortification line is a shallow ditch (600 m long).
Area: 0.9 ha.
The hillfort consists of two lines of fortifications. The inner one is formed by the stone rampart, and the outer and more distant fortification is the ditch. Solely finds from the end of the Early Bronze Age, including bronze industry, were registered there.
Ref.: Woldřich 1883; 1893; Zavřel 1990; Chvojka *et al.* 2008.

C3 Hluboká nad Vltavou-Baba (Fig. 8,5)
Geomorphology: peak of a hill.
BA period(s): Br B1, Ha B; Other period(s): –.
Excavations: 1945 (B. Dubský), 2005 (O. Chvojka, J. John).
ETRS89: B=49°04′29″; L=14°27′05″.
Fortification: two semi-circular fortifications consisting of a rampart and a ditch.
Area: 0.9 ha.
One of the most impressive hillforts in South Bohemia is Baba near Hluboká nad Vltavou. The greatest advantage of the hillfort is its position: it is situated in the inaccessible Schwarzenberg deer park. This fact has ensured its good preservation. A few archaeological finds from turn of the Early Bronze Age and the Middle Bronze Age and the Late Bronze Age have been found in the hillfort. The fortification itself was not been explored; however, we suppose there is an association with the Early Bronze Age, in view of many analogies.
Ref.: Chvojka/John 2006.

C4 Hradiště u Písku (Fig. 8,6)
Geomorphology: peak of hill.
BA period(s): Br C2/D1; Other period(s): –.
Excavations: 1923–1924 (A. Krejčí, A. Sedláček), 1946 (B. Dubský), 1979 (P. Braun).

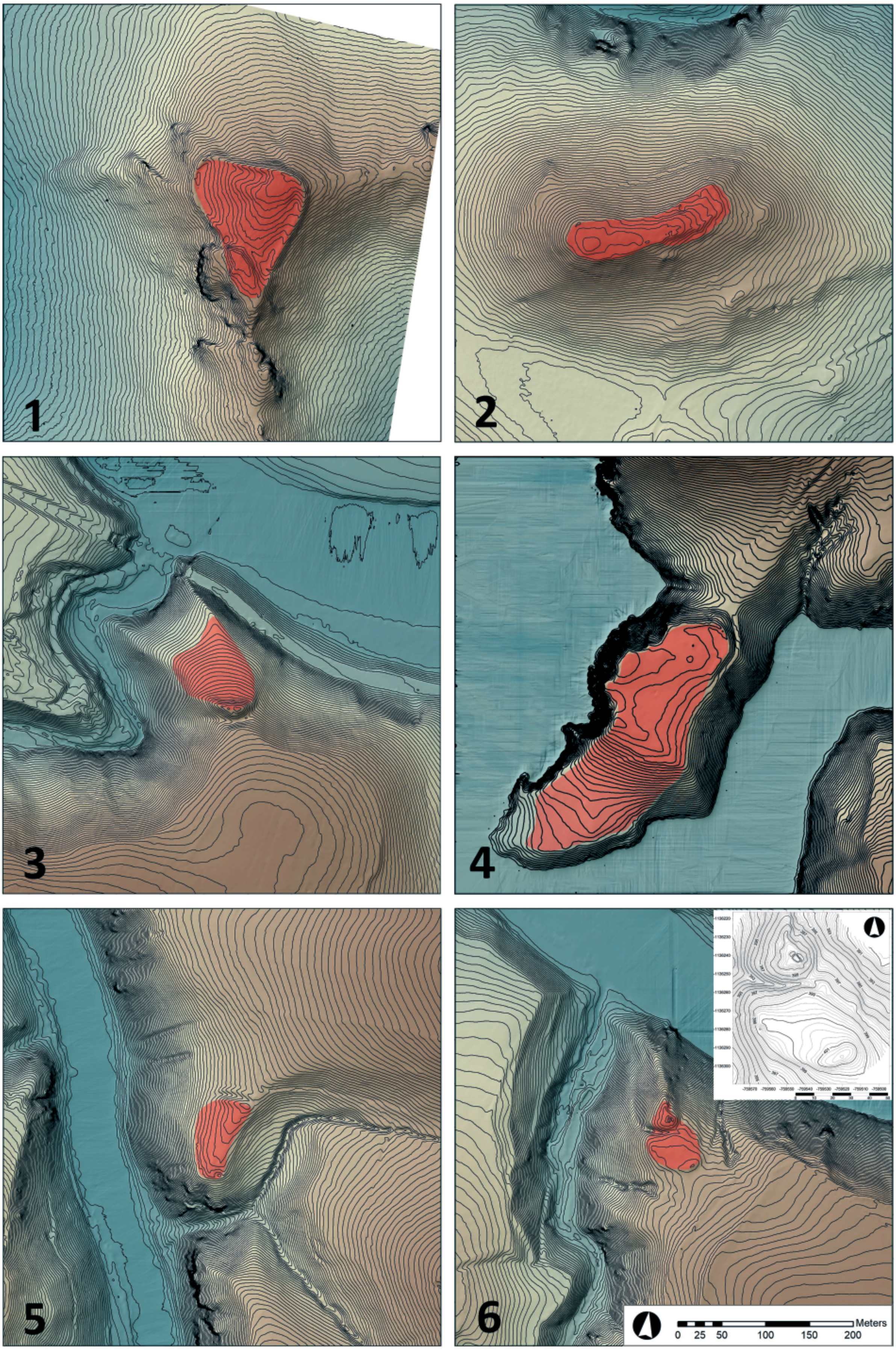


Fig. 10 Plans of South Bohemian hillforts made by airborne laser scanning (ALS): **1** Skočice; **2** Třebanice; **3** Týn nad Vltavou; **4** Voltýřov; **5** Vrcovice; **6** Všemyslice (ALS plans by the author; 6 other plan after Hlásek *et al.* 2014b)

ETRS89: B=49°18′16″; L=14°07′16″.
Fortification: A circumferential rampart of the acropolis, of stone-clay construction. The curve-shaped rampart in the foreground is connected to the enclosure of the acropolis. The fortifications are very poorly preserved in the terrain.
Area: 3.7 ha.
The two-part hillfort, which consists of the trapezoidal acropolis and the rectangular foreground, is situated upon a dominant hill. The acropolis is separated by an unnoticeable rampart and a ditch. The settlement originated during the turn of the Middle Bronze Age to the Late Bronze Age. The dating of the fortification is unknown.
Ref.: Dubský 1949; Braun 1982.

C5 Opalice (Fig. 9,5)
Geomorphology: promontory.
BA period(s): Br A (?); Other period(s): –.
Excavations: (only trial trenches).
ETRS89: B=48°53′53″; L=14°24′34″.
Fortification: The dominant inner rampart has two different parts. The huge southern part is 40 m long, the width of the base is 23 m, and the maximum height is 5 m (from the bottom of ditch 6 m). The minor northern part is situated upon a slope. In front of the inner rampart is a ditch (4–5 m wide). The outer rampart is smaller than the inner rampart.
Hypothetical area: 0.1 ha.
The hillfort was discovered in 2003. It is situated upon a narrow promontory. The monumentality of the fortification is characteristic. In the area of the hillfort several hoards and isolated finds of the bronze industry of the Early Bronze Age were found.
Ref.: Chvojka/John 2009; Chvojka *et al.* 2015, 423–425 Figs. 2–4.

C6 Týn nad Vltavou–Sv. Anna (Fig. 10,3)
Geomorphology: promontory.
BA period(s): Br A2/B1–B1; Other period(s): –.
Excavations: (only surface-artefact survey and trial trenches).
ETRS89: B=49°13′38″; L=14°23′28″.
Fortification: The monumental stone rampart with a ditch.
Area: 0.6 ha.
The hillfort Svatá Anna near Týn nad Vltavou is located above the confluence of the Vltava and the Lužnice rivers, just opposite the important synchronous settlement Hosty. Pottery finds are dated to the end of the Early Bronze Age; thus, the fortification can be dated to that period, too, although with some caution.
Ref.: Chvojka *et al.* 2016.

Type D

D1 Milenovice-Skalka (Figs. 6; 9,3)
Geomorphology: promontory.
BA period(s): Br A2/B1, Ha A2–B1; Other period(s): Hallstatt period.
Excavations: 2000 (O. Chvojka), 2016 (D. Hlásek).
ETRS89: B=49°10′36″; L=14°13′21″.
Fortification: See above the section on Fortifications.
Area: 0.6 + ? ha.
The site was long considered a multi-period hilltop site, mostly of the Late Bronze Age. It has been significantly damaged by terracing in modern times. The excavation in 2016 confirmed that the conspicuous object, which was considered to be a border to fields, is in fact the ruins of the Late Bronze Age fortification, which was formed by the rest of the rampart and the filled ditch.
Ref.: Fröhlich/Chvojka 2001; unpublished.

D2 Voltýřov – Žíkov (Fig. 10,4)
Geomorphology: promontory.
BA period(s): Ha B; Other period(s): Early Middle Ages.
Excavations: 1943, 1947 (B. Dubský); 1983, 1985, 1989 (L Smejtek).
ETRS89: B=49°32′08″; L=14°10′47″.
Fortification: See above the section on Fortifications.
Area: 2.7 ha.
The hillfort Voltýřov is situated at the northern border of South Bohemia. The most important research was led by L. Smejtek in 1980s. He concentrated on an inner area of the hillfort and made two cross-sections through the rampart.
Ref.: Dubský 1949; Smejtek 2003a; 2003b.

D3 Vrcovice–Dolní Lipice (Figs. 4; 10,5)
Geomorphology: promontory.
BA period(s): Br B1; Other period(s): –.
Excavations: 1926 (B. Dubský), 1959 (L. Hájek), 1963–1966 (A. Beneš), 2013 (D. Hlásek).
ETRS89: B=49°20′16″; L=14°09′37″.
Fortification: see above the section on Fortifications.
Area: 0.4 ha.

The site is situated upon a small promontory. The most extensive research was conducted by A. Beneš. He studied the space adjacent to the inner fortification along its course and also excavated a section of the fortification. A small-scale research focused on obtaining environmental data, including samples for radiocarbon dating, was conducted in 2013. The site is unique, because it was a one-phase settlement at the beginning of the Middle Bronze Age. The well preserved fortification, reliably dated to the Middle Bronze Age, is one of two known in Bohemia.
Ref.: Dubský 1949; Beneš 1966; Hlásek *et al.* 2014a; 2015a.

D4 Všemyslice–Kozí vrch (Fig. 10,6)
Geomorphology: promontory.
BA period(s): Br B1; Other period(s): –.
Excavations: 1976 (J. Fröhlich), 1976 (A. Beneš), 1983 (L. Jiráň), 2014 (D. Hlásek).
ETRS89: B=49°14′11″; L=14°22′05″.
Fortification: see above the section on Fortifications.
Area: 0.3 ha.
Hillfort Všemyslice is the second one-period site which is contemporary with the hillfort Vrcovice. It is a two-part hillfort with a separate acropolis and an enclosure foreground.
Ref.: Fröhlich 1977; Jiráň 1985; Hlásek *et al.* 2014b; 2015b.

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Joanna Jędrysik and Marcin S. Przybyła

The Early Bronze Age Stone Fortifications of the Maszkowice Hillfort (Polish Carpathians). Product of an Adaptive Mind or *idée fixe*?

Among many prehistoric hillforts of the Western Carpathians the one located at Maszkowice village displays unique traits. The site was excavated in 1960s and 1970s, but it was not until 2015 that the new field project revealed remains of massive stone fortifications. The wall of the Zyndram's Hill is dated to the Early Bronze Age (18th century BC), being one of the earliest examples of defensive stone architecture in Europe outside Mediterranean. In our paper we shall discuss the development of the defensive system with its geographical and settlement context. Considering the results of fieldwork and other applied methods we can assume, that the enclosed settlement in Maszkowice functioned as an isolated point located in scarcely populated area. Therefore, we need to stress the landscape and geological circumstances which played a significant role in inner layout organization, social perception and the development of settlement and its fortifications. The stone wall was erected already at the beginning of the site's occupation. The defensive system existed then in its most elaborated form (with at least two gates leading into the village), while later during several dozen years the fortifications slowly but constantly deteriorated. Finally, in conclusion we shall consider the stone wall of Zyndram's Hill not as a product of local adaptation, but as a result of a prepared execution of a project.

Introduction

It is often so in archaeology that a single discovery is capable of raising quite a new set of questions. This is also the case of the Maszkowice hillfort. In 2015, while investigating the lowermost layers of the Bronze Age settlement, we came across relicts of massive stone fortifications. Although the preliminary results of these discoveries are already published,[1] each following month spent on excavations or studies on collected materials brings us new data, which significantly broaden our knowledge about this exceptional site. In our paper we will address one of the main questions concerning the stone fortifications of the Maszkowice hillfort: can they be considered as a product of native invention, adoption to the local geographical conditions, or rather should they be seen as an execution of a mature and finished "blueprint"? In order to collect our arguments, we discuss the environmental context of the site as well as the data concerning settlement history in the region. Further, we present an overview of how the Early Bronze Age settlement developed in terms of spatial organization and demography. The second part of the study will contain an up-to-date description of stone fortifications (after the excavations in 2016 and 2017), as well as remarks on their chronology.

Geographical context

The foundation of the Early Bronze Age enclosed settlement in Maszkowice relied upon optimal landscape, environmental and economic factors. The site is located in the central part of Polish Western Carpathians, in the microregion called the Łącko Basin (**Fig. 1a-b**). This 7.5 km^2 area was formed during the Quaternary as a result of the Dunajec River activity and fluvial erosion.[2] The southern border of the Łącko Basin was created due to the indentation of the river into the steep slopes of the Beskid Sądecki Mountains. In contrast, the northern part of the region is more accessible and consists of gently waved promontories extended on the foreground of the Beskid Wyspowy Mountains. Moreover nowadays, and most probably also in prehistory, alluvial deposits

1 Przybyła 2016.

2 Zuchiewicz 1999.

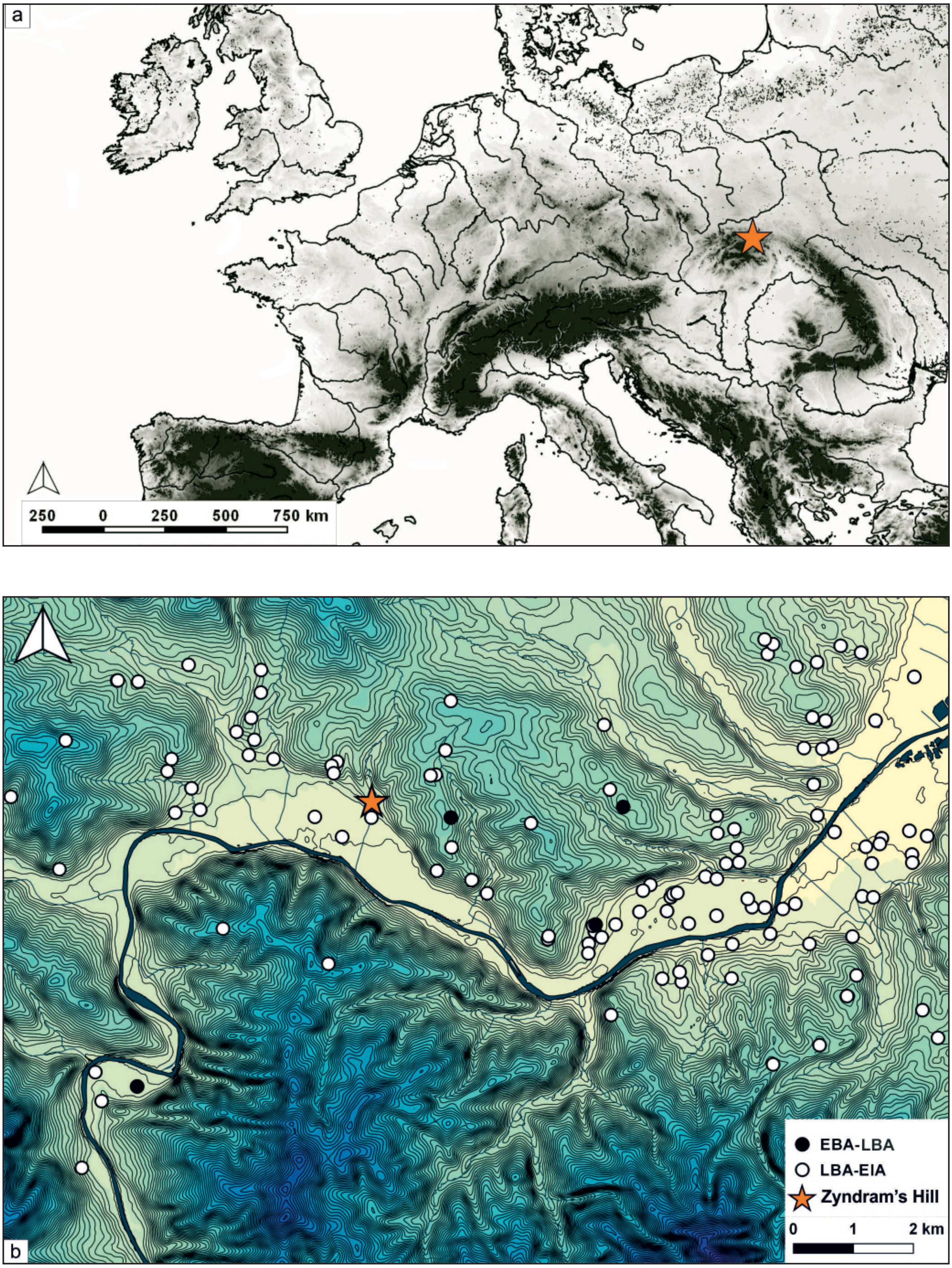

Fig. 1 Localisation of the hillfort on Zyndram's Hill in Maszkowice: **a** against the background of the Bronze and Early Iron Age settlement network within the upper Dunajec river valley; **b** location of sites (maps by J. Jędrysik)

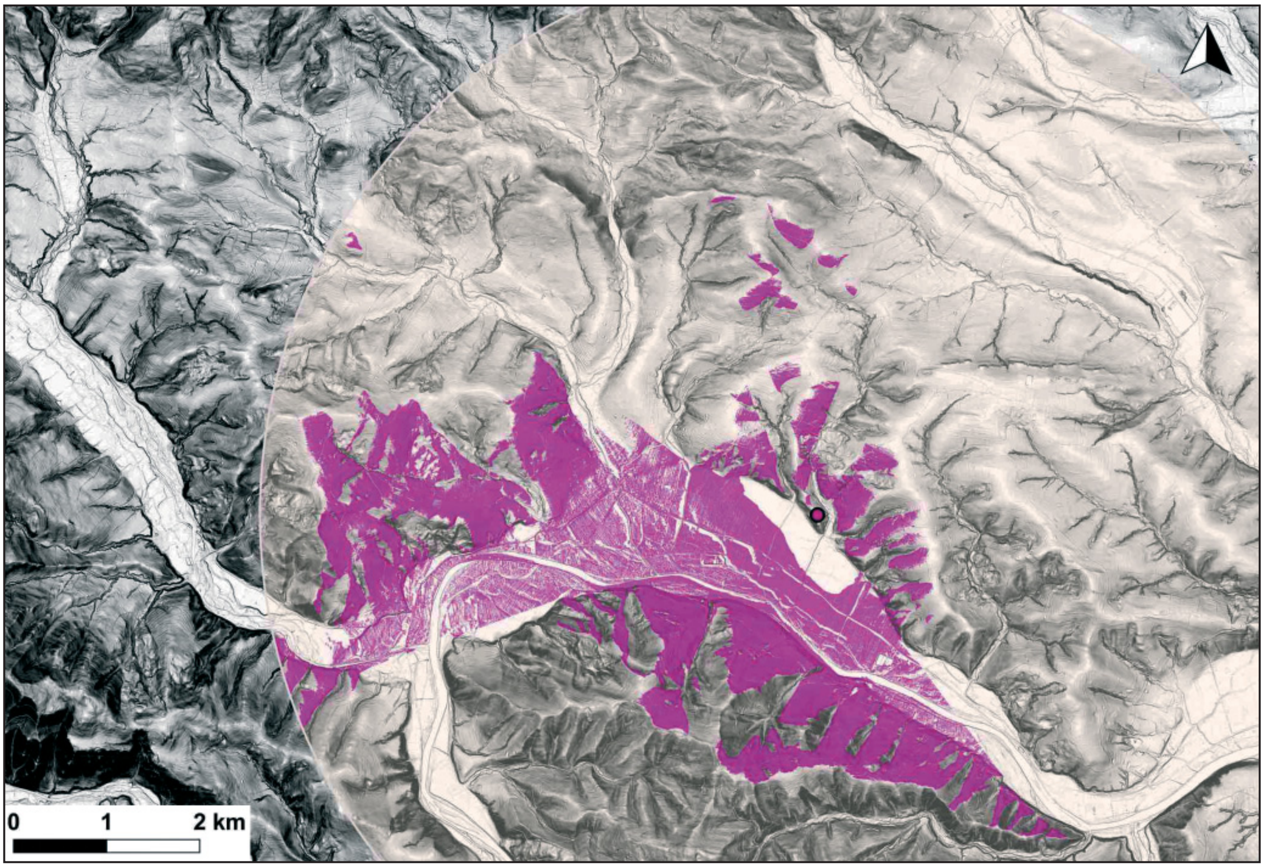

Fig. 2 Advanced viewshed analysis for the observation point located in the eastern part of the Maszkowice hillfort prepared in Quantum GIS, plug-in by Čučković 2016. Parameters: radius – 6 km, observation point – 1.6 m, receiver height – 0 m, atmospheric refraction – 0' (map by J. Jędrysik)

on the wide river terrace created favourable conditions for agricultural development. A detailed description of the archaeological site localisation and its economic consequences have already been discussed elsewhere.[3] Therefore, this paper will only concern the landscape and environmental circumstances of the erection of the stone fortifications.

The site is situated in the middle of the northern edge of the Łącko Basin and close to the widest part of the valley. The Bronze and Early Iron Age settlements were established at the tip of a small promontory called Zyndram's Hill, which rises about 410 m above sea level and 50 m directly above the Dunajec river terrace (**Fig. 1b**). The promontory is separated from the neighbouring areas by two streams flowing at the base of the hill and undercutting its steep slopes. Today this hilly region is densely covered by forest; however, the unique topography makes Zyndram's Hill a very good observation point. The viewshed analysis prepared in 6-km radius from the site shows the potential of visual control over the river valley's widening and the adjacent area (**Fig. 2**). The entire observation field of a person standing upon the highest point of the site amounts to about 15 km^2. Undoubtedly in terms of landscape conditions the localisation is attractive due to two main factors: the ability to supervise the main area of economic exploitation and the possibility to control the best communication route via the river valley. It is noteworthy, however, that mostly the area located to the south and west was clearly visible, while the interior of the Beskid Wyspowy Mountains and the easternmost part of the Łącko Basin were obscured.

Further the attention should be directed to geological aspects, which probably were of crucial importance for the manner of erection, localisation and survival of the Early Bronze Age stone fortifications. The structure of Zyndram's Hill reflects a sequence of deposits common in the region: sandstone as bedrock covered by Late Pleistocene loess sediments.[4] The essence of the matter is not only based on the proximity of building material

[3] Przybyła *et al.* 2012.

[4] Paul 1980.

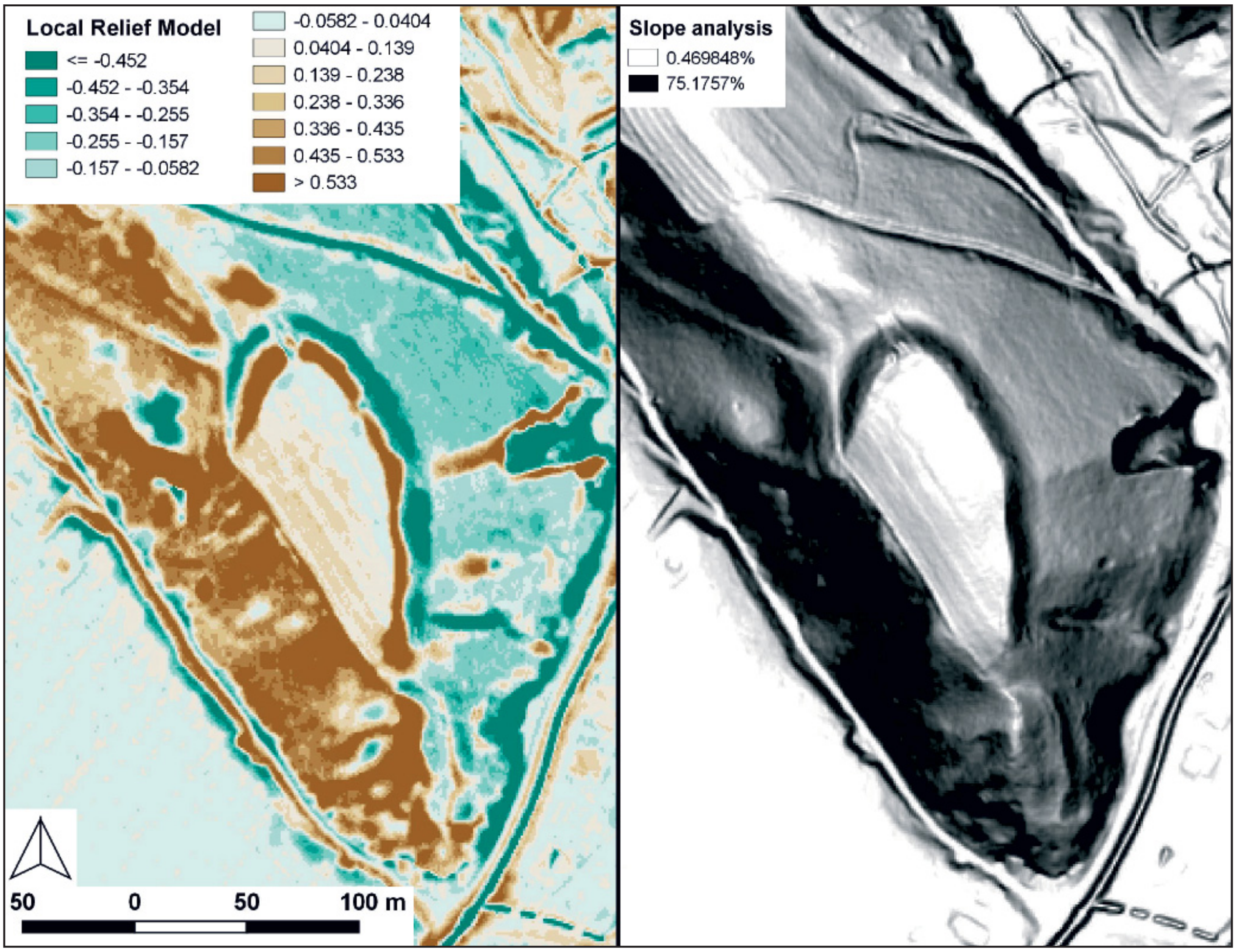

Fig. 3 Local relief model and slope analysis prepared in Quantum GIS which show detail of Zyndram's Hill's topography (steep western and southern slopes, eastern and northern terraces and plateau) (map by J. Jędrysik)

(sandstone), but also on consequences directly connected with the natural shape of the promontory. Conducted fieldwork has already unearthed the Early Bronze Age stone fortifications in a c. 50-meter long section, based on non-destructive techniques; we can estimate their total length for at least 200 m and locate them in the easily accessible northern and eastern parts of the site. The digital elevation model analysis (**Fig. 3**) and the electrical resistivity test results obtained for the entire perimeter of the site initially indicated the idea, which was later confirmed by geological reconnaissance. All obtained data show that the wall was founded not upon the bedrock, which would ensure the ground stability, but on top of thick loess sediments. This kind of substrate is susceptible to water erosion and was simply not the optimal basis for the heavy stone construction, wherefore maintaining the fortifications in good condition was probably not easy.

In the light of conducted fieldwork it can also be stated that the defensive system was not raised in the western and southern edges of the site. Not surprisingly a series of drillings and basic deposit modelling proved that the top of the bedrock in the southern part of the promontory occurs almost directly below the ground level (**Fig. 4**). The farther north and east the sandstone is covered by ever thicker loess deposits. Therefore, it is imaginable that the bedrock on Zyndram's Hill falls from the south-west to the north-east, while the highest point is located somewhere in the western or southern slopes. The clarified hypothesis is supported by field observation of the sandstone layering in one of modern quarries at the foot of the promontory. Hence, it appears that from the west and south the enclosed Early Bronze Age settlement was protected by a natural barrier in the form of steep slopes and possibly also rock faces.

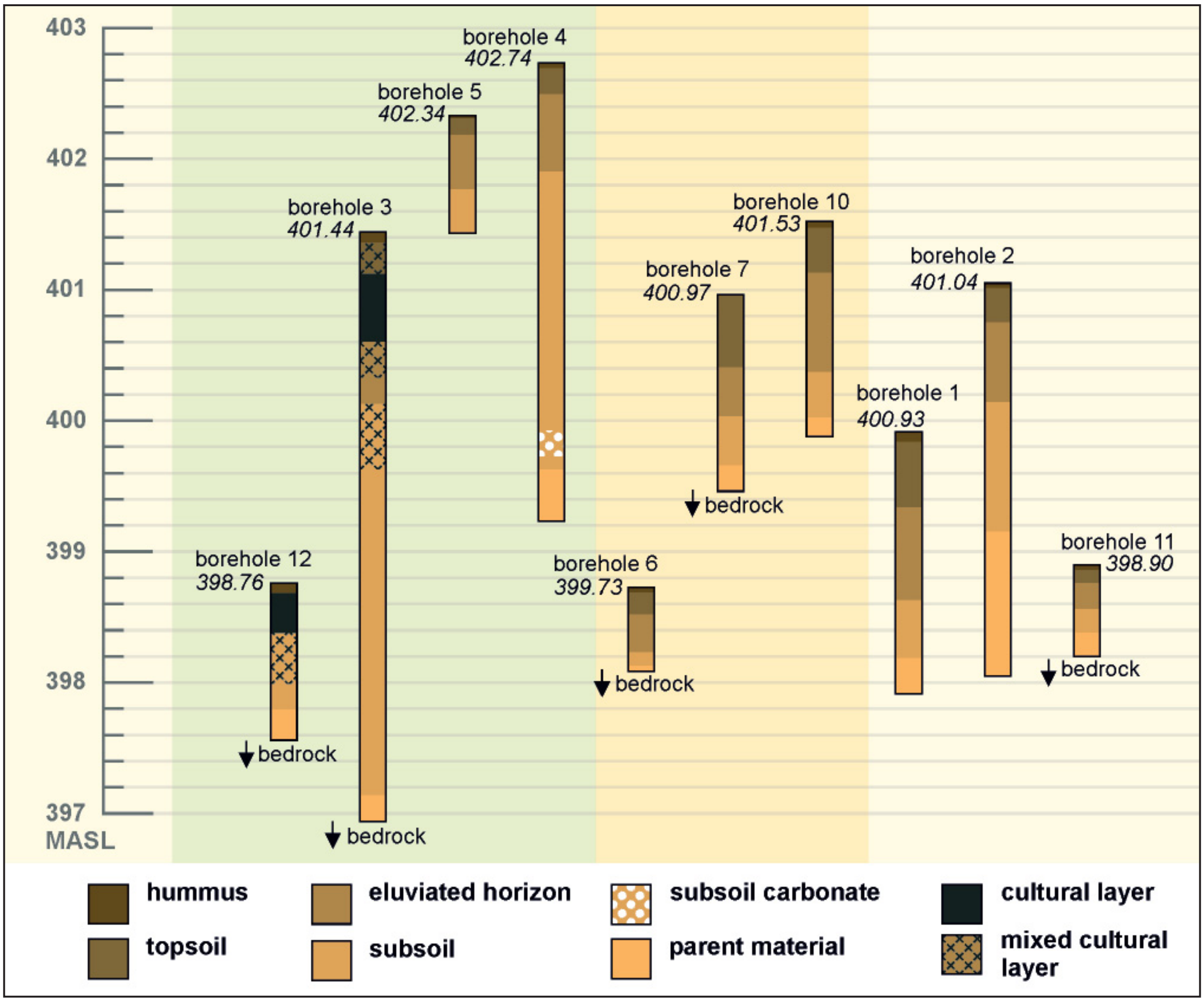

Fig. 4 Basic deposit modelling of boreholes obtained in a geological reconnaissance of the western edge of the Maszkowice hillfort (cp. Fig. 5) (illustration by J. Jędrysik)

Development of the Early Bronze Age settlement

According to palynological investigations in the area, there is a long gap in the settlement history of the Łącko Basin between the Early Neolithic and the Bronze Age.[5] This is also clearly visible in results of surveys conducted in the region since the end of 20th century BC. This research shows that the population which settled on Zyndram's Hill in the Early Bronze Age colonized an uninhabited area, which was covered by dense forest. Furthermore, except for single findings dated generally to the third and second millennia BC, there is no trace of other human activity in the region (**Fig. 1b**). Among them is the site no. 9 in Jazowsko, located on a promontory close to the eastern border of the Łącko Basin (3 km from Zyndram's Hill). It was the only possible place for stable settlement presence; surveys conducted there in 2003 delivered a few pieces of pottery and flint inventory dated to the Early Bronze Age. Unfortunately, drillings and geomagnetic survey taken recently in Jazowsko do not confirm the existence of a settlement or a cemetery in the area. In consequence of previous studies, it seems that the Early Bronze Age archaeological site in Maszkowice remains the sole, permanently inhabited point of this period in the Łącko Basin.

The situation significantly changed at the beginning of first millennium BC with the emergence of a rather dense settlement network in the upper Dunajec river valley. Through surveys and excavations, in the area of c. 168 km^2 all around the Łącko Basin archaeologists have recognized so far 108 settlement points and at least five permanently inhabited sites that are dated to the Late Bronze and Early Iron Age (**Fig. 1b**). Zyndram's Hill was

[5] Korzeń 2017.

reoccupied after a long hiatus, and its social context also had changed: once an isolated point, in this period it became one of numerous populated places in the region. Finally, here it should also be stressed that the contemporary appearance of this discussed archaeological site was formed to large extent already at the beginning of its occupation in the Early Bronze Age. This affected not only the form of later prehistoric settlement, but also the modern perception of the place and the choice of methods for its investigation.[6]

The excavations carried out on Zyndram's Hill since 2010 brought forth a plenitude of crucial information about the relative and absolute chronology of its occupation (**Fig. 5**). Thanks to precise excavation techniques such as 10-cm thick exploration levels or the three-dimensional locating of artefact positions, it was possible to investigate the complicated stratigraphy of the site. Analysis and interpretation of cultural layers, in some places as thick as two meters, are supported by ongoing laboratory studies on archaeological materials, soil micromorphology data, as well as botanical and faunal remains. At this point three main prehistoric occupational phases can be distinguished at Zyndram's Hill: the Early Bronze Age, the Late Bronze and Early Iron Age and the La Tène period. Traces of human activity in the Early Neolithic, Late Roman period, and late medieval and modern times were also recorded; however, these later artefacts are most likely connected with a temporary habitation.

It is difficult to trace any significant differences between subsequent building phases of Early Bronze Age settlement regarding pottery style. All decorated pieces belong to the classic and postclassic phases of the Otomani-Füzesabony culture, which means that the settlement was inhabited between the 18th and 16th centuries BC. This chronology is supported by a sequence of AMS datings, which point to a c. two-hundred-years long timespan between 1776 and 1509 BC (1 σ). In the course of field observations and studies on collected sources, the Early Bronze Age occupational period can be divided into three building phases. During the first of them – Maszkowice I – stone fortifications were erected (**Fig. 6**). According to radiocarbon datings of annual plants remains and charcoal obtained from destroyed occupational levels, phase I lasted approximately between 1750 and 1700 BC (1 σ). Interestingly, no features connected with daily activities were recorded in the excavated area, except for displaced cultural layers and fortifications (see below). Second building phase, designated Maszkowice II, is represented by the relics of three houses inhabited between 1700 and 1650 BC (1 σ). The buildings were situated in a row on the thick clay embankment – a kind of a building terrace that was erected along the north and east edges of the site to stabilize and to level the ground. The free-standing stone wall of the Maszkowice I phase became a retaining construction, which supported new living space. These stone and earthen works of first and second building phases caused the formation of so-called eastern terrace and plateau, which nowadays are one of integral elements of the Zyndram's Hill landscape. At last, on top of Early Bronze Age cultural layers excavations revealed floor levels belonging to three houses of the Maszkowice III phase. Buildings of the third phase were erected between 1650–1550 BC (1 σ) as slightly larger structures that copied the layout of earlier dwellings. Finally, two T-shaped storage pits (features 59 and 87) utilized in the second and third phase were also explored; they yielded considerable information about the chronology and subsistence strategies of the Zyndram's Hill population.

The majority of Early Bronze Age dwellings were explored, yet they were overlooked during the excavations of Maria Cabalska, conducted between 1959 and 1975 (**Fig. 5**).[7] Only the eastern parts of some structures were investigated during new excavations, and the documentation of the old fieldwork is very limited and imprecise in that respect. Nevertheless, it is possible to estimate the area of a single house as having been 35 to 50 m^2. According to studies concerning living space requirements in sedentary societies, it can be assumed that one person needed an average of 6.97 m^2 of area.[8] Therefore, one house on Zyndram's Hill might have been inhabited by a family unit of 5 to 7 persons. Observations based on the density of Early Bronze Age pottery in Cabalska's trenches, supported by an analogy with the inner layout of enclosed settlements of the Otomani-Füzesabony culture in Nižna Myšl'a,[9] Rozhanovce[10] and

[6] Przybyła/Jędrysik 2017.

[7] Przybyła 2016, 291–294.

[8] Porčić 2012.

[9] Gašaj 2002 Fig. 4.

[10] Gašaj 2002 Fig. 5.

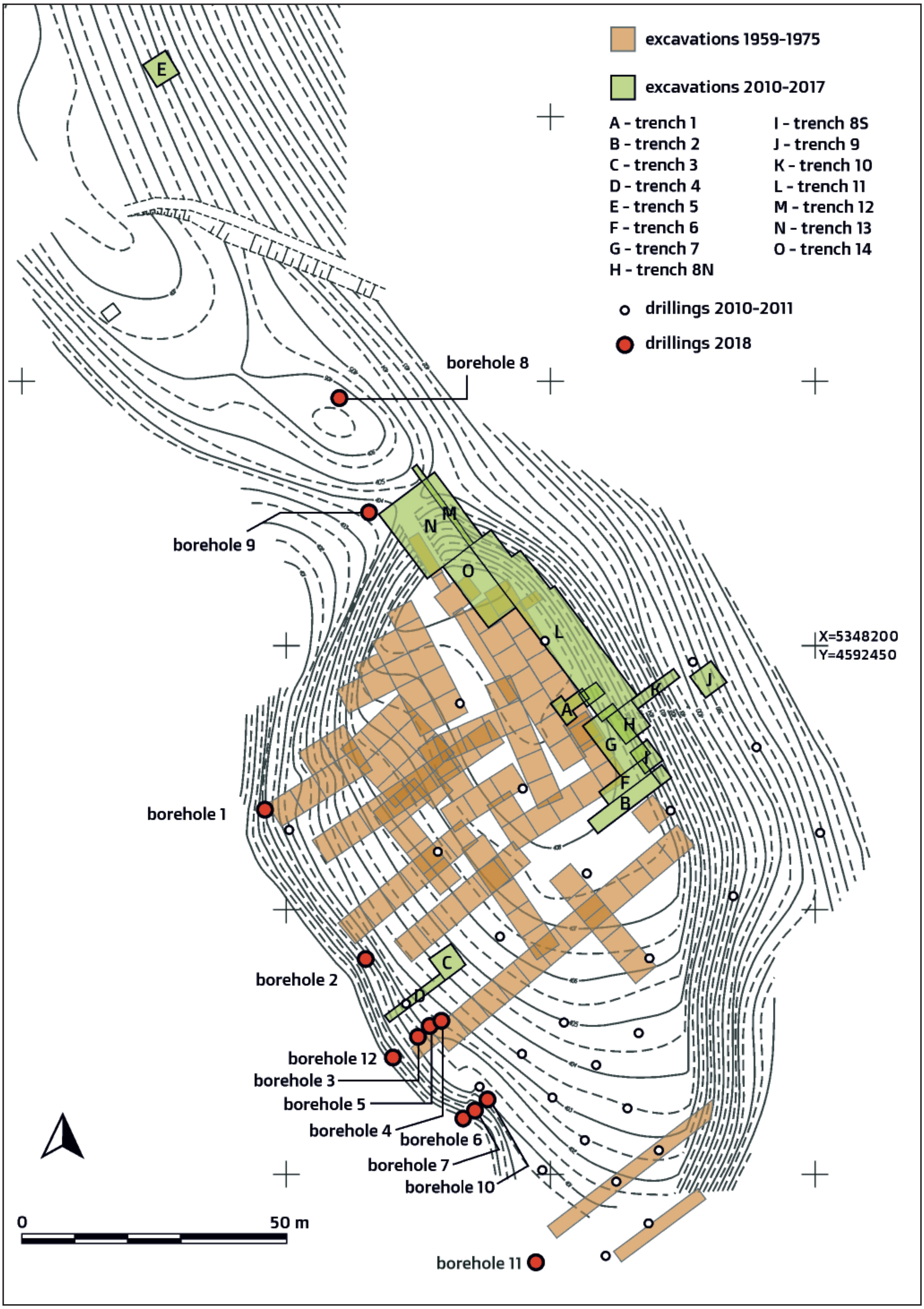

Fig. 5 Site plan with localisation of trenches and boreholes (illustration by J. Jędrysik)

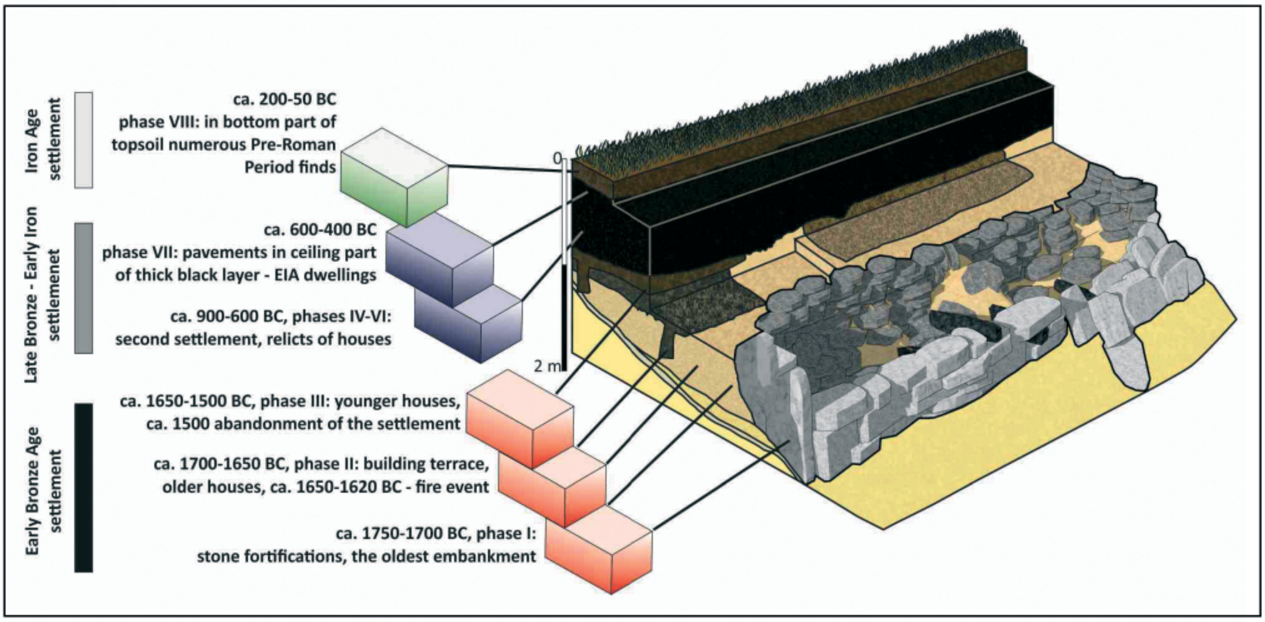

Fig. 6 Simplified chronological diagram of the hillfort on Zyndram's Hill (illustration by M. S. Przybyła)

Spišský Štvrtok (Slovakia),[11] led to the conclusion that the buildings on Zyndram's Hill were situated mostly along the eastern and northern edges of the plateau. In such a situation the minimal inhabited area was c. 1200 m² and possibly (taking into account the communication space between houses and details of spatial organization) 16–17 dwellings existed in each (second and third) building phase. Based on this simple estimation the population size in one of the Early Bronze Age phases could be evaluated at about 80 to 120 persons.

Obviously, it should also be taken into consideration that the calculations might be false, basically because the entire enclosed area could have been used for residential purposes. This kind of inner layout is known from other archaeological sites located on the northern periphery of the Otomani-Füzesabony culture, for example, the Košice-Barca settlement in Slovakia.[12] Moreover the test trench no. 5 excavated in the area in 2011 (**Fig. 5**) yielded several dozen pieces of pottery dated to the period and identified during the analysis. Therefore, the space outside of the fortifications on Zyndram's Hill could have been inhabited as well. Finally, assuming the entire area of about 5000 m² inside the fortifications was utilized, the population could have numbered more than 150 people in one of the building phases. Actually, the main problem in this study concerns the thus far unknown number, shape and construction of houses of the Maszkowice I phase; hence, the estimations about the population size of the stone-wall builders are impossible in that matter.

The stone wall

What we are dealing with in Maszkowice is a single line of a dry wall, approximately 200 m long, built of local sandstone in a cyclopean system (large boulders in the façade, smaller stones in the inner part of construction) and surrounding the main part of the Early Bronze Age settlement from north and east (**Fig. 7**). Currently it is rather impossible to establish precisely from where the building material was obtained. As was shown above, layers of sandstone are easily accessible just below the western and southern edge of plateau (at a depth of c. 0.5–2 m), as well as at the foot of the eastern slope of Zyndram's Hill. In both areas we can trace numerous smaller or larger depressions; however, at least some of them are connected with stone exploitation during medieval and modern times, which according to oral tradition was carried out until the early second half of the 20th century. Taking into account that to a certain extent the slopes of Zyndram's Hill have been transformed through natural processes (for example, one can notice traces of landslides on the western slope), it is impossible nowadays to distinguish between quarries of different ages.

[11] Gašaj 2002 Fig. 6; Oravkinová *et al.* 2017 Pl. 7.
[12] Šteiner 2009 Pl. 14.

Fig. 7 Zyndram's Hill in Maszkowice, view from the west. Graphic reconstruction: the range of the stone wall is marked according to the results of geophysical survey (illustration by M. S. Przybyła)

Nevertheless, it is highly probable that some of them were in use both in the Bronze Age and in modern times. It seems that the amount of stone needed to build the wall had to be immense (more than 1000 tons – see below). Therefore, it is possible that sandstone exploitation was carried out in an opportunistic way: meaning that the building material was probably taken from shallow layers of bedrock located in different places close to the currently built segment of fortifications.

The main problem we had to face when starting to reveal remains of the fortifications in 2015 was how to distinguish the original structure from rubble. Initially we explored courses of stones horizontally, so the result was set of drawings which allowed a virtual reconstruction of how the wall was preserved. From 2016 onwards we investigated c. 50 m-long segment of fortifications using a new methodology. Namely, layer after layer we removed stones that lay on the slope or for other reasons were supposed to be dislocated. All of the stones received an identification number and are documented *in situ* using photogrammetry. After being removed from a trench they come under closer scrutiny, because sometimes material amongst the rubble bears traces of working. The final result of this procedure is shown in the picture of the part of wall that was excavated completely in 2017 (**Fig. 8**).

The stone construction consists of three main elements. The first element is a line of outer facing. It is built of large, evenly matched boulders, some of them dressed to a regular form. Due to strong erosion it is difficult to estimate the original size and shape of majority of the stones. Better preserved blocks usually measure c. 1 × 0.5 × 0.25 m and weigh 250–350 kg, although some of them are even larger. This gives us an impression of how massive the construction originally was. The interior of wall, about 1–1.3 m wide, was constructed of randomly selected stones, probably originally supplemented with clay. Finally, one row of regularly set sandstone blocks constitutes the inner face. The stones revealed within the fill as well as the inner face are significantly smaller than those constituting the façade and weigh no more than c. 50 kg. In total the wall is usually 2 m wide.

Fig. 8 Segment of the wall completely revealed in July 2017: **1** line of the outer face; **2** inner part of the wall; **3** stone pathway; **4** short cross-wall; **5** test trench from 1961; **6** clay embankment from the second building phase (illustration by M. S. Przybyła)

There should also have been a few entry ways through the fortifications. During the excavations in 2015–2017 we succeeded in revealing two entrances: a small postern gate within the eastern segment of the wall, approximately in the middle part of it, and relics of a large gate complex located about 50 m farther north. The postern gate discovered in 2015 is located in an offset part of fortification line (where part of the outer face of wall south of the gate is receded about one meter) and survived until today in a very good state (**Fig. 9**). Its corridor, about 3 m long and 1.4 m wide, was flanked by six vertically set stone slabs. The majority of them are partly eroded and fragmented; however, the best preserved slab still measures 1.9 m, allowing us to assume that originally the passage was about 2 m high. Taking into account the number of fragmented slabs discovered directly upon the use level of the postern gate, it can be assumed that its corridor was covered – at least partially – by a kind of transom.

Contrary to the postern gate, remains of the northern gate discovered in 2017 are poorly preserved. In some parts only one layer of stones had remained *in situ*, whereas due to modern sandstone exploitation (see below) other relicts of the Bronze Age construction did not survive at all. Nevertheless, due to our careful methodology described above, we are able to propose a reliable reconstruction of the original layout of the lowermost parts of the northern gate (**Fig. 10**). Taking into account factors such as the terrain relief, the size of the stones and the character of the accompanying sediments, we could distinguish stone blocks which still remained in their original position amongst the surrounding rubble. Thus, it seems that the northern gate consisted of two massive, transversal and slightly curved walls, with a c. 2 m-wide passage between them, which had to end probably somewhere north of the excavated area. As a whole this large defensive complex (encompassing an area of more than 120 m^2) might resemble what in the history of ancient and medieval architecture is called a 'chamber gate'.

A pathway made of stone slabs may be considered as an architectural element that is unambiguously connected with the northern gate complex. It originally led from the gate entrance (this part did not survive) directly along the inner face of wall. In the best preserved parts it is about 1.5 m wide and consists of one layer of evenly matched, flat stones placed upon a thin layer of clay or di-

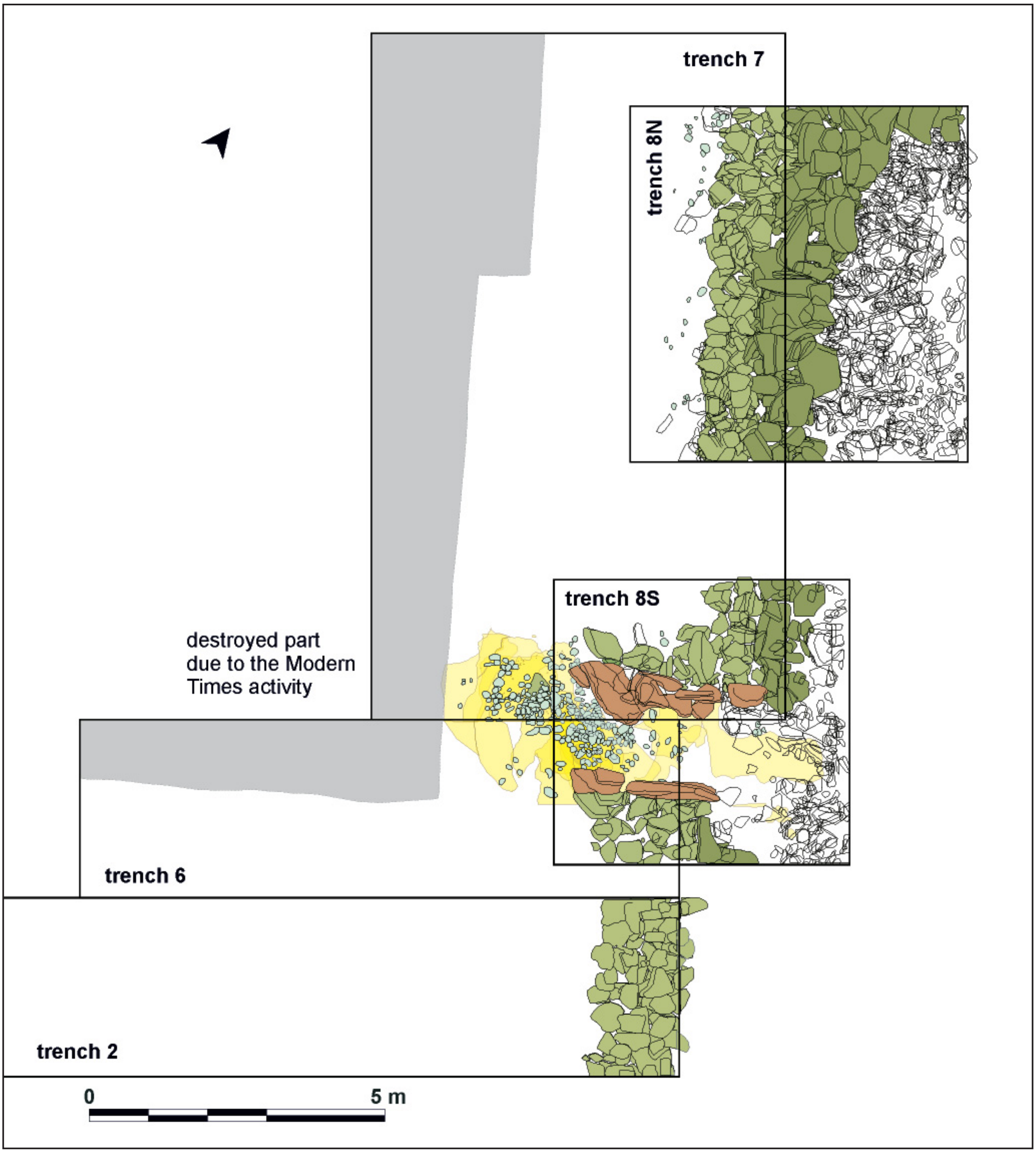

Fig. 9 Stone fortifications in the southern part of the excavated area (trenches 2. 8; cp. Fig. 5). The postern gate is located within an off-set of the wall (blue – pebbles connected with construction or gate occupational level; yellow – postern gate's occupational level; brown – postern gate's slabs; light green – inner part of the wall; dark green – outer face) (illustration by J. Jędrysik)

rectly upon the original ground surface. Its southern extremity is limited by a short cross-wall. Within this structure fragments of a large stone block survived which bears traces of working. The stone in question has two narrow dowel holes on both flat sides and a partially preserved socket (**Fig. 11**). It is noteworthy that another socketed stone was also found in that area. One may quote as possible analogies similar worked stones in Mediterranean architecture. They are assumed to be elements of entrances or more generally parts of combined stone-wooden-clay constructions.[13]

The state of preservation of the stone wall in Maszkowice is varied. In the southernmost trenches, approximately in the middle of the eastern terrace, about four courses of stones of outer face have

[13] E.g. Küpper 1996, 69–94.

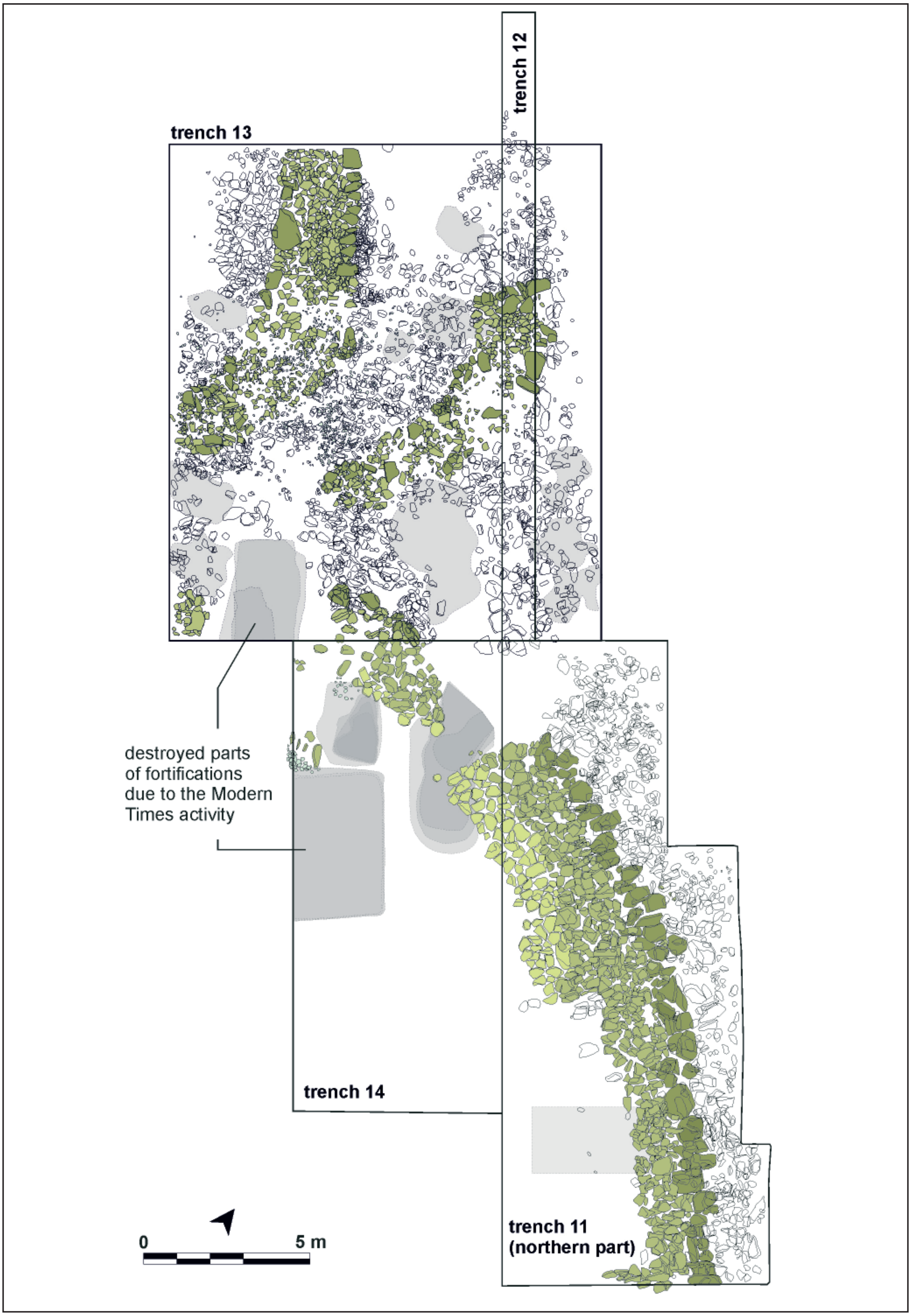

Fig. 10 Remains of the northern gate complex and neighbouring parts of the wall (trenches 11–14; cp. Fig. 5) (yellow-green – pathway; light green – inner part of the wall; dark green – outer face) (illustration by J. Jędrysik)

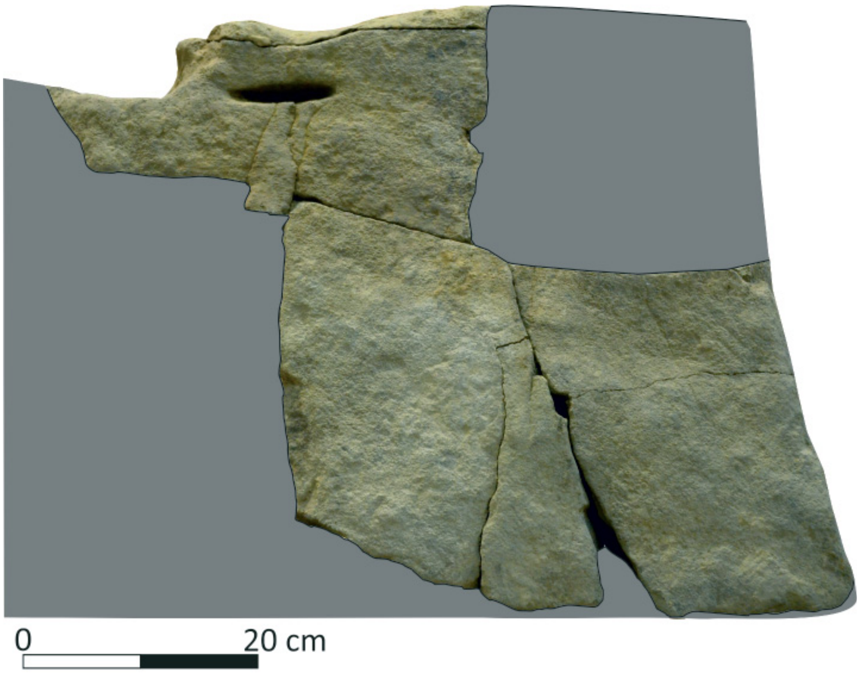

Fig. 11 Fragments of worked stone discovered within the short cross-wall, located in the southern part of the pathway. Probably an element of combined stone-wood construction (illustration by M. S. Przybyła)

survived untouched, whilst the inner part of the wall is preserved up to 1.5 m in height (**Fig. 12**). At the same time in the north-eastern segment of construction its height amounts at present to no more than c. 0.5 m. Moreover, the whole area of the northern gate has suffered significantly from the modern-day exploitation of worked stone as building material. During the excavations in 2017 we revealed a few irregular trenches, filled with dark earth, fine-grained stone rubble and pottery of the early modern period. This material turned out to cut the wall precisely to the level of the lowermost courses of stones and did not leave any traces of the original construction. This observation is in agreement with oral tradition and historical records that refer to ruins of a castle in Maszkowice, which was believed to be of medieval origin and was completely dismantled in the late 18th century AD for building purposes.[14]

Despite the fact that state of preservation of the wall is varied, we may attempt to estimate its original height. The method usually applied in this respect consists in assessing the size of rubble lying below the surviving relicts of stone construction.[15] However, one should keep in mind that the magnitude reckoned in this way is always slightly underestimated, since a certain share of stones might have slid far away downhill (outside of the excavated area) or have been removed during later phases of settlement occupation.

The northern section of a trench from 2015, which "descends" down to the base of the eastern terrace, documents some levels of rubble, probably connected with different stages of the long process of the wall's deterioration (**Fig. 13**). Amounts of larger stone blocks (significantly heavier than 50 kg), which must have originated from the outer face, allow us to estimate that it had originally measured at least 2.8 m. Because during the second phase of the Early Bronze Age site's occupation the stone construction started to function as a retaining wall (see below), its inner part is expected to match the maximal height of the adjacent clay embankment, that is c. 2 m. Summing up, it is highly probable that the fortifications of the settlement were as high as 3 m, yet we cannot exclude that they reached one or two meters more. However, the thickness of the wall (only 2 m) is an important limitation here. Taking into account the mean size of the stones as well as the probable height of the construction, we are able to estimate its weight as well.[16] The average stone block (c. 100 × 50 × 25 cm) forming the façade may weigh c. 250–350 kg, whilst one layer

[14] Orłowicz 1919; Duda 2012.
[15] E.g. Karoušková-Soper 1983, 176–178; Shennan 1995, 74.
[16] Aqua-Calc 2018.

Fig. 12 Particularly well preserved segment of the inner part of the wall (trench 8N); excavations in 2015 (photo by M. S. Przybyła)

of smaller stones from interior of the wall can weigh two times more. This implies a total weight of 5–6 tons per one meter of the wall and more than 1000 tons for the whole construction.

Rise and fall of the fortifications

There is no doubt that the fortifications were erected during the oldest phase of the settlement, at the very beginning of the site's occupation. A stone construction usually cannot be dated by itself, unless a formal analogy is used. Therefore, it is necessary to find places where it is possible to establish its stratigraphic relation to a sequence of precisely dated occupational layers. Currently we are able to identify two such situations.

The postern gate provides the first of them. It has two subsequent occupational layers, up to 10 cm thick, deposited between the slabs forming the corridor and on an inner approach to the gate. Both layers yielded a certain amount of artefacts, which may have a value as chronological indicators (**Fig. 14**). All decorated pieces of pottery belong to the classical phase of the Otomani-Füzesabony culture. Especially interesting among them is the small fragment of a bowl, which originally carried spiral decoration (**Fig. 14,18**). It is a type of pottery that frequently occurred in the Tisza river region in the 18th–17th centuries BC.[17] Pottery of the same relative chronology (classical phase of the Otomani-Füzesabony culture) was found within a floor layer, which partially covers the occupational level of the postern gate.[18] This stratigraphically younger dwelling belongs to the second building phase of the Early Bronze Age settlement. In this stage postern gate was apparently no longer in use. After the new house virtually closed its inner entrance, the passage between the sandstone slabs was densely filled with clay mixed with debris of burnt constructions and rubbish.

The stratigraphic relation between the postern gate and one of the houses of the Maszkowice II phase is interesting twofold. It gives us a hint that

[17] Motive I of the *Buckelstil* after Thomas 2008, 277–279.
[18] Przybyła 2016 Figs. 8–9.

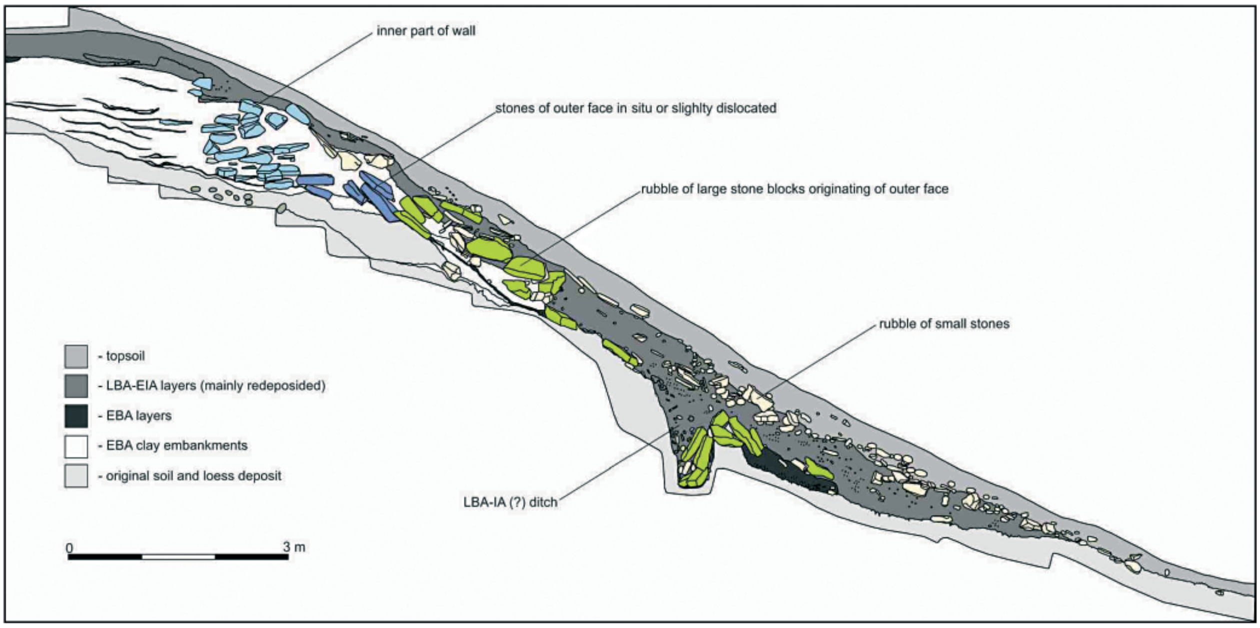

Fig. 13 Northern section of trenches 8N and 10 from 2014–2015 (illustration by M. S. Przybyła)

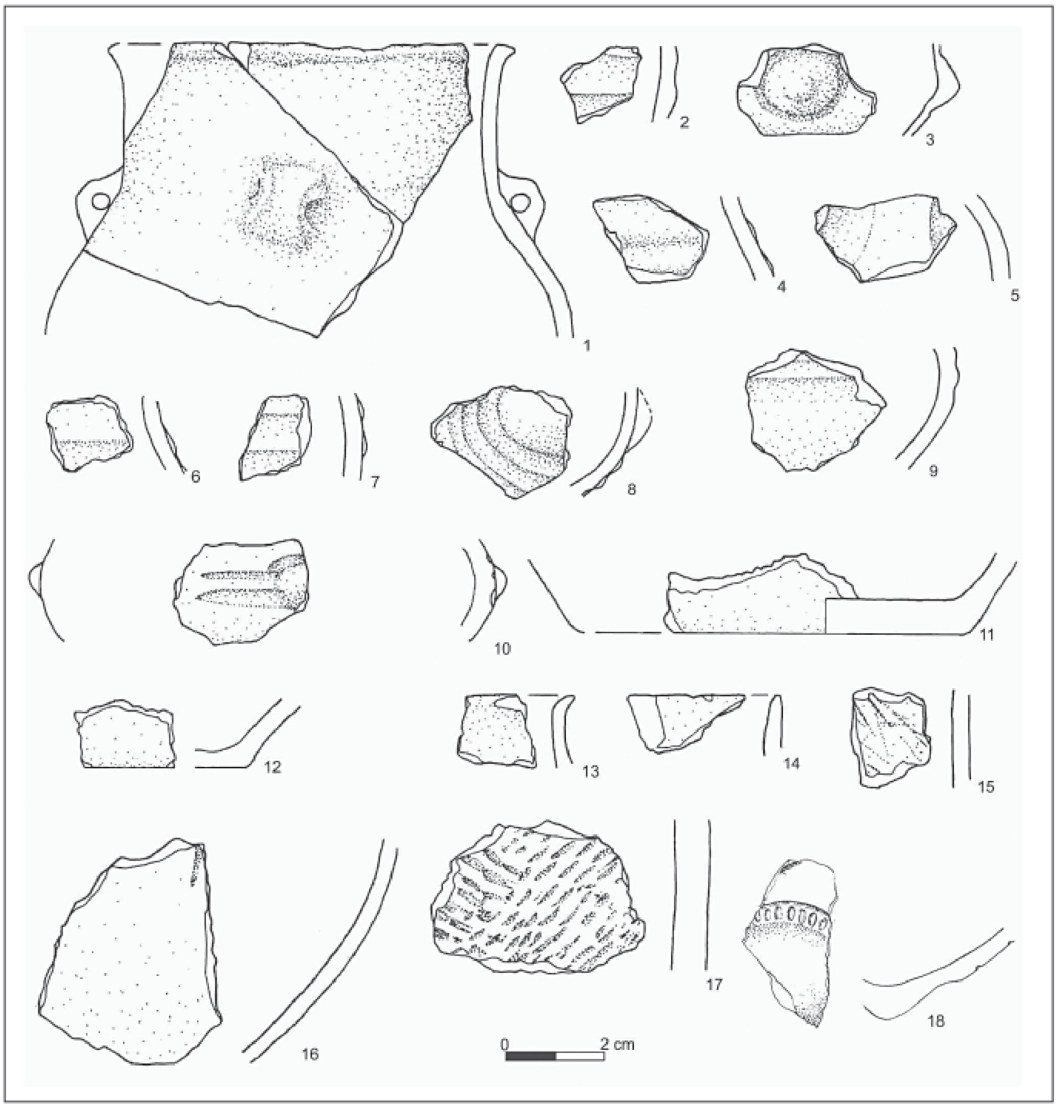

Fig. 14 Selection of pottery fragments from the postern gate occupational layer (drawings by E. Rydzewska)

Fig. 15 Stratigraphic relations observed during the excavations in 2017 (trench 11). The stone pathway from the oldest phase of fortifications is covered by the clay embankment, which in turn is the base for one of the houses of the second phase of the Early Bronze Age settlement (illustration by M. S. Przybyła)

the wall was made and existed in the earliest phase of the Early Bronze Age settlement, and that to some extent the project was abandoned already in the second building phase (the former postern gate was used as a trash deposit). It also shows us that the time, during which stone fortifications were used according to the original "blueprint", must have been rather short. As already mentioned, the pottery found in the gate corridor layers and stratigraphically younger house represents the same phase of relative chronology. Moreover, two radiocarbon dates obtained from occupational levels of the postern gate (1776–1692 BC, 1 σ; 1751–1644 BC, 1 σ) partly overlap dates from the neighbouring house (1716–1695 BC, 1 σ; 1690–1520 BC, 1 σ). Thus, it seems that the stone fortifications were erected in the late 18th century BC, but already in the early 17th century BC were radically altered to meet new needs.

The second situation in which the stratigraphic relation between the wall and the inner part of settlement is clearly visible tells us the same story. Starting already in the excavations of 2015 we were aware that the stone construction and the thick clay embankment, constituting the basis for the Early Bronze Age houses, are functionally related. Since the embankment leans against the relics of the stone wall, either both structures were contemporary or the embankment was slightly later. We have preferred rather the first possibility, as the simpler one – the wall was designed as a retaining construction and erected simultaneously with the adjacent building terrace.[19] It was not until the excavations in 2017 that our opinion was changed (**Fig. 15**). Namely, the above mentioned pathway made of stone slabs, which functionally belongs to the northern gate complex, was discovered under a 1.5-m thick layer of clay embankment.

19 Przybyła 2016, 294 Fig. 11.

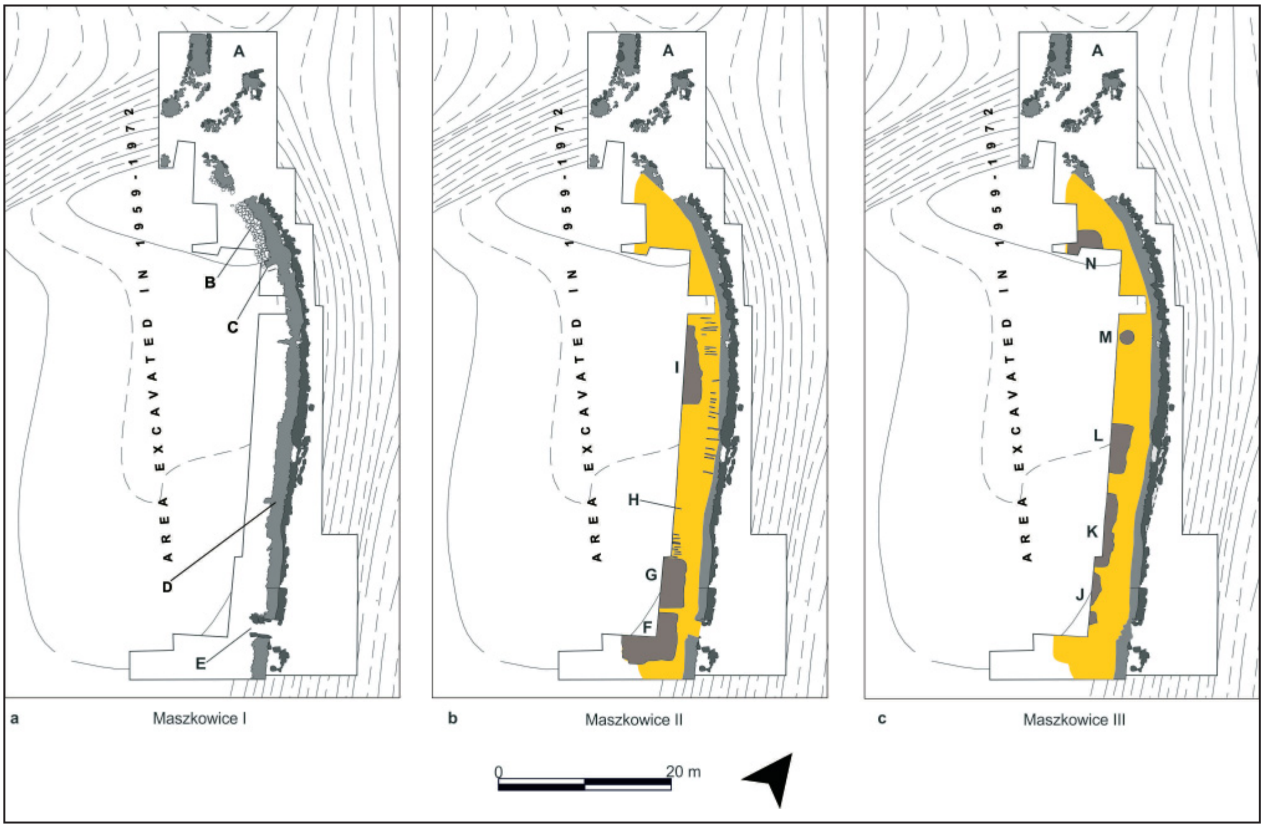

Fig. 16 Generalized plan of the settlement in phases Maszkowice I-III (a-c): **A** northern gate; **B** pathway; **C** short cross-wall; **D** partly excavated segment of wall (state in spring 2018); **E** eastern (postern) gate; **F** house I; **G** house II; **H** clay embankment; **I** house V; **J** upper part of the fill of large storage pit; **K** house III; **L** house IV; **M** storage pit; **N** house VII (illustration by M. S. Przybyła)

Directly upon the latter, relics of the house floor were revealed, which in view of the material obtained (pottery of the classical phase of Otomani-Füzesabony culture) and the results of radiocarbon dating can be attributed to the third building phase. Again, the described situation can prove that in the oldest stage of the site's occupation the fortification existed as a free-standing wall and not as a retaining construction. It was not until the second building phase that the clay terrace was erected, covering some elements of the original design, among others, the pathway leading to the northern gate.

We already know quite a lot about the north-eastern part of the Early Bronze Age settlement. All of the collected data show that the stone fortifications were designed and built at the very beginning of settlement activity and right away in their most mature and elaborated form. In this earliest stage, dated more or less to the late 18th century BC, the settlement was fortified by a free-standing wall (**Fig. 16a**). Both (unearthed) gates were in use then – the smaller, finely built eastern entrance (postern gate) and the monumental northern gate complex, with a carefully made stone pathway leading to the entrance. In view of the lack of traces of dwellings in the investigated edge area of the site, one may suppose that the oldest households were located closer to the former summit of the hill.

In the second phase, probably in the early 17th century BC, the original project was reconsidered. The free-standing wall was converted then into a retaining construction, which was expected to hold a massive clay terrace (**Fig. 16b**). On the surface of the latter a row of densely arranged houses were erected. Some elements of the original "blueprint" were abandoned. The stone path in the northern gate area was covered by the embankment, whilst the slabs that flanked the eastern entrance were (at least partialy intentionally) broken and the passage became filled with rubbish.

Finally, in the Maszkowice III phase, dated roughly to the late 17th and 16th century BC, the stone fortifications started to crumble. A radiocarbon date, obtained from a very thin layer located directly beneath one of dislocated boulders of the façade, points to the second half of 17th century BC (1693–1621 BC, 1 σ) as the time when the stone wall collapsed. There are some traces of repairs from this period too (**Fig. 16c**). One of them is a short segment of an irregular stone rampart located in the place of the former postern gate. This structure was made of secondary used stone blocks and compared to the original wall gives a strong impression of amateur work.

Conclusions

Studies on the settlement history in the region lead us to the assumption, that the settlement on Zyndram's Hill was established by a group of foreigners, unfamiliar with the local geographical conditions. We do not have any evidence that the community in question was populous. On the contrary, the arguments that we have collected, based on studies on the spatial organization of the hillfort in Maszkowice as well as on the recognition of the settlement situation in the region, suggest that here we are dealing with a small and isolated (on a meso-regional scale) population. Nevertheless, we are faced with the fact that this very population made huge efforts to surround their village with massive fortifications built of stone.

Its seems that the question raised in the introductory part of this paper, namely whether the stone wall on Zyndram's Hill can be considered as a product of local adaptation, should be answered negatively. Two sets of observations support this view. Firstly, the construction in question was not completely appropriate for the local geographical conditions. One can assume that the natural environment, which is favourable for the development of early stone architecture, provided two encouraging features: easy access to building material and the presence of stable ground under a heavy stone construction. The first condition may be considered as fulfilled in our case. Sandstone is as simple in procuring and working as limestone (preferred as a building material in the Bronze Age architecture of the Adriatic region and the Mediterranean), and sources of this rock are easily accessible to the site.

A much larger problem for the builders of the wall in Maszkowice was posed by ground stability. Whereas, for example, so called *castellieri* in north-eastern Italy and Istria were usually erected directly upon the bedrock,[20] in our case the wall was built in an area in which loess sediments are several meters thick. Concentrations of pebbles, which lay directly under the stone construction and probably were expected to strengthen its base, may suggest that the Early Bronze Age architects were aware of potential danger. On the other hand, there is evidence that the wall started to crumble within a few generations' time after it was erected.

The second argument refers to way in which architecture evolves. Assuming that we are dealing here with a local adaptation, we should expect a gradual development of a fortification system, starting from an open village of the first settlers, later surrounded by a temporary enclosure, and finally fortified in more complex way. Indeed, the archaeology of strongholds often reveals this very scenario. However, this is not the case of the Maszkowice hillfort. Here stone fortifications emerged out of nowhere and right away in a most complicated and sophisticated form. There is only one trend that is clearly visible in a diachronic perspective: namely a gradual deterioration of the wall. It was built with flourish, and yet few generations later finished as a ruin, a history that simply does not match the adaptation model.

What then was the stone wall on Zydnram's Hill? Was it built solely for fulfilling defensive needs? If so, why was it not made of earth and wood in a way preferred in this part of Europe until the Middle Ages? We think that the stone construction in Maszkowice may be considered as an *idée fixe* – the design which was embodied to some extent against reality by a group of people, who did it accordingly to their knowledge and precise concept of how their *ideal* village should look like. It may be seen also as a costly signal of how potent, important and well connected the people hidden behind it were. To whom was the stone construction addressed? Lack of fortifications on edges of the steep western and southern slopes of the hill suggests that while inhabitants of the Maszkowice hillfort were interested in the visual control of the Dunajec river valley (the main communication route in this part of Carpathians), they did not want to be seen from a far distance. The fortifications were not supposed to be visible to the random traveller. They were designed rather in order to impress the selected guests who knew how to access the stronghold.

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20 Karoušková-Soper 1983, 79-83; Mihovilić 2014, 39; Hänsel *et al.* 2015, 61-67. 75-80.

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Victor Sava, Florin Gogâltan and Rüdiger Krause

First Steps in the Dating of the Bronze Age Mega-Fort in Sântana-Cetatea Veche (Southwestern Romania)

Despite the fact that the fortification in Sântana-Cetatea Veche has been known since the 18th century and various local scholars have taken a direct interest in the site, the first excavations only started much later. The fortification was correctly attributed to the Bronze Age only in the second half of the 20th century. Until then, those interested in the issue of the great fortifications in Banat believed that the ramparts had been constructed during the Avar Period. New research on the fortification in Sântana was initiated in 2008. The northern side of the third fortification system was tested in 2009, and its construction system was documented on that occasion. The fortification system in question consisted of an earthen rampart, a wall made of wood and clay built upon the crest of the rampart, and a defense ditch. At the same time we noted that the erection of the earthen rampart had disturbed a cemetery in use in that area. The present article focuses on the dating of the third system of fortification excavated in 2009 and on the presentation of the contexts from which radiocarbon data have been collected. The results indicate that the cemetery disturbed by the construction of the fortification was used at the end of the 15th century BC and that the fortification was certainly in use during the 14th century BC.

Introduction

Ever since the 19th century there has been interest in the Bronze Age fortifications in the area of the Lower Mureş: intellectuals such as Gábor Fábián and Sándor Márki for example, passionate about local history, included in their works brief descriptions of certain "great and old earthen ramparts".[1] Even though the first archaeological excavations were performed much later, fortifications such as those in Corneşti-Iarcuri and Sântana-Cetatea Veche were interpreted as rings of the Avar era.[2] Although the discovery of 11 golden items inside Cetatea Veche in Sântana in 1888 generated an increased interest in this archaeological objective,[3] no scientific initiative was actually taken in research on this fortification until the second half of the 20th century.

Once Egon Dörner was employed as an archaeologist at the Museum in Arad, numerous field research projects of the most important sites in the Lower Mureş were initiated.[4] Through his friendship with Mircea Rusu and the latter's interest in the Bronze Age, a series of field surveys and small test excavations were performed inside the site of Sântana-Cetatea Veche. The research of these two archaeologists, later accompanied by Ivan Ordentlich, reached a peak in 1963 with an archaeological campaign that focused both on the fortification systems of enclosures I and III as well as on the inner surface of enclosure I. Starting with that year, the fortification under discussion, like the one in Corneşti (Jadani), was attributed to a so-called Hallstatt A1 period.[5] It was presumably erected by carriers of the Sântana-Lăpuş-Pecica or Sântana-Lăpuş-Gáva culture, who were also responsible for the burial of Cincu-Suseni-type deposits in the 12th century BC.[6]

1 Fábián 1835, 91; Parecz 1871, 8. 19; Miletz 1876, 166-167; Márki 1882, 112-121; 1884, 185-194.
2 Péch 1877; Márki 1882.
3 Márki 1892, 39-40; Dörner 1960. For the entire discussion about and bibliography for this hoard, cf. Gogâltan *et al.* 2013, 24-25. 28-29.
4 Gogâltan/Sava 2010, 20-22; Bader 2015.
5 This periodization is based on that suggested by H. Müller-Karpe for the southern part of Central Europe (Müller-Karpe 1959).
6 Rusu 1963, 188-189. – K. Horedt (1967b, 21) has rightfully criticized the term "Sântana-Lăpuş-Pecica culture", since it is too comprehensive and encompasses diverse groups under the same heading" ("*da sie zu umfassend ist und verschiedene Gruppen unter dem gleichen Begriff vereinigt*").

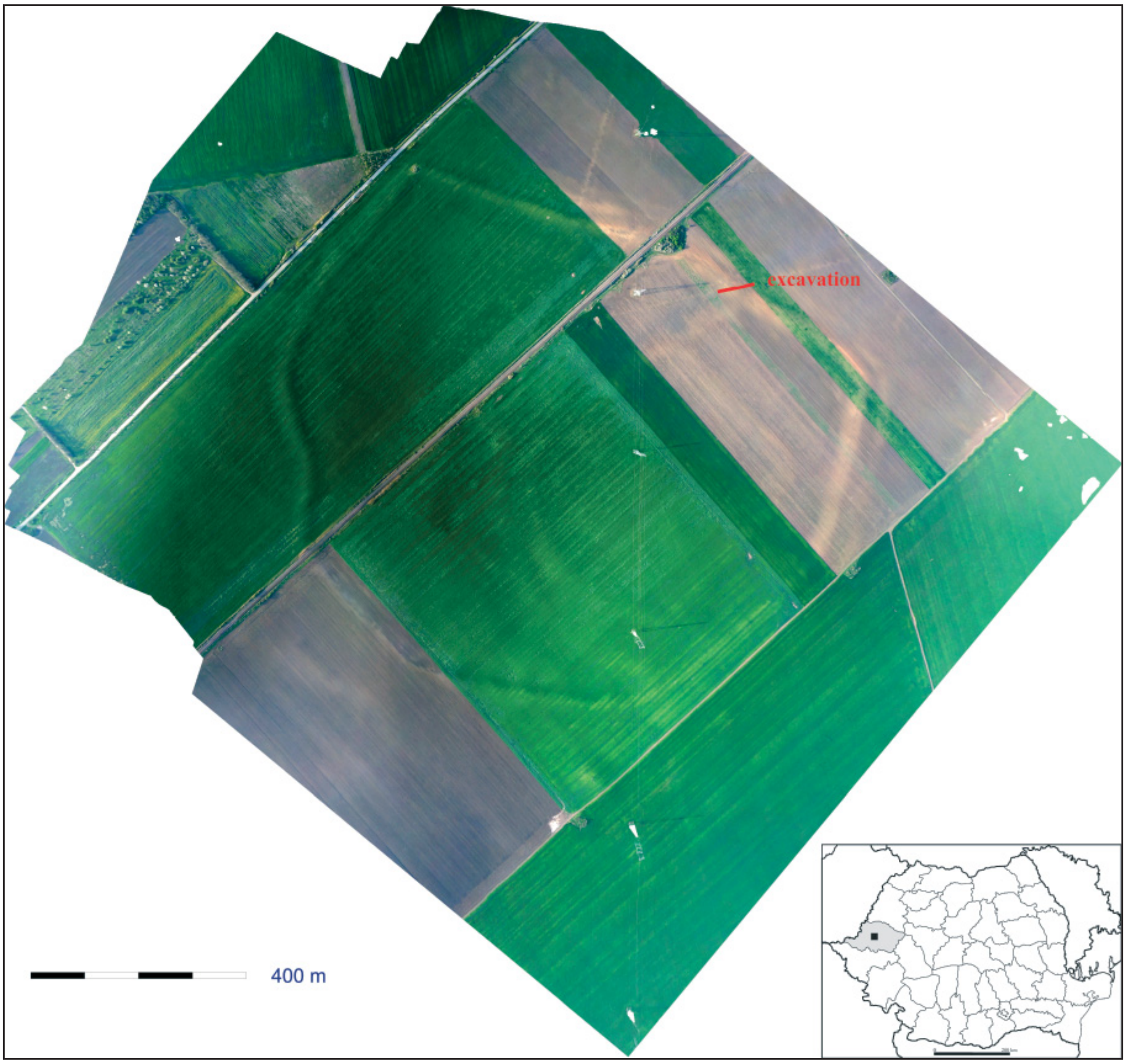

Fig. 1 Sântana-Cetatea Veche. Aerial photograph of the fortification with the location of the 2009 excavation and the location of the settlement of Sântana on the administrative map of Romania (photo by the authors)

Kurt Horedt accepted this dating straight away, but he preferred to use the term 'Late Bronze Age Period'.[7] He also added that Sântana displayed two habitation levels that could be attributed, on the basis of the gold hoard, to the stage Bronze Age D and on the basis of a bronze belt discovered on the surface of the settlement to the stage Hallstatt A.[8]

Mircea Rusu also spoke about two stages in the development of the fortification in Sântana in his presentation of the site in the *Enzyklopädisches Handbuch zur Ur- und Frühgeschichte Europas* by Jan Filip (1969). Rusu attributed the first fortification to a late phase of the Pecica-type civilization from the end of the Bronze Age and the second fortification to the first Iron Age (Hallstatt A1).[9] Other specialists have subsequently adopted this dating.[10] An archaeological report on the 1963 excavation was published much later, providing the first pieces of information regarding the structure of fortification III and the habitation identified inside fortification I. The excavations were illustrated with plans and archaeological material discovered during this work.[11] Although the fortification systems of enclosures I and III were investigated, no definitive

7 Horedt 1967b, 9.

8 Horedt 1967a, 149; 1967b, 19. – On the metal discovered in Sântana see Gogâltan *et al.* 2013.

9 Rusu 1969, 1298.

10 Horedt 1974, 224 no. 19; Dörner 1976, 42-44.

11 Rusu *et al.* 1996; 1999.

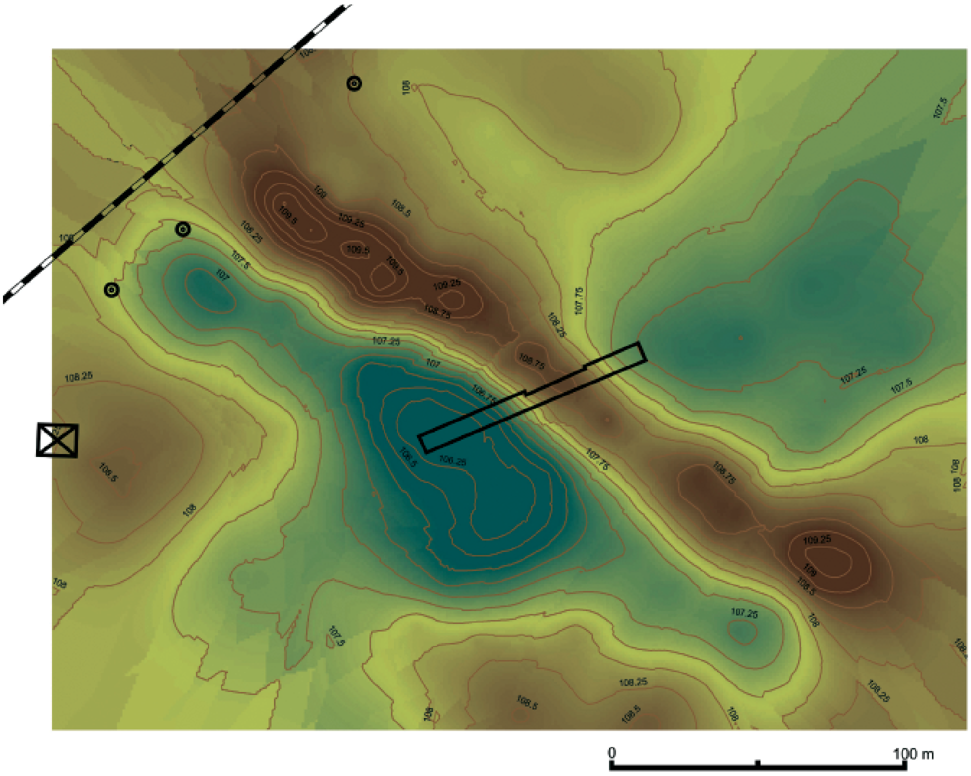

Fig. 2 Sântana-Cetatea Veche. Topographic survey of the area where the 2009 excavation was performed and the location of section S1 (map by the authors)

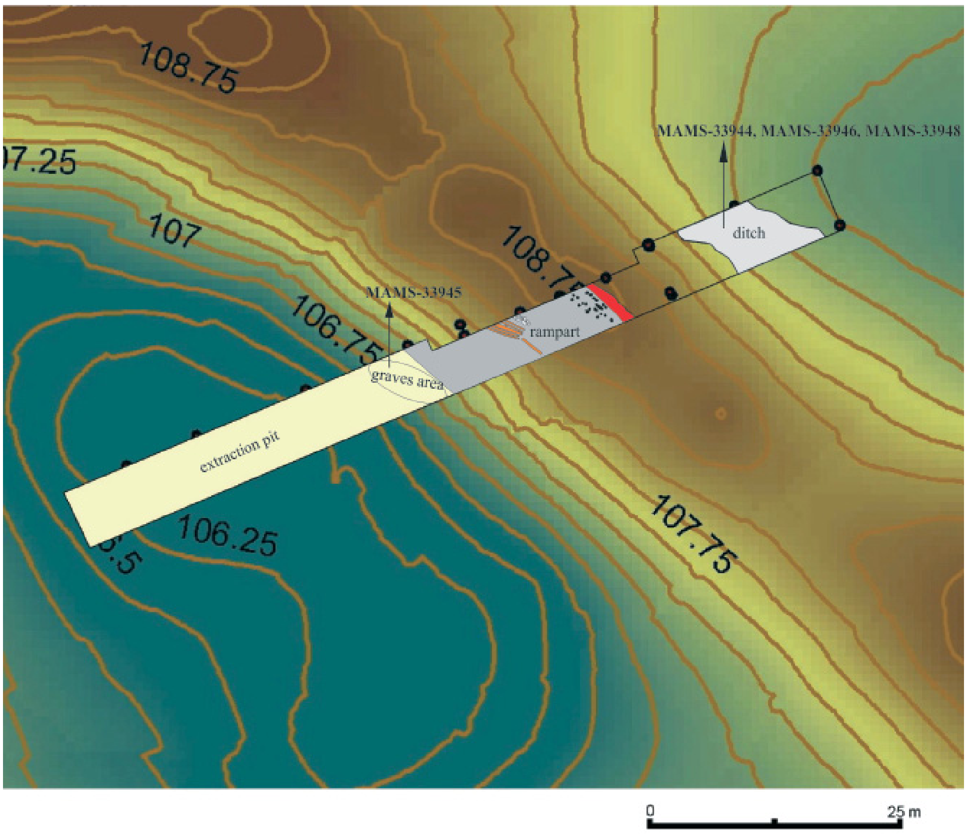

Fig. 3 Sântana-Cetatea Veche. Schematic ground of section S1/2009 and the main contexts (very light grey: ditch; grey: rampart; red: remains of the wall; brown: wood beams; light grey: stones; black: post holes; white: extraction pit and area of graves) from where AMS data were sampled (graphic by the authors)

Lab no. MAMS	Sample name	14C age [yr BP]	±	Cal 1-sigma	Cal 2-sigma	Material	Context
33944	1_Santana, Cetatea Veche S1,70A	3064	27	cal BC 1388-1283	cal BC1409-1236	human bone	ditch
33945	2_Santana, Cetatea Veche S1,Cx.41	3118	23	cal BC 1427-1322	cal BC1438-1303	human bone	cemetery
33946	3_Santana, Cetatea Veche S1,62A	3066	24	cal BC 1388-1286	cal BC1407-1263	human bone	ditch
33948	5_Santana, Cetatea Veche Cx.38	3131	23	cal BC 1433-1327	cal BC1487-1306	animal bone	ditch

Table 1 Sântana-Cetatea Veche. List of AMS dates

answer could be provided for their chronological identification. Still, the pottery fragments and metal items discovered in the perimeter of the fortification can be dated to stage Hallstatt A1, while other finds can be attributed to phase Bronze Age D or perhaps a slightly later period (Hallstatt B).

When reviewing the most important opinions on the earthen fortification in Sântana, one can note that the chronological stages of its construction, use and destruction are vaguely dated to the late period of the Bronze Age and the beginning of the first Iron Age. Even after the rescue excavation performed in the autumn of 2009, when the defense system of enclosure III was partially sectioned (**Figs. 1-3**), we were unable to refine the chronology very much.[12] Although a series of samples were collected on that occasion from the charcoal of the posts forming the wall on top of the rampart, due to the lack of financial resources we had to postpone the absolute dating of the fortification elements until 2018.

The absolute dating of some of the elements of this fortification was possible by the generous financing through the LOEWE project. In the beginning of 2018 several animal and human osteological fragments were sent for dating to the Klaus-Tschira-Archäometrie-Zentrum in the Curt-Engelhorn-Zentrum Archäometrie gGmbH in Mannheim. The bone remains had been discovered in the defense ditch, as well as in a grave identified behind the ramparts, in secondary position (**Tab. 1**). This article aims at briefly presenting the results of the AMS data sampled from the different contexts of the fortification system of enclosure III in Sântana. In order to form a general perspective, we shall first present the contexts from which the samples were collected and then the relation between the absolute dates and the archaeological material, mainly the pottery discovered during the 2009 excavation.

Archaeological contexts

Although the immediate results of the excavation performed during 2009 were already presented in 2010, nevertheless we believe it is useful to describe in detail both the archaeological contexts from which radiocarbon samples were collected and the contexts which through their very nature provide clues to the relative dating of the fortification system.

The first element of fortification consists of a defense ditch, with a width of 10.2 m and a depth of 2.86 m, located c. 8 m in front of the rampart. The profile shows that the ditch becomes narrower towards the bottom and that the inner incline is steeper (**Fig. 4**). The fill consists of 18 soil lenses, in a typical to gradual undulation; lens "L5" reflects the destruction level of the fortification. This led us to believe that the defense ditch was strongly silted at the time when the fortifications ceased to be used. Lens "L5" contained numerous pieces of adobe from the wall placed on top of the rampart. A number of pottery fragments, human and animal bone material, large quantities of adobe, a pot with grooves that could be reconstructed, and a cup were discovered in the fill (**Fig. 5**). The pot

12 Gogâltan/Sava 2010, 41-44.

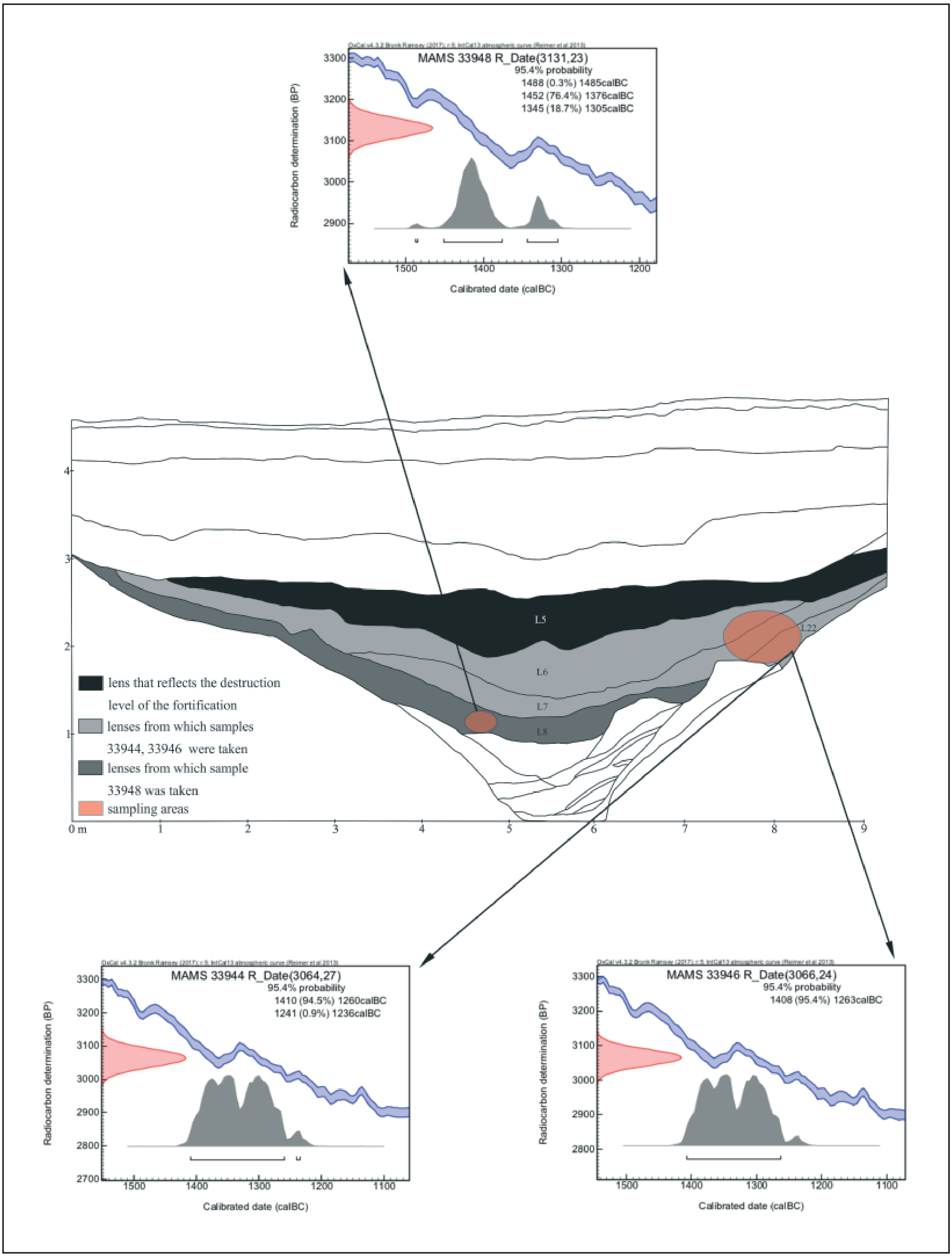

Fig. 4 Sântana-Cetatea Veche. North-eastern profile of the ditch and absolute dating of lenses "L6", "L7", "L8" and "L22" (drawing by the authors)

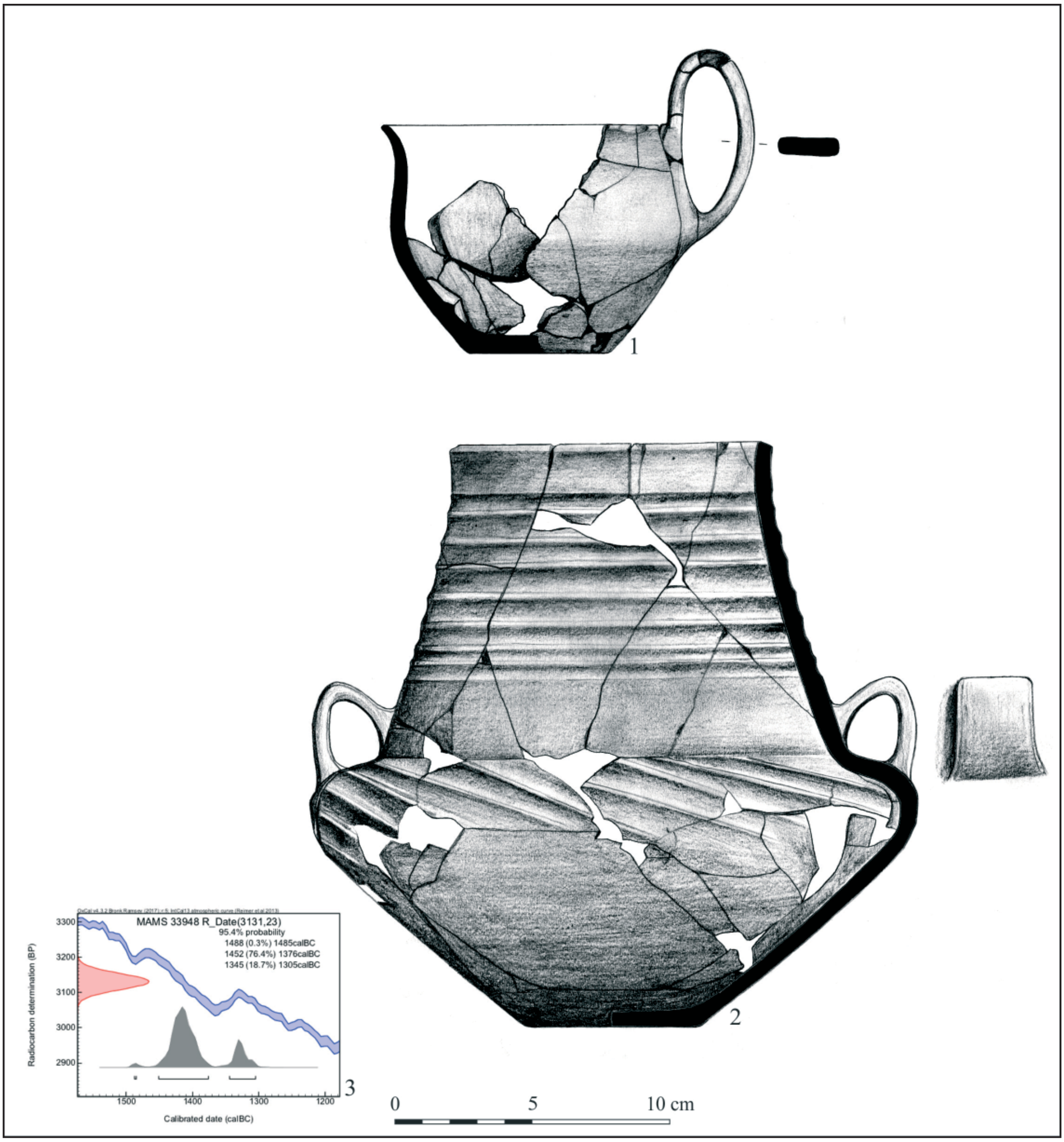

Fig. 5 Sântana-Cetatea Veche. Ceramic pots discovered in lens "L8" and the absolute dating of the context (drawings by the authors)

decorated with grooves became apparent in square 74B, at the absolute depth of 104.13 m and the inner depth of 1.9 m, i.e. in lens "L8". By chance, an animal bone was preserved inside the pot – corresponding to radiocarbon sample MAMS-33948. A deer antler was also discovered in the fill of the ditch, between lenses "L7" and "L8", in square 72B, at the absolute depth of 104.36 m and the inner depth of 1.67 m. A sample taken from this antler was sent in 2014 to the Isotoptech Zrt. laboratory in Debrecen, and another was sent in 2018 to the Klaus-Tschira-Archäometrie-Zentrum in the Curt-Engelhorn-Zentrum Archäometrie gGmbH in Mannheim (MAMS-33947). Unfortunately, both labs reported that the samples did not contain sufficient collagen for analysis.

The human bones discovered in lenses "L6", "L7", "L8" and "L22" (**Fig. 4**) represent a special aspect. The bones belonged to two mature individuals, males, aged between 20 and 30. One skull fragment displays traces of trauma, reflected by two blows that probably caused the individual's death.[13] Both de-

[13] Gogâltan/Sava 2012, 70 Fig. 10.

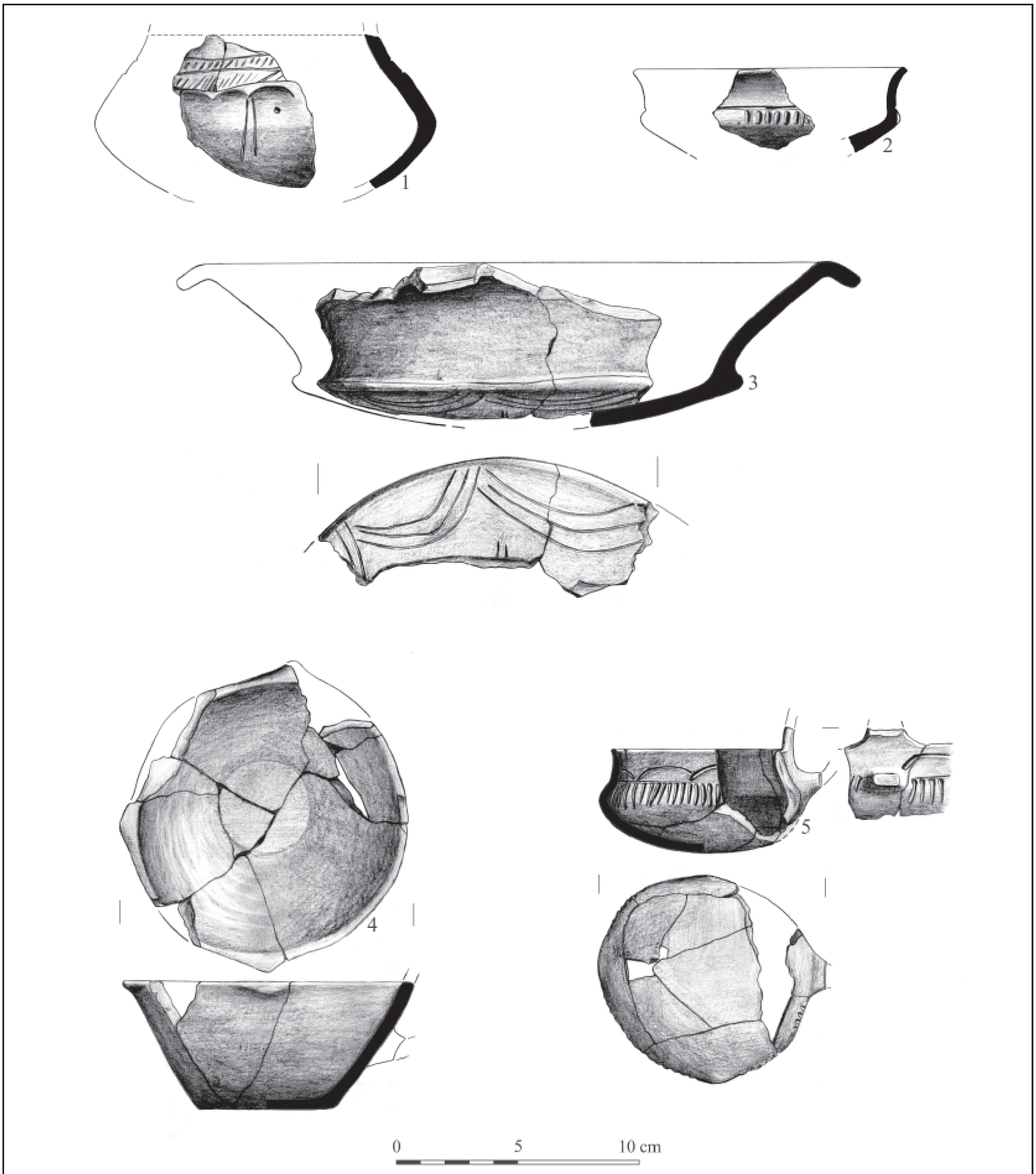

Fig. 6 Sântana-Cetatea Veche. Pottery discovered in the rampart, in secondary position (drawings by the authors)

ceased contributed to the absolute dating (MAMS-33944 and MAMS-33946); the results confirm that they died during the same chronological interval.

The rampart and the wall erected on top of it have already been described on other occasions, and we shall not repeat all now.[14] Still, we must mention the impressive dimensions of the rampart built of compacted clay, wood and stone: it measured almost 27 m in width and 2.5 m in height. As for the wall, it was erected on a structure of wooden posts rammed in the rampart, and this structure was filled with clay. The outer surface of the wall was carefully covered with clay, which had been repaired several times with new layers of clay. The entire wall was strongly burnt, as all posts were charred, and the burnt clay in some places was vitri-

[14] Gogâltan/Sava 2010, 29-33. For a graphic reconstruction of fortification III see Oltean 2016, 9. See also Gogâltan/Sava 2018.

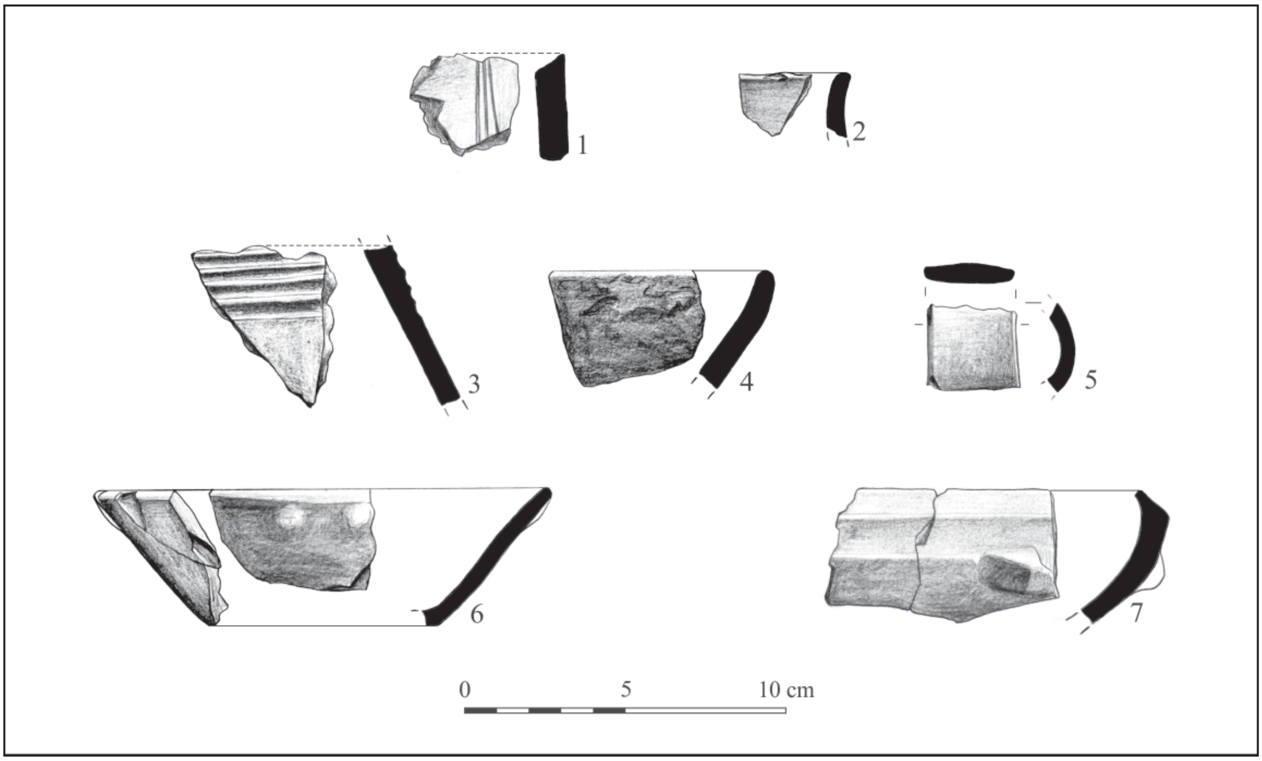

Fig. 7 Sântana-Cetatea Veche. Pottery discovered in the extraction area of the soil used for the erection of the rampart (drawings by the authors)

fied. As mentioned above, a series of charcoal pieces were collected from the charred wooden structure uncovered in 2009. However, as they could not be analysed in time, they became altered. Thus, when we had the opportunity to obtain absolute datings of the fortification through the LOEWE project, we were unable to provide samples from the structure of the wall. One of the goals of the excavation planned for the summer of 2018 is to obtain relevant samples for the absolute dating of the time at which the fortification of enclosure III in Sântana was destroyed by fire. At the moment, only the numerous pottery fragments discovered between the soil lenses of the ramparts, obviously in secondary position (**Fig. 6**), can be discussed.

A specific feature for the fortifications in the area of the Lower Mureş (for example Corneşti[15] or Munar[16]) is a ditch or rather a large cavity that doubles the rampart on the inside. In Sântana this feature was identified all along the fortification of enclosure III and in the area of trench S1; it measured 33 m in width and 2 m in depth. Based on the data available so far, we can state that this inner cavity is in fact an area from which most of the clay required by the erection of the rampart was extracted. Overtime, especially during the Habsburg era, this small depression was filled with earth; from this fill we also recovered pottery fragments from the late stage of the Bronze Age (**Fig. 7**) and some bronze items of little chronological value.[17]

The report of the 1963 excavation records the discovery, behind the fortification of enclosure III, of an *in situ* grave that contained a skeleton buried in crouched position. The inventory of this grave consisted of two ceramic vessels and a pair of bronze tweezers that were dated, with probability, to phase Hallstatt B.[18] This was not the first grave found in this area of the fortification. In 1888 the workers building the railroad that still crosses Cetatea Veche presumably discovered a hoard of gold items and old ceramic vessels in a destroyed grave. Rescue excavations coordinated by Aurel Török during the same year led to the discovery of coarsely made pots and two skeletons, one of an adult and the other of a child, both without funerary inventory.[19]

15 Szentmiklosi *et al.* 2011, 824.

16 Gogâltan 2016, 94 Fig. 6; Sava/Gogâltan 2017.

17 Gogâltan/Sava 2012 Figs. 39-40.

18 Dörner 1976, 43; Rusu *et al.*1996, 16 Pls. II,1b. VI,17-18. XIV,5; 1999, 144 Figs. 2,2. 7,17-18. 15,5. The funerary inventory is nevertheless characteristic for an earlier stage of the Late Bronze Age, as the settlement in Şagu, for example, proves (Sava *et al.* 2011 Fig. 100, cx. 83. cx. 132).

19 Gogâltan *et al.* 2013, 24 with all bibliographic data.

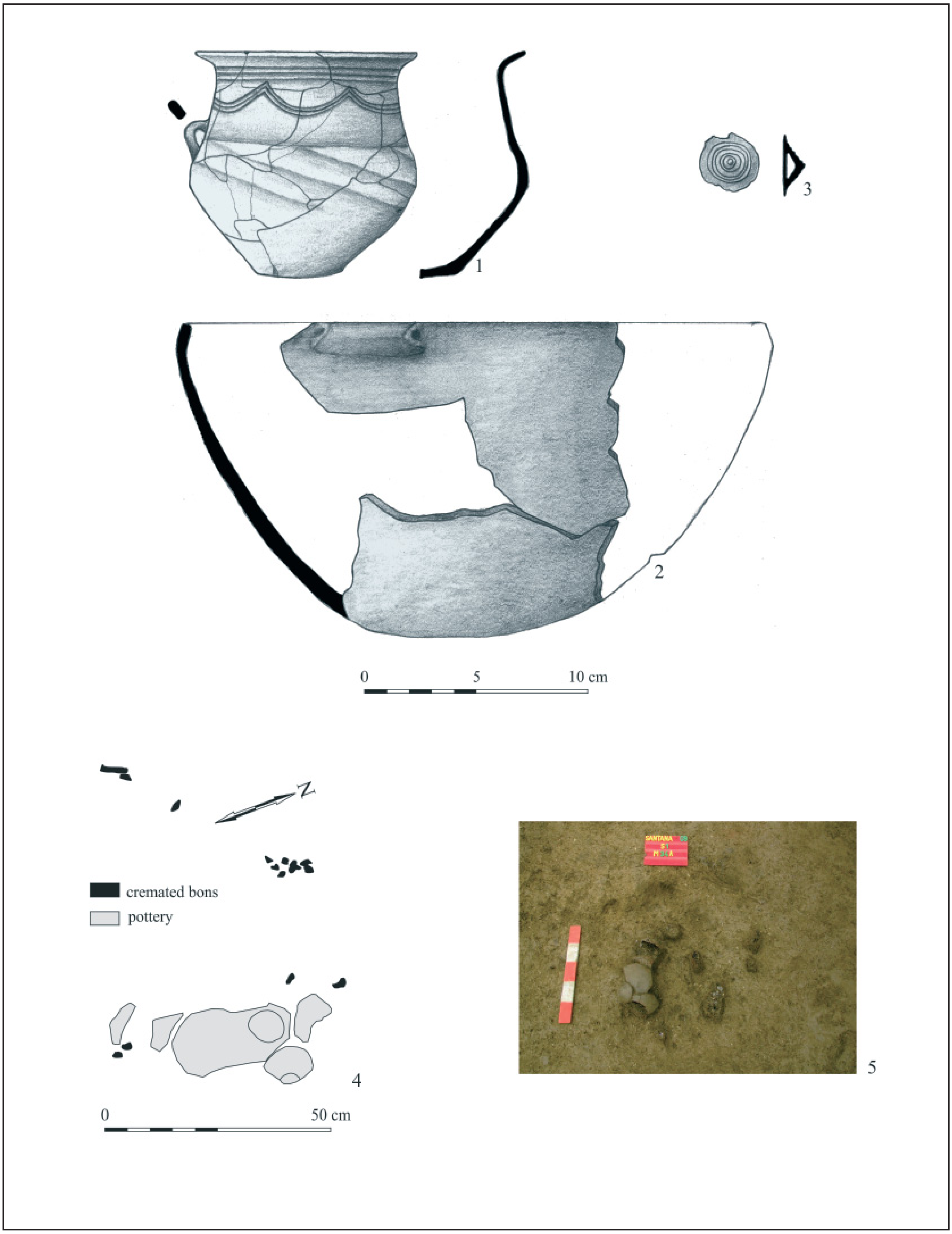

Fig. 8 Sântana-Cetatea Veche. Grave Cx. 40 (photo and drawings by the authors)

Trench S1, opened in the autumn of 2009, intersected the trench excavated in 1963. Three other graves were also identified behind the rampart, but this time in a secondary position, destroyed by the construction of the rampart. Grave cx. 5 became apparent in square 36B as a small agglomeration of human bones, mostly part of the skull cap. A bronze ring with a preserved piece of the phalanx was identified in its close proximity. No traces of a possible deposition pit of the human bone remains were observed. Based on the anthropological analyses we can state that the skeletal remains belonged to a child, at most 2 years in age. In its close proximity we uncovered another grave (cx. 40), also in secondary position. It was a cremation grave deposited in a natural cavity located slightly above the yellow clay. The inventory of the grave consisted of a fragmentary bowl, a small cup and a bronze *tutulus*. Pieces of charcoal and small fragments of cremated bones were scattered inside and around the bowl (**Fig. 8**). In the same sector of trench S1, more precisely in square 32B in the western profile, we discovered the bones of an adult in an obviously secondary position, accompanied by fragments from three bowls (**Fig. 9**). Sample MAMS-33945 was collected from the inhumation grave (cx. 41).

The presentation of these funerary discoveries indicates convincingly that a cremation and an inhumation cemetery existed behind the fortification of enclosure III. It was destroyed by the erection of the fortification system of enclosure III. Both the rites and the rituals are similar to those observed in the cemetery in Pecica-Situl 14, located c. 30 km south-west of Sântana,[20] and the funerary inventory is characteristic for the Late Bronze in this region. Furthermore, sample MAMS-33945 dated grave cx. 41 to a time between1438 and 1303 cal BC 2σ.

Results

In order to shorten the discussion of the contexts from which the samples for AMS dating were collected, we note here that three came from the defense ditch and one from grave cx. 41 located behind the rampart (**Fig. 3; Tab. 1**). As discussed above, a fifth sample taken from a deer antler found in the defense ditch did not contain enough collagen for analysis (MAMS-33947).

As one can note in **Figs. 10-11,** the earliest dates are those collected from grave cx. 41. Modelling the date, an average interval of 1411 BC is reached (**Fig. 12,1**).[21] Although the inventory of the grave was poor (consisting only of three fragmentary pots), we can remark upon the bowl decorated with two lobes on the rim and with concentric grooves on the bottom (**Fig. 9,2**). This early dating for the channelled decoration, at the passage between the 15th and the 14th century BC, confirms the use of channels ever since the 15th century, as attested by grave cx. 98 in Pecica-Situl 14.[22] The pot discovered in lens "L8" in the ditch of enclosure III in Sântana is dated to the 14th century BC (**Fig. 5,2**). Cremation grave cx. 40 was identified in close proximity to grave cx. 41 and contained a small pot decorated with channels besides a fragmentary bowl and a bronze *tutulus* (**Fig. 8,1**). This type of decoration has been traditionally attributed to the time of Hallstatt A1, i.e. the 12th century BC. Today it becomes apparent that the entire chronology of channelled pottery from the Lower Mureș Basin must be revised. Taking into account the already mentioned data, it is very likely that grave cx. 40 was relatively contemporary with grave cx. 41 and should be thus dated to the end of the 15th century BC or the beginning of the 14th century BC.

Regarding the samples collected from the lenses of the defense ditch, two samples (MAMS-33944 and MAMS-33946) were taken from the skeletal remains of two individuals, identified in lenses "L6", "L7", "L8" and "L22" (**Fig. 4**). It seems that both persons died at the same time, or within a narrow interval in time. By modelling the dates an average interval of 1394 BC is reached (**Fig. 12,2**), very close to the one obtained for the sample from the cemetery behind the rampart. Bringing together the three dates available so far from this ditch, an average interval between 1368 and

20 Sava/Andreica 2013; Sava/Ignat 2014; Andreica 2014; Sava/Ignat 2016, 185-186.

21 We thank our colleague Prof. Dr. Florin Drașovean for modelling these AMS dates and for his suggestions regarding their absolute chronology.

22 Sava/Ignat 2016, 185. After the new excavations performed in Lăpuș, the authors of the excavations have noted that the pottery decorated with channels (of the Gáva-Lăpuș II type) appeared much earlier than previously believed: "Although old-wood-effects cannot be excluded, the intervals of the dates indicate the existence of channeled ware pottery in Lăpuș in the 13th century BC if not earlier" (Metzner-Nebelsick *et al.* 2010, 223).

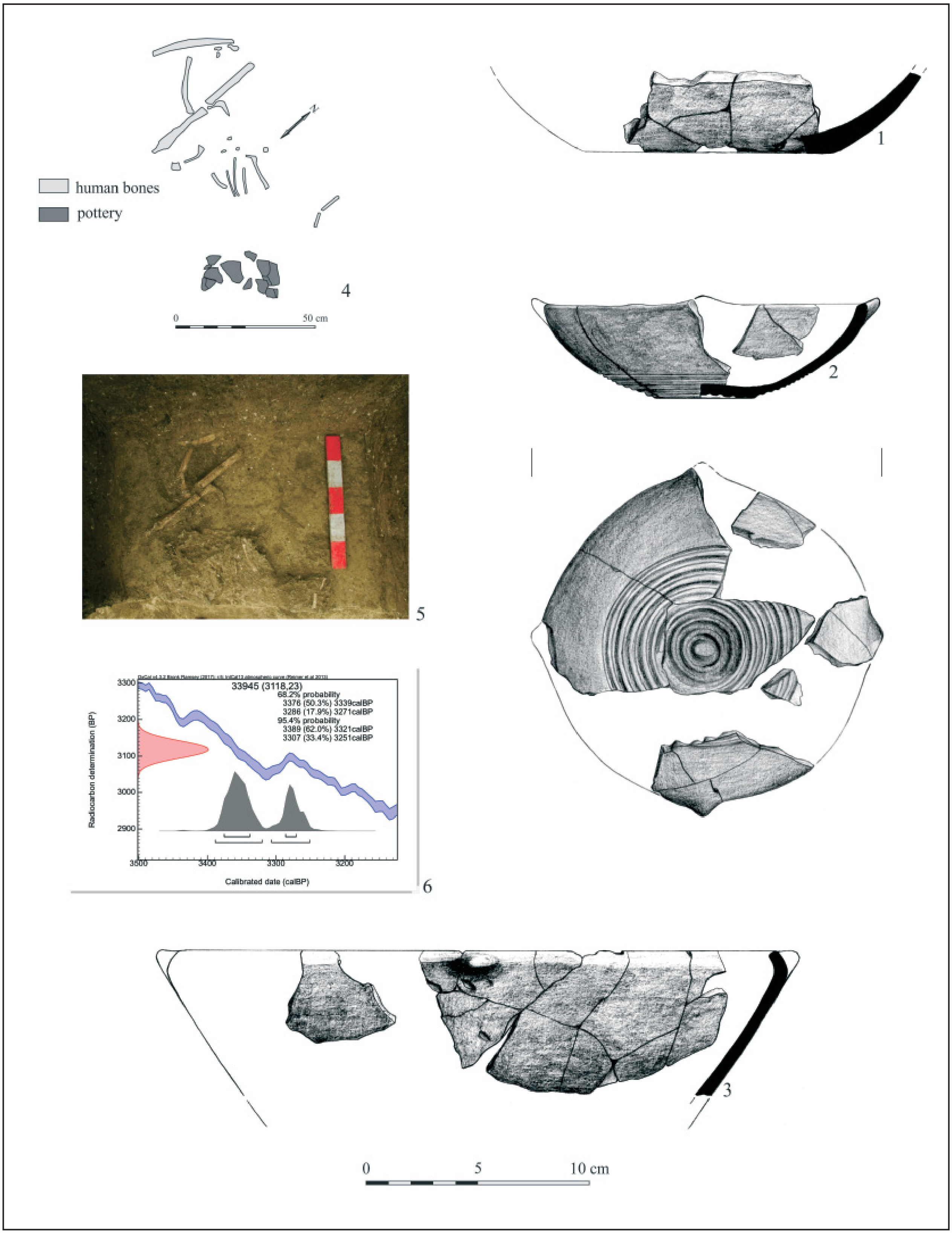

Fig. 9 Sântana-CetateaVeche. Grave Cx. 41 and its absolute dating (photograph and drawings by the authors)

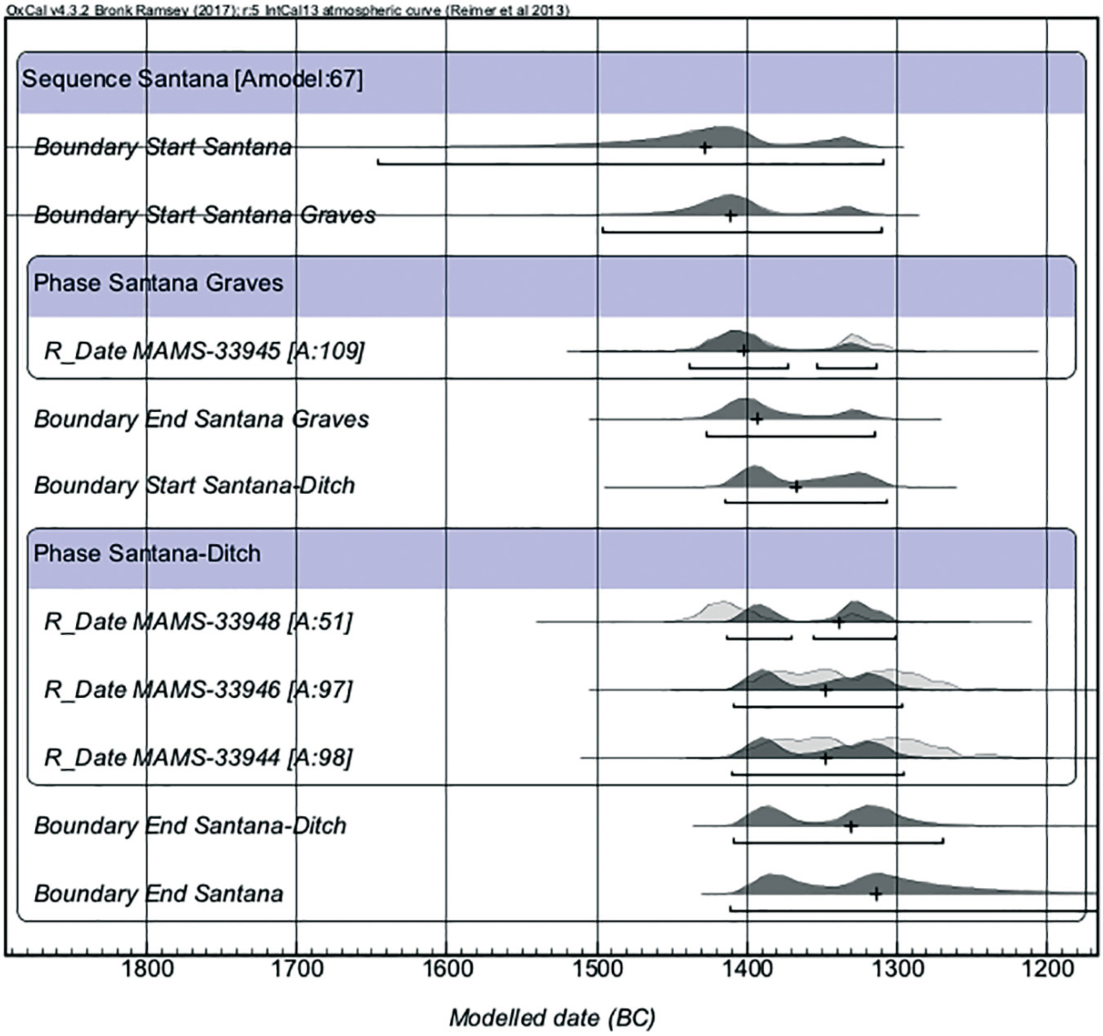

Fig. 10 Sântana-Cetatea Veche. Bayesian Model of the AMS data (graphic by the authors)

1331 BC is reached (**Fig. 12,3-4**). By correlating this chronological interval with the stratigraphy, we can state that it represents an intermediary use-phase of the ditch. The ditch was certainly dug before the 1368-1331 BC chronological interval, and the date when the fortification was destroyed, reflected by lense "L5", is later.

Although no absolute dates sampled from the earthen rampart and the wall on top of it are available so far, the discovery of rich pottery material (in an obviously secondary position) among the soil lenses of the rampart allow us to determine the time at which the fortification of enclosure III was built, at least according to relative chronology. Analysing the decoration of the pottery discovered in these contexts (**Fig. 6**), we note the presence of incised ornaments. As demonstrated on another occasion, incised arches represent a characteristic of the pottery from the phase Late Bronze Age I (c. 1600/1550-1450/1400) in the area of the Lower Mureș.[23] Pottery fragments decorated with arches, but also with other ornaments created by incision were also discovered during the 1963 excavations inside enclosure I.[24] The systematic field surveys initiated in 2007 have demonstrated the distribution of pottery fragments with this type of decoration characteristic for Late Bronze Age I not only inside enclosure I, but also all along the eastern side of the third fortification. Taking these arguments into consideration, we believe that the construction of fortification III disturbed an earlier settlement that had developed during phase Late Bronze Age I. It also destroyed a cemetery with cremation and inhumation graves. By modelling the date from grave cx. 41 an average interval of 1411 BC is reached, whereas the ditch was built before the 1368-1331 BC

[23] Sava/Ignat 2016, 195.

[24] Rusu *et al.* 1996 Pls. VII,2-4. VIII,2.5.7; 1999 Figs. 8,2-4. 9,2.5.7.

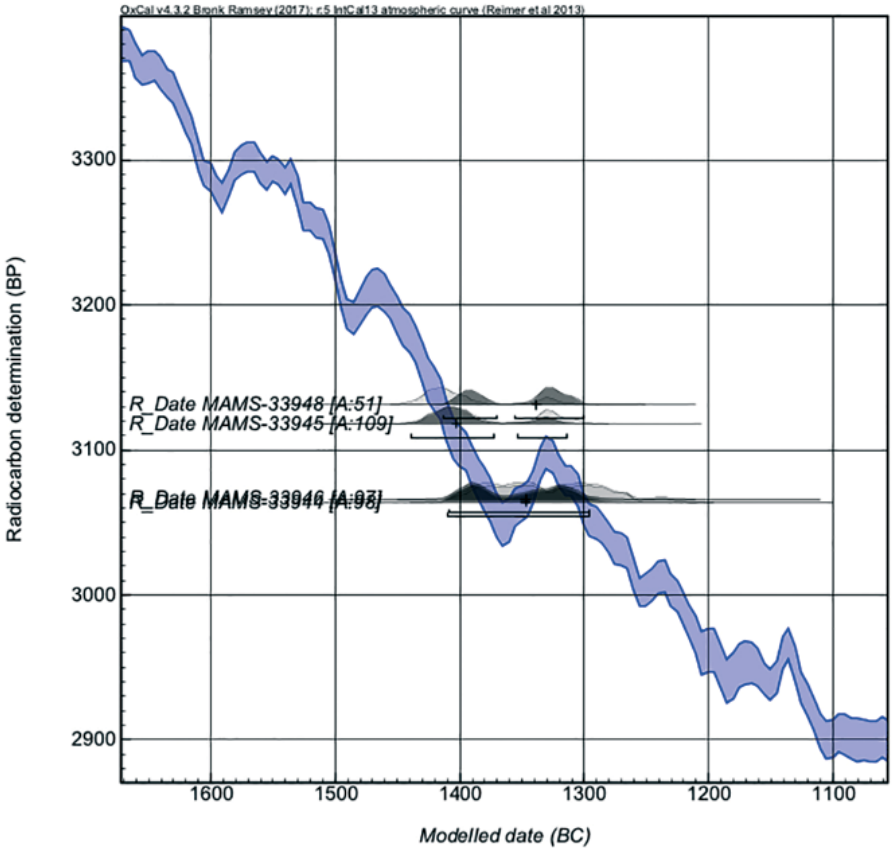

Fig. 11 Sântana-Cetatea Veche. The layout of the AMS data on the calibration curve (graphic by the authors)

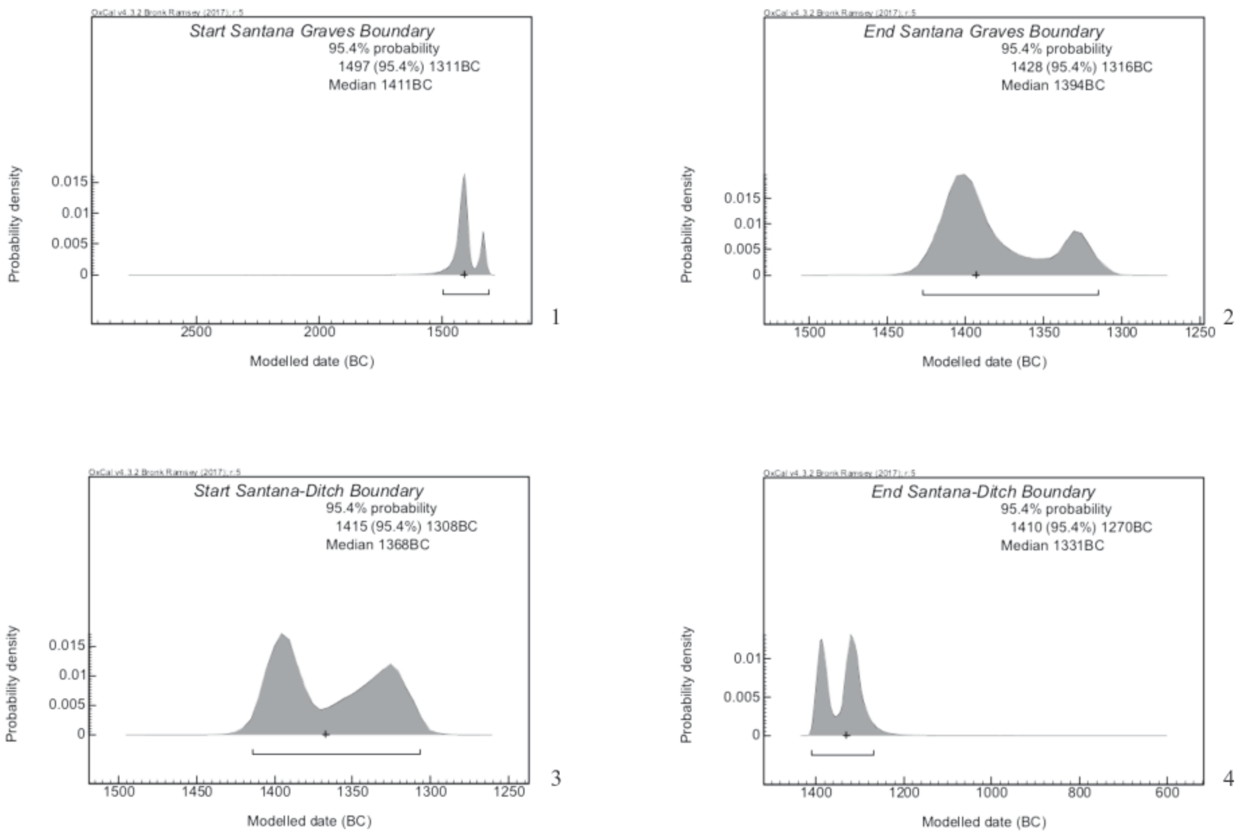

Fig. 12 Sântana-Cetatea Veche. The modelling of the AMS data: **1** Start Graves Boundary; **2** End Graves Boundary; **3** Start Ditch Boundary; **4** End Ditch Boundary (graphics by the authors)

chronological interval. In view of these conditions, the hypothesis that the fortification of enclosure III was erected in the beginning of phase Late Bronze Age II, sometime after 1400 BC, seems convincing. We are curious to see whether the excavations planned for the summer of 2018 will confirm or contradict our supposition.

Conclusions

For almost two centuries the great earthen fortifications of the Bronze Age from the Lower Mureş Basin have raised the constant interest of those interested in the old history of these places. Through their cyclopean dimensions they have fascinated numerous generations of archaeologists, yet few have also dared to research them. Appropriate investigations of the enormous surfaces between the earthen ramparts of these fortifications require special efforts. After ten years of archaeological excavations in Cornești-Iarcuri, the results barely allow for an outline of some general aspects of the mega-fort.[25]

It is obvious that the best strategy at this stage of research is to investigate the systems of fortification in order to set their absolute chronology. Through the 2009 archaeological excavation in Sântana-Cetatea Veche we wished to precisely clarify the dating of the fortification of precinct III that encloses an area of c. 80 ha. Despite the spectacular results, the dating was only reached in 2018.

At present we can state that the fortification system of the third enclosure (enclosure III) in Sântana was in use throughout the 14th century BC and that the erection of the rampart led to the destruction of an older cemetery and of an older settlement, both located in close proximity to the rampart. According to data available now, we can also state that this fortification was relatively contemporary with the first two fortifications in Corneşti-Iarcuri[26] and possibly with the first stage of the fortification in Csanádpalota-Földvár.[27] Its end was violent. An attack with burnt clay sling bullets, an innovation for that period's fighting tactics, led to the conflagration and destruction of the fortification of enclosure III.[28]

After setting the first chronological benchmarks for the mega-forts of the Late Bronze in the Lower Mureş, as Anthony Harding has inspiringly called them,[29] we still have to face numerous challenges. Only through a coherent program in research will we be able to answer other pending questions in the future. We believe that our priorities must focus on gaining better knowledge about the transition period from the multi-strata settlements of the Bronze Age in the area (tells and tell-like settlements) to the onset of these large fortifications.[30] This process took place around 1500 BC and marks the abandonment of a lifestyle that specialists dealing with this period view differently.[31] The process either encompassed dramatic social changes that led to the onset of political inequality, or it was (we believe natural) a development towards complex social relations similar to those in the contemporary Mycenaean world.

By publishing certain archaeological excavations, such as the one from Șagu located in close proximity to the fortification in Cornești, we stand a chance to identify the social and economic mechanisms that generated the development of a simple settlement into a mega-fort. Unlike its neighbours located at distances of 14 km (Corneşti), 21 km (Munar) and 27 km (Sântana), the settlement of Șagu which covered c. 25 ha was not fortified, but was oriented towards economic activities specific to the period.[32] Munar seems to have been a different case, in which a small Middle Bronze Age tell turned into a fortified settlement that covered 14 ha.[33]

Besides continuing the excavations in Sântana, these are our priorities for the subsequent years, in an attempt to clarify one of the current challenges for European archaeology: the onset of Bronze Age mega-forts.

25 Harding 2017; Heeb *et al.* 2017b.
26 Harding 2017 Fig. 1; Heeb *et al.* 2017b.
27 Szeverényi *et al.* 2017, 139. As for the dating of the fortification in Csanádpalota, the authors of the excavation mention the following: "The series of radiocarbon dates taken from samples from both the large-scale preventive excavation and the smaller excavation of the oval enclosure indicates an occupation between 1380 and 1120 cal BC."
28 Gogâltan/Sava 2018.
29 Harding 2017.
30 Gogâltan 2014; Sava/Ignat 2016; Sava 2016; Gogâltan 2017.
31 Kienlin 2015a; 2015b vs. Sava/Ignat 2014; Gogâltan 2016.
32 Sava *et al.* 2011; 2012; Sava 2014; Urák *et al.* 2015.
33 Gogâltan/Sava 2010, 57-61; Sava/Gogâltan 2014; 2017.

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The Teleac Hillfort in Southwestern Transylvania: the Role of the Settlement, War and the Destruction of the Fortification System

Geophysical prospection and excavations show that the heavily fortified Teleac hillfort was densely occupied with a population reaching the low thousands. In this article it is argued that Teleac was a local political centre that acted as a hub for transportation and trade in a region that is rich in mineral resources. Recent investigations also reveal that Teleac was attacked in the late 10th century in an event that breached and destroyed the formidable northern defensive system. This attack suggests that the level of military threat was quite severe in the eastern Carpathian Basin. The attacking forces must have had significant offensive capabilities in order to tackle Teleac's defences. It is also a strong indication that not only Teleac, but contemporary fortified settlements in the surrounding region were at least in part erected to resist serious military threats.

Introduction

With a fortified area encompassing 30 ha, Teleac is the largest Late Bronze Age and Early Iron Age hillfort in south-western Transylvania. The oldest occupation belongs to the mid-11th century Gáva culture and the end of occupation in the 9th century has Basarabi culture material. Recent investigations show that Teleac was densely inhabited with an estimated population of about 1200 persons, and that the settlement was spatially well organised with some areas set aside for large-scale, high temperature production. The immediately surrounding territory had 15 contemporary, open Gáva culture settlements with a population of approximately 2700 persons.[1] Teleac is of course not the only fortified Gáva settlement in Transylvania and neighbouring regions, but it is worth noting that there is a distance to other contemporary fortified sites, which makes it likely that Teleac was a dominant settlement in at least the immediate surrounding territory (**Fig. 1**). Another intriguing aspect is that Teleac's northern defences were destroyed during an attack, which provides new information regarding the scale and organisation of warfare during the 10th century in the eastern Carpathian Basin.

Teleac's sheer size and the fact that 30 % of the territory's population lived there, coupled with the attack on hillfort's impressive fortification system, raises the question as to the role that the settlement played in a local and regional context. In this paper we try to approach this general question by examining some key aspects of the hillfort: the makeup and defensive value of Teleac's fortification system, the internal structure and organisation of the settlement, Teleac's location in connection to natural resources and transportation routes, and the hillforts relationship with open settlements and the surrounding region. Against this background, we also attempt to explain possible reasons behind the attack of Teleac and to explore aspects of 10th century BC warfare.

Teleac's settlement structure and defences

Teleac occupies a prominent position on the western rim of the Secașelor Plateau, overlooking the Mureș River Valley. The hillfort's southern boundary is delimited by a sharp ridge that faces a small valley that joins the Mureș floodplain on the south-western side of the site (**Fig. 2**). Teleac's western side, directly in front of the Mureș Valley, is damaged by erosion, but judging from the topography, it is likely that this part of the settlement had a steep drop towards the river. The

1 Uhnér *et al.* 2017, 192-195.

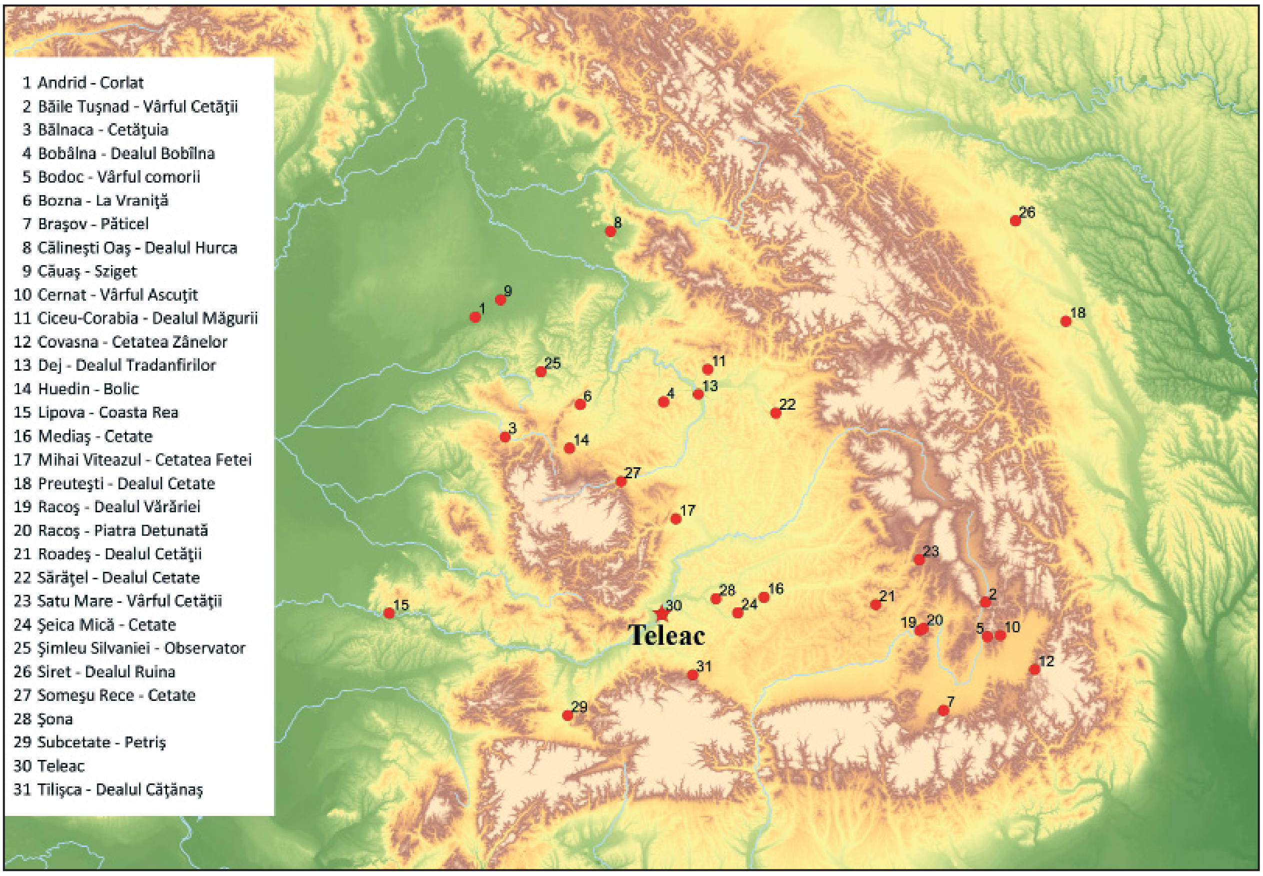

Fig. 1 Location of the Teleac hillfort and fortified Gáva settlements in the larger region surrounding Teleac (map by the authors)

only part of the site that was easily accessible from the outside was the gently sloping north-eastern perimeter leading into the Secaşelor Plateau, but here the settlement was protected by a more than 800-m long, wooden framed box-rampart filled with earth and two outer ditches connecting the naturally well defended southern ridge with the steep north-western part of the site.

Much of what we know about Teleac's internal settlement structure is based on geophysical prospection of the site, and the general nature of the anomalies on the magnetogram has been verified by excavations at key locations on the Gruşet Plateau and in the Lower Settlement. Although one cannot determine with certainty to which occupation level anomalies on the magnetogram belong, excavations show that there is good correlation between the geophysics and a roughly contemporary stratigraphic level with classical Gáva features throughout the settlement.[2] Later Gáva and Basarabi culture features in the upper 50 cm of cultural layers tend to be very badly preserved and usually not recorded on the magnetogram, and the magnetometer does not penetrate deep enough to record the earliest features in Teleac. With the caveat that later features sometimes disturb the picture, and that it cannot be ruled out that some significantly earlier features also may be recorded on the magnetogram, it is at least possible to understand aspects of the organisation of habitation and activities in Teleac.

Jidovar Hill

The Teleac hillfort's interior has several distinct parts, distinguished both by the local topography and partly by various types of occupation and areas for specific production activities (**Fig. 3**). Jidovar Hill makes up the hillfort's eastern part and was the first fortified section of the hillfort.[3] The hill covers an area of about 3 ha and consists of three narrow terraces sandwiched between the large and gently sloping lower hillside and a small flat plateau just below the hilltop. Jidovar is the highest part of the site and offers an impressive view of vast sec-

[2] Cf. Uhnér 2017, 206; Uhnér *et al.* in press Fig. 6.

[3] Ciugudean 2012b, 107. 112-113.

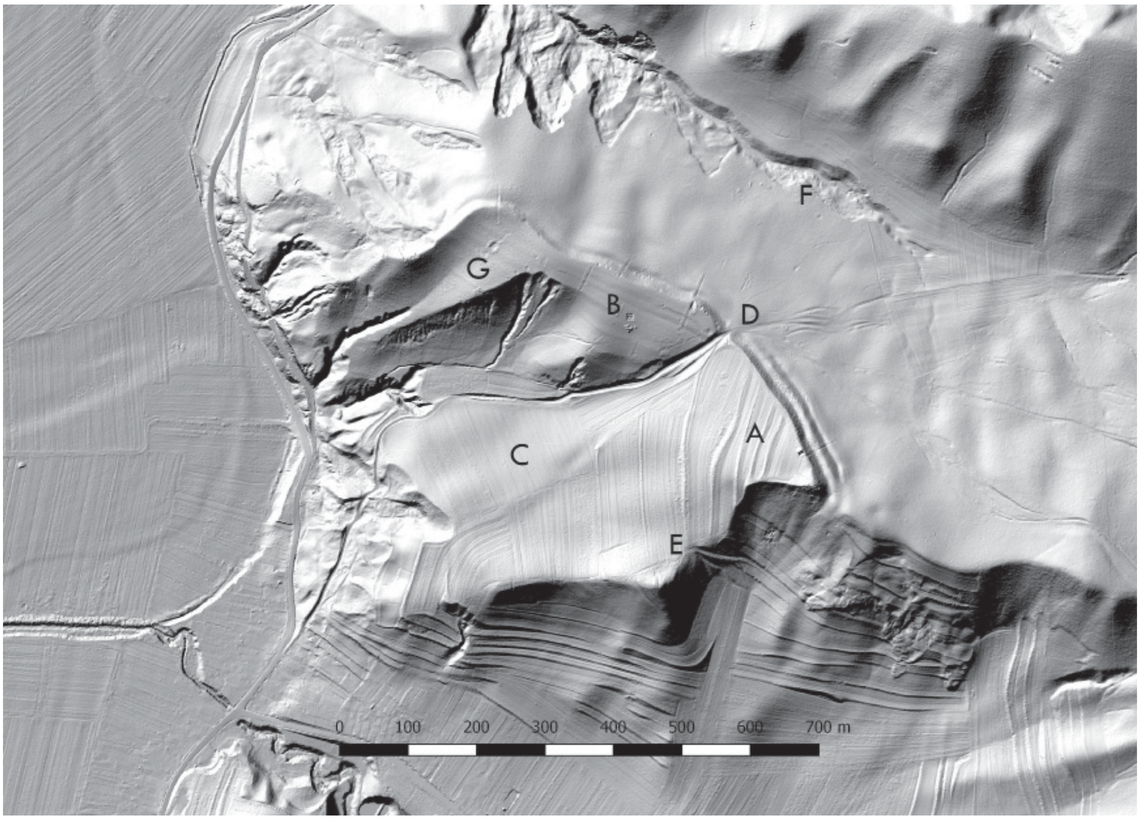

Fig. 2 LiDAR image of the Teleac hillfort. **A** Jidovar Hill; **B** Grușet Plateau; **C** Lower Settlement; **D** Northern fortification and gate; **E** Southern Ridge and gate; **F** Areas north of the settlement; **G** North-western part of the settlement (image by the autors)

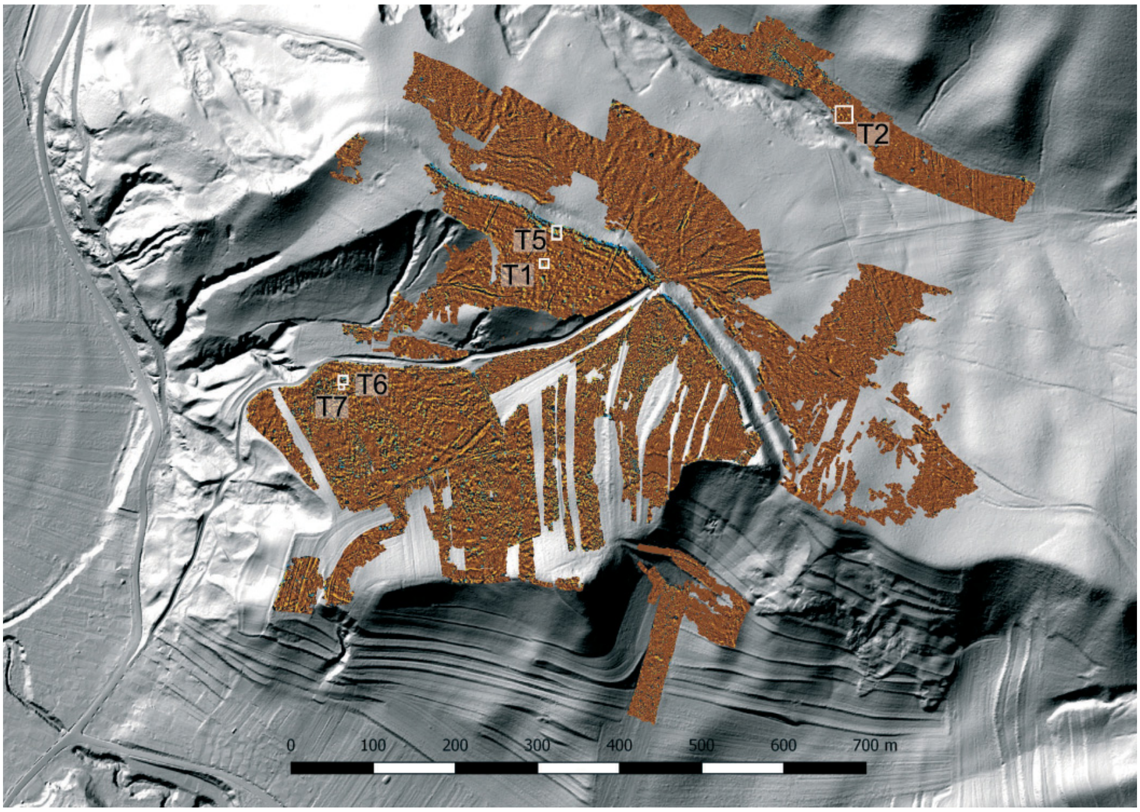

Fig. 3 Magnetogram superimposed on a LiDAR image of the Teleac hillfort. The locations of the main trenches excavated in 2016 and 2017 are outlined in white (magnetogram by J. Kalmbach, RGK)

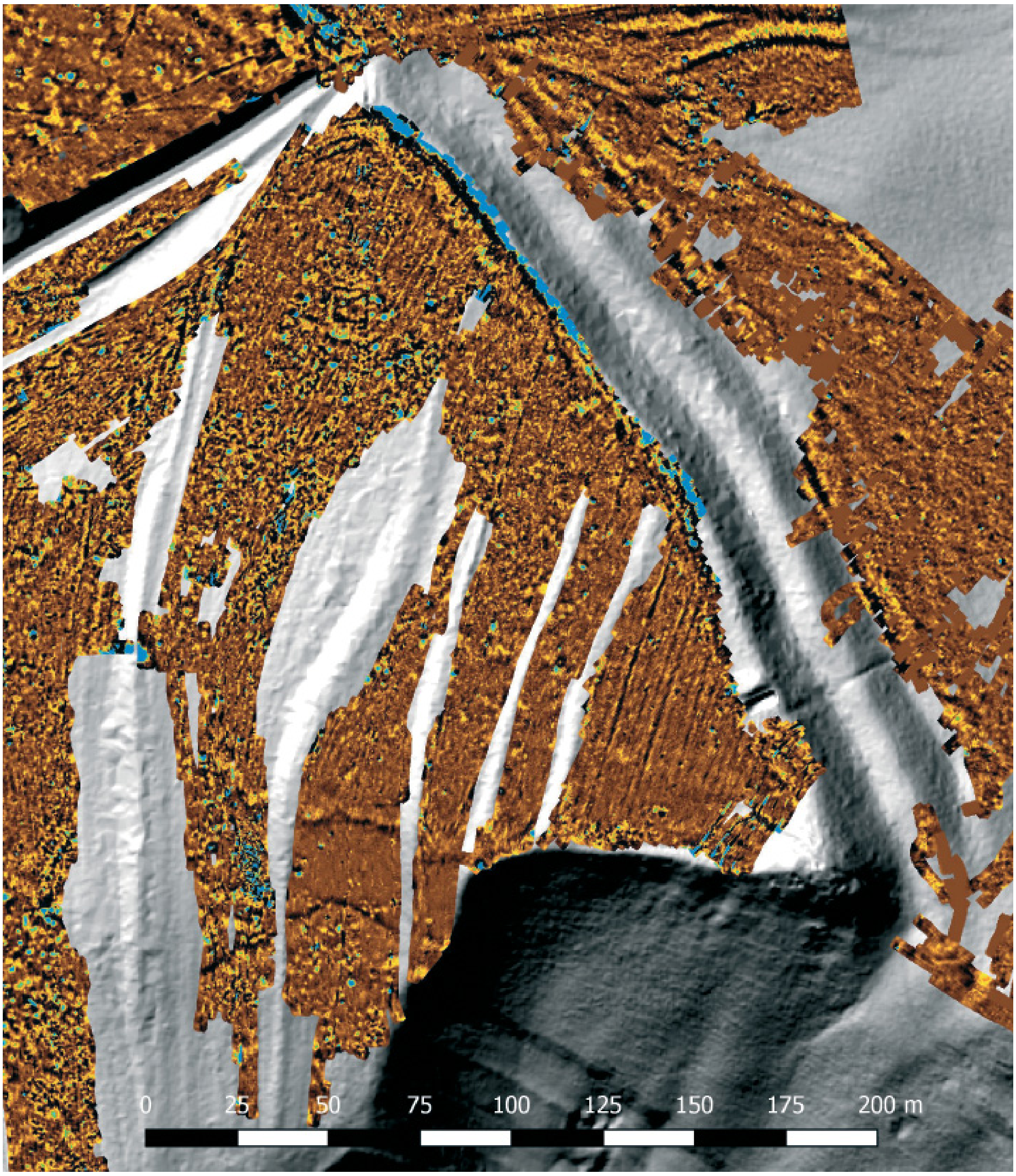

Fig. 4 Magnetogram superimposed on a LiDAR image of Jidovar Hill (magnetogram by J. Kalmbach, RGK)

tions of the surrounding landscape. It has a double ditch and a rampart along the north-eastern hillside that links up with a smaller rampart that follows the bottom of the hill to the gate area at the southern ridge. The steep top of the hill is manmade and resembles a tower. It is built up by an earth-filled wooden box construction similar to the rampart. It appears that Jidovar hill formed a separate enclosed section of the hillfort after the enlargement of the fortification system to include the other parts of the hillfort.[4]

Recent excavations and geophysical prospection indicate that the lower part of Jidovar Hill and a c. 40-m wide and 90-m long section along the inner rampart were densely occupied, whereas the southern parts of the upper terraces have fewer anomalies and their number decreases with distance from the rampart (**Fig. 4**).[5] The small plateau just below the hilltop has very few magnetic anomalies, which is peculiar as the plateau offers a good, albeit somewhat weather exposed position for occupation. A possible explanation for this condition may be that the plateau has been

4 Ciugudean 2012b, 107; Uhnér 2017, 206.

5 Uhnér 2017, 206; Uhnér *et al.* 2018.

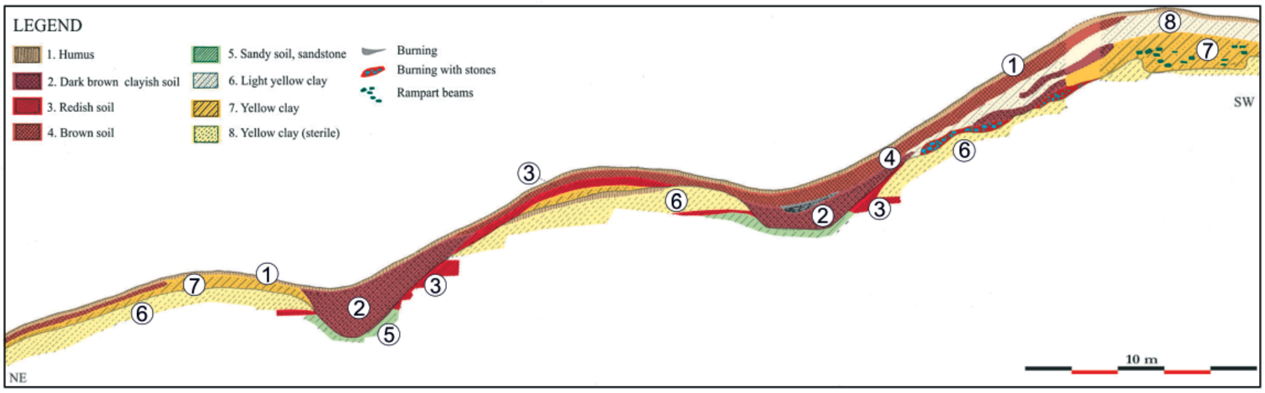

Fig. 5 Section of the northern fortification system at Jidovar Hill, showing the rampart and defensive ditches (adapted from Horedt *et al.* 1962, 3 Fig. 3)

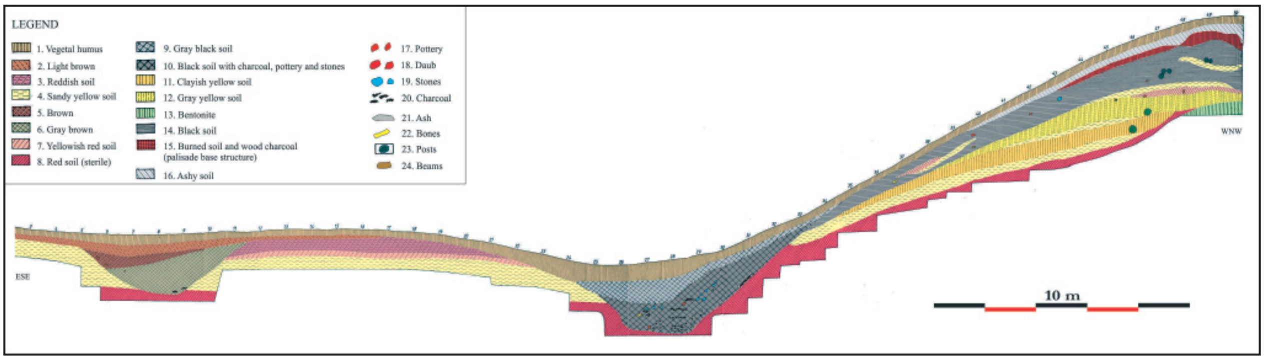

Fig. 6 Section of the northern fortification system at Jidovar Hill, showing the tower and defensive ditches (adapted from Vasiliev *et al.* 1991, 28 Pl. III)

covered by erosion from the hilltop[6] and that the magnetometer hence does not penetrate to the depth where archaeological features are found. That said, soil cores taken with a push probe show that large parts of the area have cultural layers less than a meter deep, and the poor preservation of features in the upper layers at Teleac may therefore account for the lack of anomalies.

It is tempting to describe Jidovar Hill as an acropolis or a citadel, but this has to be done with some caveats.[7] The hill is indeed the upper part of the settlement as is fitting for an acropolis and the area is heavily fortified. The steep and towering southern part of the hill offers excellent natural protection and the north-eastern hillside has a substantial rampart, which is further strengthened by two outer ditches (**Fig. 5**). It is unclear whether the area between the outer ditches had a palisade and formed an outer fortification. However, this seems likely from a functional standpoint, as an attacker had to breach two defensive lines, and because without an ancillary palisade the outer ditch would be counterproductive in the defence of Teleac, as it could provide an amount of cover from projectiles fired by the defenders from the inner rampart. The only part of Jidovar Hill that did not offer a significant height advantage of several meters in relation to areas outside the fortification was the upper part of the hill, where it meets the ridge leading down to the valley south of the hillfort. However, to amend this situation the defences there were strengthened with a wooden framed earthen tower.

Excavations show that the tower had a height of at least 3.5 m that probably was much higher in prehistory, as it is likely that part of the construction is eroded.[8] The defences at the lower hillside facing the hillfort's interior towards the west are much less substantial compared to the outer defences and consist only of an earthen rampart, probably without an outside ditch (**Fig. 6**).[9]

6 Cf. Vasiliev *et al.* 1991, 27 Pl. IV.
7 Ciugudean 2012b, 112-113.
8 Vasiliev *et al.* 1991, 28 Pl. III.
9 Vasiliev *et al.* 1991, 205 Fig. 9; Uhnér 2017, 206.

Jidovar Hill is the strongest fortified area of Teleac and forms a separate part of the fortification to which the population could retreat should the other defences fail. One could hence use the terms 'acropolis' or 'citadel' to describe Jidovar Hill from a defensive standpoint, but it is unclear if other aspects traditionally befitting an acropolis were present. The magnetogram and excavations do not provide any clear indications that the occupants of the hill had a special status, nor of the presence of centralised storage of supplies, or of buildings of an administrative or religious nature.[10] The occupation on Jidovar Hill is similar to adjacent areas in the hillfort in the sense that there appear to be a row of buildings along the inner rampart as on the Grușet Plateau and that the lower hill section has large amounts of features and anomalies similar to the Lower Settlement. One difference is that fairly large sections on the southern part of the hill are mostly empty of anomalies, whereas other areas inside the hillfort were typically densely occupied or used for production activities that show up on the magnetogram. Judging from what we know of the settlement structure, it seems that Jidovar Hill had what can be characterised as a predominantly normal occupation. Nevertheless, it should be emphasised that recent excavations at the hill only covered the late phase of occupation and that this picture may change. It is also possible that the empty areas on the southern hillside may indicate that only a small section of society was allowed to live on the hill. What supports the latter interpretation is that most other areas inside the hillfort were densely inhabited or used for production activities, and it is therefore difficult to account for that some areas were kept open, or at least were sparsely occupied, if all segments of the population had access to land on the hill.[11]

The Grușet Plateau

The Grușet Plateau is located in Teleac's Upper Settlement, north-west of Jidovar Hill. It has flat or mostly gently sloping terrain and covers an area of about 2.5 ha along Teleac's northern fortification system. The earliest Gáva habitation on the plateau was erected before the area was fortified, as is evident by a building that was later covered by the rampart.[12] The magnetogram and recent excavations show clear differences in settlement structure between the area along the fortification system and the southern and central parts of the plateau (**Fig. 7**). Directly adjacent to the inner side of the rampart is a 300-m long section with large anomalies arranged in a fashion that resembles dense habitation, a situation which is similar to the location of buildings in the fortified settlements Andrid-Corlat in north-western Romania,[13] Poroszló-Aponhát and Felsőtárkány-Várhegy[14] in north-eastern Hungary, and Smolenice-Molpír in western Slovakia.[15] Recent excavations in a 10 × 16-m trench (T5) show that the anomalies along the fortification indeed constitute houses: a 9 × 6-m well preserved building was found aligned to the inside of the rampart (**Fig. 3**).[16] The southern part of the Grușet Plateau appears mainly to have been used for high-temperature production activities. The area has several scattered 2.5 to 4.5-m large anomalies indicative of pit-buildings, which probably were used for economic activities, and a large number of circular anomalies, 1 to 2 m in diameter, which are characteristic of fire installations. Excavation of a 10 × 10-m trench (T1) in the central part of this area have verified the validity of these interpretations with the finds of two pit-buildings and 10 ovens and kilns (**Fig. 3**).[17] Several of the ovens had been renewed or rebuilt in the same location. Given that they were found on several chronological levels, it is clear that the area was used for high-temperature production for a long time.

There is an about 10 to 20-m wide strip of land that is largely empty of habitation type anomalies, which separates the row of buildings by the ram-

10 Uhnér 2017, 206; Uhnér *et al.* 2017, 189-191.

11 Judging from the topography it is unlikely that the empty areas have been subject to erosion, and it is also unlikely that they were kept open for agriculture or penning animals. Although the gate at the southern ridge is located just below the empty areas, which perhaps would have made it possible to drive livestock directly to Jidovar Hill without passing any occupied areas in the hillfort, it seems implausible that c. 25 % of the best defended part of an otherwise densely built hillfort would have been set aside for animals, although it should be clear that livestock were valuable. Given the large population in Teleac, the empty areas on Jidovar Hill would only suffice for a small part of the settlement's animals.

12 Ciugudean 2012b, 113.

13 Kienlin/Marta 2014, 396–397 Fig. 18.

14 Szabó 2004, 138–139 Pl. IX; Matuz 1992, 83; Metzner-Nebelsick 2012, 430.

15 Stegmann-Rajtár 1998, 263–265.

16 Ciugudean *et al.* 2018.

17 Ciugudean *et al.* 2017; Uhnér *et al.* 2018.

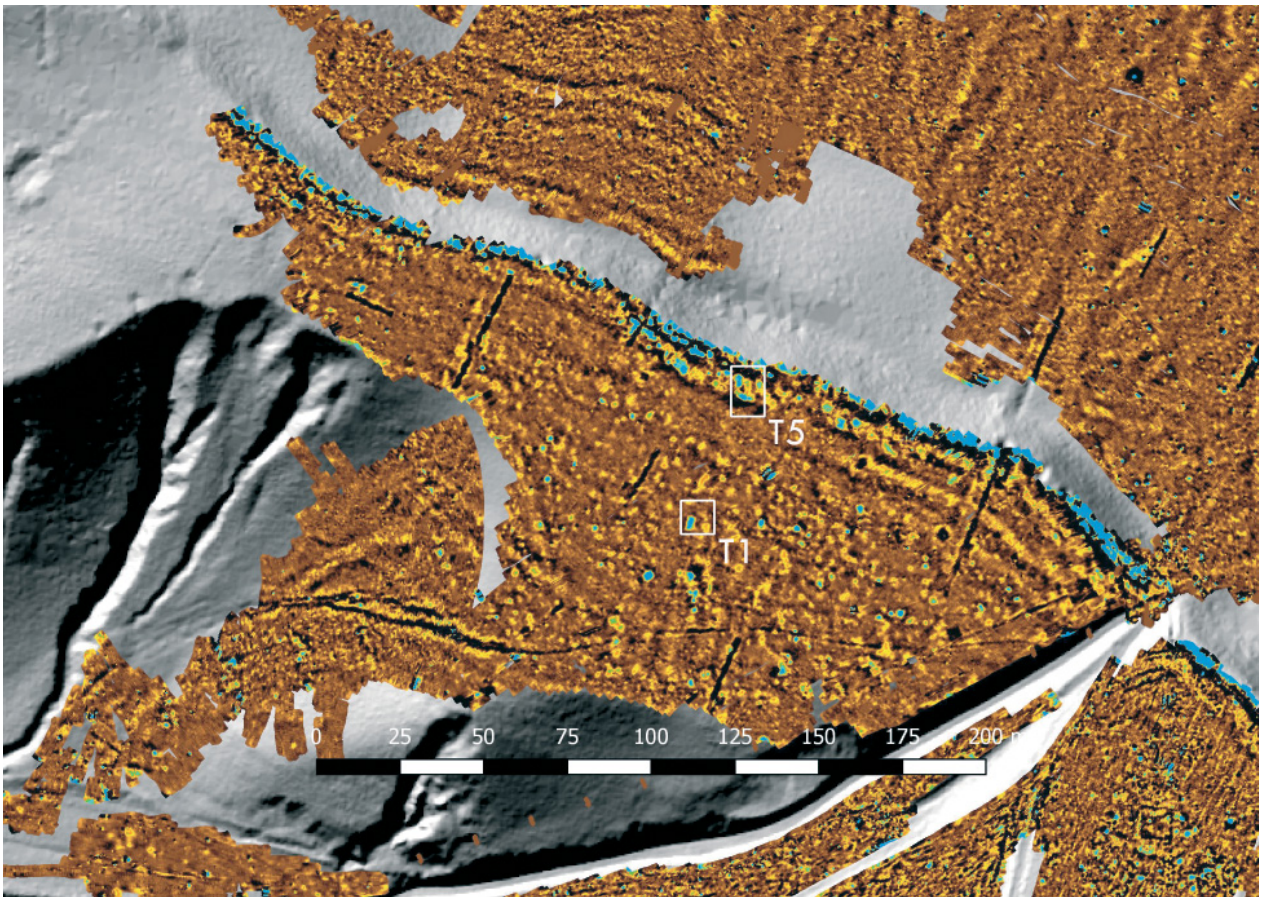

Fig. 7 Magnetogram superimposed on a LiDAR image of the Grușet Plateau (magnetogram by J. Kalmbach, RGK)

part from the southern part of the Grușet Plateau (**Fig. 6**). Today, there is not much difference in height between the upper part of the rampart and the settlement plateau, but the LiDAR image and the magnetogram of the settlement, together with recent excavations make evident that the situation was different at the time the hillfort was inhabited. Running parallel to the rampart's inner side are two distinct depressions and one more faint indentation in the terrain, all of which partly show up on the magnetogram as bands with negative nano Tesla values. It seems that these features are linked to the construction of the fortification system. Apparently, it was not sufficient to use soil from the ditch in front of the rampart in order to gain enough advantage in defensive height, so soil was also extracted from inside the hillfort in order to add to the rampart's height.

The 10 × 16-m trench (T 5) in the area provides an indication of the size of these earthworks. At a distance of circa 10 m from the face of the rampart, the ground surface starts to tilt downwards at an angle of about 20 degrees, at least reaching a depth of 1 m relative to the contemporary ground level. The area is at this point not fully excavated, but it appears that a large amount of soil from inside the hillfort was used to construct the rampart. The resulting depression is not as pronounced as the ditch in front of the rampart,[18] and would not have seriously hampered movements inside the hillfort. Nonetheless, it is clear that at least the northern sloping section of the depression was an essentially empty space without archaeological features at this otherwise densely occupied and utilised part of the settlement.

The Grușet Plateau stands out compared to the other areas in the hillfort, in that apparently a large section was set aside for specialised high-temperature production (**Fig. 8**). Although there are some differences in the settlement structure between various areas in Teleac, most other parts of the hillfort are less organised and have what appears to be mixed habitation and activity areas. This is not to say that all high-temperature production took place on the Grușet Plateau, as parts of a pottery kiln similar to the one recently excavated on the Grușet Plateau were found in a

[18] Cf. Vasiliev *et al.* 1991 Pl. II.

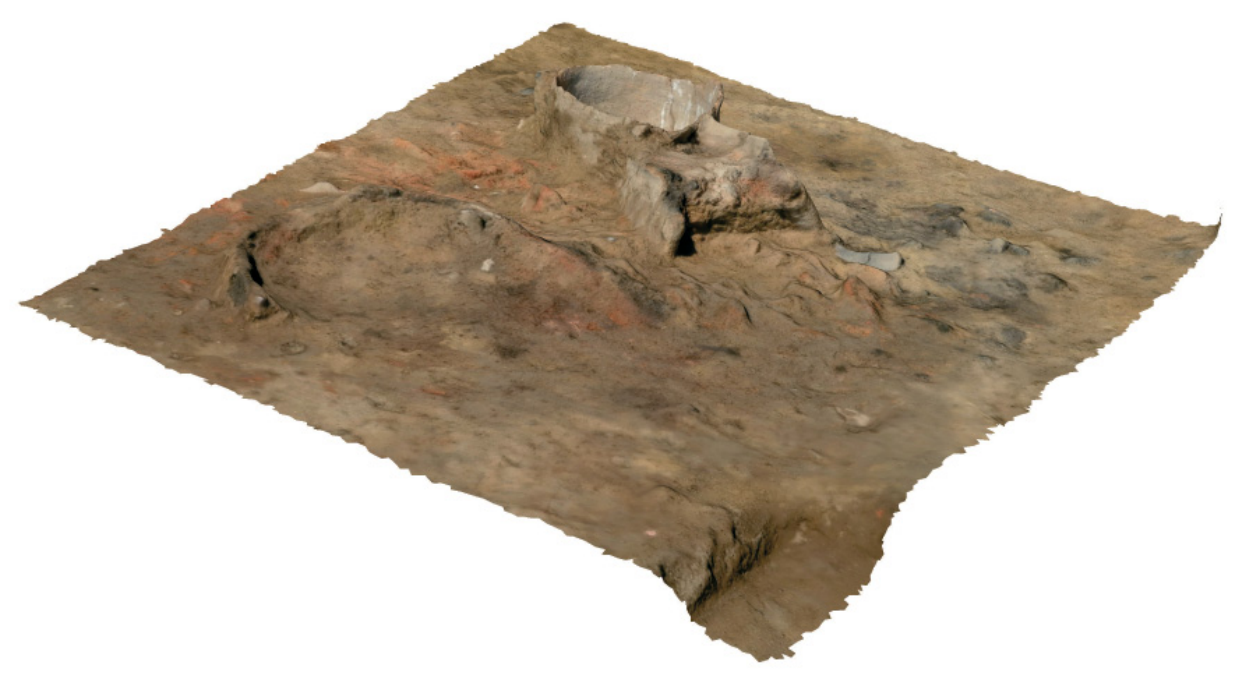

Fig. 8 3D image of a pottery kiln and an adjacent oven found at the area for high-temperature production at the Grușet Plateau (image by the authors)

building in the Lower Settlement in the 1980s.[19] Nevertheless, concentrating high-temperature production in a largely isolated area the upper part of the settlement is sensible from a utilitarian standpoint, because it reduced the fire hazard and may have provided some benefits of scale.

The northern part of the plateau appears to have had a similar layout as Jidovar Hill with houses hugging the inside of the rampart (**Fig. 9**). To erect buildings directly adjacent to the fortification system was fairly common not only in the Late Bronze Age/Early Iron Age, as demonstrated by both earlier and later European examples.[20] This practice is functional, above all in small fortified settlements, because it is an effective use of the available space and facilitates good communication inside the settlement.[21] Furthermore, the normally sturdy fortification superstructure provides good support for buildings as well as some protection from the weather. Nonetheless, this practice has some drawbacks, particularly from a defensive standpoint. With buildings joining the rampart, in particular if they are positioned close to each other as the situation appears to have been in Teleac, there are limited access points for the defenders to reach positions on top of the rampart. It is however unlikely that this posed a serious problem unless a surprise attack was mounted, and it should be noted that most tall ramparts have only a few places where defenders can climb up to them. A more serious problem was how to protect the buildings. It is impossible to determine with certainty how tall Teleac's rampart was from inside the settlement, but given that the buildings along the rampart were fairly large, it is likely that the rampart was higher than, or at least as high as the roofs of the buildings. When only the layout and part of the walls are preserved, it is of course uncertain how tall the buildings were;[22] however, considering the find of a 150 × 120-cm section of a house wall, and the fact that the roofs were most likely built at an angle, it is probable that the buildings were several meters in height.

Although there has been some erosion, the face of the rampart along the Grușet Plateau is well preserved and quite steep. There is a difference in height of about 7 m from the top of the partly infilled closest defensive ditch to the top of the rampart; measured from the bottom of the excavated ditch the difference is more than 9 m (**Fig. 10**).[23] As already mentioned, the foundation of Teleac's

19 Vasiliev *et al.* 1991, 40 ; Uhnér *et al.* 2017, 178-179.

20 E.g. Näsman 1976; Bátora *et al.* 2012.

21 Näsman 1976, 76.

22 Cf. Črešnar 2007, 326-328. 331-333.

23 Vasiliev *et al.* 1991 Pl. II

Fig. 9 Orthophoto of the 16 × 10-m trench (T5) by the rampart on the Grușet Plateau with the well preserved remains of a 6 × 9-m large building. The 150 × 120-cm wall section is located in the southern middle part of the building (photo by the authors)

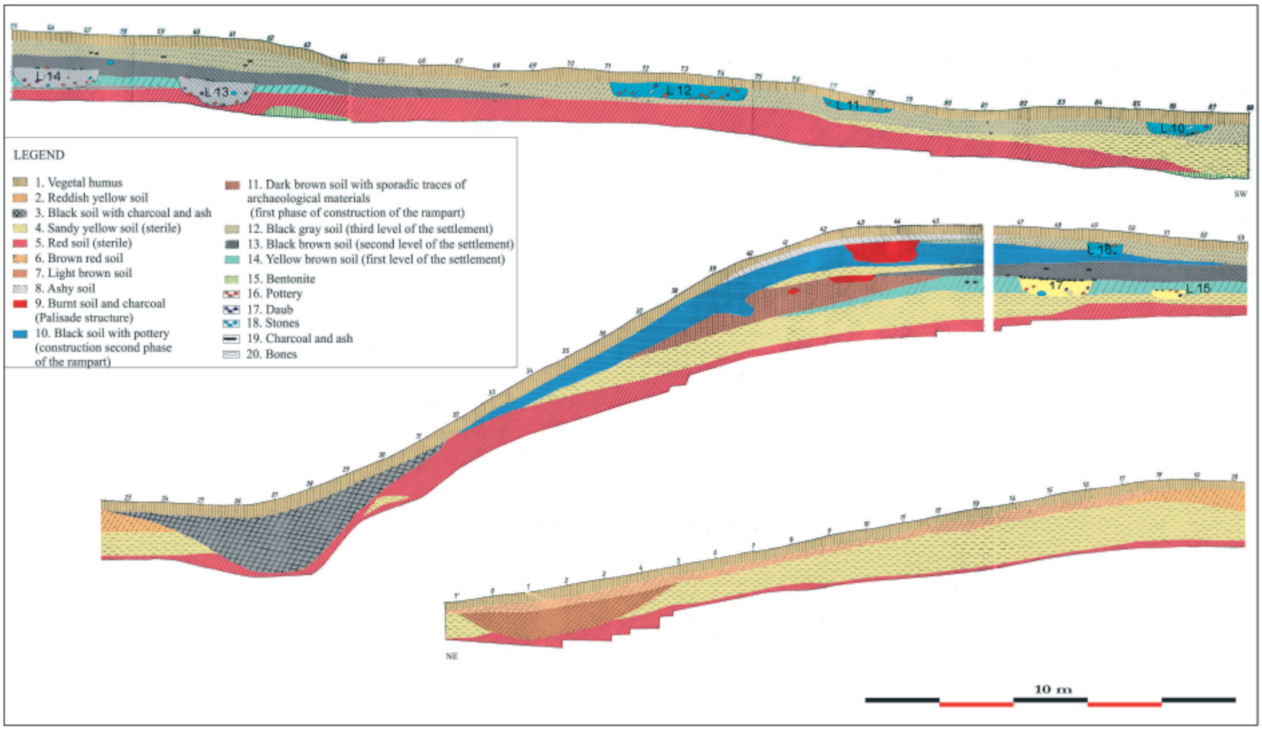

Fig. 10 Section of the northern rampart and defensive ditches at the Grușet Plateau (adapted from Vasiliev *et al.* 1991, 3 Pl. II)

rampart was composed of wooden-framed boxes filled with earth, and occasionally stones[24] and settlement debris, but it is not clear how the superstructure was built. However, recent excavations provide some clues. Only the rampart's top has been excavated at this point, but it is clear that the construction had a width of about 4 m. Although it is possible that the box-earth structure only made up the lower part of the rampart, the tower on Jidovar Hill shows that the inhabitants in Teleac were able to erect tall self-supporting structures using the same technique. The foundation is wide enough to have supported an at least 2-m high, earth-filled, wooden-framed superstructure;[25] with a parapet extension to protect the defenders on top of the rampart the entire superstructure would have had a height of 3.5 m or more measured from ground level, which perhaps would have been enough to provide cover for the buildings positioned along the rampart. The rampart would then have had a total height approaching 13 m, when viewed from the outside. A previous interpretation of the northern defences in Teleac propose that the top of the rampart had a wooden palisade,[26] which is also a possibility, but it should be noted that recent excavations at the northern rampart have not unearthed any evidence of a palisade.[27]

Although it is impossible to determine with certainty how the rampart's superstructure on the Grușet Plateau was built, there are a few additional factors that make it likely that it was an earth-filled, wooden-framed box construction of some height. A several decimetres thick layer with debris from the destruction by fire of the rampart and the adjacent building was found during excavation of the 10 × 16-m trench (**Fig. 11**). Even though the building had substantial wattle and daub walls with a thickness of 30 cm, the amount of debris clearly exceeds by a large margin what can be expected from the building. It also seems that the depression south of the fortification system, from which soil for the construction of the rampart was taken, was at least partly filled with debris from the rampart, which effectively altered the appearance of the northern plateau in making the terrain almost flat.

24 The soil in the Teleac hillfort has very few stones, which means that they have to be brought up from the Mureș Valley below. It is questionable whether the stones had a functional value in the rampart construction, because the soil is very stable. The stones found in the rampart are likely refuse from the settlement.

25 Cf. Diemer 1995, 28-33.

26 Vasiliev *et al.* 1991 Pl. IX.

27 Ciugudean *et al.* 2018.

Fig. 11 Orthophoto of the debris from the destruction of the building and rampart in T5 on the Grușet Plateau (photo by the authors)

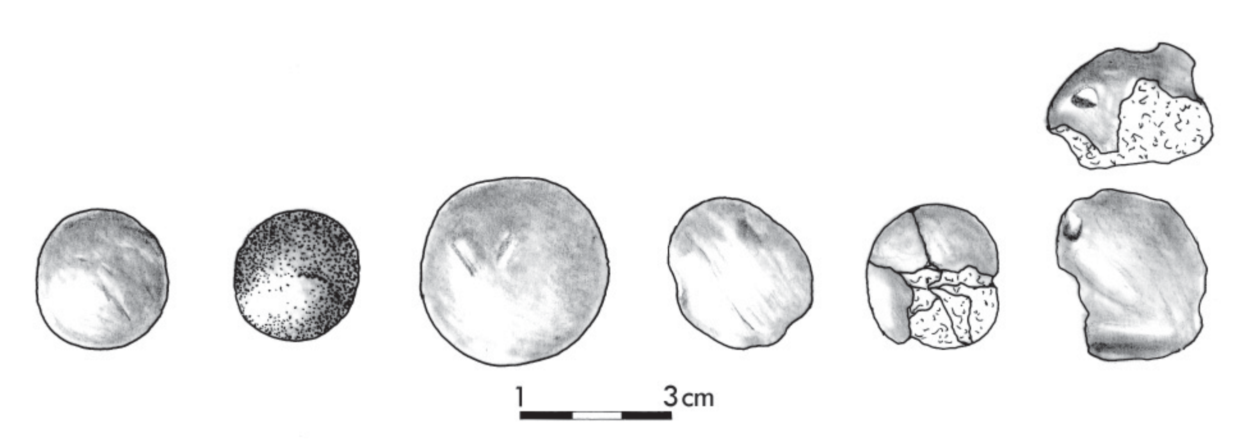

Fig. 12 Small slingshots found in the destruction debris from the northern rampart at Teleac (drawings by F. Mărcuți)

Even if one accepts that the northern rampart's superstructure was tall enough to cover the adjacent buildings, it seems that this practice involved some serious risks. Although we do not know how the buildings' roofs were constructed, it is likely that they were made from turf, thatch, shingles or planks,[28] all of which are combustible materials. It is also documented that the buildings had internal ovens or fire installations. The latter do not pose a serious risk in themselves, as the inhabitants likely had procedures to make this practice as safe as possible. However, given that the buildings were not only positioned very close to the rampart, but apparently also close to each other, a fire in one house could easily have spread to the surrounding buildings and the rampart superstructure, resulting in a conflagration that not only would destroy houses, but also seriously compromise the settlement's defences.

The magnetogram of the northern rampart on the Grușet Plateau and Jidovar Hill have continuously high nT values between 10 and 30 (**Figs. 3. 4. 7**), indicating that the entire fortification was destroyed by fire in an event that is dated to the late 10th century BC (**Fig. 20**). The extent of destruction makes it unlikely that the fire was an accident, because a concerted effort by the population probably would have succeeded in limiting the damage. More likely explanations are that the rampart was destroyed either on purpose or during an assault on the hillfort. The excavations by the rampart show that valuable portable household goods and supplies, such as 30 loom weights, ceramic storage jars filled with grain and even bronze items were left in one building, which makes a planned destruction unlikely (**Fig. 9**). There is a possibility that the rampart was burned down by attackers after capturing the hillfort, with the aim of either destroying the settlement or at least denying the inhabitants in Teleac the protection and strategic value of having strong fortifications. But even in this case it seems implausible that valuable household goods would have been left inside the building, when the fire was started. The more plausible explanation is that the northern rampart was destroyed during an attack on the hillfort. Supporting this notion is the discovery in the destruction rubble by the rampart of five small slingshots of roughly uniform size and weight and made of clay or stone (**Fig. 12**).[29] Although a hit from such a slingshot would certainly hurt, the blow would not be lethal to or seriously incapacitate a person other than in exceptional cases. Slingshots are however well suited for long distance use to harass and suppress the hillfort's defenders, forcing them to take cover behind the parapet, and thus protecting enemy troops and facilitating direct assaults to breach the defences.

The Lower Settlement

Teleac's Lower Settlement lies in a large basin in the southern part of the hillfort. It covers an area of about 10 ha with a mostly gently sloping terrain that is well suited for habitation. The magnetogram shows that it was densely settled (**Fig. 13**). The situation resembles closely the lower section at Jidovar Hill with numerous anomalies indicative of fire installations and concentrations of wat-

28 Cf. Črešnar 2007, 331-333.

29 The slingshots have diameters between 2.5 and 3 cm and weigh between 15 and 20 g.

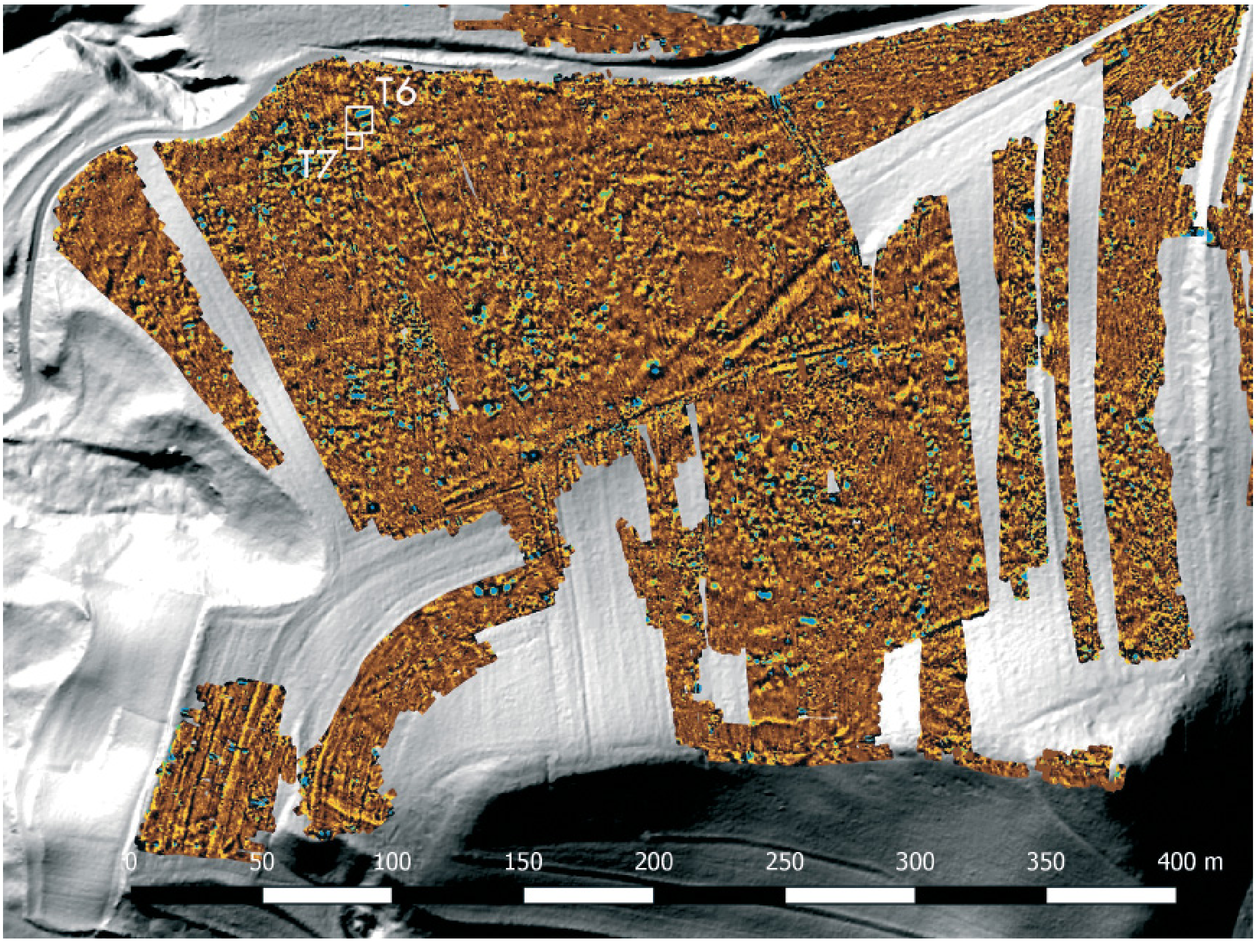

Fig. 13 Magnetogram of Teleac's Lower Settlement (magnetogram by J. Kalmbach, RGK)

tle and daub, but with the difference that some of the latter anomalies are larger than on Jidovar Hill. It is difficult to discern buildings on the magnetogram, but excavations in a 10 × 10-m (T6) and adjacent 6 × 6-m trench (T7) in the north-western part of the Lower Settlement (**Fig. 3**) indicate that some of the larger anomalies with low nT-values between 0 to 2 nT constitute large sunken buildings.[30] Given the large size of the Lower Settlement (its 10 ha constitute almost 60 % of the land suitable for habitation inside the hillfort[31]) coupled with the large amounts of anomalies recorded in the area, it seems clear that the majority of Teleac's population lived there.[32] The geophysics indicate that the settlement structure of the Lower Settlement is much less ordered compared to the Grușet Plateau and that the structure of buildings and activity areas developed in a more organic fashion (**Fig. 13**). This is perhaps to be expected from a mainly residential area, in particular when other areas in the settlement were set aside for production activities. The large size and gentle terrain of the Lower Settlement also meant that there were no topographical or structural reasons to organise the settlement differently, and from the sprawling nature of habitation it also seems clear that there was little or no socially enforced settlement planning in this part of the hillfort.

The outside borders of the Lower Settlement comprise of the southern ridge and the heavily

30 The full extent of the two buildings found during excavation in the Lower Settlement continues outside of the trenches. Judging from the magnetogram, the first building has a length of about 9 m and a width of 5 m, whereas the other building has a length of 7 m and a width of 5 m. Both features are only partly excavated, so these assessments may change during upcoming investigations. Both of these features are significantly larger than those of sunken buildings previously found in Teleac (Vasiliev *et al.* 1991, 33-37).

31 Uhnér *et al.* 2017, 167-168. Although the fortifications in Teleac encompass an area of 30 ha, only about 17.5 ha of the area were well-suited for occupation, for the site has many steep sections.

32 Uhnér *et al.* 2017, 194.

eroded western side of the hillfort that face the Mureş Valley (**Fig. 2**). Today there are no traces of fortifications in the western part of the site; yet given the large amount of work that was invested in the northern defensive system, it is safe to assume that Teleac's western side also was well-fortified. Although it is impossible to determine with certainty the topographical situation when the hillfort was settled, it is likely that the terrain at the western side rose high and steep above the floodplain below, and that limited built defences would suffice to offer very good protection.

A wooden parapet or low palisade would have been enough to make large sections of the high and steep southern ridge virtually impregnable from enemy attack, but the excavations there have not uncovered any evidence of such a construction.[33] On the other hand, it is notoriously difficult to recognise features in the upper levels in Teleac and the absence of palisade remnants or other signs of manmade fortifications should not be taken as evidence that the southern ridge solely relied on the defensive value of the tall and steep slope. Taken all together, even though the Lower Settlement appears not to have had significant built defences, it was very well protected by the terrain, which not only made assaults at this part of the site difficult, but also made most sections of the southern ridge very hard to attack with projectile weapons.

The north-western part of the settlement

The north-western part of the Teleac hillfort is heavily forested and has therefore not been subject to geomagnetic prospection apart from a small area adjacent to the rampart at the north-western corner of the fortification system (**Fig. 3**). This area has comparatively few anomalies, and – interestingly – there are no indications that the rampart at this part of the settlement was destroyed by fire. There are a few anomalies indicative of fire installations and a couple of large oblong features that might constitute buildings, but the situation is quite different compared to the area by the rampart on the Gruşet Plateau. The excavations in the 1980s and 1970s documented deep cultural layers and pit-buildings close to this area;[34] therefore, it seems safe to assume that that the north-western settlement had an occupation density similar to the Gruşet Plateau.[35] The difference in the magnetogram compared to the Gruşet Plateau and Jidovar Hill may be due to that this part of the settlement was not burned down.

The LiDAR image of Teleac shows that large parts of the slope outside the rampart down to the Mureş Valley are eroded, but it is nonetheless evident that the two outer fortification ditches extend around the fortification system's north-west corner (**Fig. 2**). At least the second ditch was largely redundant from a defensive standpoint because of the steep terrain, but the ditch may have been built to meet two other functions. The first function was that defensive systems should be continuous or link up with natural barriers to avoid flanking manoeuvres by the enemy. The second reason could have been that earth was needed to erect the rampart, similar to the situation on the Gruşet Plateau.

Water supply

It is noteworthy that there are no surface water sources inside the Teleac hillfort; moreover, given that the deep erosion ravines in the lower western part of the site are dry, it would have been impossible to reach the groundwater table through a well in prehistory. It was therefore necessary to bring water into the settlement from nearby water sources. The largest local source was the Mureş River. The LiDAR image of Teleac shows that at one point in time the river meandered close to the hillfort's western side. It is unclear whether this was the river course during the Late Bronze Age, but it is nevertheless clear that the Mureş was a potential source of water. The small valley to the south of the settlement has a creek that runs at a distance of 750 m in a straight line from the gate at Teleac's southern ridge, and about 250 m from the south-western corner of the settlement. The third water source is a small spring in a gully some 250 m north of the gate in the northern fortification system (**Fig. 2**). It is seems unlikely that this spring was large enough to supply the hillfort with sufficient amounts of water, but the population would have had a stable all-season water supply that was fairly easy to bring in to different parts of the settlement if the sources were combined.

33 Vasiliev *et al.* 1991 Pl. V[1] and V[2].

34 Vasiliev *et al.* 1991, 36 Fig. 13.

35 Uhnér *et al.* 2017, 193-194.

A problem of the water sources located outside the settlement was the inherent dangers and difficulties this entailed should a fire occur. Several parts of the settlement appear to have had buildings tightly grouped together, which of course increased the risk that a small fire could develop into a conflagration, if it were not extinguished quickly or prevented from spreading. Another serious problem was if the settlement's defences were attacked with fire. Even if Teleac had water stores earmarked for fighting fires, these would probably be depleted quickly if the attackers made repeated attempts to set the rampart ablaze, and the population would quickly succumb to thirst if the defenders resorted to using drinking water, which would force the hillfort to surrender.

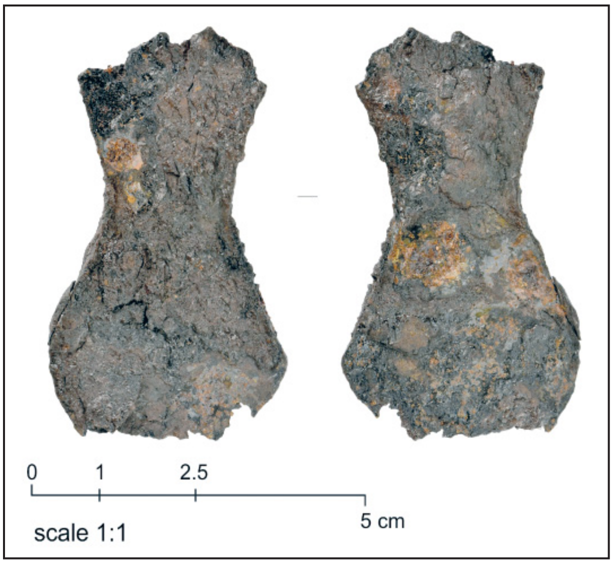

Fig. 14 Iron sword or dagger hilt found at Teleac (photo by C. Suteu)

Warfare and the attack on Teleac

The fact that Teleac had no internal water supply could have been a severe problem in wartime. If the settlement were besieged, it is unlikely that the population could have held out for long. It is however unclear how likely such a scenario is. Hypothetically, the hillfort´s population could bring in extra supplies of water in preparation to defend the site unless a surprise attack was mounted, and this supply could probably suffice for several days if rationed. Given the logistical difficulties in carrying out military operations away from one's own territory – in particular in regard to foodstuffs – it may also have been a problem for attackers to carry out siege operations for prolonged periods.[36] Attackers could of course try to obtain supplies by force from open settlements around Teleac, and perhaps to some extent live off the land, but this would mean dividing the attacking force and thus making siege operations more difficult and rendering the smaller separated forces vulnerable to counterattacks.[37] On the other hand, any forces with adequate military strength and organisation in carrying out an assault on a heavily fortified settlement with a reasonable prospect of success must have been well organised not only militarily but also logistically. And such forces would in all probability have had at least a rudimentary supportive baggage train with wagons and pack animals to help carry supplies as well as plunder if the force managed to capture the settlement. We can of course only speculate on the nature and level of organisation of such military forces; yet even if they were well organised and well supported, it must have been very difficult to keep them in the field in hostile territory for prolonged periods.[38]

Given these problems, it is perhaps not surprising that it appears that Teleac was taken by force as opposed to having been starved into submission as shown by the destruction of the northern rampart and associated finds (**Fig. 14**). That the formidable defences were attacked and breached are good indications of a few factors. It is evident that the attacking forces had significant military strength, and if we accept that the slingshots found by the fortification were used to suppress the defenders, they would also have been well organised and capable of carrying out rudimentary combined arms operations, in which slingshooters supported the troops that tried to breach the defences. Such an attack would also imply that at least the assault component of the attacking force was well-disciplined and willing to carry out dangerous tasks, which is far from the tentative and opportunistic character of warfare sometimes suggested for prehistory.[39]

It must be emphasized that this attack and destruction of the rampart did not result in the end of occupation at Teleac. Namely, two poorly preserved house contexts with accompanying

[36] Keegan 2004, 301-303.
[37] Cf. Uhnér 2010, 286.
[38] Cf. Caesar 1958.
[39] Keegan 2004, 3-12. 114-115; Carman/Carman 2005.

Fig. 15 The salt spring Ocnişoara – Murătură (com. Lopadea Nouă), located in the hills above the Mureş floodplain in a salt-rich area 25 km north-east of Teleac (photo by the authors)

hearths of the Gáva culture were located above the destruction layer by the northern rampart. Unfortunately, the poor state of preservation in the upper layers at Teleac makes it difficult to assess the impact that the attack had upon the rest of the settlement. However, even though the situation along the northern rampart certainly gives the impression that Teleac was violently sacked, there is no evidence of destruction throughout the settlement. The trenches excavated at a distance from the rampart on the Gruşet Plateau and on Jidovar Hill, as well as the trenches in the Lower Settlement have not produced similar evidence of large-scale destruction by fire with valuable household goods left *in situ*.

Mineral resources, location and control

We have previously argued that Teleac was a military stronghold[40] that was supported by and dominated surrounding open settlements.[41] Together they formed a political entity that controlled an area that at least extended for several kilometres along the Mureş Valley. It is likely that the controlled area also included the nearby highland on the Secaşelor Plateau to the east of the hillfort and perhaps more importantly parts of the highlands leading into the Apuseni mountains to the west and north-west of Teleac (**Fig. 18**). Teleac's location was not only well suited for defence. The Mureş Valley was undeniably a major trade and transportation route between the eastern and central parts of the Carpathian Basin in prehistory,[42] and Teleac occupied an eminently strategic position on a narrower section of the Valley.

Although we cannot say for sure what was transported and traded along the Mureş Valley, it is clear that Transylvania has an abundance of mineral resources. There are several rich sources of both brine and rock salt in the larger region to the east of Teleac (**Fig. 15**),[43] and the Apuseni Mountains and the Carpathians have several copper deposits, some of which may have been used during the Late Bronze Age.[44] Lead isotope analysis of the Greek Late Helladic silver, including Mycenaean shaft grave silver vessels are consistent with multi-metallic ores from the Apuseni Mountains and from Baia Mare in present-day northern Romania, indicating prehistoric extraction,

40 Keegan 2004, 139-140.
41 Uhnér *et al.* 2017, 195-196.

42 Uhnér 2017, 210-211.
43 Boroffka 2009, 126-129; Harding/Kavruk 2013; Bukowski 2013, 33.
44 Wollmann/Ciugudean 2005; Boroffka 2009, 126-128.

Fig. 16 Remnants of placer gold mining in the Arieş River Valley in the Apuseni Mountains. The mounds on the field around the steel lattice towers are spoil heaps accumulated during gold mining. The heaps have not been dated, but the majority are probably from medieval times (photo by the authors).

although not contemporary with Teleac.[45] The settlement also coincides with the introduction of iron in the eastern Carpathian Basin and Teleac is situated close to several iron sources.[46] The richness of the region around Teleac is underlined by the large number of bronze hoards,[47] including the oversized Late Bronze Age hoards from Aiud, Uioara de Sus and Şpălnaca II to the north of Teleac and Guşţerita in the south-east, which together have a combined weight of several tonnes.[48]

Another valuable resource is gold.[49] On the other side of the Mureş Valley, directly opposite from Teleac, is the entrance to the Ampoi Valley, which is one of the better access points to the rich gold deposits around Zlatna, Bucium and Roşia Montană. Furthermore, the riverbeds of the Ampoi and Arieş rivers and their tributaries have gold placer deposits (**Fig. 16**). Due to the state of research it is difficult to determine the significance of these sources for the Late Bronze Age and Early Iron Age. It is however evident that the Apuseni Mountains were an important source of gold during the Early and Middle Bronze Age: namely, the surrounding region has several finds of gold objects that correspond well with the local gold deposits which have a distinctive chemical composition with a very high silver content of c. 26 %.[50] Unfortunately, there are no chemical composition data for gold finds contemporary with the Teleac hillfort. Nonetheless, given that some La Tenè period finds have the same type of gold as the Early and Middle Bronze Age,[51] it seems safe to assume that gold from the Apuseni Mountains was also exploited during the Late Bronze Age and Early Iron Age.

In view of the somewhat scant direct evidence of metal extraction in Transylvania around the beginning of the first millennium BC, it is perhaps not surprising that we have little information on how mining operations were organised and by whom they were carried out. Metal production was an activity that required specialised knowledge and equipment. Mining was also labour intensive. Besides the manpower that was required for the direct extraction and processing of ore, considerable forestry activities were also necessary for pro-

45 Stos-Gale 2014, 198-199 Fig. 18.
46 See Hansen in this volume.
47 Ciugudean *et al.* 2015.
48 Rusu 1981; Hansen/Krause 2017.
49 Ciugudean 2012a.
50 Hartmann 1970, 40; Cristea-Stan/Constantinescu 2016, 37.
51 Hartmann 1970, 40. 47.

Fig. 17 Aerial view of the Teleac hillfort to the North (photo by J. Kalmbach)

viding fuelwood for these activities.[52] But despite this, it appears that fairly large-scale prehistoric mining operations could be carried out without direct involvement of elites in organising and supervising positions.[53] There are few indications of large-scale generation of wealth by communities in the mining districts in Transylvania, which is to be expected when taking the situation in the eastern Alps as a proxy for conditions in Transylvania.[54] Although wealth could theoretically be generated from mining raw materials, surplus extraction associated with raw materials were usually made at bottlenecks in the distribution chain that offered opportunities to certain actors to restrict access or assert a level of control over trade or the distribution of the goods in question.[55]

Settlements, and in particular fortified settlements of stronghold character, located at strategic points for communication, can constitute such bottlenecks, for they provide opportunities to control transportation and trade. The fact that a settlement is located on such a strategic position does not of course necessarily mean that it asserted control over transportation and trade, but there are a few aspects that are strong indications that this indeed was the situation in Teleac. The first aspect is that the hillfort occupies a prominent position that is visible from afar in the Mureş Valley (**Fig. 17**). Such conspicuous locations of fortified settlements were strong symbolic expressions of ownership and assertion of control over a territory and its resources,[56] and a readiness of the population to use military force to defend and enforce their interests, if they were challenged by other parties. The lasting occupation of Teleac, coupled with contemporary long-term surrounding open settlements, makes evident a close association between the population and the region, which would have established strong aspects of ownership over arable lands and fields for grazing. Much of this derived from everyday labour investments and entanglement of people in the local environment. For instance, by tilling and using the land, but also through military capacity as expressed by the strong defences in Teleac, ownership in societies without institutionalised legal systems also rested upon the ability

52 Placer mining for gold is however an activity that can be carried out by small workforces without much supportive infrastructure. That said, placer mining operations can be considerable undertakings and involve large workforces.

53 Uhnér 2010, 134.

54 Cf. Shennan 1995, 360; 1999; Uhnér 2010, 151-153.

55 Cf. Earle *et al.* 2015.

56 Earle 2017, 9.

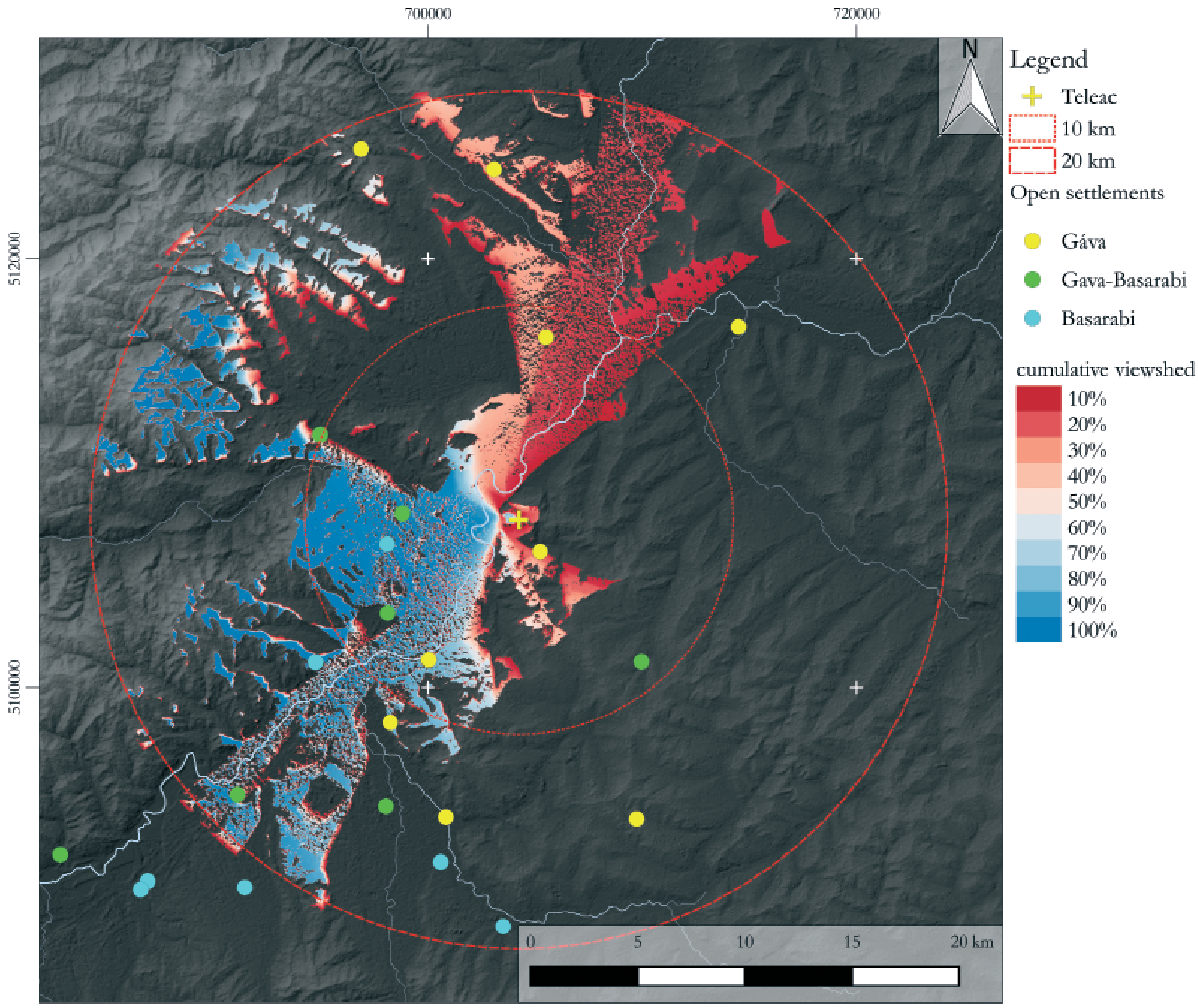

Fig. 18 Cumulative 20-km radius viewshed analysis centred on the Teleac hillfort, mapped with surrounding open settlements (image by the authors)

to defend and capture valuable objects and means, in this case the hillfort could also have been used to access and assert a level of control over nearby routes for transportation and trade. This should not be understood as total control actively backed by military force on all transportation and trade that passed through Teleac's surroundings – and it certainly did not mean that actors in Teleac could extract excessive tributes from this trade. Most trade would soon follow routes around the hillfort's territory if the latter strategy were enforced,[57] and Teleac would as a result be isolated and forgo an important economic asset.

The control that Teleac exercised likely concerned two interrelated parts. The first involved the relationship between the hillfort and the population that lived in nearby open settlements. By virtue of Teleac's large population and strong fortification system, it seems evident that the hillfort had a significant local advantage in terms of military and economic strength, which could be leveraged into establishing and maintaining Teleac as a political centre. The second aspect concerned the movement of people and goods from farther afield through the immediate region. A cumulative viewshed analysis shows that Teleac occupied a location that offered a commanding view of large swaths of land (**Fig. 18**).[58] The most visible area is to the west and south-west of the hillfort,

[57] Uhnér 2010, 284.

[58] The viewshed is based on 382 observation points covering all significant areas inside the hillfort. The advantage of a cumulative viewshed is that the method explores the whole potential of what is visible from Teleac, but it is important to emphasise that the red coloured areas in the viewshed to the north of Teleac should not be understood as being poorly visible. They are instead well visible but only from the upper northern part of the hillfort.

Total area in a 10 km radius	Total visible area in a 10 km radius	Total area in a 20 km radius	Total visible area in a 20 km radius
31383 ha	10898 ha	125534 ha	23460 ha

Table 1 Visible areas from the Teleac hillfort in 10- and 20-km radii

including large parts of the Mureş Valley and the lower section of the Ampoi Valley leading into the Apuseni Mountains to the west. At this point it is unclear what type of vegetation the Mureş Valley had in the Late Bronze Age and Early Iron Age.[59] Given that the river terraces in the valley were rather densely settled by agricultural communities and had been settled for a long time, it is likely that large parts were deforested. But since the narrowest section of the valley as seen from Teleac was 7 km wide, it would still have been difficult to see small groups of people moving through the landscape, and it would have been difficult to intercept fast moving groups on the other side of the valley, even if they were observed from Teleac. That said, since it seems clear that nearby open settlements belonged to the same political entity as Teleac, it was not necessary to centre every aspect of land control to the hillfort, and it would have been almost impossible for large parties to move through the region without being noticed.

That nearby open settlements and traffic through the Mureş and Ampoi valleys could be monitored from Teleac was of course significant, but perhaps more important was that the hillfort's presence loomed large in view. The strength of the hillfort was always present for the population in the open settlements. This could instill a positive sense of security against threats from the outside, but it was also evident where military power was concentrated and that this power could be used to keep the region's population in line if necessary. A similar argument can be made for long-distance transportation and trade. The prime reason behind the size and local importance of Teleac was the settlement's strategic location for control and participation in these activities, which gave Teleac's population an incentive to protect and support most if not all people involved, even if they came from and were headed towards other regions. Routes near Teleac were probably safe from foreign raiding, but traders probably had to collaborate with local economic interests, and perhaps pay for the privilege to pass through the territory (again with the caveat that it would have been counterproductive to demand exorbitant rates). The evident strength of the hillfort would have been an important tool to passively enforce such strategies as travelling parties would not risk stepping out of line.

Concluding discussion

Teleac was located at a geographical bottleneck for interregional transportation and trade between communities on the Transylvanian Plateau in the East and the central parts of the Carpathian Basin in the West, and the hillfort and nearby open settlements controlled the entrance to the much smaller, but on a local and regional level important Ampoi Valley. The hillfort was also positioned directly on a crossroad, which was probably only of local importance, between the Mureş Valley and a small valley that follows a creek up towards the Secașelor highlands in the East. Teleac was thus located in a strategic position both regionally and locally, which is also evident on a cost-surface analysis that shows that a large number of open settlements were located in less than 8-hours travel distance by foot from Teleac **(Fig. 19**). The strategic location explains in part both the large population and the apparent prosperity of Teleac, as well as why the settlement was heavily fortified. Once Teleac was fortified with a substantial population,[60] it had several important advantages in relation to surrounding open settlements, which would have established Teleac as a political centre, even if this perhaps was not the intention when the settlement was established.

The attack and destruction of the northern rampart at Teleac are strong indications that 10th-century military forces in south-eastern Transylvania could have been both large and well organised. The force that attacked Teleac had significant offensive abilities and the capacity to breach substantial de-

59 Feurdean/Tanţău 2017.

60 Uhnér *et al.* 2017, 192-195.

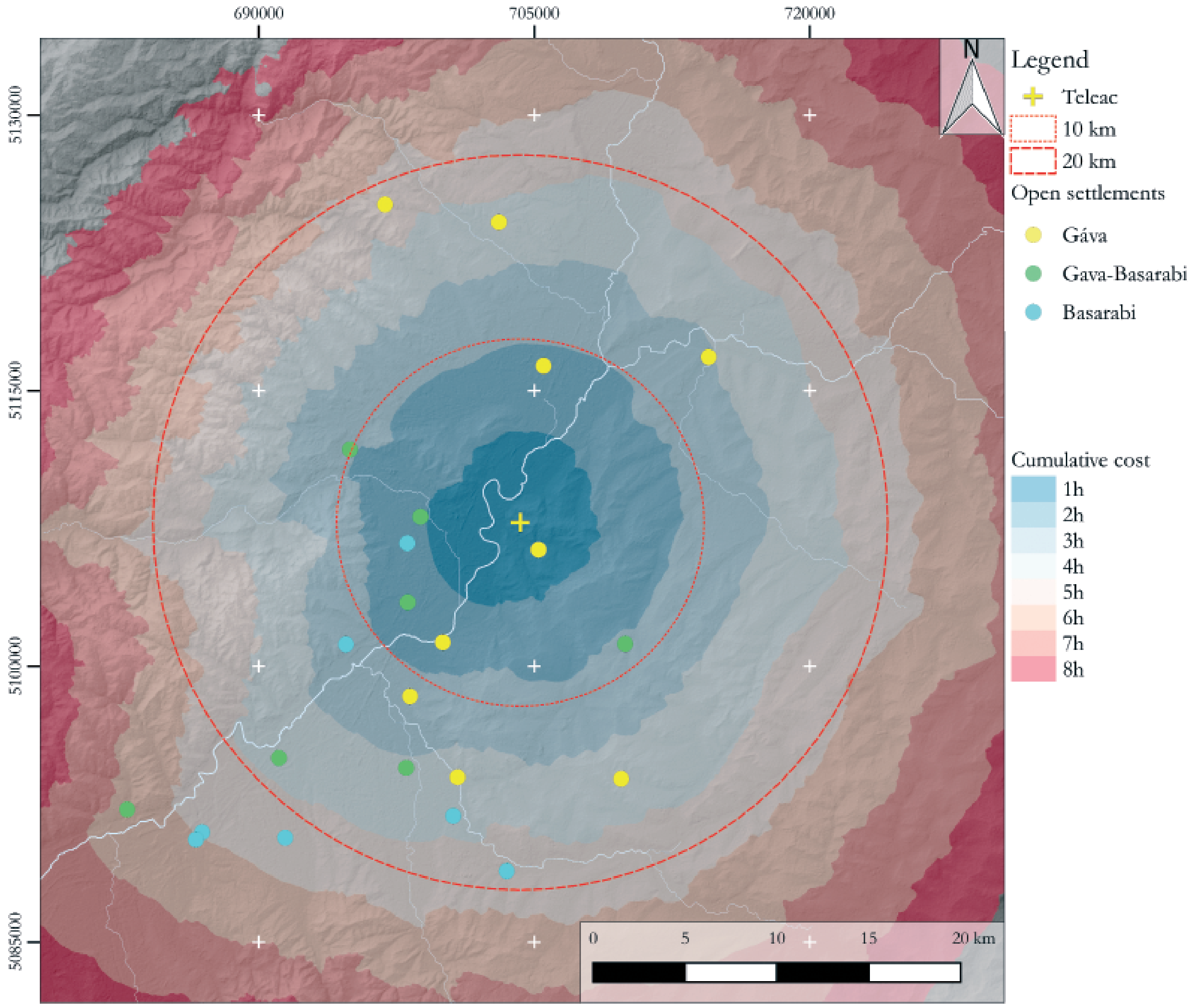

Fig. 19 Cost-surface analysis centred on the Teleac hillfort (image by the authors)

fensive systems. They could also carry out operations in enemy territory, possibly far from their home territory, which suggests that they had a good logistical support system. This implies that the level of military threat was serious, making it rational to invest in large and costly fortification systems in order to deter attackers.

Because Teleac was an economic and political centre, as well as an important hub for transportation and trade, there were several potential threats to the settlement. Apart from raiding with the straightforward goal of seizing valuable goods, there was also an incentive for people with power ambitions to subjugate the hillfort, either with the objective to take over existing power relations in the immediate region or to establish a new order of things. It is of course impossible to determine with certainty the reasons behind the attack on Teleac, but the overall situation found inside the hillfort provides some clues (**Fig. 20**). The most important aspect is that there are no indications that the rampart was re-built after the attack. It is theoretically possible that traces of a simple palisade along the rampart's edge have been destroyed since then by erosion. A low palisade or wooden parapet would have had real defensive value, as the lower part of the rampart remained largely intact along with the outer defensive ditches. What speaks against this is the position of one of the buildings that was built after the destruction event: namely, it was located so close to the hypothetical position of a palisade that it would have been impossible to man the defences. Although the earlier building that was destroyed under the attack of Teleac also was built directly adjacent to the rampart's inner side, it was located about four meters away from the face of the rampart, which left the defenders with a wide enough platform to stand upon. This would have been impossible with the location of the later building. Given this situation, it is unlikely that the defensive system was rebuilt after the attack.

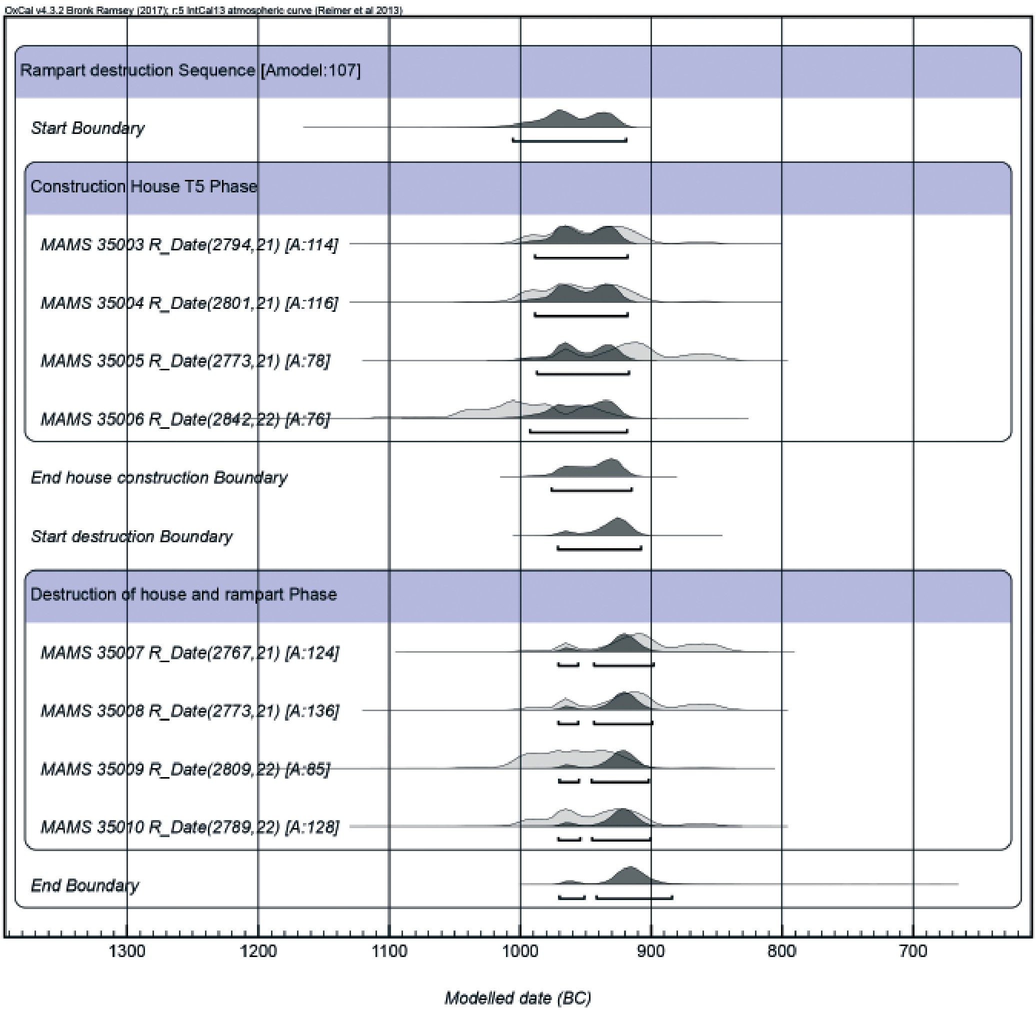

Fig. 20 Probability distributions of dates relating to the construction of the 9 × 6-m building by the northern rampart, and the destruction of the northern fortification system (graphic by the authors)

The fact that the fortifications were destroyed and not rebuilt makes it implausible that the attack was mounted by a rival faction in order to take advantage of the hillfort's strategic position and to impose a level of control over transportation and trade along the Mureş Valley using the strategies outlined above. It is of course possible that the attack was carried out just with the intention to plunder, but if that were the case it is peculiar that the defensive system was not rebuilt by the remaining population, since the threat of enemy attacks clearly existed. A possible explanation is that the settlement fell under the political and military domination of the entity that carried out the attack, and that it was in the entity's interest to hinder the resurgence of Teleac as a political centre. Even though occupation continued, it is unlikely that the settlement maintained its position after the destruction of the northern fortification system.

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Svend Hansen

The Hillfort of Teleac and Early Iron in Southern Europe

The large hillfort of Teleac, commanding the Mureş River valley, the principal East-West connecting axis in the Carpathian Basin, was likely built in the second half of the 11th century BC and occupied until the end of the 10th or the early 9th century BC. The fortification wall was destroyed around 920 BC, according to recent investigations. More than 40 iron objects were discovered in the fortified complex. These iron finds viewed together with numerous other iron finds from other sites signify that Transylvania was an early centre of the implementation of iron and presumably iron production. Thereby, the use of iron for producing weapons probably stood in the foreground. This is indicated by corresponding grave finds in Greece that contain a sword as offering, but also iron swords found in Slovenia and Romania.

Introduction

The hillfort of Teleac, located only five kilometres from Alba Iulia in Transylvania, crowns the left bank of the Mureş River (**Fig. 1**). It covers an area of c. 30 ha and, thus, represents the largest fortified hill settlement in the vicinity and in fact is one of the largest known in the Carpathian Basin. According to data that rely upon a series of 14C-datings, the settlement was erected during the second half of the 11th century BC and inhabited until the end of the 10th or early 9th century BC.[1] A clearly smaller settlement still stood in this location in the 7th century BC. The complex is impressive evidence for the significant role played by fortresses in times of violent conflicts. Around 920 BC a larger section of the hillfort and parts of the inner settlement were destroyed, yet it continued to be inhabited for some time thereafter. A 600-m long stretch of the burnt fortification wall is recognisable in the magnetogram (**Fig. 2**).[2]

Archaeological investigations were carried out at the site of Teleac for the first time in the 1950s.[3] Comprehensive excavations took place between 1978 and 1987.[4] Corresponding to excavation methods at that time long trenches, but only 1.5 m in width were installed in the complex. Their narrowness hardly provided a satisfactory picture of settlement on the hill. Since 2010 a Romanian-German team has been active in studying the hillfort, initially within the framework of the EU-project "Forging Identities". A geomagnetic plan and a new topographic map were made, and smaller trial trenches were conducted as well.[5] This work was prerequisite to resuming larger excavations in 2016 within the framework of the Loewe project "Research on Prehistoric Conflict".[6]

The Mureş river valley is the most important East-West transit axis in the eastern Carpathian Basin. Its significance for the exchange of goods and ideas has recently been convincingly described.[7] The role played by the hillfort Teleac probably pertained to the general control of this communication route. Associated with that was also the exploitation or distribution of mineral resources, which were present in abundance in the surroundings. Unfortunately, most of the direct evidence that has been gathered until now, such as mines and corresponding tools, dates to the younger Iron Age and Roman times.[8] Salt likely played an important role as well since the 13th century BC, at the latest, in the closer surround-

1 Ciugudean 2009; Uhnér *et al.* 2017; Ciugudean *et al.* 2017; 2018; see Uhnér *et al.* in this volume. On the beginnings of the hillfort, see Boroffka 1994.

2 Uhnér *et al.* in this volume; also there more on the 14C-datings.

3 Horedt *et al.* 1962.

4 Vasiliev *et al.* 1991.

5 Boroffka/Ciugudean 2012; Uhnér 2017.

6 Hansen/Krause 2017.

7 Uhnér 2017.

8 Wollmann 1999; Wollmann/Ciugudean 2005; Boroffka 2009.

Fig. 1 Teleac. View from the northeast: the hillfort and into the Mureş Valley (photo by K. Scheele)

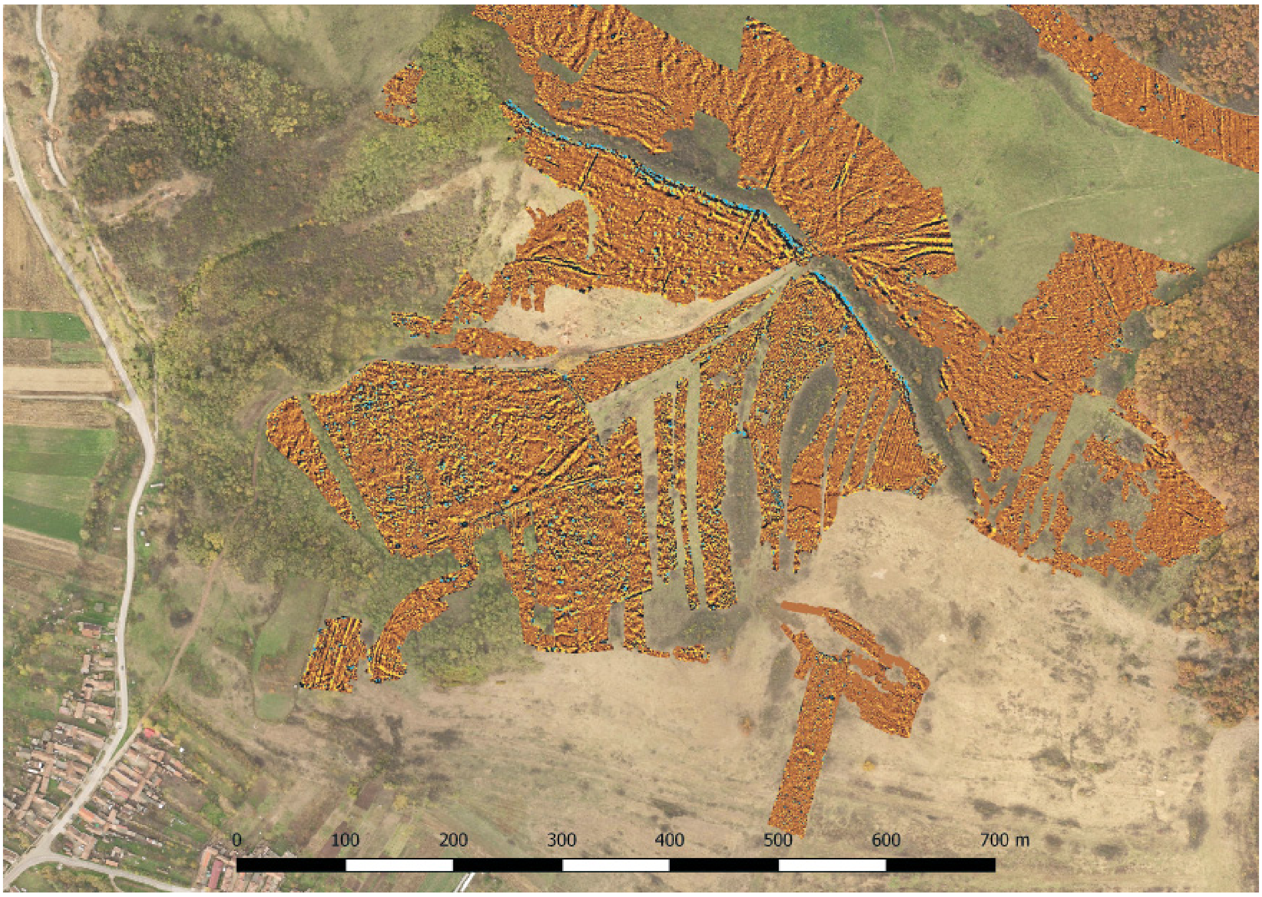

Fig. 2 Teleac. The magnetogram shows the burnt fortification wall in a length of 600 m (magnetogram by C. Uhnér)

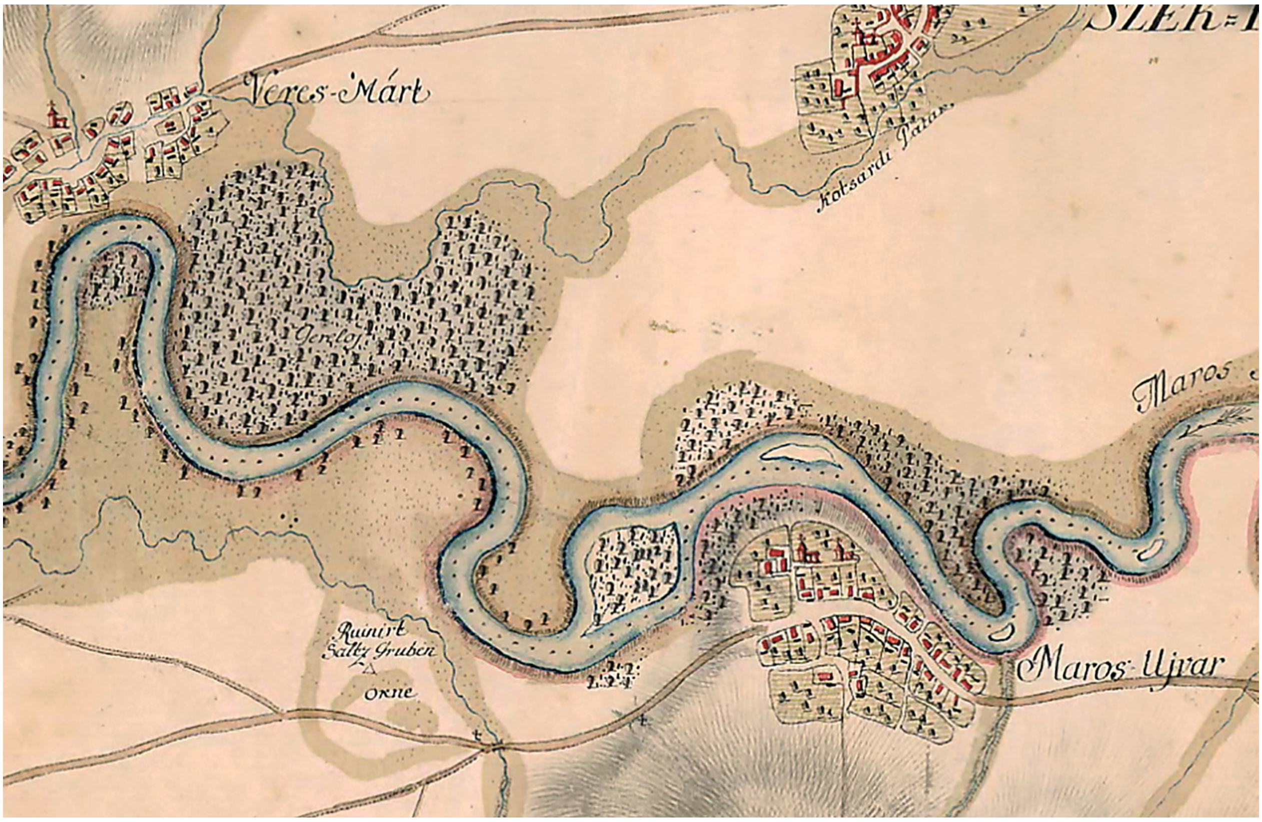

Fig. 3 Uioara de Sus (Hung.: Felsőmarosújvár) located on the Mureș River (map made during the Josephinian Land Survey)

ings of Teleac, although until now there is no evidence for the exploitation of salt deposits in and around Ocna Mureșului. Be that as it may, the largest known hoard in the Carpathian Basin, the hoard from Uioara de Sus (Felsőmarosújvár), jud. Alba, was discovered in the immediate area of a destroyed salt mine ("Ruinirt Saltz Gruben"), as shown in the Josephinian map, drawn up in 1769–1773 (**Fig. 3**).[9] The hoard was deposited there in the 12th century BC; furthermore, it contained some bronze objects that were even older in date. The bronze winged pickaxes (**Fig. 4**) in the hoard can be identified as mining equipment and could very well have been used in a salt mine.[10] Comparable winged pickaxes are known from Hallstatt and environs in upper Austria.[11] Evidence for the salt extraction process during the Late Bronze Age in Romania was recently gained in Băile Figa, c. 60 km north of Cluj/Kolosvar.[12] Gold was of importance for the region too, in Roman times in any case. Moreover, activities in gold mining in earlier times have been postulated with good arguments.[13]

The founding of Teleac

Research on conflict in prehistory requires not only empirical evidence for warlike violence, as for example the burnt fortification wall in Teleac, but also thoughts on the possible reasons that might have led to armed conflicts or warfare.[14] One very immediate reason would have been control over natural resources. In the Bronze Age (and still today) mineral raw materials were rare goods, whose exploitation was organised and controlled to varying extent. During the Bronze and Early Iron Ages there were large organised copper mines, for example the Mitterberg mining district, but also presumably smaller ore outcrops which were extracted seasonally by small communities.[15]

9 Josephinian Land Survey, Sectio 140, detail from the West edge of the map sheet.

10 Petrescu-Dîmbovița 1977 Pls. 220,17–19; 221,1.5; Vulpe 1975 Pls. 45–46; Boroffka 2009, 124 Fig. 2,1–3.

11 For salt mining cf. Reschreiter/Kowarik 2015; on the deposition of winged pickaxes in the area of the southern Alps, see Windholz-Konrad 2012, 124 Fig. 4; Neumann 2015, 148–150.

12 Harding/Kavruk 2010.

13 Ciugudean 2012b; Cristea-Stan/Constantinescu 2016.

14 Hansen 2013; 2015.

15 For the Mitterberg district, cf. Stöllner *et al.* 2006.

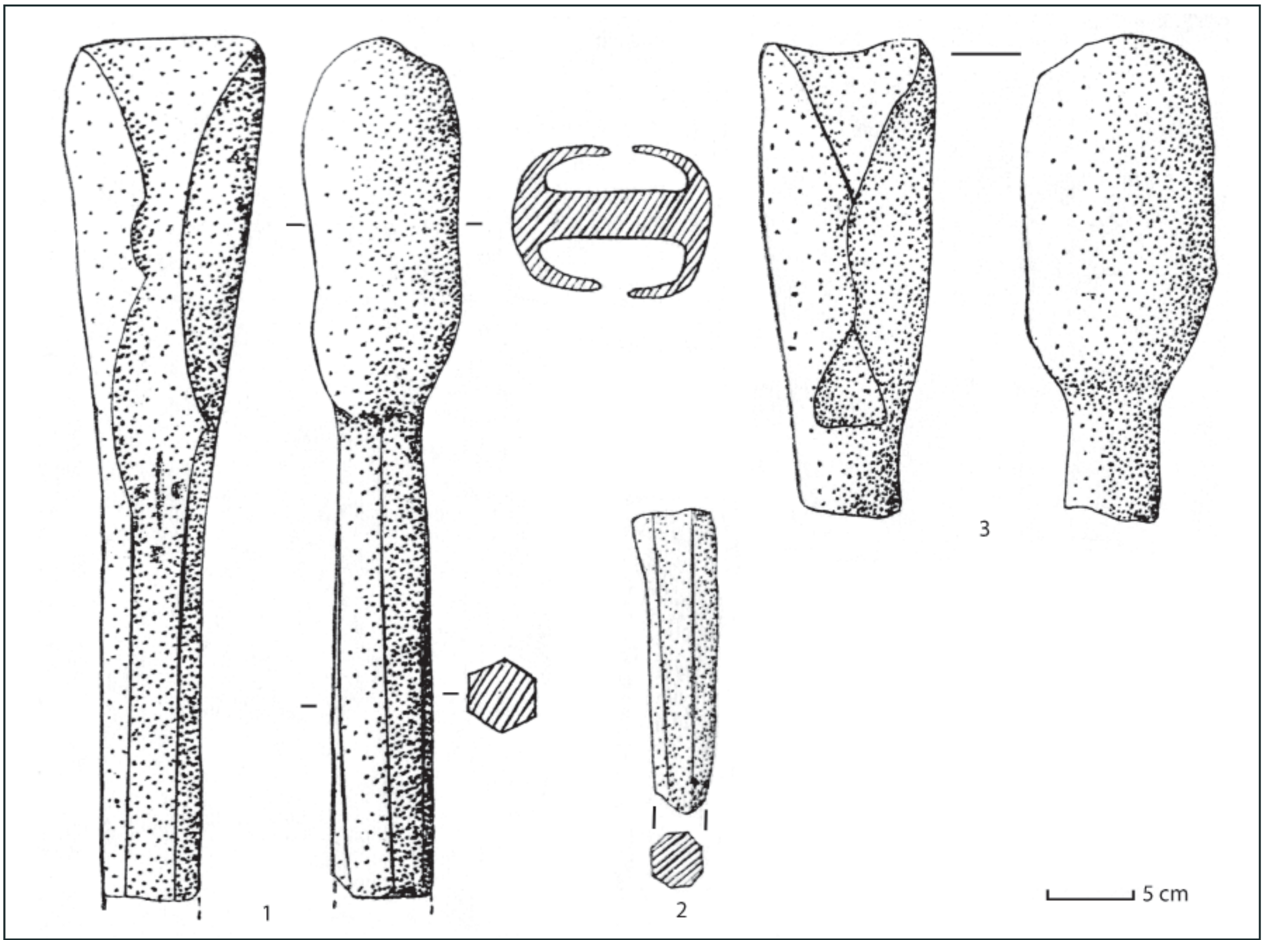

Fig. 4 Uioara de Sus. Winged pickaxes (after Petrescu-Dîmbovița 1977 Pls. 220,17–19. 221,1.5)

In an attempt to explain the immense size of the fortress at Teleac – unusual by Central European measure – the presence of salt in the closer surroundings does not suffice alone as a probable reason. Namely, salt had already been exploited in much earlier times there. Yet, during the late 11th and 10th centuries BC this region evidently gained in economic and strategic importance, a standing that justified the construction of such a large fortification. Thus, it seems reasonable to associate this advance with the onset of the extraction and production of iron. Moreover, it was the time of the technological transition from the use of bronze to iron as the material employed to make weapons and tools. The comparatively large amount of iron finds in Transylvania in general and in Teleac in particular imply that iron extraction and production played an important role early on.

Due to its hardness and elasticity iron was far superior to bronze for the production of weaponry and implements.[16] In addition, iron occurs on the Earth's surface more frequently than the two components of bronze: copper and tin. The introduction of iron technology has still not been sufficiently elucidated; yet, without doubt Anatolia was an early centre. Iron is first mentioned only sporadically in Hittite texts of the 18th century BC, whereas in texts of the 14th and 13th centuries BC weapons made of iron are named ever more frequently.[17] The oldest object made of iron found in Europe – a knife or sickle – comes from Ganovce, district of Poprad, Slovakia, in a fortified settlement of the Otomani culture.[18] Nevertheless, this episode seems to have remained sporadic as such. It is the 11th century BC that first marks the transition from bronze to iron technology, with bronze swords replaced by those made of iron, in Southern Europe and especially in Greece. The introduction of iron technology in various regions of western Asia and Europe cannot be assessed in detail yet. Nonetheless, the catalogu-

16 For basic information on iron, cf. Pleiner 2006; Snodgrass 1989; for Italy, cf. Abbingh/Nijboer 2014.

17 Yalçin 2000, 310; Siegelová/Tsumoto 2011.

18 Furmánek 2000. – The dating of this object to the 18th century BC was disputed with less convincing arguments by Benkovsky-Pivovarová 2002.

Fig. 5 Teleac. Pottery of the Gáva culture (photo by C. Suteu)

ing and critical discussion of iron finds have made great progress.[19] It was indeed a time of change in many different spheres of society, a change that can also be observed in other material remains. There proved to be differences in the production of the broad commodity of pottery: The technically demanding, black-polished pottery of the Gáva culture decorated with garland patterns or channels displays an unmistakable metallic aspect (**Fig. 5**).[20]

Changes occurred not only in the production of pottery and diverse implements, but also in symbolical and ideological aspects. The hoards in Transylvania, an important medium of communication with the imaginary supernatural powers, underwent quite a noticeable change during this time (Ha A2/Ha B1):[21] It is the expression of changed values in society. The characteristic fragment hoards of the older Urnfield culture ceased; instead hoards containing mostly intact objects were deposited.[22] On the one hand, the latter included preferably vessels and defensive arms made of sheet metal, while on the other hand large fibulae and spiral ornaments became characteristic elements of a hoard. Weaponry by contrast withdrew somewhat into the background. Yet another change in hoards came in the 9th century BC, in which jewellery or elements of dress predominated.[23] One characteristic feature in the hoards is their content of horse gear, a presence that in turn emphasises the importance of driving and riding. The density of hoards in the closer surroundings of Teleac is particular conspicuous.[24]

The early use of iron in southern Europe

A. Snodgrass distinguished three stages in the introduction of iron technology in the Mediterranean area, a distinction that is of fundamental importance.[25] Accordingly, during the Late Bronze Age iron was used to a limited extent for ceremonial purposes and prestigious objects (phase 1),

19 Pleiner 1981. – For Israel cp. Yahalom-Mack/Eliyahu Behar 2015; for Southern Europe cp. Pare 2017; for Central Europe cp. Miketta 2017.

20 Pankau 2004; Ciugudean 2012a.

21 Hansen 2016.

22 Bratu 2009.

23 Metzner-Nebelsick 1994.

24 Ciugudean *et al.* 2015.

25 Snodgrass 1980; 1989; cp. the discussion in Papadopoulos 2014.

whereas in the Early Iron Age objects of daily use were produced in iron for the first time, although still far fewer in number than those made of bronze (phase 2). Then, as of the 10th century BC iron became the prevailing metal in use (phase 3). This scheme illustrates the situation of finds; however, it does not take any possibly limiting factors into account.

Funerary customs, for instance, are a decisive factor in the tradition of iron objects.[26] Particularly during the early times of iron technology the ritual use of this valuable raw material in funerary activities stood in contradiction to very practical considerations, namely, that the objects were to be re-forged in order to make new tools or weapons. Only when a stable supply was present could offerings – especially of weapons – be placed in graves and in sanctuaries. Phase 2 according to Snodgrass, thus, represents a subject of debate. Namely, the actual extent of the use of iron is not 'precisely' denoted anywhere. Its employment could have been far greater than it seems in archaeological findings. Iron could have been re-forged at any time and made into new objects, a way of re-cycling like today.[27] The technical know-how for this was certainly not limited to specific centres, but instead was wider spread.[28] One centre of iron extraction was on the island of Thasos in northern Greece.[29] However, the finds and find contexts there do not allow a precise description of the knowledge at that time concerning carburization or other hardening processes.

The transition to iron technology in Greece, foremost in Athens and Attica, can be best drawn in great detail from the funerary practice of offering weapons.[30] Therefore, the replacement of bronze by iron in Greece is highly relevant, not in the least with regard to armed conflicts. Unfortunately, attempts at absolute chronology for the phases of ceramic styles in Greece are not at all securely confirmed and at present vary strongly.[31] Since Submycenaean times (c. 1080–1020 BC) a profound transition in the handling of the deceased took place: the transition from inhumation burial to cremation. Further, bronze weapons were not deposited with the deceased either. Hence, it cannot be determined whether iron weapons were indeed already used extensively in Submycenaean times, but not given as funerary offerings.[32]

As of Protogeometric times, traditionally dated between 1020/1000 and 900 BC, but which surely began earlier in the 11th century BC, almost all swords and most lanceheads known in Greece were made of iron.[33] B. Weninger and R. Jung have suggested the years around 1070 BC for the beginning of the Protogeometric period.[34] An early burial – grave 6 – containing a sword as grave gift was revealed in the cemetery of Kerameikos in Athens. The amphoriskos in grave 6 was associated with a flange-hilted sword made of iron (**Fig. 6**). Allegedly the 43.8-cm long sword was laid around the vessel.[35]

Grave 28 in Kerameikos also held a bent flange-hilted sword made of iron (**Fig. 7,6**) and in addition also a bent iron knife (**Fig. 7,4**).[36] The ritual bending of a sword has been attested in several findings in Athens.[37] An iron arrowhead found in the cremated remains might have caused the death of the male in grave 28 (**Fig. 7,5**). The pottery comprises two amphorae, two spherical pyxides with a lid, and a pitcher with trefoil-shaped mouth. The representations of horses on the neck of an amphora are indeed noteworthy, because they express the high esteem of the horse in society in Geometric times (**Fig. 7,2**). Grave 40 contained a larger set of clay vessels, composed of two skyphoi, two pitchers with trefoil-shaped mouth, eight lekythoi and two amphorae (**Fig. 8**). The metal objects in this grave consisted of a large bronze phalera and the fragment of a fibula; the accompanying trunnion axe *(Ärmchenbeil)* and a chisel are made of iron.[38] Grave E in Kerameikos contained a cup together with a 46-cm long iron

26 Derrix 2001.

27 Today c. 570 million tonnes of steel are re-melted annually and forged into new products worldwide. Cf. http://www.stahl-online.de/index.php/themen/energie-und-umwelt/recycling/ (accessed 7 May 2018).

28 For Ionia, see Verčik 2017.

29 Sanidas *et al.* 2016.

30 See the catalogue of the Submycenaean and Protogeometric graves in D'Onofrio 2011.

31 Cp. the study by Toffolo *et al.* 2013.

32 Cp. also Bräuning/Kilian-Dirlmeier 2013, 31.

33 Kilian-Dirlmeier 1993.

34 Weninger/Jung 2009, 392 Fig. 14.

35 Kraiker/Kübler 1939, 99 Pl. 57. 76; Müller-Karpe 1962, 91 Fig. 9,1-2; Kilian-Dirlmeier 1993, 110 no. 316; for the chronology cf. also Krause 1975.

36 Kübler 1943, 34-35 Pl. 38,6.8.15.20.38; Müller-Karpe 1962, 92 Fig. 10,1-7; Kilian-Dirlmeier 1993, 106 no. 274.

37 D'Onofrio 2011; 2017.

38 Kübler 1943, 41 f. 27 ff. Fig. 5 Pls. 5. 8. 18. 22. 37. 38; Müller-Karpe 1962, 93 Fig. 11.

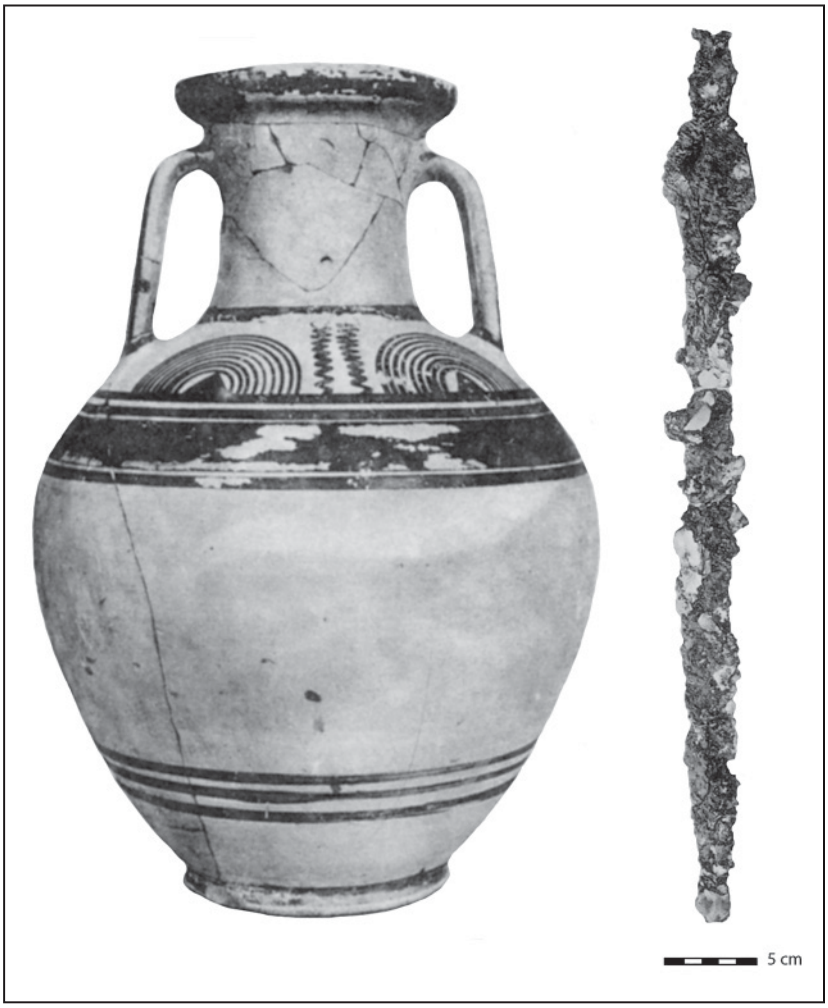

Fig. 6 Kerameikos, Athens. Protogeometric grave 6 (after Kraiker/Kübler 1939, altered)

sword that was broken in several pieces (**Fig. 9**).[39] In the present state of research these four graves cannot be dated precisely within the time span of the late 11th to late 10th century BC.[40]

A continuity can be observed then in weaponry of the Early Geometric period (probably earlier than 900–850 BC) and the Middle Geometric period (850–750 BC), whereas a definite decrease in the number of weapons in graves is noticeable at least in Attica during the Late Geometric period of the 8th century BC.[41]

It should be emphasised that initially iron played a decisive role in the production of weapons, because this new material had superior properties, which – quite significantly – were immediately used for military purposes. This confirms once again the technological basis of Christian Jürgensen Thomsen's three-period time sequence. It is indeed the "cutting tools" with which the Bronze and Iron ages should be defined.[42]

With emerging iron technology, the dynamics in exchange processes between the East and the West changed. In this regard, the expansion of the Phoenicians as far as the west of the Iberian Peninsula is obviously of great significance.[43] H. Schubart emphasised iron production in Phoenician establishments. He interpreted the precolonial find of bronze swords from Ría de Huelva in the context of early trade in iron.[44] As early as in the precolonial phase, the search for iron ore and also for silver was an important mission for Phoenicians on

39 Kraiker/Kübler 1939, 106-107 Fig. 8 Pl. 36.

40 Basing on stylistic features of the pottery Kübler (1943, 13) assigns the graves to the middle phase (grave 6) and to the late phase (graves 40 and 28). In Kraiker/Kübler's opinion the cup from grave E may be assigned to the mature style (Kraiker/Kübler 1939, 154).

41 Morris 1987; Bräuning 1995.

42 Thomsen 1836.

43 Nijboer 2018.

44 Schubart 2001, 301–303. 554. The find dates in the 11th/10th centuries BC: Brandherm/Moskal-del Hoyo 2014.

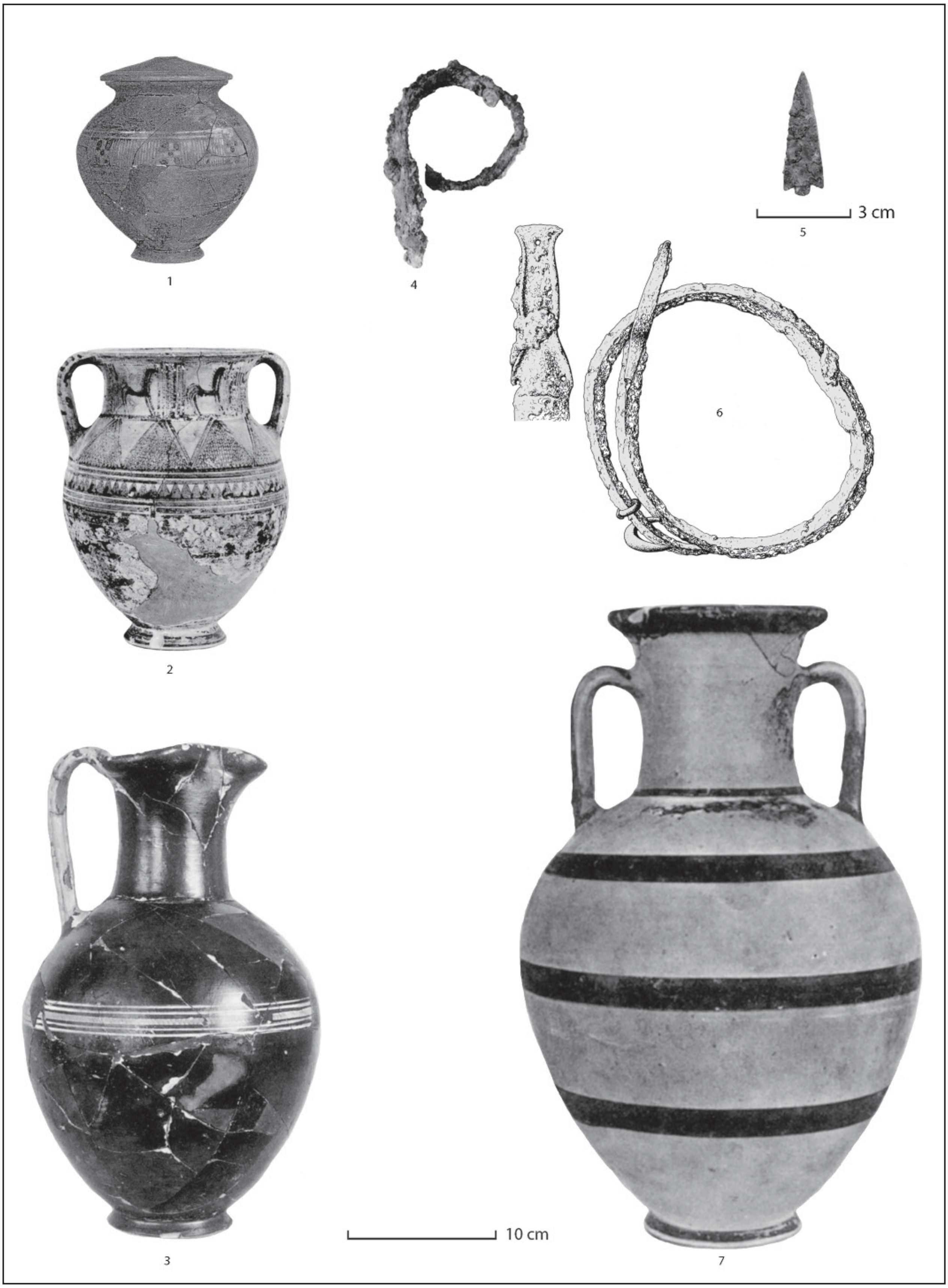

Fig. 7 Kerameikos, Athens. Protogeometric grave 28 (after Kübler 1943, altered)

Fig. 8 Kerameikos, Athens. Protogeometric grave 40 (after Kübler 1943, altered)

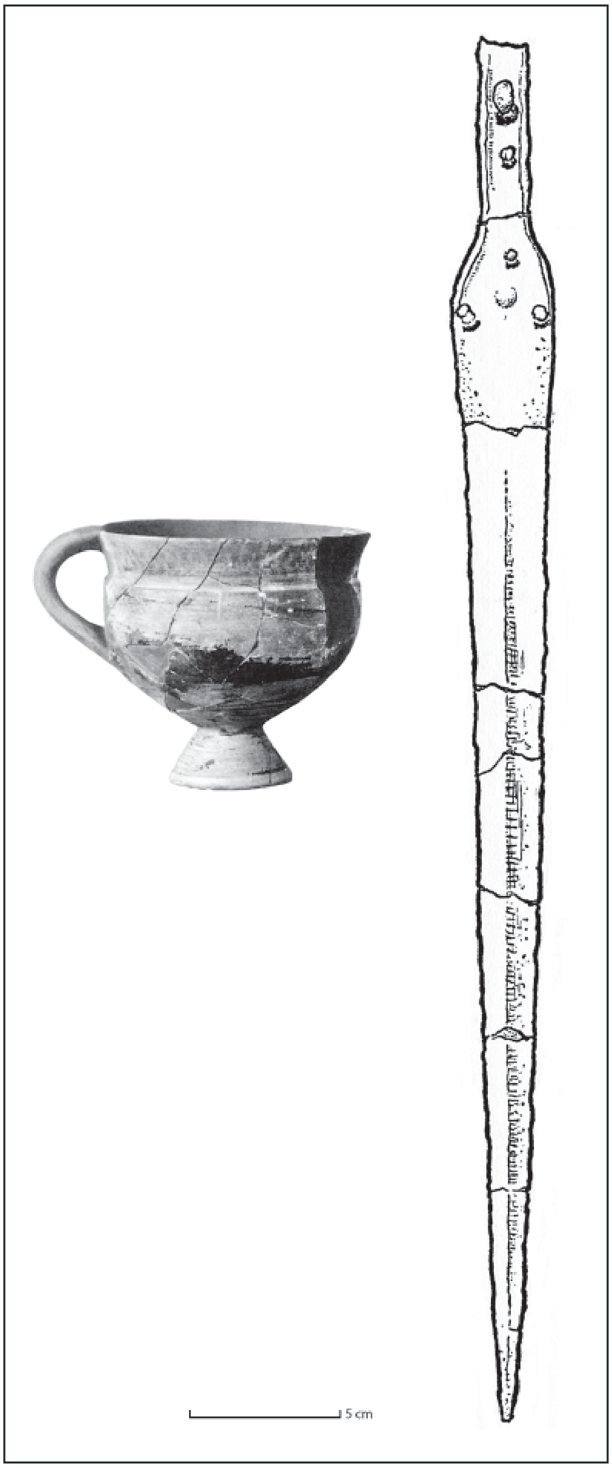

Fig. 9 Kerameikos, Athens. Protogeometric grave E (after Kraiker/Kübler 1939, altered)

the Iberian Peninsula. Even the Late Bronze Age cauldron found in a copper mine in Cabárceno, Cantabria, in the north of the Peninsula, may be seen in this association. Further, the occurrence of goethite there is an indication of the early exploitation of iron in the 10th century BC.[45]

[45] Schubart 1961; de Blas Cortina 2007; for the dating, cf. Gerloff 2010, 204.

Also in Italy the change from Late Bronze Age to Iron Age can be dated between 1000 and 950 BC by radiocarbon dating.[46] The course of the introduction of iron in the area of Central Europe was evidently somewhat delayed. Nevertheless, around 1000 BC a substantial decrease in the number of swords made of bronze can be observed. One might then presume that valuable iron weapons already existed in plenteous number, yet were not deposited in graves. The fact that the fragment of an iron sword was discovered in Teleac points once again to the importance of this particular site.[47] And in this regard special note should be made of the iron sword among the votive offerings found in the *Mušja jama* near Škocjan (the Fly Cave near St. Kanzian).[48] The sword, 59 cm in length, had been bent with great force prior to its deposition (**Fig. 10**). The blade has a simple form: rhombic in cross-section. The outline of the tongue bulges slightly and ends in a fish-tail shape. The hilt is likewise slightly bulged and has two rivets; two rivets are also in the tongue. Comparable swords made of bronze were summarised as the "Dalmatinian-Pannonian type" and dated to the 11th century BC.[49] Included in this type is a bronze sword of the same form found in Celldömölk-Sághegy, Kom. Vas, in Transdanubia. It should be dated to the Ha B1 period.[50] The form of the tongue as well as the scheme of the rivets are likewise present in a number of swords deposited in Early Iron Age graves in Vergina and also sporadically on Euboea and in Athens.[51] Most probably the iron sword found in *Mušja jama* can be assigned to phase Ha B1 too, as the majority of votive offerings found in the cave date to that time. Yet, the Hallstatt-period group of finds identified by the authors cannot be considered a possible date for the production of the iron sword. For this issue the sword find from Alsenborn may be

[46] Van der Plicht/Nijboer 2017/2018.

[47] See Uhnér *et al.*, Fig. 14 in this volume. Other early iron swords but without datable associated finds were discovered in Tilişca, a fortified hill settlement located between Sebes und Sibiu, which begins with the Gava culture (Lupu 1989, 125 Pl. 1,1), and Novi Sad (Koledin 2012).

[48] Teržan *et al.* 2016, 689 Pl. 14,3.

[49] Pabst 2009, 22. 57 Fig. 6.

[50] Kemenczei 1988, 69 Pl. 41,370.

[51] Cp. Pabst 2009, 22–23; Kilian-Dirlmeier 1993, 113–115 Pls. 48,356–359; 49,360–364; 50,365–376. 369; 51,368.370.372; Bräuning/Kilian-Dirlmeier 2013.

brought forth (**Fig. 11**), whose iron blade F. Sprater had already earlier compared to the sword from *Mušja jama*.[52]

Yet another extraordinary find should be mentioned here: the sword found in grave 169 in the cemetery at Brno-Obřany, Moravia (**Fig. 12–13**). The sword has a length of 56.6 cm and a similar form with two rivets in the hilt and presumably originally two rivets on the since broken-off tongue.[53] The hilltop settlement that used the cemetery was an important crossroads between the Lusatian and the Podol cultures, ever since the 11th century BC. Covering an area of 42 ha it has an unusually large expanse.[54] Moreover, grave 169 in the cemetery at Brno-Obřany contained a remarkably long iron lancehead (L. 48.4 cm), two fragments of an iron knife, and a bow-shaped iron object as well as an iron socketed axe. The last-named object belongs to a group of socketed axes with a slit in the socket, whose production – according to B. Teržan – may be presupposed as early as the 9th century BC, if not since the 10th century BC. Further, implied with that would be the dissemination of technical knowhow.[55] Socketed axes such as these are also known from Teleac and surroundings (Vinţu de Jos).

The scabbard terminal of the sword from Brno-Obřany (**Fig. 12**) leads to the Caucasus, where comparable "fin-shaped chapes" *(Flossenortbänder)* are common.[56] Although their dating through 14C must still be determined, their placement in the 10th century BC seems nonetheless plausible.[57] The fin-shaped chape might have stimulated the production of semi-circular chapes of the late Urnfield period in the West.[58] Further grave goods comprise a golden spiral, a so-called whetstone and five clay vessels.[59]

Iron lanceheads are known from the *Mušja jama* as well (**Fig. 14**). Concerned here are ten examples with – as far as recognisable – a narrow blade that attaches comparatively high and a small socket.[60] Unlike the iron sword from this site, at present there are no secure typological indications for their dating to Ha B1 or to early Hallstatt times. Here however attention must be directed towards

Fig. 10 Flange-hilted sword made of iron, an offering found in the *Mušja jama* (Fly Cave) near Škocjan, Slovenia (after Szombathy 1913)

52 Sprater 1939; in Kibbert 1984, 154–155, under "Wattenheim".

53 Adámek 1961, 95–96 Pls. 131–133; Stegman-Rajtár 1986.

54 Kmetova/Stegmann-Rajtár 2014.

55 Teržan 2017, 123.

56 Reinhold 2007, 43 Pl. 37,1–4; Metzner-Nebelsick 2002, 377–378 Fig. 171. – A 'fin-shaped' chape was found in the cemetery of Narzanniy-2 together with an Assyrian helmet: Belinskiy/Dudarev 2013, 198 A Fig. 14.

57 Pers. communication from S. Reinhold.

58 For example, the Heiligenberg near Heidelberg: Hein 1989.

59 Stegman-Rajtár 1986.

60 Teržan *et al.* 2016, 96–97 Pls. 12. 50.

Fig. 11 The hoard from Alsenborn in the Palatinate, including the fragment of an iron sword (after Sprater 1939)

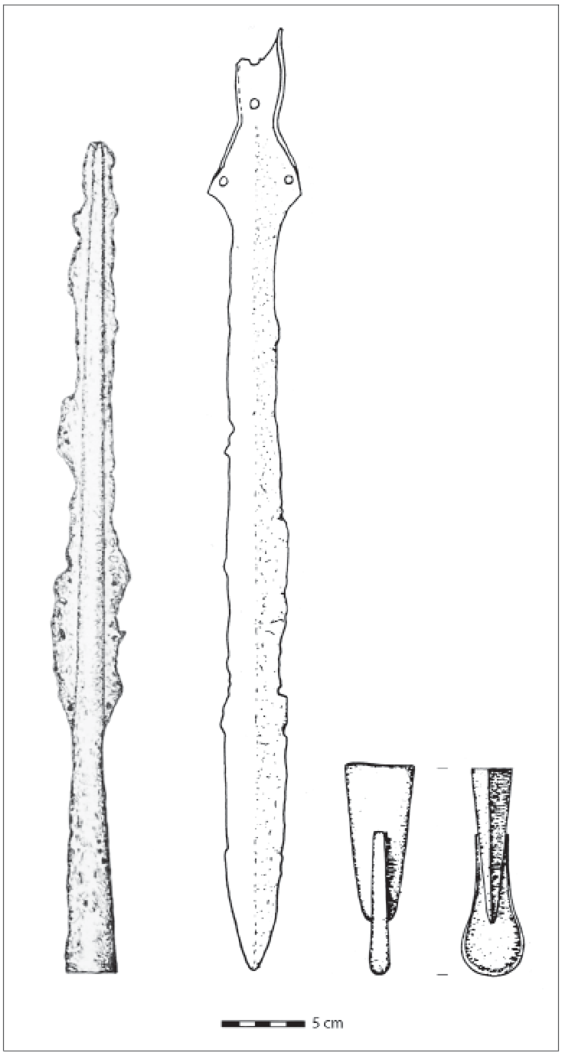

Fig. 12 Grave 169 in Obřany, Moravia: (from left to right) lancehead, sword, and fin-shaped chape made of iron (after Stegman-Rajtar 1986)

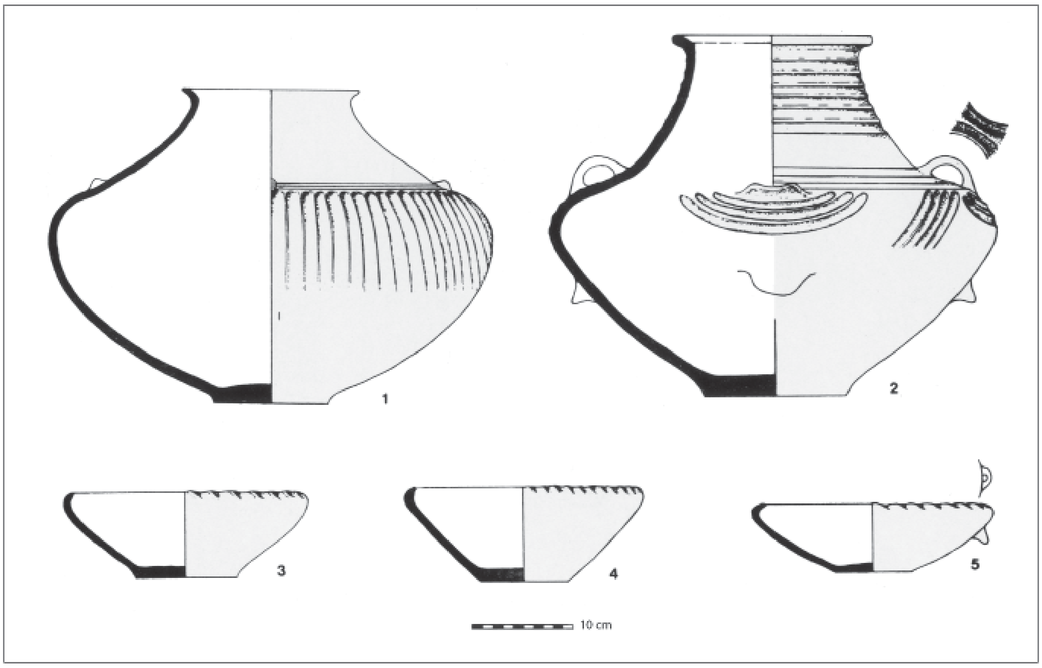

Fig. 13 Grave 169 in Obřany, Moravia. Ceramic vessels (after Stegman-Rajtar 1986)

Fig. 14 Iron lancehead from the *Mušja jama* (Fly Cave), Slovenia (after Szombathy 1913)

a lancehead found in Nidau-Steinberg near Lake Biel, which displays the characteristic decoration of the Ha B1 period. The blade is made of iron, the socket – of bronze.[61] Aside from these weapons, note should be made of the eye-catching spectacle fibulae, which were a widespread element of dress at that time and possibly illustrate the mobility of larger or also smaller groups of peoples between the Carpathian Basin and Greece.[62]

Iron in Transylvania

Outside of Greece, in Southeast Europe, the east Carpathian Basin was without doubt a centre of early iron technology. There a significant increase in iron finds can be noted in the 10th century BC. Their appearance even earlier in Transylvania, in the 12th century BC, is a subject of controversy. Whereas N. Boroffka dates the earliest iron finds to the 12th century BC, C. Pare considers early evidence for the use of iron there as insecure; he postulates instead that the picture changed substantially only after the middle of the 10th century BC with iron finds from Cernat (jud. Covasna), Hida (jud. Sălaj) and Cîţcău (jud. Cluj).[63]

The iron finds in the hoard found in the hillfort *Vârful Ascuţit* at Cernat stem from a context that is addressed as a "workshop".[64] Discovered there were – among others – a spindle whorl, a casting ladle, clay vessels, as well as a bronze lancehead and a fibula. The iron finds include a trunnion axe *(Ärmchenbeil)*, a double axe, a knife, a chisel and twelve bar ingots (**Fig. 15**). It is noteworthy that this hoard was near an area of abundant finds within the fortified complex of Cernat. Surveys with a metal detector retrieved numerous bronze

61 Jacob-Friesen 1967, 262–273 Pl. 186,4; Tarot 2000, 13. 16.

62 Pabst 2011, 212–215; 2012, 324–338; Bräuning/Kilian-Dirlmeier 2013.

63 Boroffka 1991; Pare 2017.

64 Székely 1966.

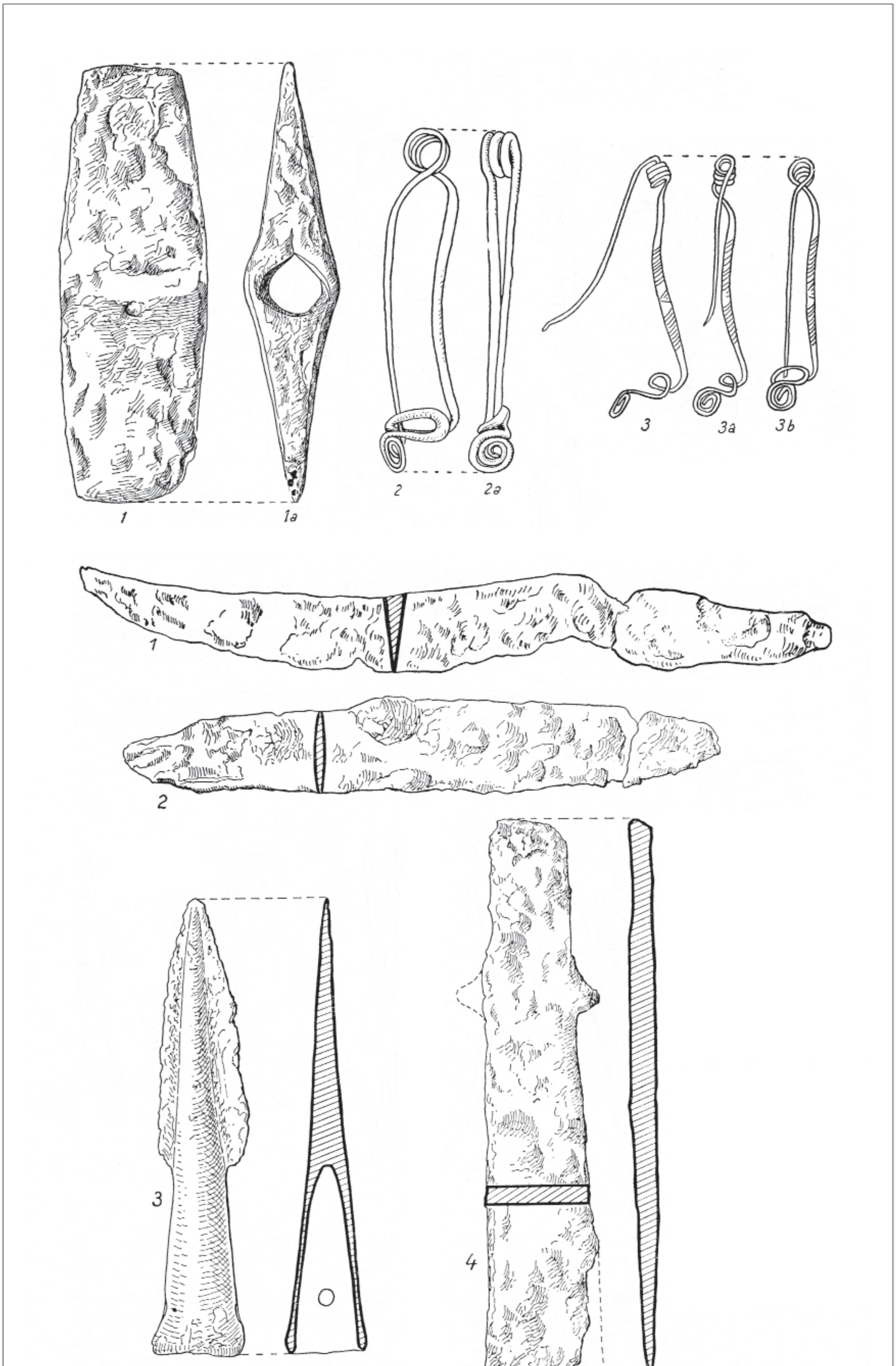

Fig. 15 Metal finds in the hoard from the hillfort "Vârful Ascuțit" in Cernat, Romania (after Székely 1966)

Fig. 16 Teleac. Double axe made of iron (Museum Cluj, photo by C. Suteu)

and iron objects, such as socketed axes and hammers, which date to the phases Ha B1 and Ha B2, as well as bronze bar ingots and hardly datable iron socketed axes, knives and lumps of raw iron. Also retrieved from within the area of finds was a "bronze hoard of the phases Ha B2-3, which consisted of six socketed axes as well as a one-piece, willow-leaf-shaped bow fibula".[65] The objects had been deposited in pits.

According to C. Pare, the bronze fibula in the hoard from Cernat can be anchored in his "hoard horizon IV" in view of a similar example in the hoard from Ghirişu Român. Pare therefore proposes its dating in the second half of the 10th century BC, which would correspond with Ha B2.[66] However, both fibulae are variants of Late Bronze Age violin-shaped fibulae.[67] Here in particular mention must be made of the fibula type Unter-Radl, as according to P. Betzler.[68]

S. Pabst recently determined that in her proposed Carpathian-northeast Alpine distribution area this fibula-type primarily stems from graves as well as from hoards of the periods Bronze Age D/Baierdorf/Čaka and Hallstatt A1/Kurd/Suseni.[69] T. Bader defined the Cernat variant, which is limited to the eastern Carpathian sphere, and is distinguished by a spring (*Federspirale*) that is wound outwards.[70] B. Teržan later made clear that the fibulae indicate a date in the phase Ha A, and that therefore the Cernat hoard certainly cannot be dated to the younger Urnfield time.[71] She also emphasises that the Ghirişu Român hoard belongs to the time Ha A2/B1, and that a late date is out of question.[72]

Among the other finds in the Cernat hoard is a double axe (**Fig. 15,1**), which is clearly indicative of ties to the Aegean. Double axes made of iron were common in Greece, at least from the early 9th into the 4th centuries BC.[73] C. Pare refers to a double axe found in the mound in Assiros (northern Greece), whose find context however is not secure (layer 2 or 3).[74] If this comparison also contains a chronological component, then it is likely associated with a clearly higher date. Namely,

65 Szabó 2011, 339.
66 Pare 2015, 281–282.
67 Pabst 2018.
68 Betzler 1974.
69 Pabst 2014.
70 Bader 1983, 16 Pls. 1,3–6. 41b.
71 Teržan 2010, 208.
72 Petrescu-Dîmboviţa 1977 Pls. 358,5–17. 359.
73 Kilian-Dirlmeier 2002, 10–11.
74 Wardle 1987, 320 Pl. 51b.

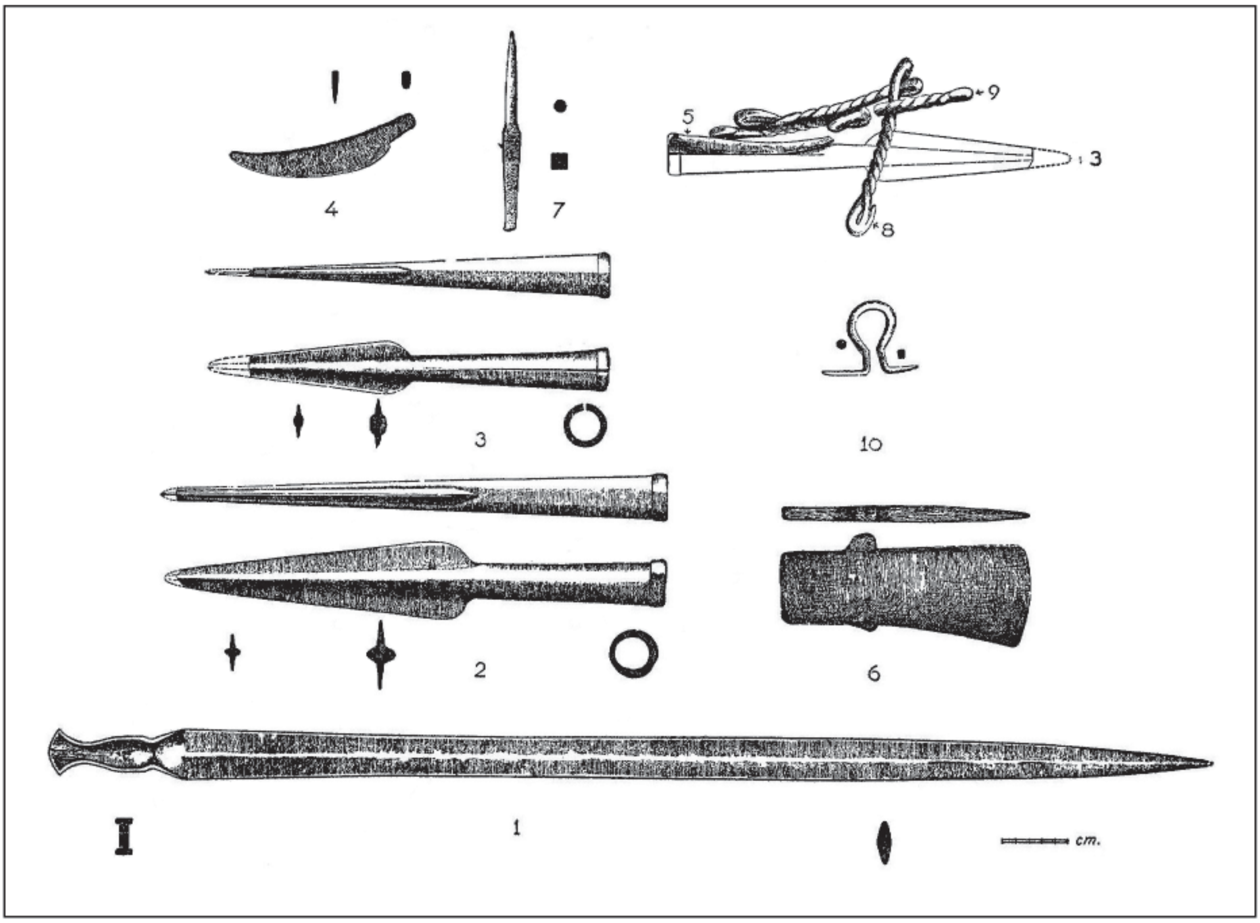

Fig. 17 Agora, Athens. Metal finds from the Early Geometric grave XXVII (after Blegen 1952)

14C-datings for Assiros indicate the beginning of the Protogeometric style (in Assiros) during the time around 1080/1060 BC.[75] This would support a higher dating for Cernat as well. Double axes made of iron are known from Teleac in Romania, too (**Fig. 16**).[76] The hoard in Bîlvănești, jud. Mehedinți, contained two examples.[77]

According to A. Wesse, the trunnion axe in Cernat belongs to the type IIID,2 and is distributed over a wide area.[78] Wesse dates the trunnion axes found in Teleac to Ha B.[79] The earliest iron example in Greece was found in Protogeometric grave 40 in Kerameikos (**Fig. 8**).[80] Grave XXVII in the Athenian Agora (**Fig. 17**), considered by C. Blegen as characteristic for the transition from the Protogeometric to Early Geometric period, contained a socketed axe made of iron, too.[81] The deposition process: the neck-amphora used as an urn was placed in the grave pit. The iron sword was bent to an extreme and then laid around the urn. Two iron lanceheads, one trunnion axe, two bits from horse gear and several clay vessels completed the above-average furnishings of the grave, which included even more clay vessels.

The hoard from Hida, jud. Sălaj, contained the bronze antenna-shaped grip of a bimetallic knife, whose iron blade, unfortunately, is not preserved.[82] Its dating is disputed. A dating to phase Ha B1 is also supportable. For instance, the lance ferrule in the hoard from Hida is a characteristic object for this phase.[83]

75 Wardle *et al.* 2014.
76 Vasilliev *et al.* 1991, 53 Pl. 16,8.9.
77 Petrescu-Dîmbovița 1977 Pl. 398,12.
78 Wesse 1990, 78. 143.
79 Wesse 1990, 144.
80 Wesse 1990, 205 no. 208.
81 Blegen 1952; Wesse 1990, 205 no. 208.
82 Petrescu-Dîmbovița 1978, 149 no. 261 Pl. 259 C. 260 A.
83 Cp. Hansen 1991, 14–15; i.e. München-Widenmayerstraße: Brug/Weber 1899; Bader 2009.

Fig. 18 Teleac. Finds made of iron (photo by C. Suteu)

Iron in Teleac

Older excavations in Teleac recovered 29 objects made of iron (**Fig. 18**). Of these, 25 finds were attributed to settlement layer III and four finds to layer II. Reportedly, iron objects were absent in the oldest settlement phase (layer I).[84] During our research in Teleac in 2010 and 2011 a substantial number of iron objects was recovered.[85] Later excavations brought forth even more iron objects, which now can be clearly dated to the 10th century BC. In light of recent investigations, the dating of finds from older excavations should be reviewed. Proof of far-reaching connections point to the Caucasus as well. For example, a 40-cm long Caucasian dagger with an iron blade and bronze grip was discovered in Pănade, a site located north of Teleac. And it can be dated to the 10th/9th century BC, too.[86]

The connections to Greece since the 11th/10th century BC are ultimately confirmed by the spectrum of iron forms, in particular, the typifying double axes, the trunnion axes and the swords. Here too, reference must be made to spectacle fibulae, which ultimately mark the mobility of groups of persons.[87] In this regard, the small bronze figure of a horse found in Teleac (**Fig. 19**) also deserves attention.[88] Like the aforementioned horse gear, this small artwork demonstrates the high esteem held for horses, an esteem that is also sufficiently attested in Greece. Reference was made above to the representations of horses on the neck-amphora in Kerameikos grave 28 (**Fig. 7**).[89] The great partiality for figures of horses as votive offerings in sanctuaries, made of clay or bronze, is well known.[90] A team of horses with a two-wheeled wagon – according to pictorial evidence – was especially prestigious. This iconography also represents an element of continuity between the Bronze Age and the Iron Age.

84 Vasiliev *et al.* 1991, 126–128.
85 This field research was conducted within the framework of the European project “Forging Identities”.
86 Vulpe 1990, 20–22 Pl. 1,1; Boroffka 1991, 10 no. 27 Fig. 6,3; Metzner-Nebelsick 2002, 372–373 Fig. 168,1. The publication of the iron finds is being prepared by Nikolaus Boroffka.
87 Pabst 2012; cp. also Aldea/Ciugudean 2005.
88 Vasiliev *et al.* 1991, 71 Fig. 19,9; on horse figures of the Hallstatt period cf. Teßmann 2009.
89 Benson 1970; Greenhalgh 1973.
90 Heilmeyer 1979.

Fig. 19 Teleac. Small figure of a horse, made of bronze (L. 5.7 cm) (photo by C. Suteu)

Nothing is known about the procurement of iron ores in the surroundings of Teleac or in Transylvania during the Late Bronze Age or Early Iron Age. Ores are in abundance and not at great distance from Teleac (for example, in Băișoara, jud. Cluj, Rimetea/German Eisenburg/Eisenmarkt). A comprehensive occurrence of iron ores is recognisable in the map of Banat and of Transylvania and can be integrated within a supra regional context (**Fig. 20**). In order to identify evidence of ores and mining future studies will also concern analytical possibilities for research on iron provenance.[91]

Iron technology was an exceedingly important stimulus for innovation, at first providing warfare with a new basis for a long time. Its significance for the production of agricultural equipment, by contrast, cannot be substantially attested for early times, but quite likely it played an increasingly significant role (for example, in the production of axes, sickles, chisels etc.). In any case, the control over and access to this raw material were of economic and strategic advantage.

Thus, the fortification at Teleac comes all the more into focus. The immensity of the fort reflects the potential of violence of that time. Obviously, there was a sufficiently large population for mobilising an attack on the massive fortification and to set it on fire. At present we only know that the walls were a wood-earthen construction, but there are many details of the fortification that must still be investigated.[92] Furthermore, the burnt walls presage insight in a martial violence, which has hitherto been attested in only few places in Central Europe.[93]

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91 Cp. Schwab *et al*. 2006.

92 Cp. Uhnér *et al.* in this volume.

93 Heunischenburg near Kronach: Abels 2002.

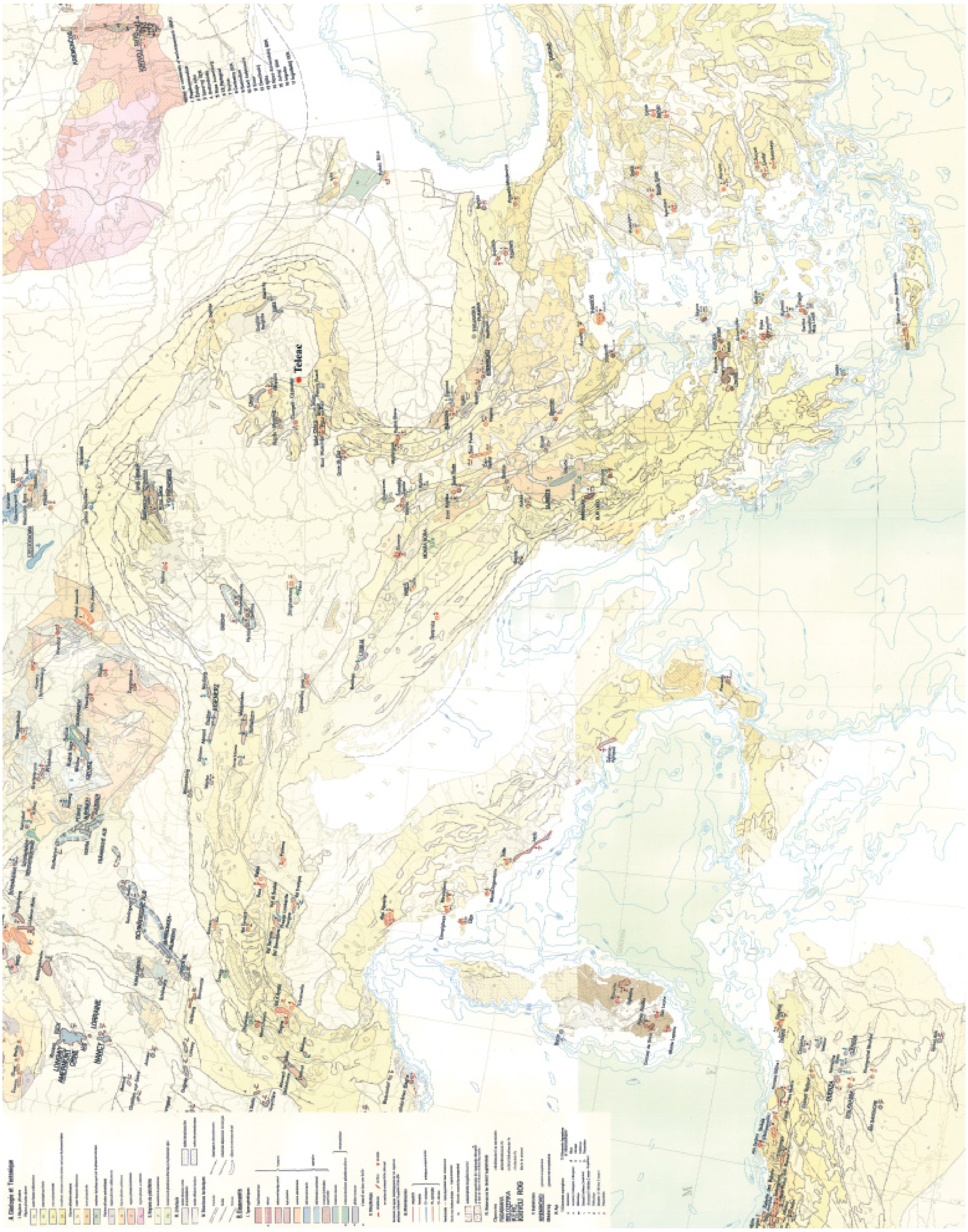

Fig. 20 Occurrence of iron ore in Southern Europe (Carte Internationale des Gisments de Fer de l'Europe, pages 11 and 15, altered and supplemented by C. Uhnér and F. Becker)

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Beatrice Ciută

Archaeobotanical Results from the Late Bronze Age Hillfort Teleac (Alba County, Romania)

The article discusses the plant species found during the 2016 archaeological campaign inside the fortification of Teleac. Analysis of the macro remains recovered from archaeological deposits in Teleac helped to reconstruct the plant species cultivated by the Late Bronze Age inhabitants. The predominant cereal species in the samples was Panicum miliaceum (broomcorn/domestic millet) with 51 seeds, followed by Triticum monococcum (einkorn) with 27 seeds and Triticum spelta (spelt wheat) with 14 seeds. Also revealed were Triticum dicoccum (emmer) with 9 seeds and Secale sp. (rye) with 7 seeds. An overview of the entire Bronze Age, our focus shows that during this period the communities were engaged predominantly in agriculture, preserving their habits from the area of their origin. The results of specific analyses show that peasant farming was the mainstay of Bronze Age life.

Introduction

In this article we discuss and try to reach some preliminary conclusions regarding the plant species included in the diet of communities, who lived inside the fortification at Teleac. The results presented here are from the first archaeological campaign (2016), which was conducted inside the Teleac fortification and supported by the LOEWE project, part of a three-year project developed between 2016 and 2018. The focus of our archaeobotanical investigation were macro remains from archaeological contexts. Analysis of macro remains recovered from archaeological deposits in Teleac helped to reconstruct the plant species cultivated by the Late Bronze Age inhabitants.

The Teleac hillfort is situated on Grușeț Hill, north of the village. The western slopes of the hill (part of the Secașelor Plateau) descend towards the Mureș floodplain and a dead channel of the river that delimits the settlement in this direction (**Fig. 1**).[1] In this region prevails a variety of soils, such as brown soils, podzols, pseudorendzinas, eroded soils, regosols and alluvial soils. The potential natural vegetation is believed to have consisted of forests, which have been cut in order to create areas for grazing and crop cultivation (**Fig. 2**). It is also important to emphasize the importance of alluvial soils sited below in the nearby floodplain of the Mureș River, which are an excellent soil for agriculture.[2] The proximity of fertile soils certainly also played a role in the selection of the site.

From earliest times onwards the human habitat was influenced and controlled by the climate. Mankind was able to establish himself only in those areas where climatic conditions were approachable for his activities and needs, or conditions which through invention he was able to modify. Climatic and environmental conditions fluctuated, so that the inhabitants will have suffered bad years for crop production along with good ones, as has always been the case. The extent to which human groups buffered themselves against such effects is a cultural matter; there is some evidence that during the Late Bronze Age, for instance, specific strategies were adopted for this precise purpose.[3]

Evidence generally shows that plants played an important role in the subsistence of Late Bronze Age communities, which in turn were very much influenced by the availability and abundance of plant resources as well as climatic conditions. The evolution of human communities has been greatly influenced by the potential sources for life sustenance that are accessible in the area in which they live.

1 Ciugudean *et al.* 2017, 144-146.

2 Vasiliev *et al.* 1991, 13.

3 Harding 2010, 20.

Fig. 1 Location of the site of Teleac in Romania (map based on Google Earth)

The Bronze Age is assigned to the climatic period called the Subboreal, which is between the Atlantic and the Subatlantic periods. In general, this was a warm and dry period, in contrast to the warm wet Atlantic and the cool wet Subatlantic. Nevertheless, such a mild general statement conceals a mass of small variations, both spatial and temporal. A pollen diagram shows that within the broader picture obtained by traditional pollen analysis there is a similar detailed set of fluctuations happening in the pollen record, which as a proxy climate indicator reflects changes in air temperature, precipitation and so on.[4]

According to palynological analyses for the Romanian intra Carpathian Basin, there seems to have been a cooling of the climate in the second half of the 2nd millennium BC, during which a colder and more humid, but balanced climate was established. The cooler and humid climate favoured the wide spread of beech forests that formed an area of their own by pushing the spruce forests into a more concentrated level. The beech expansion was also accompanied by *Abies sp*., a species that shares the same environmental conditions. The climate, although colder, favoured the planting of cereal species and legumes that were adapted to environmental conditions. The cultivated fields were extended by deforestation, according to palynological analyses, which reveal the presence of ruderal species that usually accompany human settlements and cultivated plots. The flora specific to the intra Carpathian Basin for the targeted segment was made up of species of trees and shrubs represented by *Juniperus, Fraxinus, Betula, Quercus, Ulmus, Salix, Tilia, Corylus, Fagus, Abies, Juglans, Alnus, Picea, Hedera, Viscum, Sambucus, Vitis* and *Pinus*.[5] Grassland herbs and ruderal species were also present, for example Poaceae, Cerealia, *Secale* sp., *Plantago lanceolata*, *Artemisia* etc. Other plants that populated the intra Carpathian Basin belonged to the taxa Rosaceae, Ericaceae, *Rumex*, Ranunculaceae, Rubiaceae, Urticaceae, *Cannabis* type, *Polygonum* sp., Caryophyllaceae, Fabaceae, Brassicaceae, Cyperaceae, Valerianaceae and Liliaceae.[6] The species listed above were present in greater or lesser proportion within the palynological samples.

From specific bibliography we learn that throughout the Bronze Age the main grain crops exploited were wheats and barleys. In many areas

4 Harding 2010, 19.

5 Tanțău *et al*. 2006, 55; Bodnariuc *et al*. 2002, 1480.

6 Tanțău *et al*. 2006, 56.

Fig. 2 View of the landscape (photo by B. Ciută)

these were supplemented by pulses, peas and beans, and by other edible plants that were gathered wild rather than cultivated. A wide range of fruits and berries was also exploited, as evidenced by a number of well-preserved wet sites. At certain times other grains were also important, and oil plants usually played a role as well.[7]

Archaeobotanical data

During the excavation season of 2016 at the Teleac site, the bulk and feature soil samples were collected from archaeological contexts, which were revealed in two excavated trenches: T1 and T2. From Trench 1 sixteen bags were sampled (**Fig. 3**), and from Trench 2 seven bags were sampled (**Fig. 4**). In sum 23 samples were collected, each sample consisting of 40 litres of soil (four buckets of 10 litres). Whole soil samples were sorted with the help of a water flotation device (made according to the Ankara model design), using mesh sizes of 3.15 mm, 2 mm, 1 mm and 0.5 mm (**Fig. 5**). All in all, during the entire season approximately 920 litres of soil were processed with the flotation device. Almost all samples contained charred macro remains. The samples were sorted under a magnifying lamp. The species were identified using a binocular microscope and a reference seed collection.[8]

A total of 355 charred seeds representing cereals, vegetables and ruderal plants was recovered from the samples. In the following are details about the list of discovered species. In general, 68 seeds could be identified as cereals. We could determine the seeds only to this general category, because the external aspect of these seeds had deteriorated through their context deposition. It is important to mention that most of the charred seeds belonging to the cereals category were recovered from the samples collected above and inside the oven discovered in Trench 1 (**Figs. 6**-**7**).

The predominant cereal species in the samples was *Panicum miliaceum* (broomcorn/domestic millet) with 51 seeds, followed by *Triticum monococcum* (einkorn) with 27 seeds and *Triticum*

[7] Harding 2010, 143.

[8] We also used the on-line available *Digital Atlas of Economic Plants in Archaeology.* The nomenclature used in this report is based on Zohary/Hopf (1988).

Fig. 3 View towards Trench 1 (photo by B. Ciută)

Fig. 4 View of Trench 2 (photo by B. Ciută)

spelta (spelt wheat) with 14 seeds. Also revealed were *Triticum dicoccum* (emmer) with 9 seeds and *Secale* sp. (rye) with 7 seeds (**Fig. 8; Tab. 1**).

Triticum monococcum: In the past einkorn cultivation was more extensive. This wheat was one of the founder grain crops. However, since the Bronze Age its importance declined gradually, very likely because of the competition from free-threshing wheats. Einkorn is a small plant, rarely more than 70 cm high, with a relatively low yield, yet it can survive on poor soils where other types fail. The fine yellow flour is nutritious, but gives bread of poor rising quality. Thus, einkorn was consumed primarily as porridge or as cooked whole grains.[9] Although it is a relic crop, einkorn wheat is still present in the Romanian flora, being cultivated mainly in mountain areas in Transylvania, mostly in the Apuseni Mountains.[10]

Triticum dicoccum: From the very beginnings of agriculture in the Near East emmer was the principal wheat of established farming settlements. Although remains of cultivated barley and cultivated einkorn also occur quite regularly in these contexts, quantitatively emmer prevails. Emmer was widely grown in Chalcolithic and Bronze Age times, although in the Late Bronze Age, like einkorn, it was generally replaced by free-threshing wheats.[11]

Triticum spelta: This is a species very frequently found in the sites belonging to this period, because it was predominantly cultivated by Late Bronze Age inhabitants. Spelt was widely disseminated from its Near East origin during the Bronze Age (4000–1000 BC) throughout the Balkans, Europe and Transcaucasia. It belongs to the category of hulled wheat.[12]

Panicum miliaceum: The small seeds belonging to broomcorn millet were found in every Late Bronze Age context in Teleac. According to specific literature[13] domestic millet became predominant in Europe only in the Late Bronze Age, being a latecomer to the cereals category. Common millet ranks among the hardiest cereals. It is a warm-season plant, which stands up well to intense heat, poor soils and severe droughts. Moreover and very important, it completes its life cycle within a very short time (60–90 days), succeeding in areas with short rainy seasons.[14] Broomcorn millet was used for making porridge in past times. In Bulgaria in recent times a fermented drink called *boza* is made from millet; a similar beverage could have been made in prehistoric times, too.[15]

Fig. 5 Flotation barrel used in the selection process (photo by B. Ciută)

In this context mention should be made of the archaeobotanical results from older research on the Teleac fortification. During this work species belonging to *Hordeum vulgare* and *Triticum durum* were sampled that had been recovered from a ritual pit located under a house (house no. 5).[16] Further, a sample containing charred seeds from a ritual pit discovered at the site of Șimleul

9 Zohary/Hopf 1988, 28.
10 Săvulescu *et al.* 1957, 76.
11 Zohary/Hopf 1988, 42.
12 Renfrew 1973, 57.
13 Renfrew 1973, 99.
14 Zohary/Hopf 1988, 76.
15 Renfrew 1973, 101.
16 Vasiliev *et al.* 1991, 131.

Fig. 6 Oven in Trench 1 (photo by R. Burlacu)

Fig. 7 Charred seeds recovered from inside the oven (photo by B. Ciută)

Archaeobotanical analysis for Teleac site **Late Bronze Age**									**Abreviations** **sp.= unknown specie; cf.= probably;** **example T1-1= Trench1, sample 1; T2-1= Trench 2, sample 1**										
Sample origin																			
Sample description	**T1-5**	**T1-6**	**T1-7**	**T1-8**	**T1-9**	**T1-10**	**T1-11**	**T1-12**	**T1-13**	**T1-14**	**T1-15**	**T1-16**	**T2-1**	**T2-2**	**T2-3**	**T2-4**	**T2-5**	**T2-6**	**T2-7**
Sample dimension in liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters		40 liters		40 liters		40 liters
No. of charred macroremains/fragm	**3**	**13**	**17**	**3**	**42**	**8**	**152**	**50**	**4**	**7**	**3**	**19**	**6**	**5**	**4**	**6**	**6**	**0**	**5**
Cerealia (seeds or fragm.)	1	1+3	4	1	27		58	29+2			3	5	2	1	1	1	4		4+1
Triticum sp.									1								1		
Triticum monococcum					3	4	15	3		1			1						
Triticum dicoccum						1		8											
Triticum spelta	1						8	1	1			3							
Secale cereale							7	6											
Panicum miliaceum	1	9	10		9		8		1	1		6	1	1	1		1		
Avena sp.							1	1											
Leguminosae (seeds or fragm.)						1		1				2							
Vicia faba						2						2							
Pisum sativum				1+1					1	1									
Fruits																			
Cornus mas (stone)														1					
Sambucus nigra													1						
Ruderal species																			
Rumex sp./Rumex acetosella			1				2					1							
Chenopodium album										1			1			4			
Chenopodium hybridum		1												1	2				
Galium aparine			2		3		51			1									
Polygonum sp.														1		1			
Bromus secalinus							2												
Raphanus raphanistrum				1															

Tab. 1 Plant species found at Teleac (graphic by B. Ciută)

Silvaniei-Observator, dated to the Late Bronze Age. Identified in the sample with a weight of 0,538 g were species of *Triticum monococcum* and *Triticum dicoccum.*[17]

Vegetables discovered in the Teleac site are represented by pulses, such as *Vicia faba* (horse bean) with 4 seeds and *Pisum sativum* (green pea) with 3 seeds, and 4 cotyledons of the *Fabaceae* family (**Fig. 8; Tab. 1**). Ruderal plants are represented by *Rumex acetosella* (common sorrel), *Galium aparine* (cleavers) and *Chenopodium album/hybridum* (fat hen). These species are found very frequently in human settlements, a common companion of inhabited areas.

Einkorn, emmer, as well as spelt are hulled (syn. glume) wheats, in which robust glumes surround the grain. To separate the grain from the glumes, additional steps in processing are necessary: parching by fire, pounding in mortars, repetitive winnowing and sieving. In contrast, ("modern") bread and macaroni wheats are free-threshing, which means that the grain falls out of the glumes already during threshing.[18] The advantage of hulled wheats is that the robust glumes protect the grain more efficiently against pests in the fields (birds and rodents); glumes safeguard the grain against insects and fungal attacks during storage, thus making hulled wheat more vigorous than free-threshing wheats.[19]

Pulses started their role as a companion to wheat very early in the agricultural history of the Old World. By rotation or mixing of legume crops with cereals the cultivator was able to maintain higher levels of soil fertility. Rather than using up nitrogen, pulses add to the soil. Another virtue is that the seeds of pulses are exceptionally rich in storage proteins, while cereals are rich in starch. Thus, they complement each other as food elements and contribute to a balanced human diet. Each agricultural civilization developed not only its staple cereals, but also its characteristic companion legumes.

To grow and ripen well, all the cereals require certain climate and soil types. For instance, wheat does not thrive well on loose sandy or peaty soils nor on wet clay soils. It provides the best yields on firm clay loams that are well drained. Wheat exhausts the land more than any other crop. It tends to lodge when growing on rich, damp bottom

17 Ciută/Bejinariu 2012, 158.
18 Hajnalova/Dreslerova 2010, 170.
19 Nesbit/Samuel 1996, 54.

Fig. 8 Plate showing the plant species recovered from the Teleac site (photo by B. Ciută)

land.[20] Wheat grains were of importance in the diet of prehistoric communities. After threshing and grinding the grains into a coarse meal, they were utilized either to make gruel or porridge or baked into bread. Wheat flour can be of two types, either *strong* or *weak*. Strong flour is caused by the high gluten content in the grain, which gives it elasticity so that it can be baked into light porous loaves. When the grain is grown under conditions of low rainfall, on rich soil, with a hot, dry and sunny ripening period, strong flour is produced. Weak flours, by contrast, tend to produce compact, hard loaves. They are frequently found in areas with high rainfall and soil moisture, and cool, cloudy weather during the ripening period.[21] We exemplify these environments, because – as we have demonstrated – during the Late Bronze Age the climate fluctuated so that the crops were of either type. In this case we can assume that the cultivated species were adapted to the climate. Also, we presume that the cultivated fields were somewhere outside of the settlement, either in the south-eastern part or in the western part, in the floodplain of the Mureș River.

Discussion

The Bronze Age witnessed important social and economic changes, as attested by the establishment of large, stable and fortified settlements with trenches and walls of earth, and by specialised growth of the agricultural economy (livestock and cultivation of plants). New tools made of more robust materials, including the bronze plough and sickles, played an important role in the agricultural process during the Middle and Late Bronze Age.[22]

As it turns out Bronze Age communities adapted to the climate by cultivating species suitable for their environmental conditions. Cereals, legumes and dried fruits must have been stored for winter consumption. The form of storage for cereals (whole spikelets or free grains) is not yet securely known. Studies have shown that storage of grains as whole spikelets provide better protection against fungi and insects, and that the absence of spikelet bases in the seed samples can be linked to their collection and flotation techniques.[23] On the other hand, it is considered that storage was not essential only for the winter season alone. Assumptions are that the production surplus was inherent as a safety measure in the areas where the annual harvest could fluctuate significantly.[24] This surplus could have important implications when used as trade good to acquire other products.

An overview of the entire Bronze Age, our focus in the space above, shows that during this period the communities were engaged predominantly in agriculture, preserving their habits from the area of their origin. The results of specific analyses show that peasant farming was the mainstay of Bronze Age life. Further, results of archaeobotanical research revealed an important characteristic of the Bronze Age: the purity of cultivated crops. Most of the analysed samples contained cereal samples with very few impurities. Does this reality signify a start in the specialization of everyday activities? Or, respectively, does it signify that communities were mainly occupied with only the cultivation of plants and dedicated themselves exclusively to these skills? We may state as a first general conclusion that the analysed plant remains from Teleac hillfort are representative for the Late Bronze Age, similar to other sites in Europe. It will remain for future archaeological campaigns and archaeobotanical results to complete the picture of plant species included in the diet of inhabitants of the Teleac fortification.

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20 Renfrew 1973, 66.
21 Renfrew 1973, 67.
22 Vulpe *et al.* 2001, 238.
23 Hilmann 1981, 127.
24 Halstead 1989, 68.

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Maren Gumnior and Astrid Stobbe

Palaeoenvironmental Reconstructions at Corneşti-Iarcuri (Southwestern Romania) – Preliminary Results from Geomorphological, Pedological and Palynological On-Site Studies

This paper provides a glimpse into the palaeoecological conditions at the prehistoric settlement Corneşti-Iarcuri in the southwest Romanian Banat, which is known as the largest Bronze Age fortification in Europe. Preservation of pollen is generally poor in the region, where extensive marshlands have been drained and converted into arable lands since the 18th century. Remarkably, some fossil topsoils buried under thick colluvial[1] layers within the fortification proved to contain pollen. Together with the sediments themselves, which serve as direct evidence for anthropogenically influenced geomorphodynamics and could partially be put into chronological context by radiocarbon dating, the on-site palynological data offer a unique opportunity to reconstruct the palaeoenvironmental setting at Corneşti. Results reveal that during the Chalcolithic period, a partially cleared open woodland with Tilia, Quercus and Corylus prevailed. Soil erosion began in some central parts of the settlement site, resulting in the accumulation of up to 90 cm of colluvium in the main valley. Until the Early Iron Age, regional tree percentages dropped from around 38 to 22 %, while anthropogenic indicators (Cerealia, Plantago lanceolata, Polygonum aviculare) increased from 11 to 16 %. Meanwhile, between 50 to 170 cm of colluvium were deposited at the investigated floodplain sites.

Introduction

Corneşti-Iarcuri, the largest known prehistoric settlement in Europe, is situated approximately 20 km north of the town of Timişoara in Romania's Banat region. As the southeastern part of the Great Hungarian Plain, the Banat is bordered by the rivers Tisza in the west, Danube in the south, Mureş in the north and the western Romanian Carpathians (Apuseni mountains) in the east (**Fig. 1**). The landscape is characterised by undulating loess-covered piedmont hills and wide alluvial plains, which had been dominated by vast wetlands until far-reaching drainage measures were put into effect from the 18th century onwards. Albeit separated by the Carpathians, the natural vegetation is regarded as forming the westernmost portion of the Eurasian forest steppe belt.[2]

The archaeological site of Corneşti lies at about 140 m asl on a gently dipping plain, intersected by two small northeast-southwest oriented valleys that are incised to depths between 20 and 50 m.[3] Spreading over 17 km^2, it is surrounded by four ramparts of a total length of 33 km.[4] They are made of earth-filled wooden boxes that are believed to have reached 5 m in width and 6 m in height.[5] The ramparts have been dated to the Late Bronze Age and the transition to the Iron Age;[6] additional datings have recently been carried out under the scope of the LOEWE research initiative 'Prehistoric Conflict Research – Bronze Age Fortifications between Taunus and Carpathian Mountains'. Even though the Late Bronze Age is recognized as the main occupation phase of the site,[7] settlement activities have been documented from almost all archaeological periods since the Neolithic.

Our DFG-sponsored project is concerned with "Archaeobotanical investigations on the landscape and vegetation history of the Late Bronze Age fortification Corneşti-Iarcuri and its environs in the Romanian Banat". The research focuses on

[1] All colluvial deposits mentioned in this text are of Mid- to Late Holocene origin, and their genesis is closely linked to settlement activities at Corneşti-Iarcuri.
[2] Magyari *et al.* 2010.
[3] Micle *et al.* 2009.
[4] Szentmiklosi *et al.* 2011; Heeb *et al.* 2015.
[5] Heeb *et al.* 2017 Fig. 3.
[6] Harding 2017.
[7] Szentmiklosi *et al.* 2011.

off-site and on-site archives as well as the analysis of macro-plant remains obtained during archaeological excavations.[8]

The detection of off-site archives is important as a general source of information on the Holocene vegetation development. Due to the intensive drainage measures contributing to the mineralisation of potentially organic deposits, it turned out to be labourious and difficult to find adequate locations. Undisturbed archives in the form of lakes or peat bogs only exist at distances of at least 100 km in high-altitude areas of the southern or eastern mountain ranges.[9] We managed to find one suitable site near Vinga, 7 km north of Corneşti, where pollen have been preserved under alluvial to lacustrine conditions and will be discussed in a separate publication.

The exploration of on-site archives within the fortification itself has been accompanied by research on the deposition history in order to get a wider picture on Holocene landscape dynamics in relation to the occupation of Corneşti. The sedimentology and geomorphology of the site have already been intensively studied by Nykamp,[10] who focused on alluvial fans and linked them to activity phases during its settlement history, describing daub- and charcoal-bearing colluvial layers of up to 3 m thickness, and dating some of the charcoals to the transition of the Bronze to the Iron Age and the Chalcolithic.

Palaeoenvironmental research in the greater region

Most studies have concentrated on montane environments in the eastern,[11] western[12] and southern[13] Carpathians, where classical archives such as bogs or lakes are present. Other research took place in lower mountain ranges[14] or intramontane basins, for example in Transylvania[15] or Hungary,[16] where environmental conditions can largely be parallelized with those in the study area.

The Holocene climatic history has mainly been reconstructed by isotope ($\delta^{18}O$ and $\delta^{13}C$) studies on speleothems which account for a gradual warming from around 11700-11500 BP, more pronouncedly from 8200 BP onwards until approximately 5200 BP, interrupted by some smaller oscillations, but with generally higher temperatures than the present ones.[17] Towards the Early Atlantic, precipitation seems to have been on the increase,[18] while the climate of the Mid- and Late Atlantic became cooler and probably more arid, as attested by lake level fluctuations.[19] This implies that an explicit Holocene climate optimum can actually not be accounted for.[20] The same holds true for the development of temperatures during the Subboreal, but several authors agree that at least the second half was characterised by higher rainfall which prompted a rise in lake levels and the formation of swamps.[21] In the Subatlantic, more continental conditions became established.[22]

The Holocene vegetation evolution in the Great Hungarian Plain starts with a quick shift from postglacial forest steppes with coniferous and cold deciduous taxa to mesothermophilous forests dominated by oak and hazel at around 11000 BP. Between c. 6000 and 4000 BP, first *Carpinus* and eventually *Fagus* gained central importance, but since 3700 to 3000 BP, forests were increasingly replaced by steppe vegetation as a result of anthropogenic influence, coupled with higher aridity.[23] Magyari *et al.*[24] investigated the prevalent view that the wooded steppe in Hungary can be regarded as a natural vegetation formation which became established in

8 For preliminary results of the latter, see Krause *et al.* in press

9 E.g. Rösch/Fischer 2000; Farcaş/Tanţău 2012.

10 Nykamp *et al.* 2015; 2016; 2017.

11 E.g. Farcaş *et al.* 1999; 2013; Feurdean 2004; Florescu *et al.* 2004; Forray *et al.* 2015; Magyari *et al.* 2009; Geanta *et al.* 2014.

12 E.g. Bodnariuc *et al.* 2002; Feurdean/Willis 2008; Feurdean *et al.* 2009; Grindean *et al.* 2015; 2017.

13 E.g. Farcaş *et al.* 1999; Magyari *et al.* 2009; Rösch/Fischer 2000.

14 E.g. Björkman *et al.* 2002; Farcaş/Tanţău 2012; Feurdean 2004; 2005; Feurdean/Astalos 2005; Feurdean/Bennike 2004; Feurdean *et al.* 2008; Tanţău *et al.* 2003; 2006; 2009; 2011.

15 Feurdean *et al.* 2007; 2015; Grindean *et al.* 2014.

16 Magyari *et al.* 2001; 2008; 2010; 2012; Gardner 2002; Jakab *et al.* 2004; Jakab/Sümegi 2010; Sümegi *et al.* 2012; Willis *et al.* 1995.

17 Constantin *et al.* 2007; Feurdean *et al.* 2007; 2014; Perşoiu 2017.

18 Gardner 2002; Kiss *et al.* 2015.

19 Magyari *et al.* 2010.

20 Constantin *et al.* 2007; Onac *et al.* 2002.

21 Kiss *et al.* 2015; Magyari *et al.* 2001.

22 Feurdean *et al.* 2013; Perşoiu 2017.

23 Feurdean/Tanţău 2017; Tomescu 2000; Chapman *et al.* 2009.

24 Magyari *et al.* 2001; 2010.

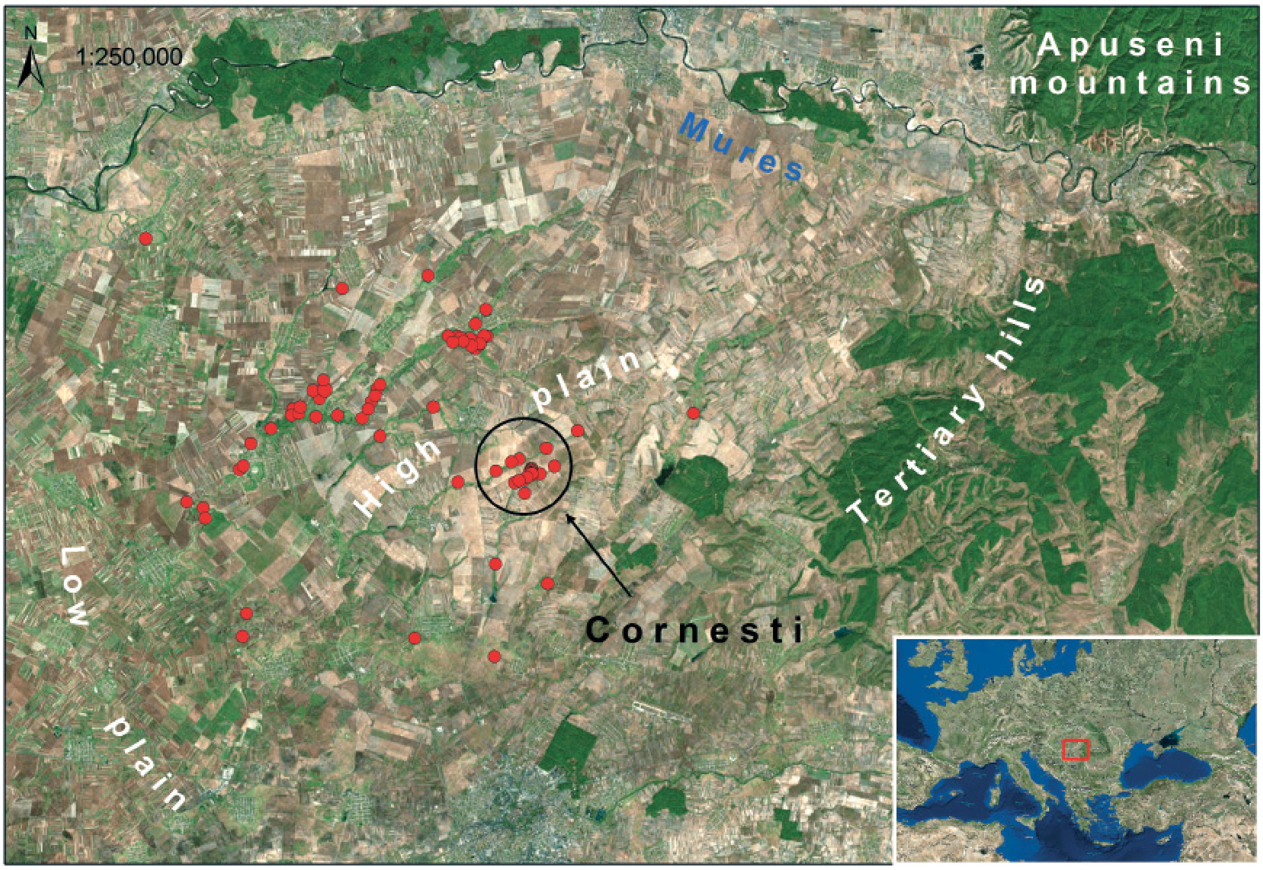

Fig. 1 Overview of study area and coring sites (map by the authors; image source: ESRI open data)

the Boreal. But instead, with the exception of some edaphically dry areas, they noted an expansion of deciduous forests during that phase. Studies in the Transylvanian lowlands point to a similar vegetation development: After an Early Holocene mixed oak forest phase, *Carpinus* took over at the onset of the Subboreal, followed by beech around 4000 to 3000 BP and accompanied by increasing signs of deforestation.[25] However, primary indicators of human impact can be traced back as far as the Mid-/Late Neolithic. [26]

Study area

The Great Hungarian Plain forms part of the Carpathian Basin which started to subside in the Early to Mid-Miocene, while the surrounding mountains were uplifted and folded. It was subjected to first marine (Tethys), then lake (Pannonian) transgressions until sedimentation started to exceed subsidence by the end of the Pliocene/beginning of the Pleistocene, also accompanied by differential uplift at the fringes. The crystalline basement is consequently covered by up to 1000 m of marine, lacustrine, and fluviodeltaic sediments.[27]

The study site (**Fig. 1**) is located in the so-called Vinga High Plain (90–190 m asl) which gently inclines to the southwest and forms part of the Mureş alluvial fan that was partly active until Holocene times – a Mureş palaeomeander approximately 30 km west of Corneşti could be dated to 7100 BP by OSL.[28] While the eastern part comprises several loess-covered Pleistocene terraces with a relatively coarse texture (gravels and sands), the western section is dominated by 5 to 15 m of Holocene alluvium, deposited in broad valleys. It also prevails in the lower plains and contains some reworked Pleistocene sands and gravels. The majority, however, consists of relatively clayey 'alluvial loess' (sometimes also called 'infusion loess'), believed to have originated from former Pannonian sediments reworked by aeolian

25 Feurdean *et al.* 2007; 2015; Tanţău *et al.* 2006.
26 Feurdean *et al.* 2017; Grindean *et al.* 2014.
27 Kiss *et al.* 2015; Ţărău *et al.* 2014.
28 Kiss *et al.* 2015.

activity during the Pleistocene and frequent river avulsions throughout the Holocene.[29]

Typic Chernozems are still widespread in the northwestern part of the Vinga Plain; some have undergone decalcification and/or leaching, thus transitioning into (luvic) Phaeozems.[30] They are characterised by very dark brown to black mollic topsoils with humus contents around 2–3.5 %.[31] Eroded subtypes ar**e** prevalent on many slopes, particularly because loess soils have been subjected to intensive agricultural use. In the valleys, dark-coloured alluvial soils are abundant which have been termed fluvi-gleyic Chernozems[32] or Humogleys.[33] As they are usually clay-rich, they have also been mapped as Pelosols or, more frequently, as Vertisols, when respective properties were evident. Craciun *et al.*[34] report that, outside of Lluvisol-dominated areas, smectites are prominent within the clay mineral spectrum. The vertic properties can be disguised, however, as soils are often inundated.

The recent climate in the Banat is transitional, i.e. predominantly temperate (Cfb, according to Köppen), with a northeastward increase of continental and orographic effects (Dfb), while frequent cyclones from the Mediterranean cause positive precipitation anomalies especially in the western parts. Due to the maritime influence, winters are mild and short, but when northeastern conditions prevail, harsh frosts may occur. Mean annual temperatures range between 12 °C (with average summer temperatures above 22 °C in July) and 6 °C towards the eastern highlands. Annual rainfall (with spring maxima) in the central and western parts of the Vinga Plain is 550 mm per year, with a potential evapotranspiration around 700 mm and occasional summer droughts.[35]

The Banat is part of the Pannonian floristic province, but congruently with the interlocking climatic subzones it represents an ecotone between the central eastern European and south European vegetation units, comprising numerous intra- and azonal elements. The potential natural vegetation is believed to consist of a typical forest steppe towards the central parts of the Great Hungarian Plain and open deciduous woodlands at its periphery, similar to the Transylvanian lowlands or large areas of the Ukraine.[36] Contemporary woodlands are mostly dominated by *Quercus robur*. Other temperate summergreen species are *Fraxinus excelsior/angustifolia/ornus*, *Tilia tomentosa*, *Acer campestre/tataricum*, *Cornus mas/sanguinea*, *Ulmus glabra/laevis*. On drier sites such as loess-covered areas, thermo-/xerophilous (Balkan-type) oak associations (*Quercus pubescens/cerris/frainetto*) can be found.[37] As a consequence of thorough drainage, the former floodplain forests composed of *Salix alba* and *Populus* sp. have been replaced by a cultural steppe with some singular forest islands and marsh remnants.[38]

Methods

With special focus on the alluvial deposits inside of the fortification (**Fig. 3**), 16 cores were collected by vibracoring with a petrol-powered hammer and corers of 1 and 2 m length (60 mm Ø). Sediment units were subsampled for geochemical analyses at a minimum of 30-cm intervals or less, when lithological or pedogenic changes were evident. Samples for pollen analysis were taken wherever pollen preservation seemed likely, putting particular emphasis on the different colluvia separated by fossil topsoils in the 2nd m. All soil types were identified according to the World Reference Base for Soil Resources,[39] including those on the interfluves that were sampled with a Puerckhauer auger (n = 23; **Fig. 3**) and will be covered in detail in a later publication.

Geochemical laboratory analyses of selected profiles focused on pH (KCl; DIN 19684; 78 samples), humus content (loss on ignition;[40] 78 samples) and granulometry (pipette method after Köhn;[41] n = 33). 54 samples (0.3 cm^3) were prepared for pollen analysis, following the standard procedure after Fægri/Iversen[42] with the addition of *Lycopodium* tablets in order to determine pol-

[29] Grigoraş *et al.* 2004; Urdea *et al.* 2012; Dicu *et al.* 2013; Ianoş 2002; Rogobete *et al.* 2011.
[30] Sherwood *et al.* 2013.
[31] Grigoraş *et al.* 2004.
[32] Dicu *et al.* 2012; Grigoraş *et al.* 2004.
[33] Grigoraș/Piciu 2005.
[34] Craciun *et al.* 2010.
[35] Grigoraş *et al.* 2004; Rieser 2001; Ţărău *et al.* 2010.
[36] Magyari *et al.* 2010.
[37] Sümegi *et al.* 2002.
[38] Neacşu *et al.* 2015; Rieser 2001.
[39] IUSS Working Group 2015.
[40] Riehm/Ulrich 1954.
[41] Werner 1973.
[42] Fægri/Iversen 1989.

len concentrations.[43] Pollen grains were embedded in silicone oil and examined under the light microscope (magnification factors 470 and 756). Taxa were identified with the aid of the departmental reference collection and respective literature.[44] The pollen types were divided into local (wetland and aquatic plants including Cyperaceae, spores) and regional taxa (including Poaceae). Owing to the poor preservation conditions, the total pollen sums were rather low, amounting to 311 grains in Profile I and 316 in Profile II with mean pollen concentrations of 873 grains cm^{-3} in Profile I and 1855 grains cm^{-3} in Profile II, respectively. Charcoal from two samples was radiocarbon-dated by acceleration mass spectrometry (AMS) at the Archaeometry department of the Curt Engelhorn Centre, Mannheim. Results were calibrated with OxCal 4.2.[45]

Results and discussion

Sediments

The most common surface deposits in the Corneşti area are reddish (Munsell colour 10 YR 3/4) silty clays which are apparently deeply pre-weathered and contain plenty of carbonate concretions. Termed 'Vinga clays' by Dragulescu *et al.*[46] and Mihaila/Popescu,[47] they have been ascribed to the Upper Pleistocene. Subsequent to the formation under stillwater conditions, solifluction is believed to have led to their prevalent accumulation on top of loess, as is also evident in the profiles presented by Sherwood.[48] However, since the granulometric conformity of Quaternary deposits in the area pertains to the 'Pannonian loess' as well, not only the underlying alluvial silty clay loams but also the near-surface deposits have often been referred to as loessic and loess-like. Against an average silt/clay ratio of 2.5 in a loess cover near Vinga, the values within the floodplain profiles vary between 1.4 in suspected Vinga clays and 2 in supposed alluvial loess derivates, while pedisediments show overlapping spectra, depending on their dominant source(s) of material (**Fig. 2**). All of this indicates a range of interfingering, reworked and mixed facies. At greater depths, around 7 m according to Nykamp *et al.*,[49] old Mureş fan deposits are present, consisting of sands and gravels which are also accessible at several pits along the main valley of Corneşti. On the lower slopes and in dell-shaped depressions, colluvia prevail, sometimes forming fans at the edges of valleys or the interior of ramparts.

Soils

Soils are predominantly characterised by gradual transitions between horizons and layers, accounting for the omnipresence of bioturbation, and possibly also peloturbation/self-mulching. Smectite contents are probably high, as clay mineral analyses carried out in the neighbouring Apa Mare river system at Vinga yielded smectite/mixed layer values up to 67 % of supposedly authigenic origin. Like the slopes, valley bottoms contain buried soils with humic horizons (SOM values between 1.6 and 2.7 %), covered by younger pedisediments (**Fig. 2**). The upper boundary of the buried soils is often obscured; however, a confusion with clay- and humus-enriched horizons as they have partly evolved on the interfluves[50] is unlikely – not only due to the stratigraphic positions of the humic topsoils (mostly in the 2nd m underneath relatively thick colluvia; **Fig. 2**), but also the lower pH-values, and, finally, the occurrence of pollen.

Chronostratigraphy

Regarding the origin of the sediments in which the mentioned fossil topsoils have developed, fluvial transport from greater distances can be ruled out in view of the small catchment and low stream capacity. In most cases, they are thought to be *in-situ* 'Vinga clays' containing the characteristic carbonate nodules, but having changed colour in the course of gleization. On the other hand, occasional finds of daub and charcoal point to an older generation of colluvium. Its distribution and thickness are assumed to be highly variable both longitudinally and transversely as a direct result of the land-use history and the erosional dissection

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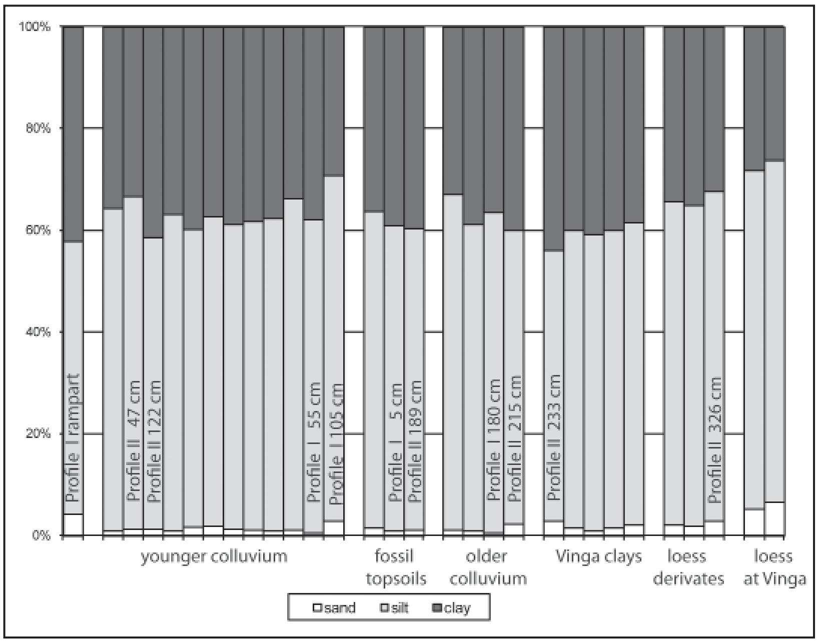
43 Stockmarr 1971.
44 E.g. Moore *et al.* 1991; Punt and Clarke 1976–2003; Reille 1992; 1998.
45 Bronk Ramsey 2017; Reimer *et al.* 2013.
46 Dragulescu *et al.* 1968.
47 Mihaila/Popescu.1987.
48 Sherwood 2013.
49 Nykamp *et al.* 2016.
50 Nykamp *et al.* 2016.



a

b

Fig. 2 a Grain size composition of floodplain deposits from Corneşti; **b** Examples of fossil topsoils (top: 2nd and 3rd m of floodplain profile, bottom: 2nd and 3rd m of slope profile with underlying loess) (graphic and photos by the authors)

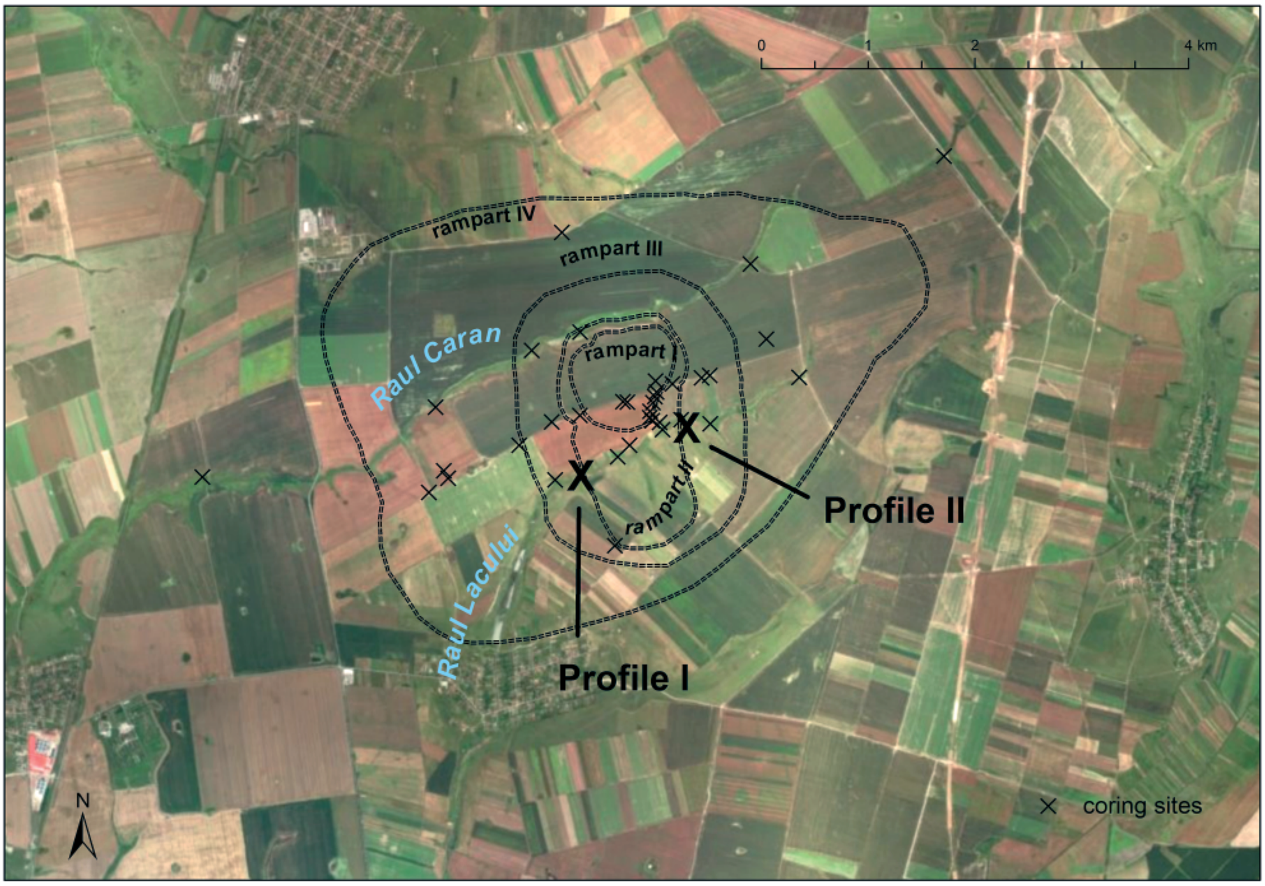


Fig. 3 Positions of coring sites at the fortification (illustration by the authors; image source: ESRI open data)

of the settlement site.[51] Our two pollen-bearing profiles suggest that both sediments in question are older colluvia by not only containing Late Holocene pollen assemblages but also charcoal dated to the Copper and Iron Age (see below).

The profiles presented here (**Figs. 3-5**) originate from the main valley of Corneşti ('Lacului' or 'Lake' Valley). The first one, Profile I, is situated immediately below Rampart II (western part) which is still approximately 140 cm high. Underneath the wall-construction material, a fossil topsoil was found that had developed inside 170-cm thick colluvial loams of differing granulometric composition. They lie on top of another 90-cm thick silty to clayey colluvium, comprising ceramics as well as iron/manganese mottles and carbonate nodules. Below a depth of 260 cm lies a layer of alluvial loess with a high percentage of $CaCO_3$ concretions and some iron/manganese oxides (in which another fossil A-horizon is developed). The cultural layer contains pollen at 194 and 220 cm depth (height of rampart subtracted). A piece of charcoal at 194 cm has been dated to 4350 ± 28 uncal. BP (cal. BC 3078 – 2903; 2-sigma); i. e. the Copper Age as *terminus post quem*. It may therefore be assumed that the upper 170 cm of pedisediments immediately underlying the rampart are a product of land-use dynamics during the period between the radiocarbon date given above and the time that the fortification was erected.

The second sediment core, Profile II, lies immediately upstream of the eastern flank of Rampart II and consists of colluvial silty clays to a depth of 170 cm. Below, a fossil A horizon of 20 cm is located inside 50 cm of silty clay loams which grade into thick silty clays. The loams are colluvial in nature; however, in terms of colour and texture, they are almost indistinguishable from the deposits beneath, assumed to belong to the 'Vinga clays'. This illustrates the overall difficulty in specifying this important transition between Pleistocene and young Holocene deposits concerning almost all investigated profiles. Below 315 cm, a lighter coloured (10 YR 4/2) silty clay loam with many iron/manganese mottles and secondary carbonate concretions, most likely loess loam, is found down to the maximum coring depth of 5 m. Unlike the almost sterile fossil topsoils in Profile I,

51 Nykamp *et al.* 2015.

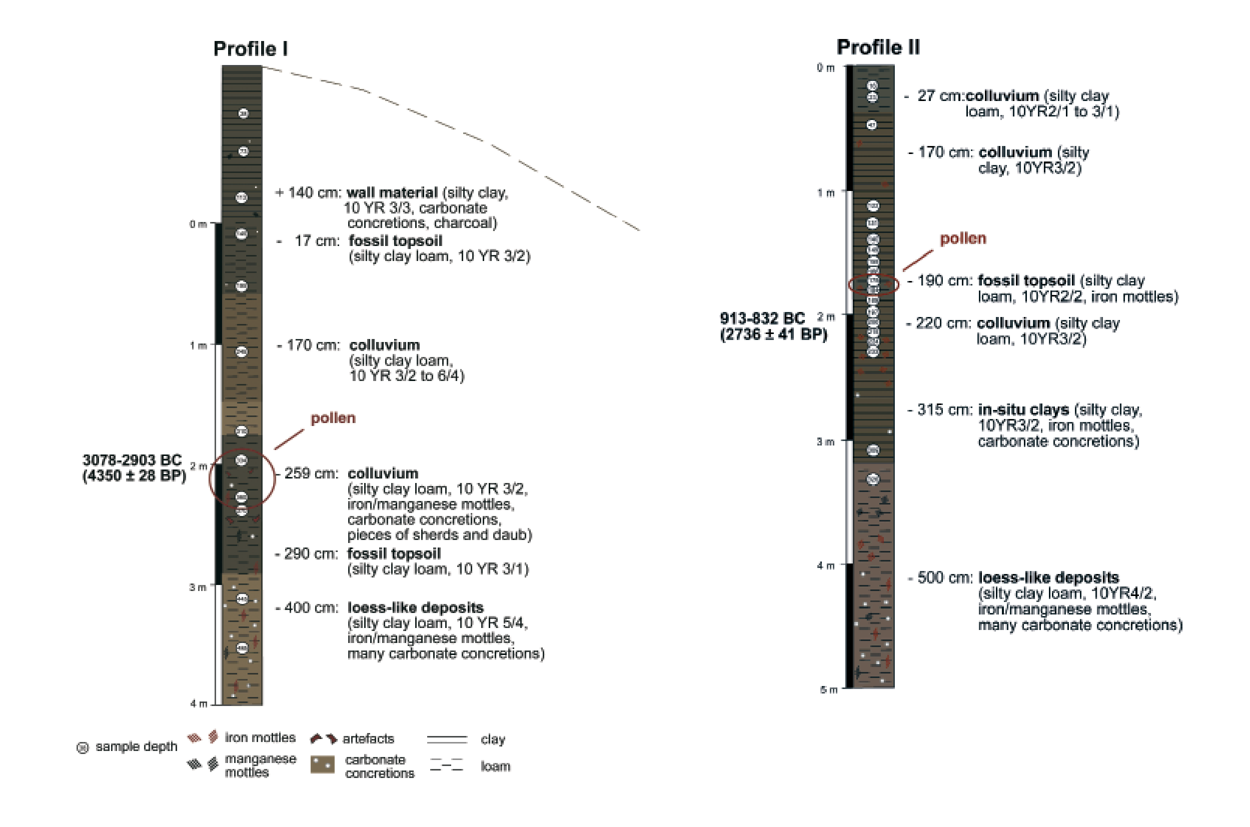


Fig. 4 Sedimentology and chronostratigraphy of the presented profiles (graphics by the authors)

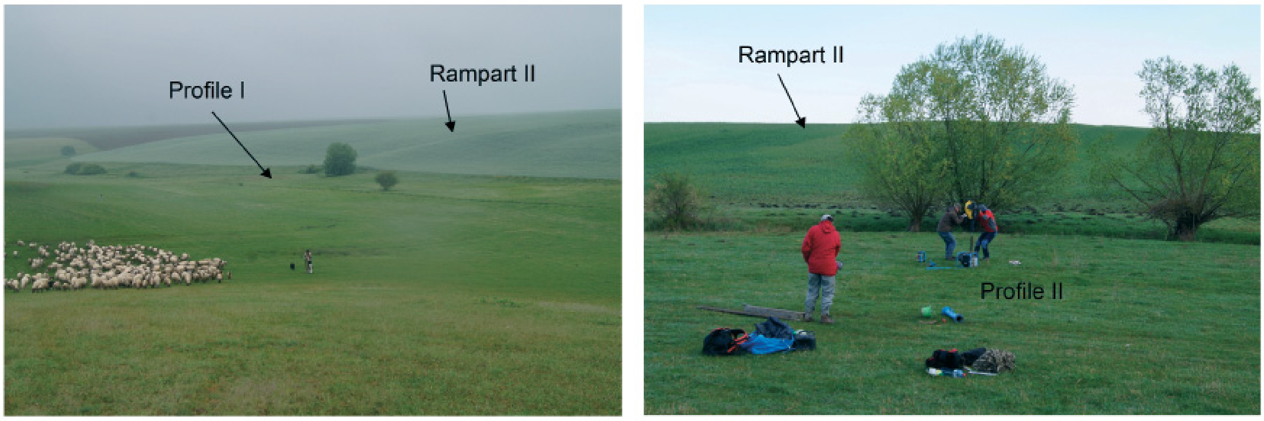


Fig. 5 Locations and surroundings of Profile I (left) and II (right) (photos by the authors)

the one in Profile II contains pollen. A piece of charcoal at 2 m depth was dated to 2736 ± 41 uncal. BP (cal. BC 913 – 832; 2-sigma) i.e. the Early Iron Age. Consequently, the upper colluvial strata have been deposited between the Middle Iron Age and the Modern Age.

Models of landscape evolution are necessarily constrained by the lack of high-resolution data including multiple radiocarbon ages, also because the construction of ramparts has resulted in a number of slope ruptures[52] which complicate longitudinal profile correlations. Nevertheless, the obtained data provide some crucial insights in processes of erosion and deposition. The existence of 90 cm of Chalcolithic colluvium overlain by 170 cm of younger, pre-Late Bronze Age sediments reflect a considerable amount of anthropogenically induced mass movements. The erection of the rampart contributed to the preservation of the eroded soil material, which may otherwise

[52] Micle *et al.* 2009.

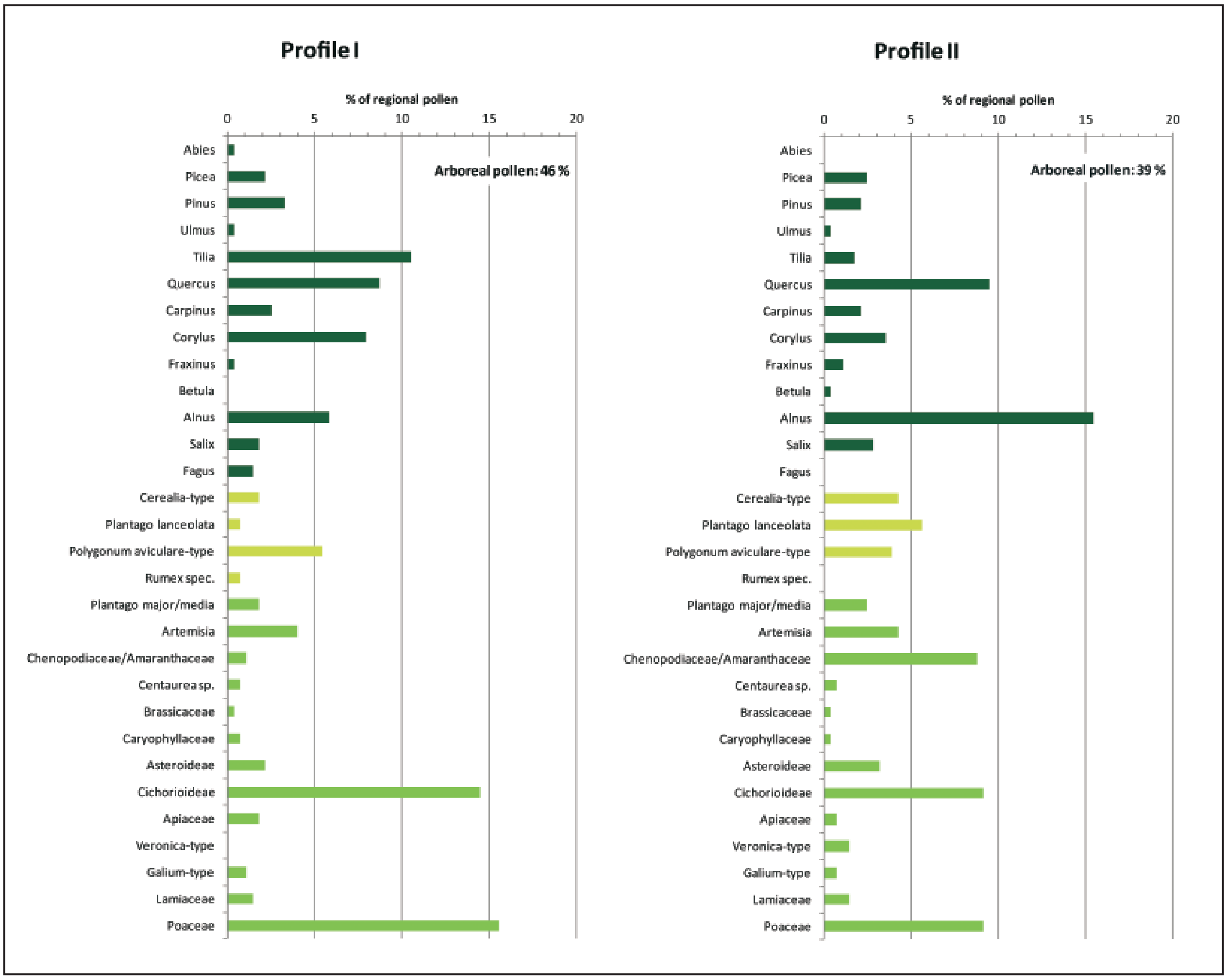


Fig. 6 Selected palynomorphs from the Copper Age (Profile I) and the Iron Age (Profile II) (graphics by the authors)

have been removed from similar floodplain positions. This underlines that large quantities of sediments must have been translocated within a relatively short period of time, notwithstanding the overall geomorphic stability on the interfluves where most soils have remained intact in general, even if the effects of widespread deflation have been discussed as well.[53]

None of the colluvia was dated to the Late Bronze Age settlement phase at Corneşti. This is mainly due to the fact that such deposits were not among the pollen-bearing strata, upon which age determination has focused so far. Early to Mid-Bronze Age deposits are however indirectly proven in Profile I. Their thickness of 170 cm, together with 90 cm of Chalcolithic material, reveals the high degree of land degradation at the centre of the site before the time of rampart construction. The findings are in line with the radiocarbon dates and chronostratigraphical interpretations presented by Nykamp *et al.*,[54] which show that the fan material between 145 and 225 cm depth was deposited between the Copper Age and the Early Iron Age. The 50 cm of Iron Age colluvium in Profile II also fit into this picture, but the development of the fossil topsoil equally proves that the period after deposition was followed by an interval of geomorphological stability. However, human impact intensified once again in a later period, as implied by the presence of 170 cm of (sub-) recent colluvium.

Pollen spectra

Even though sites with hydromorphic conditions can be found at Corneşti (particularly in the Caran valley), they do not contain reasonable amounts of pollen. Remarkably, larger numbers of palynomorphs which have synsedimentarily been incorporated in terrestrial soils do exist at least in a few horizons with increased organic matter contents

53 Nykamp *et al.* 2017.

54 Nykamp *et al.* 2016.

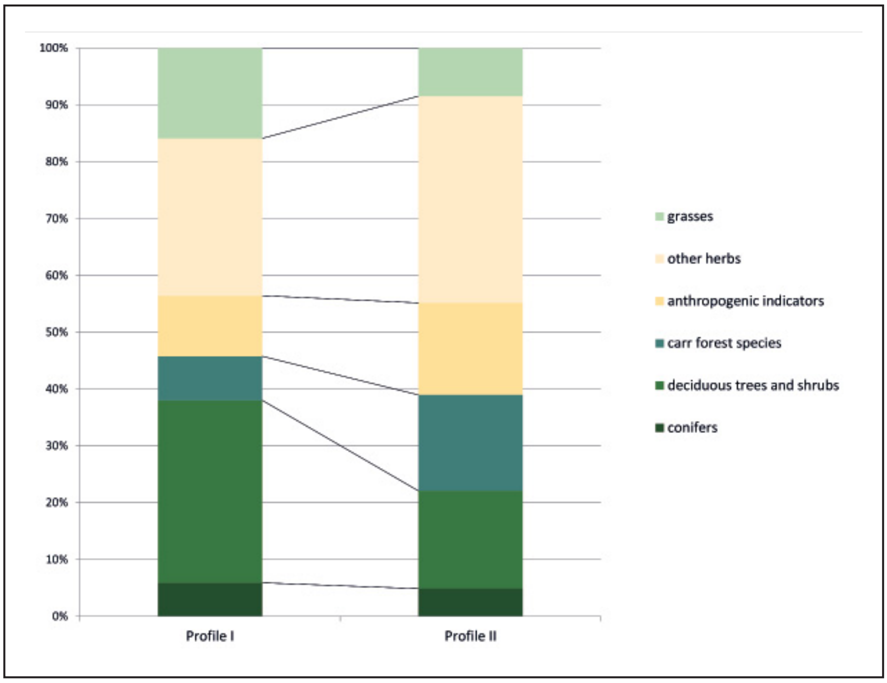


Fig. 7 Allocation of regional taxa from the Copper and Iron Age to ecological groups (graphic by the authors)

in the two profiles described above. Two samples each from the cultural layer of Profile I (194 and 220 cm below the surface) and the fossil topsoil of Profile II (at 175 and 184 cm depth) were subsequently analysed. **Fig. 6** shows relative frequencies of selected taxa at the two sites, expressed as percentages of the regional pollen sum. **Fig. 7** features their distribution into major ecological classes, i. e. coniferous and deciduous trees, trees from the local floodplain, anthropogenic indicators, other herbaceous plants and grasses.

Profile I contains about 46 % of woody taxa with *Tilia* as the dominant tree (over 10 %), followed by *Quercus* and *Corylus* (around 9 and 8 %). *Carpinus* is present, as well as *Fagus* and *Abies* which, together with the radiocarbon age, attest the Mid- to Late Holocene nature of the spectrum.[55] Primary and secondary indicators for human presence (here: *Cerealia*, *Plantago lanceolata* and *Polygonum aviculare*) reach levels of 11 % in the samples. Among the other herbs, Cichorioideae constitute the major part with 14 %, comparable to the values of grasses and most likely a result of selective corrosion.

In Profile II, an even lower percentage of arboreal pollen of around 39 % is evident among which *Alnus* dominates with approximately 15 %, proving that alluvial forests were present outside of Ram-part II until the Early Iron Age. However, if forest representatives *Alnus* and *Salix* are excluded from the regional tree spectrum, *Quercus* remains the major woodland constituent, while the other deciduous species have been reduced considerably, from a total of 32 to 17 %. The frequencies of anthropogenic taxa are distinctly higher than in Profile I and amount to 16 %. In the class of other herbs which have generally increased from 28 to 36 %, especially Chenopodiaceae show a drastic rise from 1 to 9 %. This serves as additional evidence for land degradation in the area caused by continuous human presence.

The tree values (without *Alnus*/*Salix*) of 38 % in Profile I indicate that a sparsely wooded steppe existed during the Copper Age. Until the Early Iron Age, the respective species had declined by over one-third to only 22 %. In most pollen profiles from the greater region,[56] tree percentages commonly do not drop below 60–65 % until approximately 3000 BP.[57] Reduced levels around 50 % have been documented in Lake Stiucii, Transylvania, for the Bronze Age[58] and the Matra up-

55 E. g. Fărcaș/Tanţău 2012.

56 Off-site data from the archaeological periods in question were not collected until our last coring campaign and are therefore not yet available for comparisons.

57 E.g. Magyari *et al.* 2010; Grindean *et al.* 2014.

58 Feurdean *et al.* 2015.

lands in northeastern Hungary for the Iron Age.[59] As a consequence of the different depositional environments, a direct comparison is difficult, but the divergence of values gives some clue to the degree of woodcutting that has obviously taken place at Corneşti even before the fortification was built.

The general composition of arboreal species shows the existence of a *Tilia/Quercus/Corylus* woodland, as was also common in northeastern Hungary at least before 3700 BP.[60] Until the Iron Age, *Quercus* had become the dominant tree at Corneşti, which has been equally observed in largely deforested areas from Hungary to Transylvania.[61]

Conclusion

The pollen-bearing on-site sediments in the prehistoric settlement Corneşti-Iarcuri offer profound insights into its local vegetation and settlement history by depicting the environmental conditions before and after it became the largest known fortified site of the Late Bronze Age. Cereals (as a direct sign of agriculture) and ruderal plants (showing land-use in general) account for 11 % of regional pollen in the Copper Age and rise to 16 % in the Iron Age. This, in combination with the low amount of arboreal pollen, indicates substantial human impact. It is equally documented by slope erosion processes that led to the dissection of the settlement area and accumulation of up to 260 cm of sediment in the main valley. Composed of several distinct colluvia of Copper to Early Iron Age origin, it represents important steps in the creation of a cultural landscape. In turn, extended phases of geomorphological stability have not only been postulated for the interfluves, but are also attested by the occurrence of numerous fossil humic horizons within the valley deposits.

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59 Gardner 2002.
60 Magyari *et al.* 2008; Willis *et al.* 1998.
61 Gardner 2002; Feurdean *et al.* 2015.

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The Genesis of the Fortification of Corneşti-Iarcuri near the Mureş Lower Course (Romanian Banat) – A Phase Model on the Chronology of the Settlement and Fortification Structures

The large fortification of Cornești-Iarcuri is located on the Mureș River in Romania and comprises four rings of defensive ramparts. With the outermost rampart encircling a total area of 17.65 km², Cornești-Iarcuri is thus considered the largest Bronze Age fortification in Europe. New intensive research began in 2007 with the six-year project "Investigations on settlement structures and the chronology of the Late Bronze Age fortification of Cornești-Iarcuri in Romanian Banat", funded by the German Research Foundation (DFG). The project terminated in the autumn of 2017. Now the goal is to evaluate the data collected during the last eleven years and to develop the first syntheses. As part of the new excavations, a total of 109 radiocarbon datings from different contexts (ramparts, ditches, pits, house structures, etc.) were obtained. The subsequent phase model based upon these data essentially refers to the dating of ramparts I and II and to pits associated with house contexts. Thus, it enables a site biography for Cornești-Iarcuri to be outlined for the first time and four settlement phases to be distinguished.

Introduction

The large fortification of Corneşti-Iarcuri is located on the eastern edge of the Great Hungarian Plain on the lower reaches of the Mureş River, where the westernmost foothills of the Carpathian Mountains join the lowlands. It encompasses four ring-shaped, earth-wood ramparts, with the outermost rampart enclosing a total area of 17.65 km². In view of the immensity, Corneşti-Iarcuri is considered the largest Bronze Age fortified enclosure in Europe. An intensive phase of new research began in 2007 and was funded by the German Research Foundation (DFG).[1] In the course of the excavation campaigns during the past eleven years samples for radiocarbon dating were taken from the respective different find contexts and structures, for example, from ramparts, house structures, pits and the infill of ditches in front of the ramparts. These efforts were meant to achieve, on the one hand, more precision in datings, while, on the other hand, to enable the chronological assignment of finds associated with these contexts using methods that are independent of typology. The questions also changed according to the investigated structures. In the beginning investigations were mainly concerned with the basic dating of the complex.[2] Was Corneşti-Iarcuri indeed a fortification of the Bronze Age, and if this were the case, what was the temporal relationship between the different defensive ramparts? Were they erected in succession, at the same time or immediately one after the other, or were they built during different epochs in time? How intensively and at what times was the fortification system in use?

With the increase in radiocarbon datings and finally the growing certainty that the fortification does indeed date to the Late Bronze Age, the focal approach ultimately became on achieving the most precise dating of the individual fortification

1 The project "Investigations on settlement structure and chronology of the Late Bronze Age fortress Corneşti-Iarcuri in Romanian Banat" ("Untersuchungen zu den Siedlungsstrukturen und zur Chronologie der spätbronzezeitlichen Befestigung von Corneşti-Iarcuri im rumänischen Banat") is funded by the DFG (Deutsche Forschungsgemeinschaft). Applicant and director of the project: Prof. Dr. Rüdiger Krause, PD Dr. Astrid Stobbe, both of the Institut für Archäologische Wissenschaften der Goethe-Universität Frankfurt, and Prof. Dr. Matthias Wemhoff, Museum für Vor- und Frühgeschichte Berlin.

2 Heeb *et al.* 2008.

rings and phases, as well as their relationship to the evidence for settlement structures. Intensified research and accompanying combination of different methods (surface prospection, geomagnetic measurements, excavations) have brought forth an increased density in the evidence of massive traces of fire in the first two fortification rings (I and II). In addition, comprehensive geomagnetic measurements revealed that not only had the first and second rampart burned completely, but also large areas of the settlement structures. These results were supported by surface prospections as well as individual excavation sections, from which comparably large amounts of burned clay were retrieved. With that, the indications increased to at least one, possibly two or even several conflagrations, in whose course large areas in the centre of the fortified complex were destroyed.[3]

Following the premise that there was one single fire event and in view of the excavated features and their dating, the question arose as to how the individual building phases and use-horizons prior to and after the fire can be reconstructed. An important basis for answering this question is the most precise datings, yet even more essential, the context-related datings and the chronological models based upon them. Even though the dating intervals distinguished in 14C measurements remain uncertain due to their probabilistic character,[4] the chronological modelling and the resulting relationship between the fortification rings and settlement structures are the foundation for the reconstruction of the genesis of settlement and the interpretations based on it.

A further aspect plays an important role in the genesis of settlement in Cornești-Iarcuri and the reconstruction of phases, events and use-horizons: the unusual dimensions of the fortification system and its location in a naturally divided landscape. As a rule, terms such as 'site' or 'findspot' circumscribe local, closely delimited areas. Yet in the case of Cornești-Iarcuri, these terms fall short. This particular complex is part of a landscape, designated the Vinga Plain, on the eastern fringe of the Great Hungarian Plain. The outermost of the four defensive ramparts (Ring IV) encompasses a total area of 17.65 km^2, in view of which the complex is considered the largest Bronze Age fortification in Europe.[5] The dimensions of the outermost Ring IV can only be seen from an aerial perspective. In addition to the three smaller fortification ramparts – of which the smallest Ring I still has a diameter of one kilometre – Ring IV includes an entire landscape, which was inhabited in different periods. In the centre of the landscape are two valleys running northeast-southwest, which divide not only the landscape but also the complex itself. Whereas Ring I lies on the plain between the two valleys and is flanked by them, Ring II encloses or transects parts of the northern and the southern valley (**Fig. 1**). In particular, the valley to the south – the "Valea Lacului" – is still fed by a spring, whose source lies in the centre of Ring II. This was a major factor when this site was chosen for settling, not only during the Late Bronze Age, but also during all of prehistory; moreover, it was crucial to the conception of the fortification system and the structure of the settlement. This aspect and the associated methodological issues for the evaluation of individual 14C data from features, as well as the conception of a chronological phase model with an emphasis on the relationships between the first two fortification rings (I and II) and their inner settlement, will be discussed in the following.

Preliminary methodical and source-critical remarks

Of the 15 excavation trenches that were installed as part of the various projects and campaigns in recent research history on the Cornești-Iarcuri site, 12 trenches have been radiocarbon dated (**Fig. 1**). The remaining three trenches have been dated basing on find material and structural contexts (trenches IX and XV) or were not dated at all due to the lack of diagnostic finds (trench III).[6]

With the completion of field research in early autumn 2017 and continuing with the datings and later dates for individual contexts, we now dispose over a total of 109 context-related radiocarbon datings.[7] The number of data per trench varies considerably. The contexts of the individual features were sampled in different ways: according to

3 Lehmphul *et al.* 2018, 43.
4 Schier 2013, 268.
5 Lehmphul *et al.* 2018.
6 Heeb *et al.* 2012, 54.
7 In the following, reference to the date Poz-53350: 7490 ± 90 will be made solely in statistical considerations, but not graphically represented due to its high age.

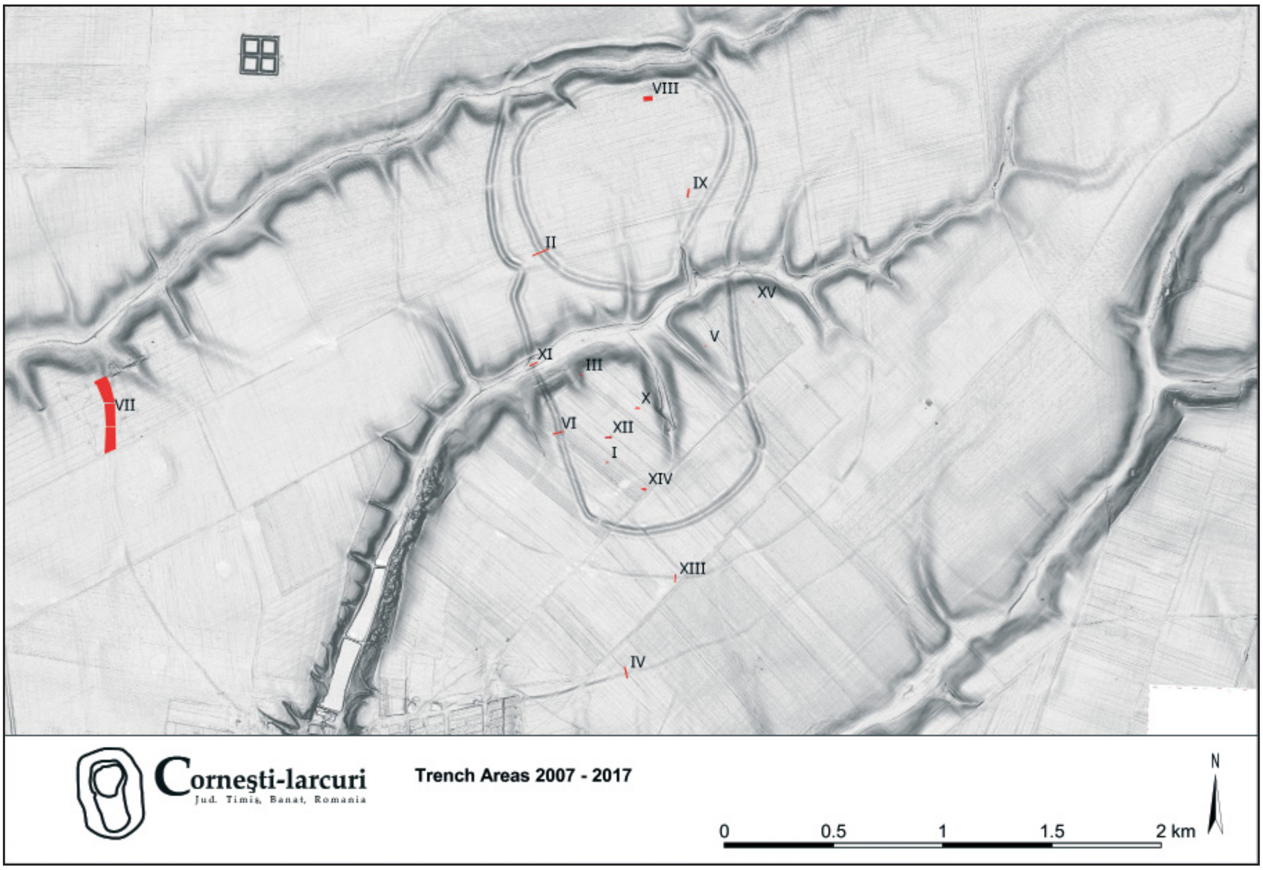


Fig. 1 Corneşti-Iarcuri. Location of excavation trenches I to XV from the past eleven years of field research (graphic: Corneşti Project, D. Schäffler)

the size of trenches, the presence of datable sample material, the density of feature contexts, the specific research question or the specific feature context. The samples were analysed and radiocarbon dated in three laboratories: Poznan Radiocarbon Laboratory in Poznan, Beta Analytic in Miami/Florida and Klaus-Tschira-Archäometrie-Zentrum in Mannheim, with the AMS method (Accelerator Mass Spectrometry) (**Tab. 1**).

Until 2013 radiocarbon dating was carried out only on the basis of charcoal samples. The focus during that phase of research was mainly on the dating of the ramparts and/or the ditches in front of them, the latter which as a rule held very few finds. The strategy employed in taking samples was enhanced by the partially burnt fortification rings, because this condition offered datable material, occasionally found still *in situ*.[8]

Already partly in 2013 and then completely during the excavation campaign of 2015,[9] the sampling strategy was adjusted and from then on solely macro remains were dated, which had been archaeobotanically identified beforehand. This short-lived sample material provided not only reliable datings, but also aided in avoiding potential sources of error and subsequent unclear results due to the problem of the 'old wood effect' in long-lived oak wood. However, especially in the field campaign of 2017 an aspect became apparent in short-lived macro remains, which is of importance from a source-critical view: Several features which could be definitely assigned to the Late Bronze Age basing on the pottery, provided not only Late Bronze Age dates, but also considerably older dates (Early Bronze Age) as well as younger dates (Sarmatian times). The causes for this large range are complex and likely due primarily to taphonomic processes. Consequently, questions arose not only as to when the dated material was removed from its life-cycle,[10] but also

8 Szentmiklosi *et al.* 2011 Fig. 5.

9 Trench IX was excavated in 2014 basing on the geomagnetic images. Contrary to expectations, the structures discovered there proved to be from the Copper Age (Tiszapolgár culture, phase B2). Scientific datings on these Copper Age contexts are planned.

10 It is at that moment that the measurable decay of the radioactive isotope 14C begins.

Trench designation	Year	Investigated structures	No. of 14C datings
I	2007	Settlement trench in Ring II (posts and pits)	1
II	2008	Ring I	5
III	2010	Settlement trench in Ring II (pits, posts, not dated)	–
IV	2011	Ring IV	6
V	2011	Settlement trench in Ring II, ring structure (ascribed to the Vatina culture)	2
VI	2012	Ring II	10
VII	2013	Rescue excavation in Ring IV (area of gate)	7
VIII	2013	Settlement trench (house structures, pits) in Ring I	26
IX	2014	Settlement trench in Ring I (Copper Age)	–
X	2015	Settlement trench in Ring II (house context, pits)	6
XI	2016	Ring II	10
XII	2016	Settlement trench in Ring II (house structures, pits)	15
XIII	2017	Ring III and ditch	3
XIV	2017	Settlement trench in Ring II (house structures, pits)	18
XV	2017	Settlement trench outside of Ring II (storage pit, material of the Sarmatian period)	–

Tab. 1. Cornești-Iarcuri. Trench designation, excavation year, investigated structures and number of radiocarbon datings obtained (n = 109)

when and how it finally arrived in the dated context. To approach this problem, aspects which can influence the chronological model-building will be discussed in the following.

Because of the large number of datings, statistical tendencies can be derived to a certain extent, which also can influence the model-building as probable assumptions *(priore)*.[11] In particular, macro remains of only few millimetres' size are subject to a certain carbonisation probabilistic. The presupposition is that seeds and stored reserves of different cultivated plants represent valuable goods, because they ensured the subsistence of prehistoric societies during winter months. Thus, aside from, for example, accidents that could lead to fire in a house, the probability of carbonisation can be graded as low. Oppositely, combustibility will increase rapidly in the course of an extensive fire event, such as that which we could discern in Cornești-Iarcuri. In the moment of combustion most of the seeds and stored goods burn completely. However, the probability also increases that many and probably also many contemporaneous seeds are carbonised at the same time. They then become part of taphonomic processes, or in the course of increased soil dynamics they frequently enter features and cultural layers.[12]

The increase in combustibility is reflected in events (fire events, fire places, field fires), which – depending on the particular event – resulted in varying large amounts of charred macro remains. A second decisive factor is the probability of dislocation. This can be discerned only after several datings have been made from relative-chronologically secure feature contexts. Viewing the great number of 14C datings in Cornești-Iarcuri, statistically measurable tendencies towards an increased dislocation are recognisable, as well. And with these tendencies the aforementioned problem of the widely differing datings within a single feature context becomes clear: They reflect rather a taphonomic process, involving the secondary – possibly frequent – dislocation of dated macro remains.

In Cornești-Iarcuri the discrepancy between the datings based on macro remains and those based on charcoal is twice as high. The gradation of sample contexts in four categories according to qual-

11 *'Priore'* can be differentiated as informative and not informative. Especially informative *'priore'* are those that are often based on stratigraphic information (cp. Seidel *et al.* 2016, 233. 247).

12 The extent to which these considerations are quantifiable basing on settlement contexts in Cornești-Iarcuri must still be shown in further analyses.

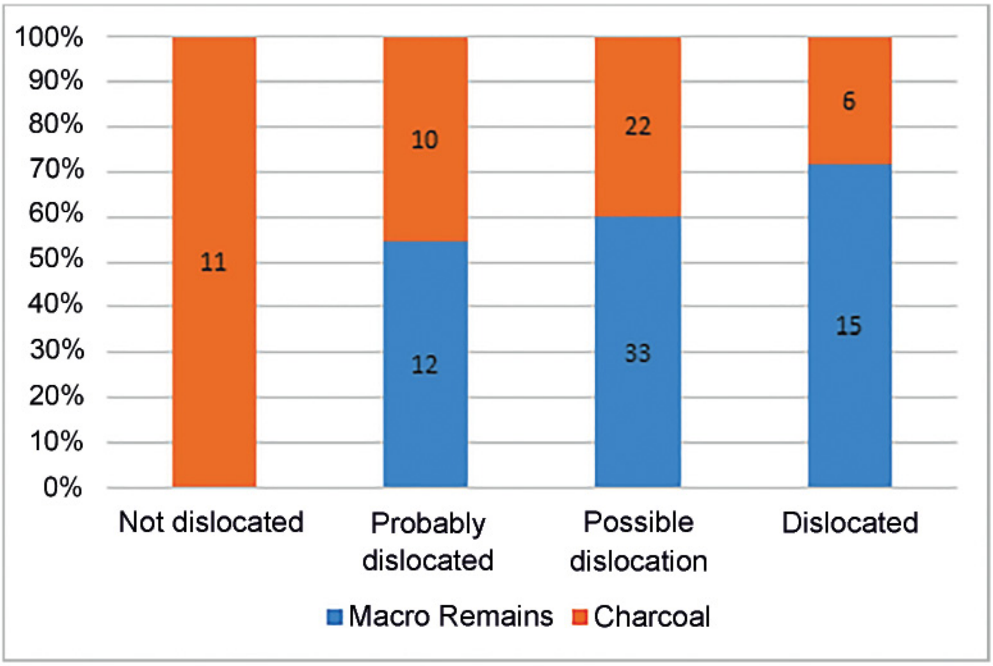


Fig. 2 Corneşti-Iarcuri. Probability of dislocation among 14C datings gained from charcoal and macro remains (graphic: Corneşti Project, R. Lehmphul)

ity ranges from 'definitely not dislocated' samples to 'definitely dislocated' samples; recognisable in this scale is the tendential increase in the probability of dislocation among macro remains. In the case of macro remains classified as 'dislocated', this is expressed in the comparably numerous as datings classified as 'outliers' (**Fig. 2**, outer right). The marked difference between charcoal and macro remains in Corneşti-Iarcuri can be explained, on the one hand, by soil conditions in the surrounding landscape. However, on the other hand, concealed here is yet another aspect: the datings also allow conclusions about the settlement history of the landscape within the fortification as well as in its surroundings. The evidently locally limited appearance of accumulations of 'outliers' among securely classified contexts of the Late Bronze Age and Early Iron Age is thus a disadvantage for an accurate chronological assignment of structures, yet this can be viewed as a positive aspect for the evaluation of archaeological settlement processes. These can be used as indirect settlement indicators, as horizontal displacement over long distances is rather unlikely.

First, some remarks about the prevalent soil conditions in the landscape around Corneşti-Iarcuri. The soils were recently classified as chernozems and phaeozems.[13] Characteristic features of these black earth soils – aside from their dark colour which can be ascribed to their high humus content – are a thorough mixing caused by bioturbation as well as an increased content of chalk and clay. Especially the latter in combination with specific three-layered clay minerals, smectites, leads to strong swelling and shrinking processes, which together with heightened bioturbation cause a marked soil dynamic and increased, mostly polygonal crack formation (**Fig. 3**).[14]

Considering the thorough mixing of soils ever since the erection of Ring I and lasting three and one-half thousand years, amplified even more in the course of intensive agricultural activities (deep ploughing, heavy machinery), it is quite probable that some of the merely millimetre-sized macro remains were dislocated over time, even if only locally. They ultimately settled through soil dynamics along the soil cracks in the fill of the features.[15] Moreover, it is likely that some of the older dated macro remains probably entered the feature contexts already during the erection of ramparts, houses and pits during the Late Bronze Age and/or Early Iron Age.

[13] Nykamp *et al.* 2015, 78; see Gumnior/Stobbe in this volume.

[14] Details on this in Gumnior/Stobbe in this volume; Fritzsch in this volume.

[15] In 2015 a particularly long and deep dry soil crack could be followed as deep as underneath level 2, that is, ca. 0.5 m below the recent surface.

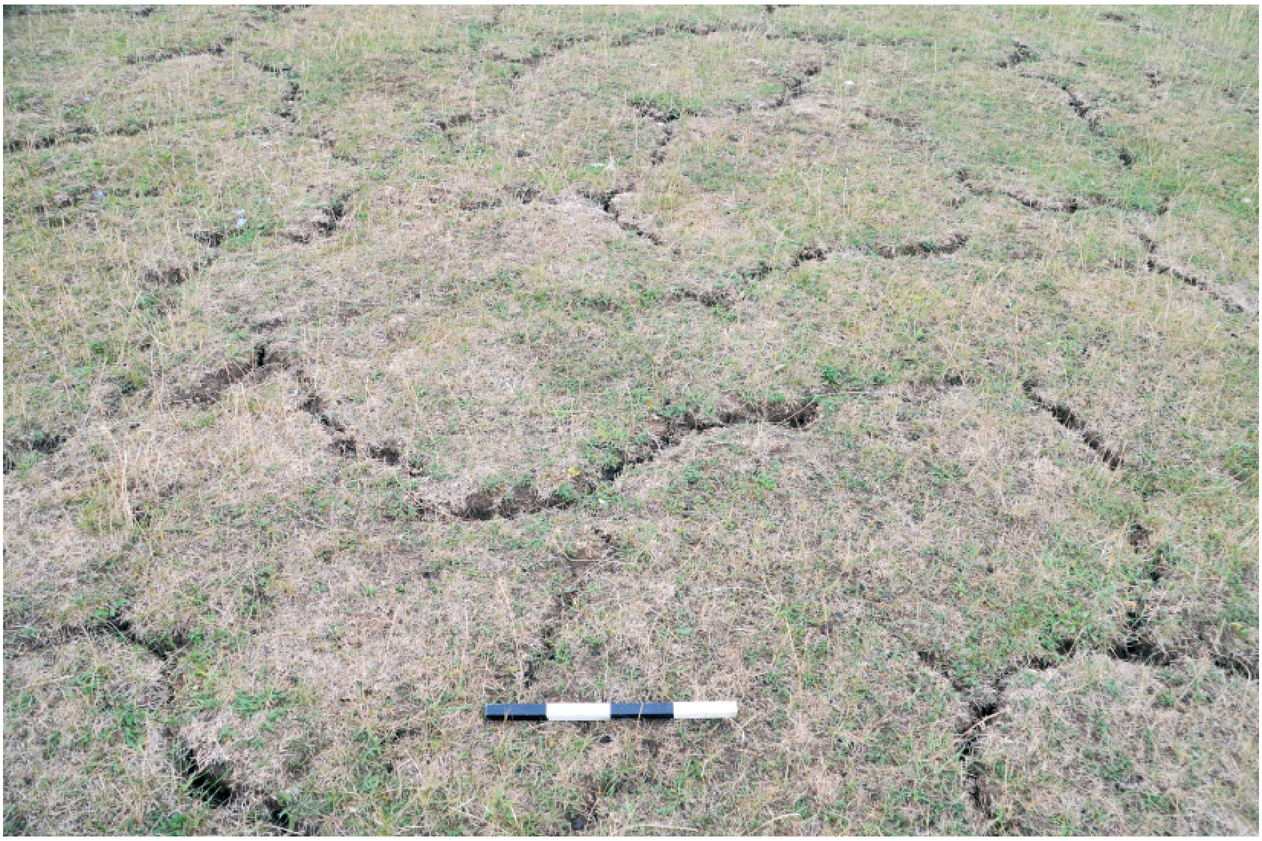


Fig. 3 Corneşti-Iarcuri. Cracks in the soil recorded in the late summer of 2017 in *Valea Lacului* at the height of Ring III (photo: R. Lehmphul)

The connection between processes of soil formation and the potentially possible dislocation of macro remains is of relevance from a methodical view and in view of the evaluation scientific datings, yet it holds a certain potential error. Consequently, since 2015 complex features have been sampled several times and at different levels of their filling, in order to be able to identify as well as to evaluate 'outliers' as such in these contexts.

The settlement history of the landscape around Corneşti-Iarcuri in the light of radiocarbon datings

The 2σ-probability range of hitherto gained dating intervals, with reference to the course of the calibration curve, but also without a differentiated observation of the specific sample contexts, sample material or Bayesian modelling, nevertheless allows the recognition of an increased density of dates in the second half of the 2nd millennium BC (**Fig. 4**). Almost 85 % of the datings fall into this period. The find contexts of the datings derive from fortification structures, settlement pits, house contexts and cultural layers in Corneşti-Iarcuri. In addition, other periods have also been documented on the basis of the datings, which confirm the settlement of the landscape in and around Iarcuri in different prehistoric and early historic epochs and periods. Until now concrete feature contexts from the Copper Age and pre-Roman Iron Age or early Roman Iron Age have been found in trenches IX and XV (**Tab. 1**).

As mentioned above, the different datings for macro remains offer the opportunity to make further statements about the settlement history of the landscape within and around Corneşti-Iarcuri. Aside from time, context and location, the datings also reflect the factor of space. The spatial distribution of 14C dates provides an additional approach for explaining the locally varying concentration of single time periods in specific areas. Hence, the dates can basically be drawn in reference – and this without clearly defined contexts – as indicators of settlement activities before the erection of the ramparts and their use-phases as well as afterwards, that is, after the site was abandoned. **Fig. 5** illustrates the distribution of the datings gained from archaeological fieldwork, de-

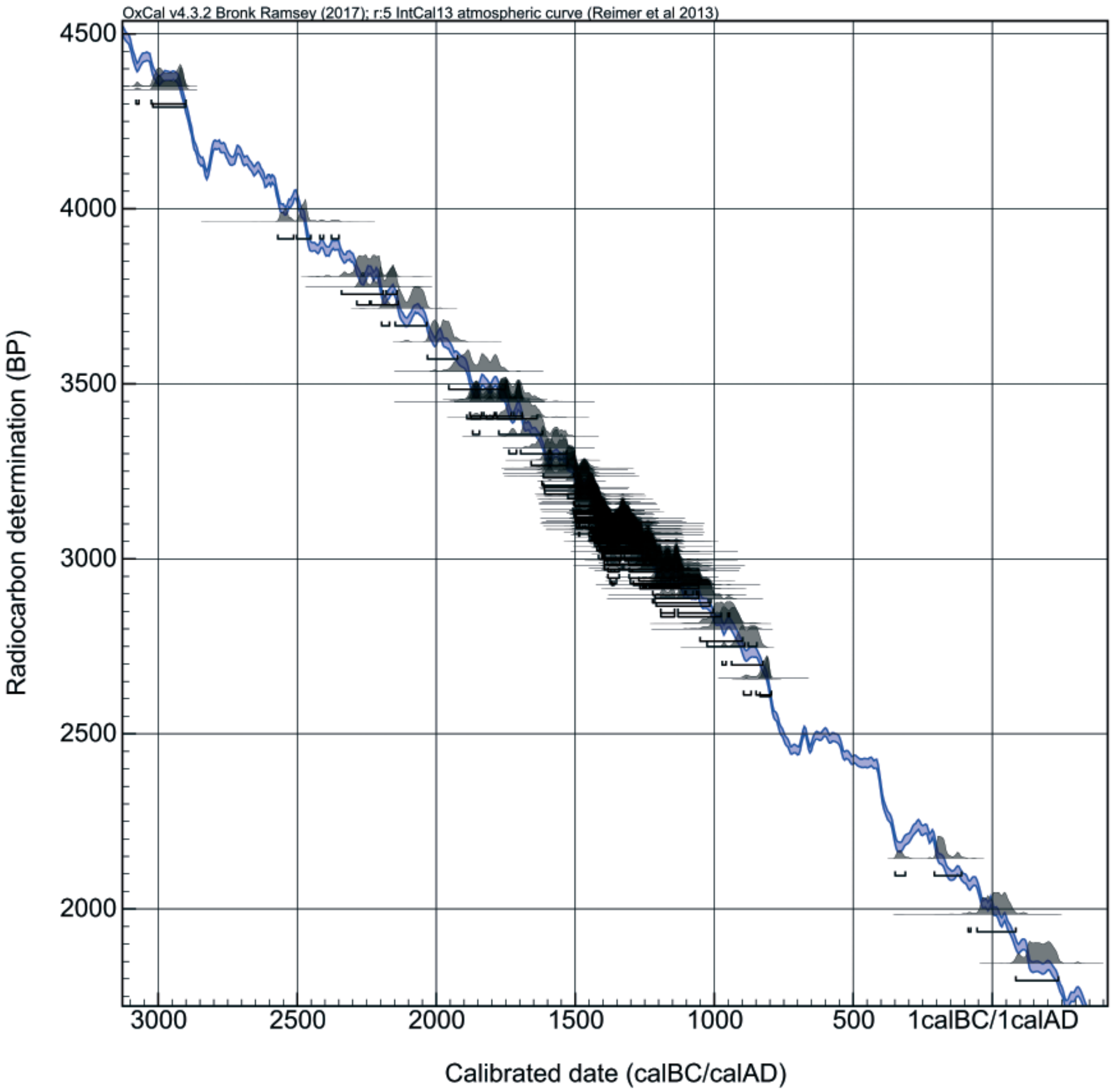


Fig. 4 Corneşti-Iarcuri. Distribution of the 2σ dating intervals of 108 datings in the course of the calibration curve (graphic: Corneşti Project, R. Lehmphul)

noted in colour according to epochs and periods as well as the transition to the individual periods (for example, Middle/Late Bronze Age).[16]

Thereby it becomes clear that the diversity among considerably older and younger datings in the settlement trenches XII and XIV is especially great. The map illustrates a distribution, which – following the aforementioned reasons – is less likely the result of concrete contextual association, and derives far more from spatial relationships. The excavation trenches lie at a short distance from the above-mentioned spring. It is located at the beginning of the erosion gully in the centre of Ring II, south of the main valley, and was a central if not decisive factor in the supply of water for settlement communities during all attested periods in time. This is confirmed not only by the datings for the Early-, Middle- and Late Bronze Age or even Sarmatian times that were gained from charred remains of cultural plants, but also the Copper Age settlement. Thus, already in 2009, by means of geomagnetic survey, it was possible to confirm the presence of a settlement of the Copper Age Tiszapolgár culture, divided in several concentric ditches immediately east of the water source.[17]

16 Exceptions are trench IX (Copper Age) and trench XV (Sarmatian period). Their contexts were dated solely by means of the find material.

17 Szentmiklosi *et al.* 2011, 832 Fig. 14.

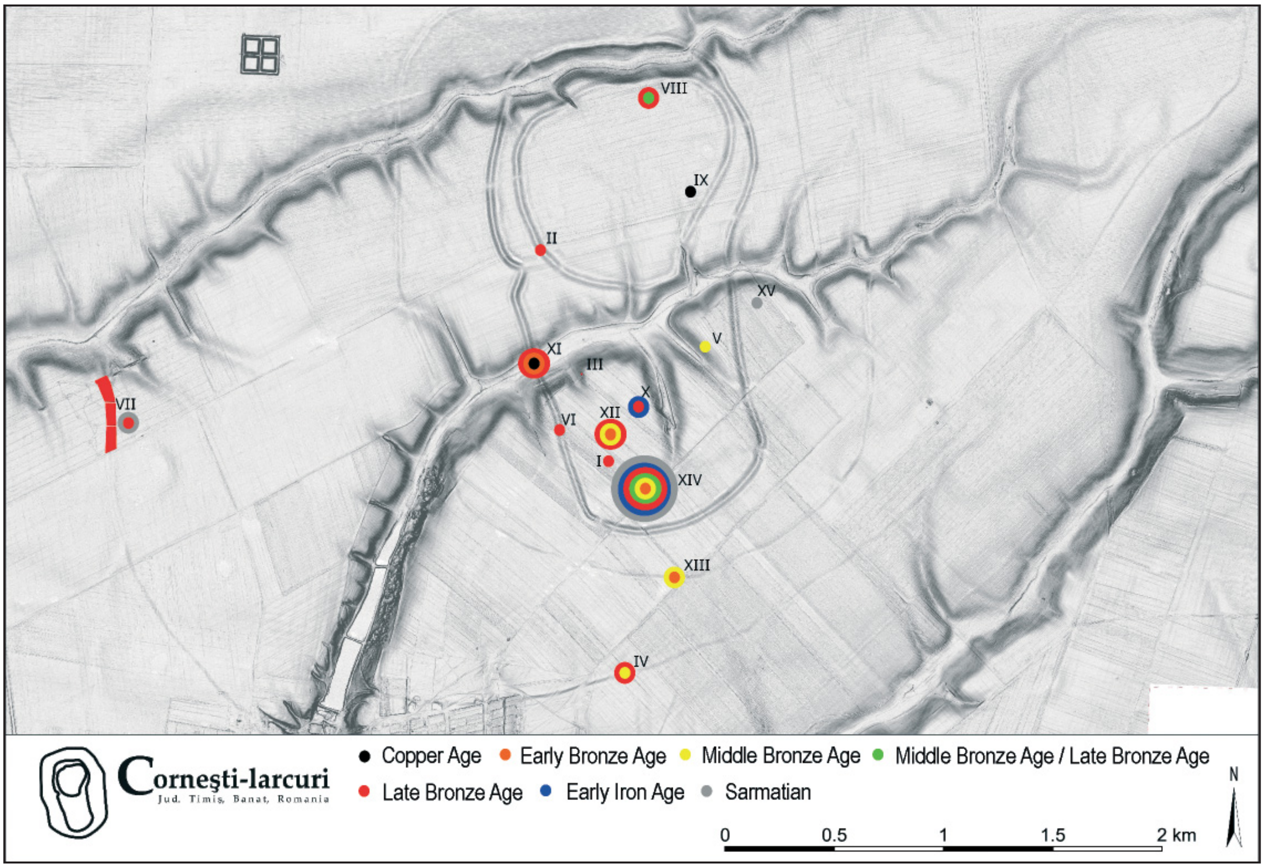


Fig. 5 Corneşti-Iarcuri. Spatial distribution of 14C datings for the individual excavation trenches; colours denote epochs and periods (graphic: Corneşti Project, D. Schäffler/R. Lehmphul)

In addition to local associations, evidently diachronic relationships show up in the spatial distribution as well, which can be used to reconstruct settlement focal points. Following the premise that the carbonisation probability of macro remains, when comparing the settlement with the settlement periphery, must have been higher within the settlements: Therefore, the datings reflect a spatial component, which allows conclusions to be made about the older and younger settlement areas. It remains to be seen in the future whether and to what extent the temporal division of finds from surface prospections can be confirmed by means of scientific data on observed associations and considerations.

The Late Bronze Age to Early Iron Age dating of Corneşti-Iarcuri

Fig. 6 shows the sum calibration of all 14C datings, from which an estimation of the probability density for a particular time period can be deduced, during which the majority of events took place. The distribution has one to three distinct peaks between 1500 and 1250 cal BC. As will be shown, present in these datings or in this time period is also the majority of dated timbers from Ring I and II. This is also the period of time in which the archaeologically, meaning stratigraphically proven phase B of Ring I[18] as well as Ring II, which was investigated in two trenches, were erected.

Moreover, the course of the sum calibration shows that both prior to as well as after this time period there were activities on the ramparts as well as in the settlement area enclosed by them. Compared to datings for the Copper Age and the Early and Middle Bronze Age, the probability density is significantly higher and reaches a peaked increase again during the Early Iron Age, around 800 BC.

All in all, a total of 91 datings are directly associated with Late Bronze Age to Early Iron Age contexts and originate from stratified pit fills, construction elements of the ramparts, the fills of the ditches in front of them, cultural layers and several house structures belonging to Rings I and II (i.e., posts, ditches and pits). Accordingly, these data show several events as well as entire construction and

[18] Cp. Szentmiklosi *et al.* 2011 Fig. 4.5.

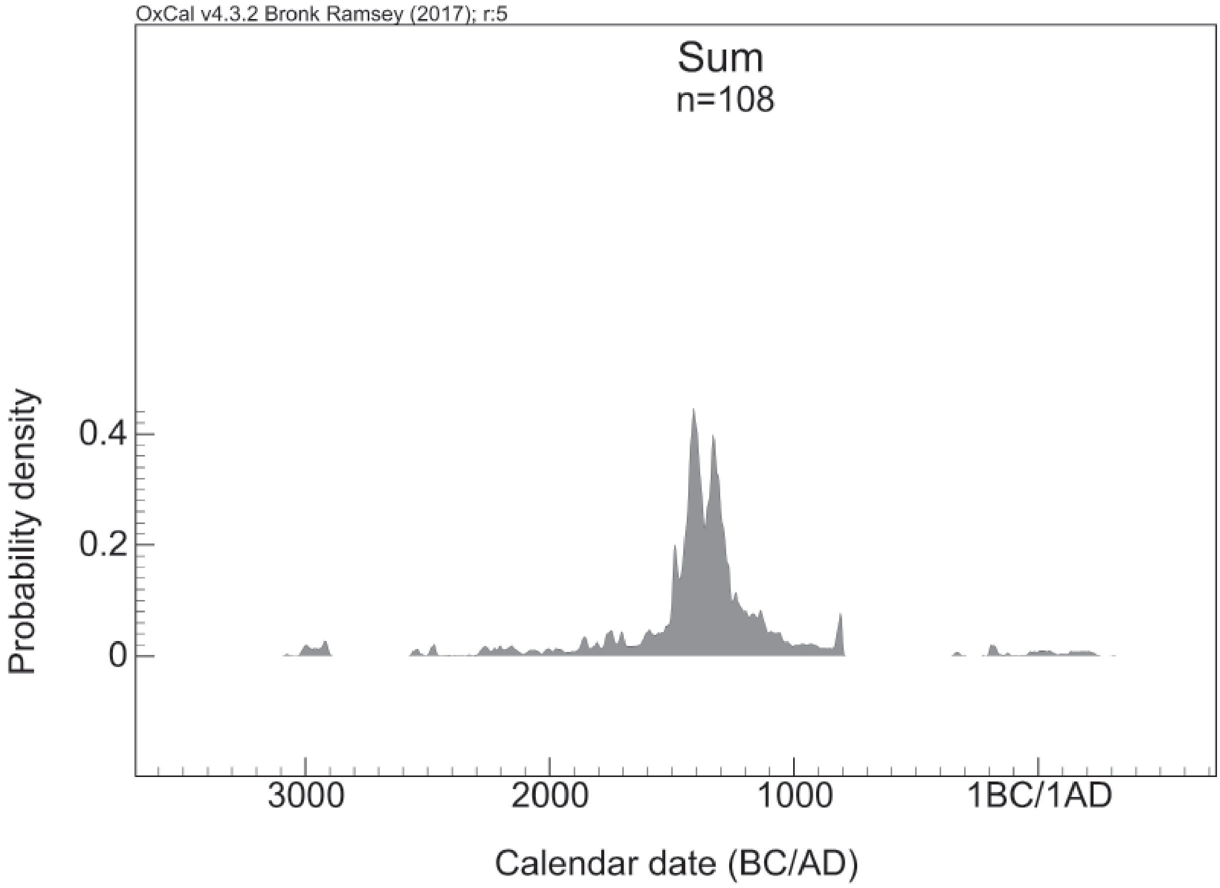


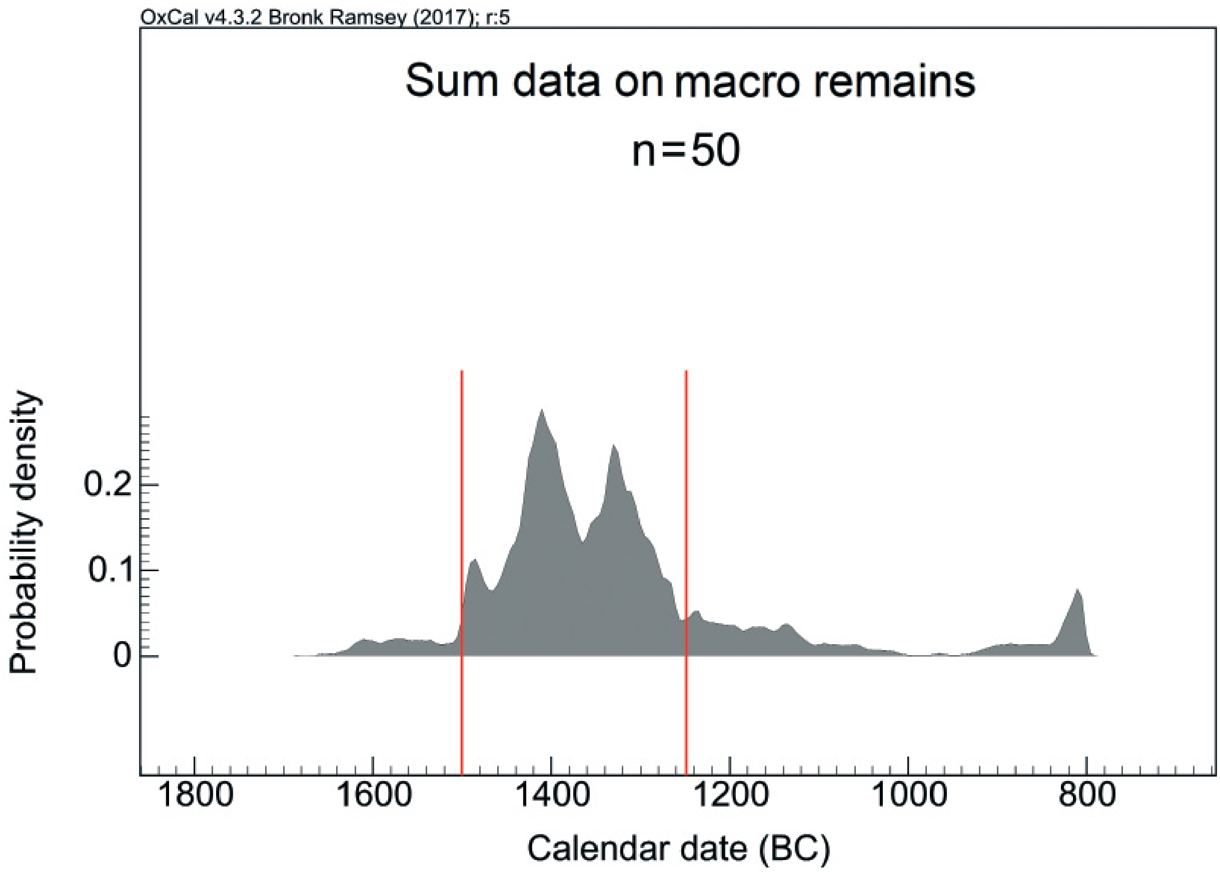
Fig. 6 Corneşti-Iarcuri. Sum calibration of 108 14C datings

use-horizons. The majority of construction phases is usually linked with charcoal data, that is, either building timber that was found *in situ* or charcoal found in the fill of postholes. Theoretically, these might vary due to the 'old wood effect', because the wane (the last original outer edge of the wood) is seldom recognisable and/or is datable only on the charred remains of planks and trunks; or the samples from the fill of postholes are too fragmented.[19] In contrast, the short-lived macro remnants are based on one-year events. The initial substance of the sample is more distinct and, compared to charcoal, can provide more reliable datings.

Fig. 7 shows the sum calibration of the 91 Late Bronze- to Early Iron Age datings, differentiated according to macro remains (n=50) and charcoal (n=41). Direct comparison enables a better judgment of the potential differences in the course of the curves. For example, a systematic offset in the curves would be an indication of an 'old wood effect'; then the charcoal datings would be significantly older than those for macro remains, and that although both samples theoretically could originate from the same time period. In comparison, there are hardly any differences between the two kinds of samples. Both the majority of the data obtained from charcoal and the macro remains are scattered with a significantly increased probability density between 1500 and 1250 cal BC. As the dating intervals and with them also the sum calibration are dependent upon the course of the calibration curve and the plateaus in it, so-called 'wiggles', the data always are indistinct to a certain extent. If there is indeed an 'old wood effect', it will not show at least in the majority of datings. This leads to the conclusion that the events leading to the construction of phase B of Ring I, to the construction of Ring II and also to those events in which the majority of the macro remains charred, have a certain temporal proximity to each other. Evidently, they fall together in one and the same section of the calibration curve – without a recognisable 'old wood effect' (**Fig. 7**).

For further discussion additional information is needed, with which the dating probabilities of the

[19] Determination of wood structure (hardwood, sapwood) was not undertaken.



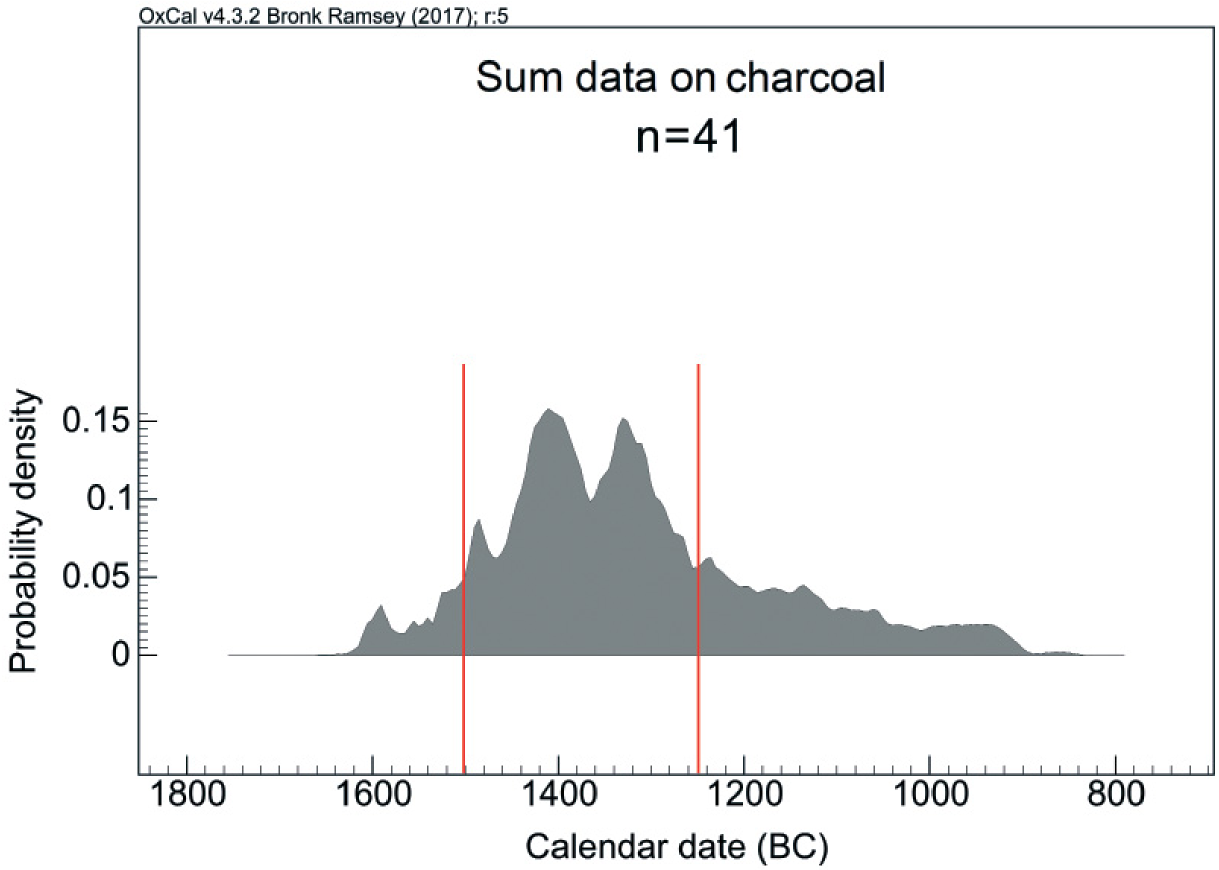


Fig. 7. Corneşti-Iarcuri. Sum calibration of 91 Late Bronze- to Early Iron Age 14C datings, differentiated according to macro remains (n=50) and charcoal (n=41) (graphic: Corneşti Project, R. Lehmphul)

Lab-No.	Sample material	Context	14C Age [Year BP]	±	cal BC 1-sigma	cal BC 2-sigma
Poz-45667	Charcoal	Front of the rampart, beam No. 2 (phase B)	3070	30	1393–1287	1415–1236
BETA-258645	Charcoal	Context 327, wood from the inner fortification (phase A), dislocated	2970	40	1263–1128	1375–1055
BETA-258642	Charcoal	Front of the rampart, beam no. 11, construction (phase B)	3040	40	1378–1211	1397–1128
BETA-258641	Charcoal	Front of the rampart, beam no. 7, construction (phase B)	3110	40	1420–1301	1449–1260
BETA-258640	Charcoal	Front of the rampart, beam no. 6, construction (phase B)	3060	40	1390–1260	1417–1208

Tab. 2. Corneşti-Iarcuri. 14C dates (unmodelled) with laboratory number, sample material and feature context from trench II (2008)

intervals can be more differentiated or delimited. This would include, for example, stratified contexts of different samples from the fill of a feature, like a pit, or construction elements, such as several datings for a house structure or still interconnected rampart structures. With the assistance of these archaeological contexts and pre-suppositions, improved posteriori probabilities (that is, shorter intervals) can be modelled from the dating probabilities using Bayesian statistics. All of the datings discussed and modelled here in the following are in reference to the 2σ-range, because solely the 2σ-range enables an argumentatively justifiable measure for the probability with the general valid significance level in statistics of 95 %.[20] The modelled intervals shown in the tables are rounded off to five years. Smaller deviations of a few years can appear in every modelling or statistical calculation.[21] Furthermore, the modelled intervals are presented in italic script, following convention, in order that they are distinguishable from calibrated datings.

Context of samples from Ring I (trench II)

Tab. 2 presents the feature contexts and the sampled material as well as the datings (unmodelled) from trench II in Ring I. With the exception of "BETA-258645", all of the samples can be stratigraphically assigned to phase B of this first rampart. Some of the datings have already been published,[22] and will be augmented by a new date ("Poz-45667"). The latter date, like the other dates, comes from a charred beam, found horizontal *in situ*, in phase B in Ring I.

The construction or the erection of the investigated section of the rampart represents –according to the pre-supposition – an event, in whose course the timber used was felled relatively quickly and subsequently used for building. Just as a swift and timely renewal of the entire fortification may be reckoned here, there is also the high probability that the timber was struck in a perhaps young forest and used for renovation.[23] Therefore, in such cases the potential of an 'old wood effect' would be negligible. This is also supported by the fact that no great differences can be recognised in dating intervals that were not modelled. On the premise of same-aged construction timbers from

20 Schier 2013, 268.

21 Cp. Bayliss *et al*. 2011, 21; Seidel *et al*. 2016, 249.

22 Szentmiklosi *et al*. 2011 Tab. 1. Fig. 9.

23 It is noteworthy that traces of posts that stood in the post holes in the Ring I indicate a diameter of only a few decimetres. The model reconstructed from this has a maximal diameter of 25 cm with a mean of 22.5 cm (cp. Krause *et al*, in print, Tab. 6). In view of the enormous consumption of wood, just for the erection of the first two rings, it can be assumed that mainly young trees, perhaps only a few decades in age, were felled. Through this, the 'old wood effect' – at least in wood for constructing the fortifications – would likely be relativised.

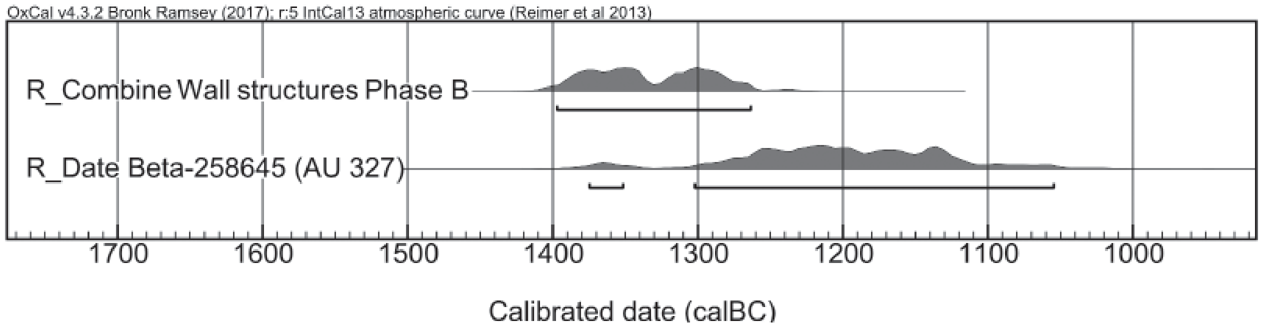


Fig. 8. Corneşti-Iarcuri. Combined probability density of the four radiocarbon datings from phase B of Ring I (graphic: Corneşti Project, R. Lehmphul)

Fig. 9. Corneşti-Iarcuri. The six dated posts of the front of rampart Ring II (easterly direction) (photo: Corneşti project, A. Szentmiklosi)

a presumed young forest, the datings that originate solely from beams in the front of the rampart can be combined with one another.

The modelled dating interval lies in the 2σ-range, between 1400–1250 cal BC, from which a *terminus post quem* after 1400 BC can be derived for the construction of phase B of Ring I. From this follows a *terminus ante quem* for phase A of this first rampart, that is, an erection before 1400 BC (**Fig. 8**). The single date "BETA-258645" indicates an overlapping with the others within the 2σ-range, but it was not drawn in reference. Either it belongs to this phase, or it came into secondary position through anthropogenic or biogenic activities.

Context of samples of Ring II (trench VI and trench XI)

The ten datings that were gained from trench VI in the year 2012 are displayed in **Tab. 3**. As was the case with phase B of Ring I, solely charcoal samples were used for dating, of which six samples originate from six different post features in the front of the rampart and therefore stood in structural association with one another (**Fig. 9**). Two other samples were taken from different posts in the back row of posts: sample "Poz-53351" originates from a stratigraphically deeper post in level 3, and sample "Poz-53347" – from a collapsed layer in the upper part of the rampart (**Tab. 3**). Sample "Poz-53350", from the fill of a post in the back row of posts, yielded a late Mesolithic date. Because of its obviously secondary dislocated position there, it was not considered in the following discussion. The preservation of the charcoal – similar to that in Ring I – can be attributed to the fact that this investigated section of the rampart had burned down during both phases.

The same premise as for Ring I, phase B, applies to this rampart-section and the samples obtained from it, too: the timber originated presumably from a young forest; the trees were felled within a short time and used for construction at the same time. The maximal diameter of larger posts is given

Lab-No.	Sample material	Context	14C Age [YearBP]	±	cal BC 1-sigma	cal BC 2-sigma
Poz-53342	Charcoal	AU 41 – Post, front of the rampart (row of posts)	3085	35	1409–1299	1430–1261
Poz-53343	Charcoal	AU 39 – Post, front of the rampart (row of posts)	3105	35	1422–1304	1442–1273
Poz-53344	Charcoal	AU 37 – Post, front of the rampart (row of posts)	3095	30	1413–1304	1429–1280
Poz-53345	Charcoal	AU 38 – Post, front of the rampart (row of posts)	3100	30	1416–1304	1431–1283
Poz-53346	Charcoal	AU 115 – Post, front of the rampart (back row of posts)	3050	30	1385–1263	1401–1226
Poz-53347	Charcoal	AU 12 – collapsed layer, back side of rampart	3095	35	1414–1302	1432–1267
Poz-53349	Charcoal	AU 42 – Post, front of the rampart (row of posts)	3020	35	1374–1214	1395–1129
Poz-53350	Charcoal	AU 170 – Post, front of the rampart (back row of posts)	7410 (TOC, 0.3mgC)	90	6402–6214	6435–6084
Poz-53351	Charcoal	AU 186 – Post layer 3	3075	35	1397–1292	1423–1233
Poz-53352	Charcoal	AU 40 – Post, front of the rampart (row of posts)	3085	35	1409–1299	1430–1261

Tab. 3. Corneşti-Iarcuri. 14C datings (unmodelled), with laboratory number, sample material and feature context, from trench VI (2012)

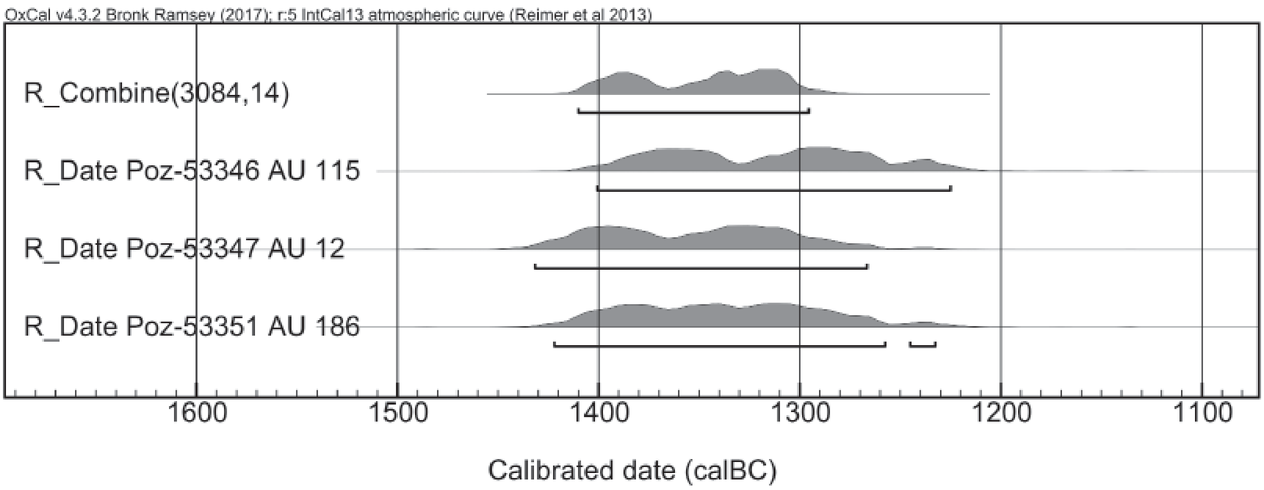


Fig. 10. Corneşti-Iarcuri. Combined probability density of the six radiocarbon datings from the front of rampart Ring II (graphic: Corneşti Project, R. Lehmphul)

as 20 cm,[24] so that here as well a similar average age for rather young trees can be assumed. Two different models can be derived from the sample contexts. In the first model only the six posts from the front of the rampart are combined, while the other posts are not included. The six samples from the posts represent the younger phase as archaeologically proven by the profile of Ring II (**Fig. 10**).

The combination of the datings yielded an interval between 1410–1295 cal BC, and with that a high dating probability in the 2σ-range for the erection of the Ring II during the 14th century BC.

24 Krause *et al*, in print, Tab. 7.

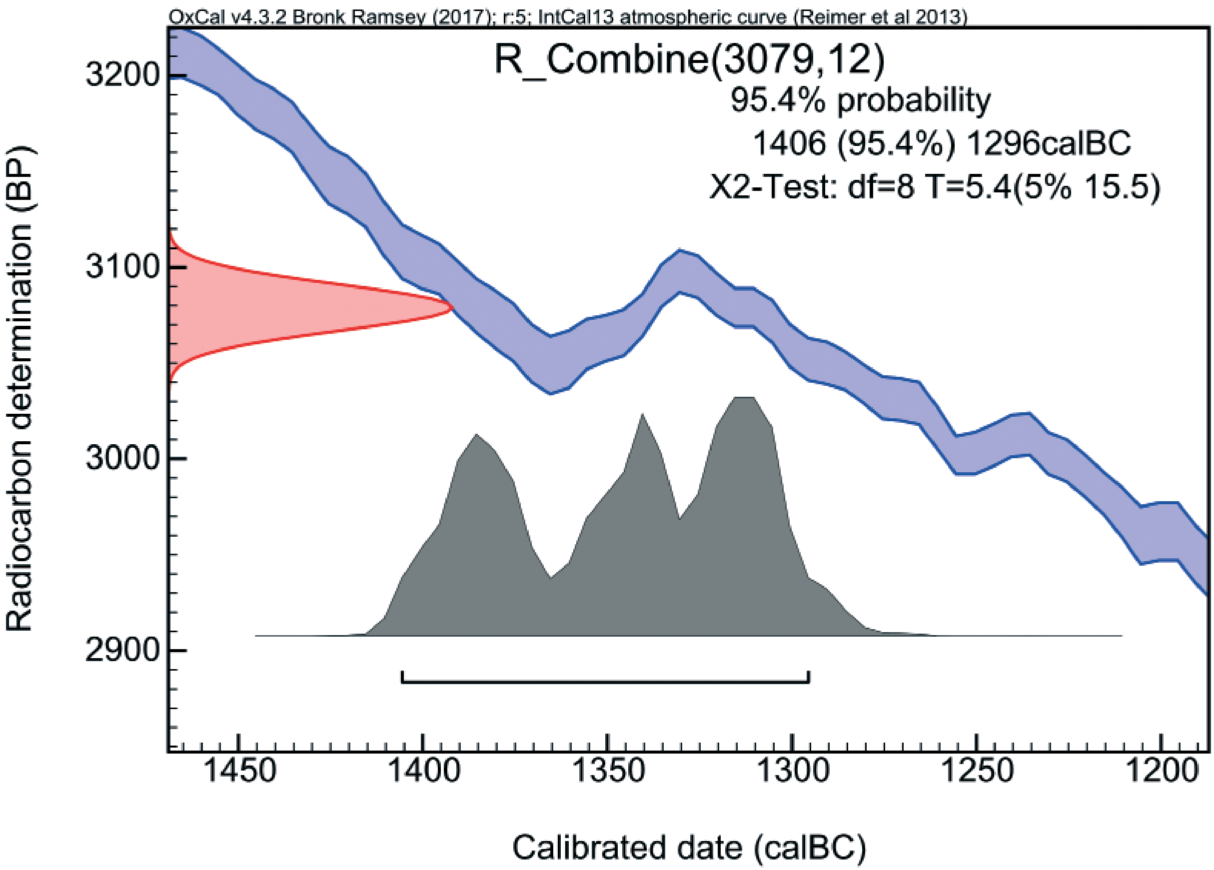


Fig. 11. Corneşti-Iarcuri. Combined probability density of the nine radiocarbon datings from trench VI in Ring II (graphic: Corneşti Project, R. Lehmphul)

In the second model all of the datings are combined. This is based on the assumption that the three remaining contexts (older posts, samples from the older [?] collapsed layer, posts from the back row of posts) also originate from wood, that was cut relatively quickly and was used for the construction of the fortification. The result corresponds largely with that of the first model and further limits the dating probability in the 2σ-range: a time span between 1405–1295 BC (**Fig. 11**).

Even though two stratigraphically separate phases can be recognised in the course of the profile of the rampart trench VI,[25] datings at disposal until now do not provide any indications for the erection of the second fortification ring before 1405 cal BC. The combined dating intervals allow the assumption that both phases occurred within a relatively short period of time. As could be shown for phase B of Ring I, here as well a *terminus post quem* around/after 1400 BC is probable.

This result is supported by the datings for trench XI. This trench was made in early summer 2016 within the framework of the LOEWE project "Research on Prehistoric Conflict". Trench XI is located within the "Valea Lacului", in a part of Ring II that crosses the valley and thereby blocked it. The composition and structure of the construction elements of the body of the rampart are – compared to Ring I and II (trench VI) – essentially similar. Here as well there are stratigraphic indications of a second phase, in which the body of the rampart was renewed at least in the upper part, after fire had damaged the front of the rampart.

In contrast to trenches II and VI, an alternative dating or sampling strategy was tested in trench XI; solely those macro remains were dated that originated from posts and layers in the body of the rampart. The aim thereby was to improve the posteriori probabilistic with this short-lived sample material and its stratigraphic information. This of course changed the premises and/or pre-suppositions with regard to the formation of the respective sample contexts. In specific, the carbonisation process of macro remains inside the body of rampart – opposite burnt timbers – is unlikely. The macro remains must have already been carbonised and entered the

[25] Heeb *et al*. 2017, 220.

Lab-No.	Sample material	Context	14C Age [YearBP]	±	cal BC 1-sigma	cal BC 2-sigma
MAMS-29739	Macro remain	Au 759 Post, front of the rampart	3126	21	1430–1326	1443–1306
MAMS-29740	Macro remain	Au 006 Colluvium in front of the rampart	2938	20	1206–1115	1213–1057
MAMS-29741	Macro remain	Au 070 Ditch behind rampart	3102	21	1413–1310	1427–1299
MAMS-29742	Macro remain	Au 007 Erosion layer	3165	22	1491–1417	1496–1411
MAMS-29743	Macro remains	Au 749 Post, in front of the rampart	4341	25	3009–2906	3017–2902
MAMS-29744	Macro remains	AU 051 Rampart layer	3776	21	2274–2143	2285–2138
MAMS-29745	Macro remains	Au 756 Post, in front of the rampart	3160	21	1487–1414	1496–1406
MAMS-29746	Macro remains	Au 13 Erosion layer from the body of rampart	3104	21	1414–1311	1428–1300
MAMS-29747	Macro remains	Au 757 Post, in front of the rampart	3101	21	1412–1310	1426–1299
MAMS-29748	Charcoal	Cor1 334 Core drilling below the rampart	4350	28	3010–2911	3078–2903

Tab. 4. Corneşti-Iarcuri. Datings (unmodelled), with laboratory number, sample material and feature context from trench XI (2016)

layers and contexts through the massive movement of earth in the course of erecting the rampart. The time span between carbonisation and final deposition of macro remains is an unknown factor in this model, but nevertheless it should be regarded when considering the dating. Accounting for the amount of time that passed from carbonisation to deposition of macro remains, a *terminus post quem* for the erection of the fortification derived from this model would be too early.

The data displayed in **Tab. 4** show that in addition to the Late Bronze Age, the Copper Age and the Early Bronze Age are represented, too. This is not surprising, as the prehistoric settlement activities as well as the erosion caused by them on the edges of the valleys likely increased greatly.[26]

The Bayesian model is based upon stratigraphic contexts and with an agreement-index-value (A_{model}) of 106.1 principally, it indicates good accordance with the unmodelled A-priori-probabilities (**Tab. 5**, **Fig. 12**). The date of sample "MAMS-29742" was not regarded in this calculation and was marked as an 'outlier', because in the course of the computation this sample showed statistically only slight accordance; evidently it represents the result of a deposition at a considerably later time. Considering the modelled datings and the two stratigraphic phases discerned in the rampart profile, a comparably shorter time span can be derived for both the erection as well as the renewal of the rampart. Accordingly, the date of the beginning of the construction of the first phase lies between 1480 and 1330 cal BC. The beginning of the second phase dates between 1430 and 1325 cal BC; the end is between 1420 and 1265 cal BC. Since both the erection and the renewal as well as the destruction of the fortification likely reflect

26 This is impressively confirmed by the massive colluvial material, which was deposited in the valleys ever since the Copper Age (cp. Gumnior/Stobbe in this volume; Nykamp *et al*. 2016).

Sequence Ring II Trench XI **A_{model}=106.1 / $A_{overall}$=111.9**	**Unmodelled date** **2σ (95.4 %)**	**Modelled date** **2σ (95.4 %)**
R_Date MAMS-29744 (AU 051)	**2286–2137** cal BC	***2286–2137*** cal BC
Boundary Begin Phase 1		***1480–1330***
R_Date MAMS-29739 (AU 759)	**1445–1305** cal BC	***1445–1400*** cal BC
R_Date MAMS-29745 (AU 756)	**1497–1406** cal BC	***1435–1395*** cal BC
R_Date MAMS-29747 (AU 757)	**1427–1298** cal BC	***1430–1380*** cal BC
Boundary End Phase 1/ Begin Phase 2		***1430–1325***
R_Date MAMS-29741 (AU 070)	**1428–1299** cal BC	***1420–1315*** cal BC
R_Date MAMS-29746 (AU 013)	**1429–1300** cal BC	***1420–1305*** cal BC
Boundary End Phase 2/ last Activities		***1420–1265***
R_Date MAMS-29742 (AU 007) ?	**1497–1410** cal BC	***1495–1410*** cal BC
R_Date MAMS-29740 (AU 006)	**1214–1056** cal BC	***1215–1055*** cal BC

Tab. 5 Corneşti-Iarcuri. Modelled and unmodelled datings from trench XI (2016)

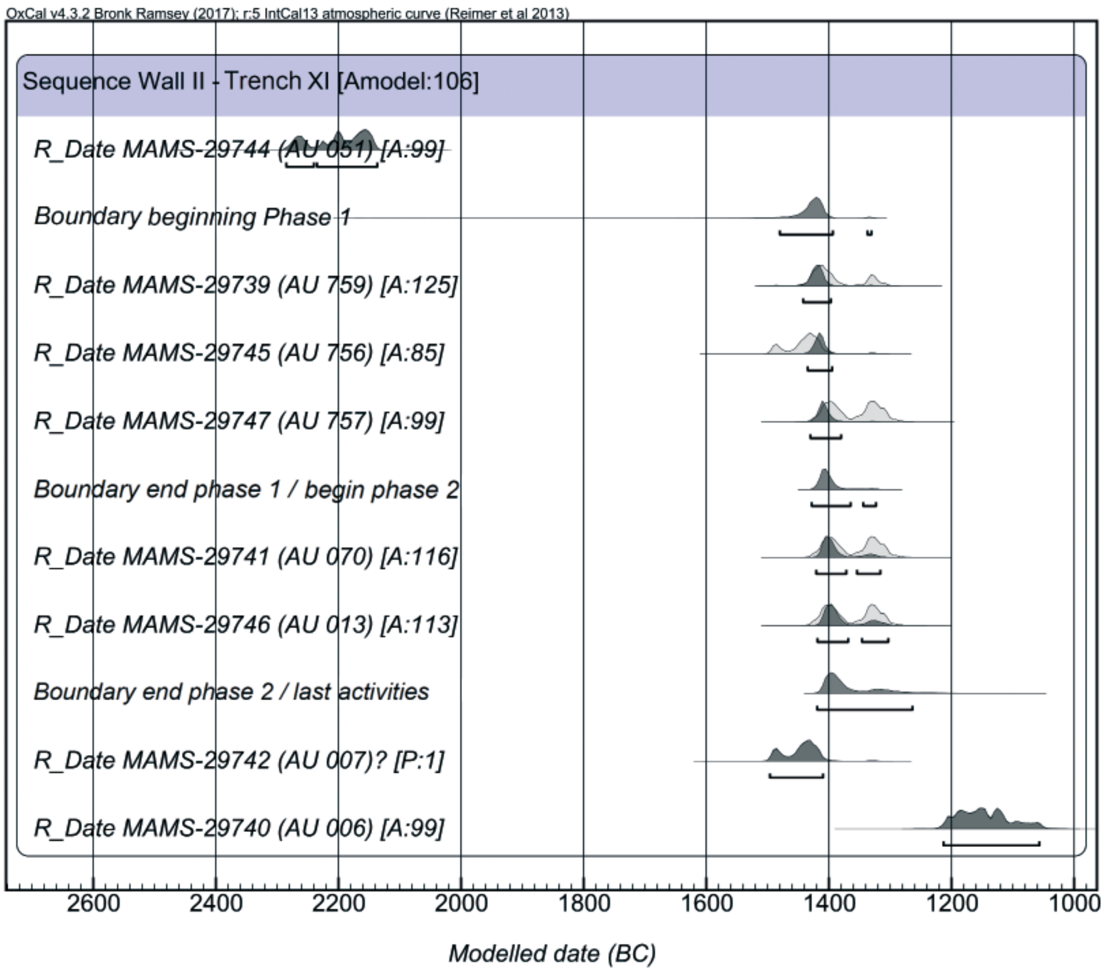


Fig. 12. Corneşti-Iarcuri. Posteriori probabilities of the dating model for Ring II in trench XI (graphic: Corneşti Project, R. Lehmphul)

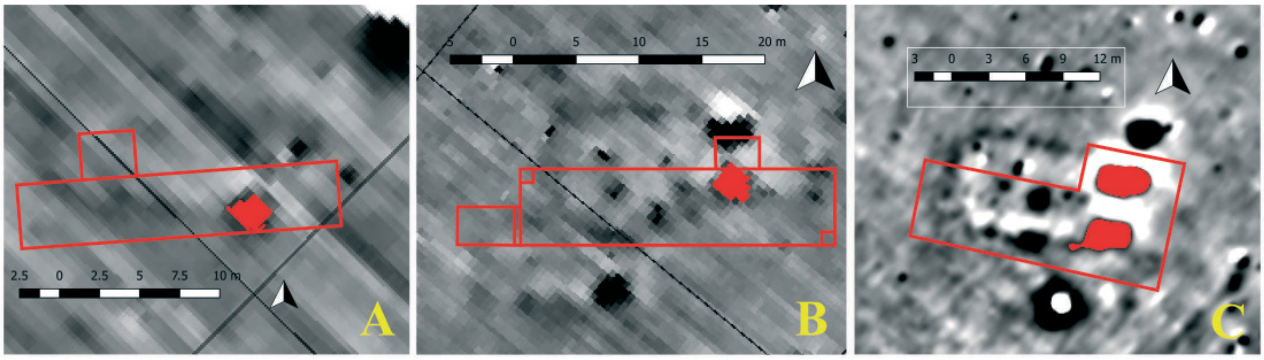


Fig. 13. Corneşti-Iarcuri. Magnetogram of house contexts with excavation trench boundaries within the settlement area of Ring II. The pits that belong to the investigated house contexts are marked red. A: excavation in 2015/ AU 057; B: excavation in 2016/ AU 013, C: excavation in 2017/ AU 001 in the south and AU 002 in the north (graphic: Cornesti Project, R. Lehmphul)

comparably brief events, the dating probabilities derived from the model testifies to a comparably high dynamic during this time.

In the following, the dating probabilities of both models for trench VI and trench XI will be correlated and discussed. Both date to Ring II. Furthermore, both models are based on different sample types, which can be used to make different conclusions based on their contexts. The charcoal samples from trench VI supply a *terminus post quem* of around/after 1400 cal BC, but they date foremost to the stratigraphically younger phase. The stratigraphic contexts of macro remains from trench XI allow the probabilistic modelling of the time span, during which the rampart was erected (phase 1: 1480 to 1325 cal BC) or renewed (phase 2: 1430 to 1265 cal BC) (**Tab. 5**).

Since the two phases proved in these trenches were obviously built in relatively short succession and since the timber attested in trench VI could be easily combined, there is a high dating probability for the construction of the first phase of Ring II at the end of the 15th and beginning of the 14th century BC. Taking into account a certain time span from the point in time of carbonisation to the deposition of the dated macro remains, the dating probability is supported by the second model from trench XI and for the 2σ-range, i.e. at a high level of significance. (**Fig. 12**). Finally, the models from trenches IV and XI complement each other in that one and the same structure was dated.

Context of samples from the settlement area of Ring II (trenches X, XII and XIV)

In the course of the excavations in 2015, 2016 and 2017, basing upon magnetometer data it was possible to identify the site of individual houses and also – at the end of the excavation campaign in 2017 at the latest – to verify these places by the distribution of find densities in the cultural layers.[27] Of central significance for the chronology of Corneşti-Iarcuri is the relationship between house sites and pits, the latter mostly pairwise, but also single and of elongated oval form. When existent, the pits lie regularly on the eastern narrow side of the houses (**Fig. 13**).[28] In all of the hitherto excavated examples (2015: context AU 057; 2016: context AU 013; 2017: contexts AU 001 and AU 002) a notably similar scheme could be observed in the fill of the pits: The lower fill layer contained – aside from animal bones – individual vessels, some almost completely preserved. No traces of fire were noted on the finds from this layer; burned clay was likewise absent in the fill. The second stratigraphically younger level consisted of a compact layer with partly slagged burned clay and secondarily burnt pottery. The top was formed by a pack of layers that are difficult to differentiate,[29] which again contained secondarily burnt pottery as well as burned clay and merged evenly into the culture layer. There occasional, unburnt finds were observed.

[27] Lehmphul *et al*. 2018; Bălărie *et al*. 2016.
[28] Cp. Lehmphul *et al*. 2018.
[29] Micromorphological analyses could show that the sediments in the upper fill of the pit are marked by post-depositional, pedogenic processes (cp. Fritzsch in this volume). This possibly also explains the dislocation of macro remains, mentioned in the introduction, or the outliers in the dating of some feature contexts.

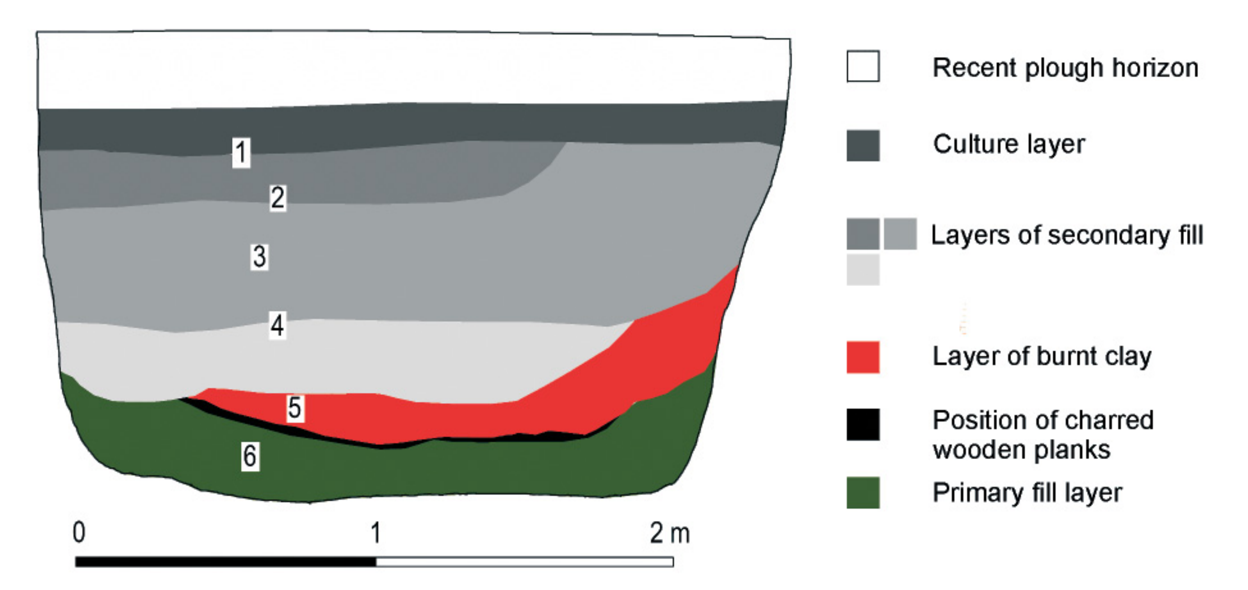


Fig. 14. Corneşti-Iarcuri. Typical scheme of the infill of pits. Here: AU 013 (2016). The numbers mark the position of micromorphological samples (cp. Fritzsch in this volume) (graphic: Cornesti Project, R. Lehmphul)

The chronological significance of the stratified pit fillings is based on their generally similar filling pattern, their location in relation to the house structures and, finally, the depth in time that they possess. Thereby, the burned clay layer forms a rupture that marks the horizon of destruction described above. The enclosed macro remains in the layers of the pit fills can represent, in principle, very different events: Whereas in the primary layer the time of the use of the pits appears with theoretically several differing events, the succeeding burned clay layer most probably derives from one single event, in the course of which the probability of the burning or carbonisation of macro remains is quite high. Therefore, the destruction horizon also marks the end of a settlement phase and the point in time at which the house burned down.

The formation of the stratigraphically youngest layers resulted from successive infilling, during which surrounding material (burned clay, charcoal etc.) came into the pit (**Fig. 14**). Of principal importance is that micromorphological analyses could show that the composition of this package of layers can be attributed to processes of disposal, which cannot be associated exclusively with fire. This was because both burnt and unburnt material reached the upper fill of the pits.[30]

Table 6 lists the radiocarbon datings that were gained from the fills of pits that accompanied the houses. In view of the stratigraphically similar contextual fills and their relation to the house structures, a relative contemporaneity of use and event horizon among the pits is assumed in the following. In consequence, the stratified contexts are summarised in one single stratigraphic model and modelled.

In the stratigraphic-chronological model for pits accompanying the houses, the datings for the primary fill of the features (AU 057, AU 013, AU 001 and AU 002) are summarised and separated from samples from younger contexts. The separation is given both by the similar layer sequence and by the very differently preserved layers of charred wooden planks (2016: AU 013 and 2017: AU 002).[31] Thus, also a relative closeness can be assumed for the older contexts. In addition, of the total of eight data from the older phase, four were from macro remains from the filling of almost complete vessels. And these allow the possibility of their dislocation, such as through bioturbation, to be largely excluded.

The A-posteriori probabilities derived from the model generally show good agreement with the a-priori probabilities. Thus, the Agreement-Index-Value (A_{model}) lies at 91.4 (**Fig. 15**, **Tab. 7**). Only one dating, sample MAMS-35955 from the primary fill of pit AU 001, was not regarded in the calculation and was marked as an outlier. This sample either derives from a younger layer, was secondarily deposited, or entered the fill directly prior to the de-

[30] Cp. Fritzsch in this volume.

[31] Lehmphul *et al.* 2018.

Lab-No.	Sample material	Context	14C Age [Year BP]	±	cal BC 1-sigma	cal BC 2-sigma
Trench X						
MAMS-26691	Macro remains	AU 057 (upper fills)	3085	25	1409–1317	1423–1294
MAMS-26692	Macro remains	AU 057 (bottom of pit)	3170	27	1491–1418	1499–1407
Trench XII						
MAMS-30423	Macro remains	AU 013, 30-40cm under layer 1	3106	18	1415–1318	1428–1303
MAMS-30432	Macro remains	AU 013 (burned clay above charred wood construction)	3116	24	1426–1320	1437–1301
MAMS-30433	Macro remains	AU 013 (vessel 1)	3200	18	1497–1448	1502–1432
MAMS-30434	Macro remains	AU 013 (vessel 2)	3138	19	1434–1404	1487–1320
MAMS-30435	Macro remains	AU 013 (vessel 4)	3223	18	1507–1454	1526–1443
Trench XIV						
MAMS-35575	Macro remains	AU 001 (upper fill) layer 2	3099	18	1410–1310	1422–1299
MAMS-35576	Macro remains	AU 001 (lower fill) layer 6 (ceramic concentration)	3179	18	1494–1430	1497–1422
MAMS-35577	Macro remains	AU 002 (upper fill) 30–40 cm under layer 2	3130	19	1432–1396	1445–1311
MAMS-35578	Macro remains	AU 002 (vessel 7) bottom of pit	3204	20	1498–1452	1505–1431
MAMS-35579	Macro remains	AU 001 (upper fill) 50-60 cm under layer 2	3044	19	1376–1264	1390–1230
MAMS-35580	Macro remains	AU 002 (upper fill) layer 2	3128	18	1430–1331	1441–1312
MAMS- 35955	Macro remains	AU 001 (lower fill)	3071	23	1391–1292	1408–1270
MAMS-35957	Macro remains	AU 002 (lower fill)	3132	22	1434–1329	1486–1306

Tab. 6. Corneşti-Iarcuri. Unmodelled 14C dates with laboratory number, sample material and feature contexts from the pits accompanying the houses in trenches X, XII and XIV

struction.[32] In order to delimit the time of destruction, the fill of the stratigraphically youngest layer is defined as the potential end of the destruction horizon, and it is assumed that the pit was filled shortly afterwards or sedimented relatively soon thereafter.

According to the model, the beginning of settlement, that is, when the pits began to be filled, can be dated to the end of the 16th or the beginning of the 15th century BC (1520–1435 cal BC). This however presupposes that the pits were not cleaned out in the meantime. If this were the case, then theoretically the time of their use would be longer or the feature older. The end of the use-phase is calculated at between 1485 and 1395 cal BC, from which a *terminus post quem* after 1395 cal BC is derived for the postulated destruction horizon. The end is dated on the basis of modelled dates between 1410–1305 cal BC, thus, in the 14th century BC.

[32] The dislocation probability is higher for this sample, because there was no preserved wood in the context, or else it could not be detected.

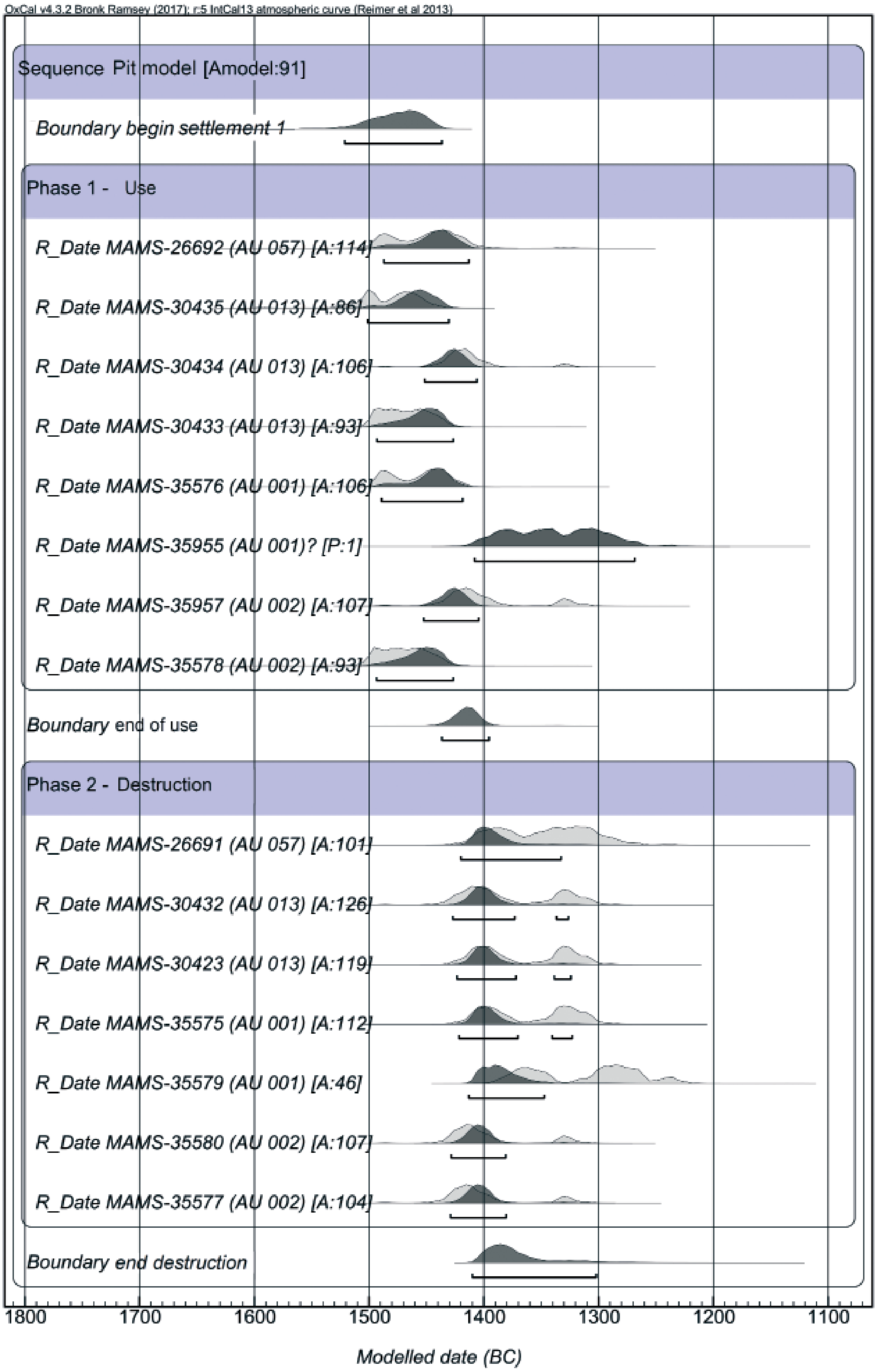


Fig. 15. Cornești-Iarcuri. A-posteriori-probabilistic of the model for pits accompanying houses in Ring II (trenches X, XII, XIV) (graphic: Cornești Project, R. Lehmphul)

Sequence pit model A_{model}=91.4 / $A_{overall}$=96.6	Unmodelled date 2σ (95. 4 %)	Modelled date 2σ (95. 4 %)
Boundary: beginning of settlement		*1520–1435*
Phase 1 – use		
R_Date MAMS-26692 (AU 57)	**1501–1406** cal BC	*1490–1415* cal BC
R_Date MAMS-30435 (AU 13)	**1527–1443** cal BC	*1500–1430* cal BC
R_Date MAMS-30434 (AU 13)	**1488–1320** cal BC	*1450–1405* cal BC
R_Date MAMS-30433 (AU 13)	**1503–1433** cal BC	*1495–1405* cal BC
R_Date MAMS-35576 (AU 001)	**1498–1422** cal BC	*1495–1425* cal BC
R_Date MAMS-35955 (AU 001) ?	**1409–1269** cal BC	*1410–1270* cal BC
R_Date MAMS-35957 (AU 002)	**1452–1307** cal BC	*1490–1410* cal BC
R_Date MAMS-35578 (AU 002)	**1506–1431** cal BC	*1495–1430* cal BC
Boundary: end of use		*1435–1395* cal BC
Phase 2 – destruction		
R_Date MAMS-26691 (AU 57)	**1416–1280** cal BC	*1420–1335* cal BC
R_Date MAMS-30432 (AU 13)	**1438–1301** cal BC	*1430–1325* cal BC
R_Date MAMS-30423 (AU 13)	**1429–1302** cal BC	*1425–1325* cal BC
R_Date MAMS-35575 (AU 001)	**1422–1300** cal BC	*1420–1325* cal BC
R_Date MAMS-35579 (AU 001)	**1391–1229** cal BC	*1415–1350* cal BC
R_Date MAMS-35580 (AU 002)	**1442–1311** cal BC	*1430–1380* cal BC
R_Date MAMS-35577 (AU 002)	**1446–1311** cal BC	*1430–1380* cal BC
Boundary: end destruction		*1410–1305* cal BC

Tab. 7. Corneşti-Iarcuri. Unmodelled and modelled datings for the pits that were associated with houses inside Ring II (trenches X, XII, XIV)

On the genesis of settlement and fortification of Corneşti-Iarcuri – summary of the phase model

In the following, the models based upon radiocarbon datings and archaeological contexts from the different trenches are correlated and a phase model for the genesis of Corneşti-Iarcuri is discussed (**Tab. 8**). One essential aspect concerned here is a model. 'Bayesian', thus 'modelled' chronologies are both context-related as well as interpretative. They are changeable and strongly dependent upon the assumptions and the number of data contained in the models.[33]

By the end of the excavation campaign in 2017, Rings I and II as well as the settlement area enclosed within them had been almost entirely prospected geomagnetically. The magnetogram shows that not only both of the ramparts, but also – contrary to earlier assumptions – the enclosed settle-

[33] Cf. among others, Bayliss *et al.* 2011, 19–21; Schier 2013, 270 n. 56.

Trench / Year	Features/ Structure	Modelled dating interval 2σ (95.4 %)	Dating model	Settlement phase
Trench II (2008)	Ring I Phase A	not dated	*terminus ante quem* 1400 cal BC for the erection of phase A of Ring I	Phase 1
Trench II (2008)	Ring I Phase B	1400–1250 cal BC	*terminus post quem* 1400 cal BC for the erection and destruction of the second phase (Phase B) of Ring I	Phase 2
Trench VI (2012)	Ring II	1405–1295 cal BC	*terminus post quem* around/after 1405 cal BC for the erection of the first and the second phase of Ring II and its destruction (model 2)	Phase 2
Trench XI (2016)	Ring II	Beginning/end of first phase: 1480–1330 / 1430–1325 cal BC End of second phase: 1265 cal BC	These periods describe both the earliest possible beginning for the construction of the first phase and the latest possible end of the 2nd phase of Ring II.	Phase 2
Trench X (2015) Trench XII (2016) Trench XIV (2017)	Primary fill in pits (AU 057) (AU 013) (AU 001) (AU 002)	1520–1395 cal BC	This time span dates the earliest beginning of use of the accompanying house pits, as well as their latest possible end, and thus provides a *terminus post quem* after 1395 cal BC for the destruction of the house structures.	Phase 1
Trench X (2015) Trench XII (2016) Trench XIV (2017)	secondary fill in pits (AU 057) (AU 013) (AU 001) (AU 002)	1410–1305 cal BC	This time span 1305 cal BC marks the latest possible end for the destruction horizon.	Phase 2

Tab. 8. Corneşti-Iarcuri. A summary presentation of the models reconstructed from the trenches for settlement phases 1 and 2

ment area had burnt down over large areas. This observation enabled the correlation of the models developed separately for each trench. Thereby, the dated event or destruction horizon functions here as a kind of guiding horizon. However, it proved to be difficult that two phases are confirmed in Ring II in both trenches VI and XI. Traces of fire are more or less visible in both phases.

Moreover, the respective stratigraphically youngest phase was obviously not renewed. Two phases are likewise documented in Ring I. However, only the younger phase B displays traces of fire. And here as well no visible repairs or renewals undertaken after the damaging fire were attested. Consequently, the most recent phase at the fortification Rings I and II is linked to the destruction horizon found in the pits accompanying the houses. The correlation bases upon the observation of the absence of repairs or renewals, both at the fortifications and at the house locations investigated within Ring II in trenches X, XII and XIV.

The beginning of settlement phase 1, and with that also the beginning of the Late Bronze Age settlement of Corneşti-Iarcuri, dates to the end of the 16th century BC, or at the transition from the 16th to 15th century BC. This first settlement phase is probably represented in phase A of Ring I. The areas inside the fortification ring were loosely settled and buildings were found mainly in the northeast, not far from the northern valley, "Valea Caraniului". The datings of the house structures investigated in 2013 confirm early as well as later activities there.[34] Further, there is the possibility

[34] On the datings for trench VIII, cf. Krause *et al.* in print; Harding 2017 Tab. 1; Heeb *et al.* 2017, 224.

Lab-No.	Sample material	Context	14C Age [Year BP]	±	cal BC 2-sigma	Settlement phase
Trench XII						
MAMS-30426	Macro remains	AU 001 lower pit filling	2947	18	1221–1059	Phase 3
MAMS-30436	Macro remains	AU 091 (Pl. 1.5-2)	2970	18	1258–1123	Phase 3
MAMS-30427	Macro remains	ceramic concentration 6 AU 091	2987	18	1271–1129	Phase 3
Trench X						
MAMS-26689	Macro remains	AU 003 (Layer 5)	2747	27	972–823	Phase 4
MAMS-26690	Macro remains	AU 003 (Layer 3)	2661	27	895–794	Phase 4
Trench XIV						
MAMS-35586	Macro remains	AU 014 sample of ridge post, in secondary position	2657	19	835–799	Phase 4

Tab. 9. Corneşti-Iarcuri. Representation of the datings gained from individual trenches for settlement phase 3 and 4

that initially the settlement area within Ring I was not enclosed by a rampart. Independently of this, a large-scale settlement to the south of the "Valea Lacului" and to the west of the erosion gully already existed at that time – indeed, at the origin of the spring, which is still intact today. This settlement was with high probability not fortified at this early stage.

At the turn from the 15th to the 14th century BC, or shortly thereafter, a certain dynamic emerged. External factors, presumably perceived as threats, led to a reaction that is reflected in the conception and erection of Ring II. This action marks the transition to the second settlement phase in Corneşti-Iarcuri. Settlement phase 2 dates to the 14th century BC and marks a turbulent episode in Corneşti-Iarcuri: during this time Ring II, which had been built shortly before, burned down twice. After the (partial?) destruction of the first phase or the rampart of Ring II, it was renewed at the front of the rampart with a comparable construction principle. Judging from the datings, during the same period of time phase B of Ring I was erected. As the first phase A had not burned down, evidently after an initial conflict it was necessary to repair Ring I as well.

Still during the 14th century BC the entire complex, that is, Ring I/phase B and the second phase of Ring II as well as the enclosed settlement areas, was destroyed – a caesura in the habitation of Corneşti-Iarcuri, which at the same time marks the end of the second settlement phase. This interpretation is supported by datings in the sum calibration together with the concept of an increased carbonisation probability in the course of fire events.

Although this was likely a crucial break, it did not necessarily signify the end of settlement in Corneşti-Iarcuri. This is demonstrated, on the one hand, by the sum calibration of datings at disposal, in which there is a high density of data also for the 13th and 12th centuries BC. However, on the other hand, above all and in relation to the investigated areas, individual settlement features from later times have been repeatedly detected. So, here of importance is that the number and density of the scientific datings do not indicate a break in settlement, a factor that is indicative of continuous settlement.

Settlement phase 3 is detectable in individual features and datings, the latter to the 13th, 12th and 11th centuries BC. The intervals in the dates in the 2σ-range for features show hardly any overlapping between older intervals and none at all in younger intervals (**Tab. 9**). Two features were found in trench XII (2016): a storage pit (AU 001) and a trough-shaped pit, whose function was evidently different (AU 091). One single date (MAMS-29740) derives from a colluvial layer in Ring II (trench XI), which enabled the recognition of at least a few activities in this area (**Tab. 4**). Further data come from the bottom of the ditch in front of Ring IV, which provide indications about the use of the complex during settlement phase 3 – even though they do not date the point in time of the erection of the wood-earth rampart.

Settlement phase 4, dated by radiocarbon datings to the 10th and 9th centuries BC, that is, the Early Iron Age, likewise yielded features (**Tab. 9**). In 2015 a pit in trench X was investigated. Basing upon two datings for macro remains and on the ceramic inventory, the pit could be dated to the Early Iron Age.[35] A further dating comes from the context of a roof beam of the Late Bronze Age house in trench XIV. Evidently, the sample material was secondarily dislocated. Finally, a dating was gained from the charcoal in a core-drilling profile in the upper region of the "Valea Lacului". This sample stems from colluvium in a depth of 2 m and is considered an indicator for settlement activities during this time (phase 4).[36]

Judging by the 14C datings, the settlement in Cornești-Iarcuri ceased during the Early Iron Age. After a hiatus of a few hundred years, at the end of the 4th century BC, groups of Sarmatians settled at the periphery of the valleys and areas within the ramparts, which were certainly still impressive at that time.

Summarising observations

In the area of the largest Bronze Age fortification in Europe (more than 17 km^2) a total of 108 14C datings have been gained from various contexts (ramparts, ditches, pits, houses etc.) since the start of new investigations in 2007. With the phase model presented here, which basically refers to the dating of Ring I and II as well as the pits that belong to house structures within Ring II, the possibility emerges for the first time to sketch a site biography for Cornești-Iarcuri. According to the biography, a total of four settlement phases can be identified at present, basing on the one hand upon a large-scale destruction horizon dated to the 14th century BC, and on the other hand upon individual settlement features of later date.

Methodically, within the framework of model-building, the size of the fortification system as well as the enclosed settlement landscape were drawn into consideration, in addition to specific feature contexts and various types of samples. Beyond the relation of space and time, which is reflected in every radiocarbon dating due to its spatial context and chronological intervals, diachronically effective interrelations and the beginnings of settlement foci of older and younger epochs are tangible as well. Although the latter were not immediately connected with the Late Bronze Age and Early Iron Age history of Cornești-Iarcuri, they nevertheless offer the possibility in the future to investigate questions concerning settlement continuity and origins. The data show that in the Copper Age, at the latest since the Early Bronze Age, continuous settlement activities occurred in the settlement area of Cornești-Iarcuri (**Fig. 16**).

Included in the model-building are feature contexts as well as assumptions derived from statistical analyses, which take into account the different burning or carbonisation probabilities of different types of samples as well as the probability of relocation, that is, taphonomic processes. The probability of dislocation of sample material is enhanced, on the one hand in Cornești-Iarcuri through the prevailing soil-dynamic processes, while on the other hand it is influenced by older and younger settlement activities.

The destruction horizon recorded in the most of the excavation trenches and geomagnetic surveys forms a horizontal – sometimes also a vertical – stratigraphic and a guiding horizon relating solely to Cornești-Iarcuri, with which the different chronological models can be correlated and associated with one another. The statistically comprehensible concept of the increased carbonisation probability – also found in the sum calibration – supports this approach. Thus, the phase model presented here provides a framework – first on a local level – for the typochronological discussion of the find material in general as well as for individual feature-inventories. The model shows the different intensity of the proven use-horizons in Cornești-Iarcuri. In addition, this model does justice to the desideratum to date and to chronologically assign Bronze Age fortifications independently of find-typology and reinforced by scientific datings. In this sense, A. F. Harding presented a still very fragmentary phase model and pointed out the few scientifically dated fortifications of the Bronze Age in Central Europe.[37]

35 Bălărie *et al*. 2016.

36 Gumnior/Stobbe in this volume, Figs. 3–4.

37 Harding 2017; cp. Metzner-Nebelsick 2013, 343.

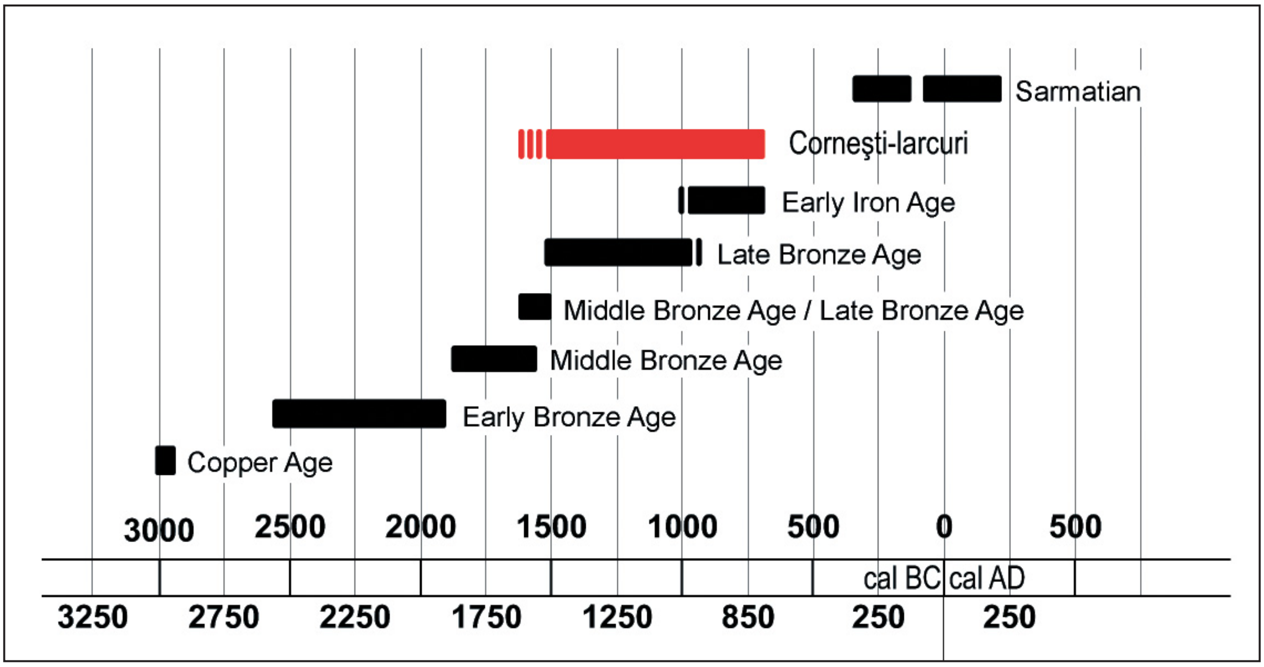


Fig. 16. Corneşti-Iarcuri. Epochs and periods or transitional periods (black) in relation to fortification and settlement contexts (red) in Corneşti-Iarcuri, based upon 14C datings from the site of Corneşti-Iarcuri (graphic: Cornesti Project, R. Lehmphul)

The significance of scientifically dated and chronologically modelled contexts, especially for the mega-sites in the Hungarian Plain and in the Romanian Banat is highlighted in this volume with the contribution on a further mega-site in Banat: Sântana-Cetatea-Veche.[38] The presentation of raw data and the model generated from them suggest that the destruction and probably the erection of the third fortification in Sântana should be dated to the 14th century BC, too. This increases the probability that both the complex in Corneşti-Iarcuri and that in Sântana were not only destroyed during the same time period, but also existed at the same time. This result is critical for answering future questions; it not only contributes to the general understanding of mega-sites, but also of regional Late Bronze Age settlement dynamics, social structures and economic aspects. Lastly, from it emerges a completely new perspective for comprehending and assessing conflict in prehistory, which is indeed the focus of the LOEWE project.

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[38] Cp. Sava *et al.* in this volume.

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Dagmar Fritzsch

Micromorphological Analysis of the Fine Stratigraphy of a Pit Fill (Corneşti-Iarcuri)

Micromorphology is a suitable method to study the contents and stratigraphic relationships of pit fills. Within the ramparts of Corneşti-Iarcuri, fill layers of a pit were sampled. The pit fill was macroscopically divided into primary and secondary fill due to striking differences. These differences could be verified and concretized micromorphologically.

Overview

For the last ten years the largest known Bronze Age ramparts in Europe close to the village of Corneşti in the Romanian Banat have been the focus of archaeological research. Within the framework of the DFG research project "Investigations on the Settlement Structures and the Chronology of the Late Bronze Age Fortification of Corneşti-Iarcuri in the Romanian Banat" in 2016 trench XII was created in the settlement area. Special features in this trench were the find contexts 1, 13 and 91. Finding 13 (AU 013) proved to be a nearly rectangular pit with dimensions of 2.4 m × 1.4 m and a preserved depth of 1.2 m. Compared to other findings it was considerably large. The pit is part of an ensemble in the context of two indirectly proven houses, which were clearly identified as houses in the field campaign 2017.[1] The surveyed stratified pit contained a primary backfill with no burnt clay found inside. It was separated from a secondary backfill by a charred wooden construction. The secondary backfill layer, above the wooden construction, was characterized by abundant burnt clay.

Pit fills at representative sites were sampled for micromorphological analysis, and the samples were made available to the author for thin section analysis (**Tab. 1**). The undisturbed sediment blocks required for this purpose were made to large-format sediment thin sections. The preparation of the thin sections followed the protocol of Altemüller.[2] For this purpose, the samples were prepared in the micromorphology laboratory of the Institute of Physical Geography of the Goethe University Frankfurt for thin sections with a thickness of about 30 μm. The thin sections are almost transparent in this thickness and can be described in transmitted light under a polarizing microscope. The description of the thin sections was made with the Zeiss Axioskop 40 polarizing microscope in linear polarized transmitted light (PPL) and in crossed polarized transmitted light (XPL) with a magnification of 25- to 400-fold. Microimages were taken with a connected camera (AxioCam MRc).

Soils in the immediate vicinity of section XII can be described as Vertic Phaeozem (clayic) according to international nomenclature.[3] According to the German soil classification it is named humus-rich Pelosols.[4] These dark humus-rich soils are characterized by a high clay content, which is macroscopically represented by a segregation structure. These pedogenic features – high clay and humus contents – can be found in the pit fillings as well.

Loess-dominated soils with low clay contents, as described by Nykamp,[5] are not found on the basis of the results of grain-size analysis after DIN 19 683.[6] Although the silt content, which represents the loess, reaches approximately 50 %, the clay content regularly reaches 40 to 45 %, which is much higher than described by Nykamp.[7] This was found in the field analysis as well.

[1] See Lehmphul *et al.* in press.
[2] Altemüller 1962, 165 f.
[3] IUSS Working Group 2015, 97.
[4] AG Boden 2005, 214.
[5] Nykamp 2016, 608.
[6] DIN 19 683, 1973.
[7] Nykamp 2016, 608.

thin section	depth [cm]	field description	
1	about 20	secondary filling	above wooden construction
2	about 30	secondary filling	above wooden construction
3	about 70	secondary filling	above wooden construction
4	about 80	secondary filling	above wooden construction
5	about 110	secondary filling	above wooden construction
6	about 130	primary filling	below wooden construction

Tab. 1 Number, depth and short field description

Micromorphology

Samples 1 to 5 were taken from the secondary fill of the pit above the charred wooden construction (**Tab. 1**). In addition to pedogenic features, these samples show typical anthropogenic contents of pit fillings. These contents could also be described macroscopically.[8] Bone fragments, as shown in Figure 1, which presumably originate from animal bones, appear bright yellowish in colour, which indicates a low temperature influence.[9] The bone fragment (**Fig. 1**) is from a very low or not heated bone. However, the vitrified material (**Fig. 2**) in the same layer indicates high burning temperatures. This highly heated material most likely originated from phytoliths. Phytoliths are mineral plant components composed of amorphous silicon. The biogen silicon merges at temperatures above about 800 °C (**Fig. 2**).[10] In addition to the vitrified phytoliths, intact phytoliths (**Fig. 3**), e.g. of reed (phragmites) (**Fig. 4**), are present in the pit filling. The large number of burnt clay fragments could be described macroscopically. Under the microscope the fragments show elongated pores that are oriented parallel. These pores form during production due to the biogenic tempering of clay with straw. Since the organic components were decomposed, the traces of the straw remain and build so-called plant pseudomorphoses, which characterize the typical microstructure of burnt clay (**Fig. 5**). The mixture of burnt, heat-affected material and unheated materials proves the intermixing of the sediments during backfilling. An *in situ* fire event in the secondary pit fill above the charred wooden construction can be excluded.

The sediments of the pit fill above the charred wood are characterised by post-depositional, pedogenic processes. Clay cutans on the surface of cracks, so-called slickensides, are visible (**Fig. 6**). This phenomenon can be observed in clay-dominated soils with clay contents of more than 45 % in the characterising horizon.[11] These slickensides are the result of high swelling pressure. Through repeated swelling and shrinking processes of the clays, clay minerals are reoriented at the cleavage.[12]

These slickensides are clearly distinguishable from vertically relocated clay (**Figs. 7–8**). Vertically displaced clay minerals, transported with percolating water, are deposited pore-oriented. They cover the walls of chambers, channels and planes or completely fill these pores. This accumulation can happen in several phases.[13] Due to these repeated phases based on different precipitation events, laminated clay coatings can accumulate. Figure 7 shows multi-layered clay coatings in different colours. Light brown clay alternates with greyish brown clay. The dark, so-called dusty clay is characterized by organic enrichment and is often based on anthropogenic influence.[14]

The formation of blue vivianite crystals ($Fe_3^{2+}[PO_4]_2 * 8H_2O$) should also be regarded as a pedogenic feature within the pit fill (**Fig. 9**). In natural soils, however, the phosphate contents are too low to form this iron phosphate mineral. Phosphates are present in sufficient quantity in the pit fill due to anthropogenic use. In the archaeological context, these available phosphates often derive from the degradation of plant material, excrements, urine, ashes, meat, fish, fish bones or bones and ashes.[15] Under reductive conditions vivianite

8 See Lehmphul *et al.* in press.
9 Villagran *et al.* 2017, 22.
10 Fritzsch *et al.* 2018, 70; Röpke/Dietl 2017, 175.
11 AG Boden 2005, 214.
12 Scheffer/Schachtschabel 2010, 350.
13 Kühn *et al.* 2010, 218 f.
14 Kühn 2003, 550; Kühn *et al.* 2010, 223.
15 Nicosia *et al.* 2017, 337; Holliday/Gartner 2007, 302.

Fig. 1 Fragment of bone (PPL) (thin section 1) (photo by D. Fritzsch)

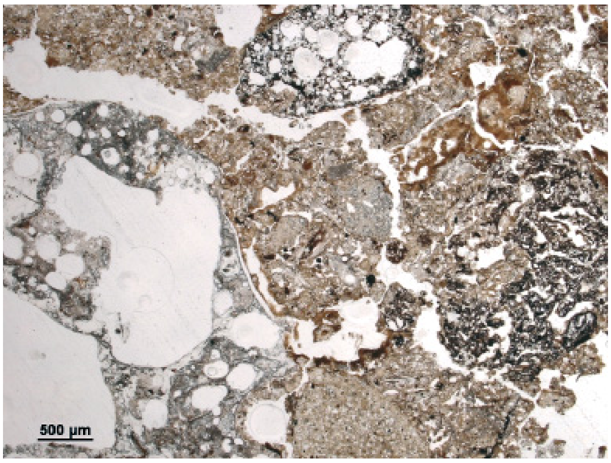

Fig. 2 Vitrified material (PPL) (thin section 4) (photo by D. Fritzsch)

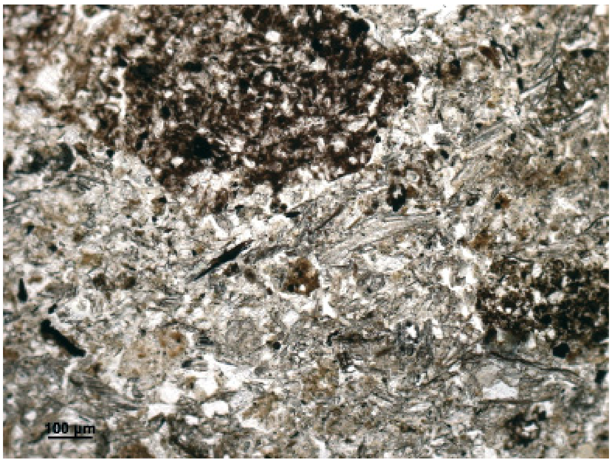

Fig. 3 Phytoliths (PPL) (thin section 4) (photo by D. Fritzsch)

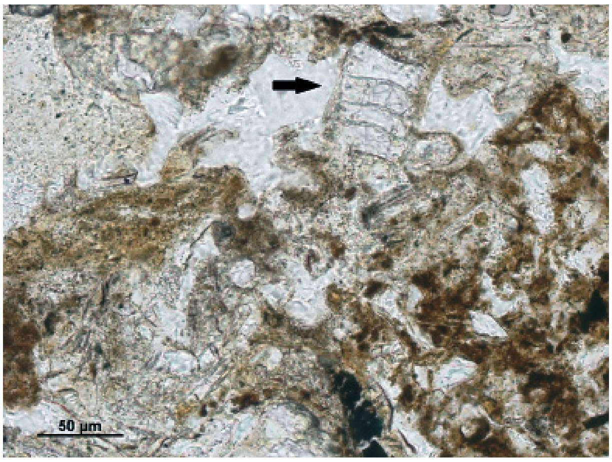

Fig. 4 Phytoliths; arrow: phragmites (PPL) (thin section 5) (photo by D. Fritzsch)

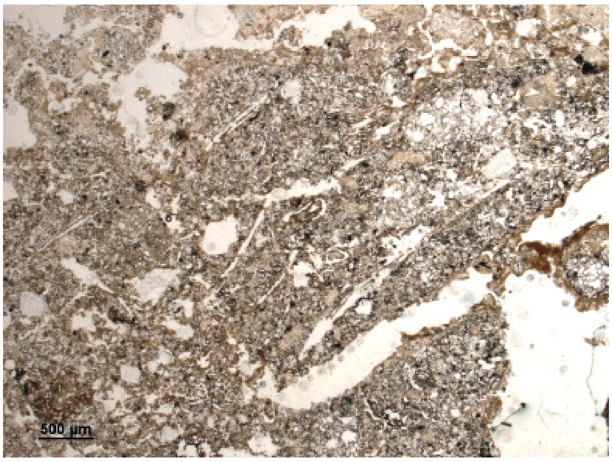

Fig. 5 Fragment of burned clay with pseudomorphoses of organic temper (PPL) (thin section 4) (photo by D. Fritzsch)

Fig. 6 Slickensides (arrow) (XPL) (thin section 2) (photo by D. Fritzsch)

crystallizes.[16] The anaerobic conditions in the clay-rich pit filling is based on the influence of backwater. Figure 9 shows a yellow phosphate precipitation. In the centre blue vivianite has crystallized.

Below the charred wood structure, a single sample, sample 6, was taken. In sample 1 to 5 typical anthropogenically induced contents such as bone fragments, vitrified material etc. could be identified. The filling below the charred wooden structure seems to be free of these anthropogenic materials. Only single microscopic charcoal fragments can be recognized by micromorphological analysis.

Compared to the sediments of the secondary pit fill, the precipitation of phosphates below the charred wooden construction is massive. Phosphatic impregnation is oriented to pores. It is crystallized on pore walls (**Fig. 10**) as well as within the matrix (**Fig. 11**). Such a large input of phosphates in anthropogenic environments is reported from stables, ponds and (waste) pits.[17]

Clay coatings are pedogenic characteristics of the pit fill (**Fig. 12**). Compared to the accumulation of clay within sections 1 to 5 (**Fig. 7**), here the coatings are much darker. Apparently, the clay was translocated together with humus and/or micro-charcoal from the charred wooden construction. Gebhardt describes the connection between dusty, dark clay coatings in the context of charcoal combustion.[18] For the phenomenon of very dusty clay coatings to occur, it is necessary that the surface is without vegetation and that tillage is frequently undertaken.

Figure 13 shows that these dark clay cutans were deposited on the phosphate-impregnated areas. This illustrates the relative sequence of the two relocation processes. The phosphates were subject to the first translocation process, followed by accumulation of clay, which probably continues until today.

Conclusion

The pit fill reflects layers of sediments at the time of backfilling of the pit. The soils at that time were, just like today, heavily clayey and humic, and differ scarcely or only slightly from today's soils. The secondary pit fill above the wooden structure shows typical anthropogenic contents mixed into the clayey-humic sediments. An *in situ* fire event never occurred, which is substantiated by the intermixing of burnt and unburnt sediments.

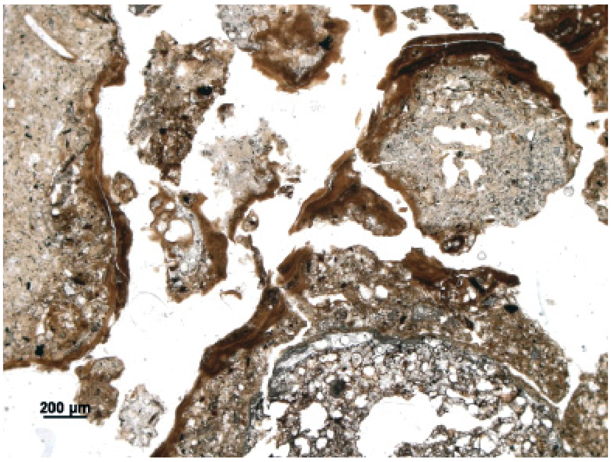

Fig. 7 Clay coatings (PPL) (thin section 4) (photo by D. Fritzsch)

Below the burned wooden construction, the clayey matrix of the primary pit fill, except for tiny charcoal fragments, does not show any anthropogenic additions directly recorded. Conspicuous, however, are massive phosphate inputs in the primary backfill, which are related to the Late Bronze Age anthropogenic use of the pit.

The process of phosphate impregnation cannot be determined. One possibility would be that the settlement pit was used as a waste pit and that high levels of phosphate were thus released into the ground. Thereby, this would have led to a removal of the phosphates through the entire profile to secondarily precipitate below the charred wooden construction. In the secondary pit fill above the wood phosphates are detectable indeed, but to a much lesser extent than below the charred wood. This possible deposition does not explain the large differences in the phosphate contents.

The use as a cesspit would explain the large differences in phosphate content. Due to its location in direct relation to a house structure, this kind of usage seems rather unlikely, but it must be considered based on its micromorphological results.

16 Karkanas/Goldberg 2010, 535.

17 Shahack-Gross 2017, 269; Macphail *et al.* 2008, 64.

18 Gebhardt 2007.

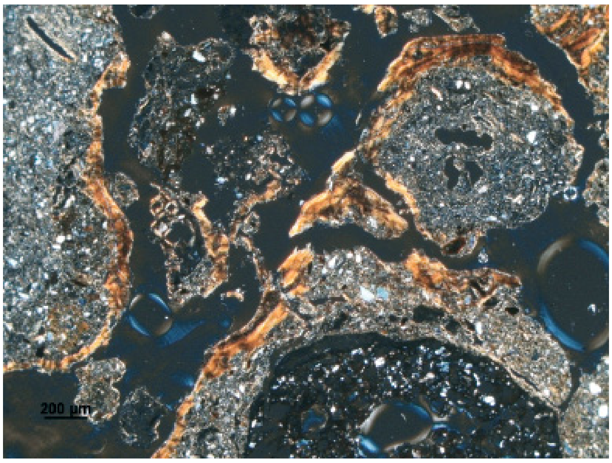

Fig. 8 Clay coatings (XPL) (thin section 4) (photo by D. Fritzsch)

Fig. 9 Vivianite (PPL) (thin section 4) (photo by D. Fritzsch)

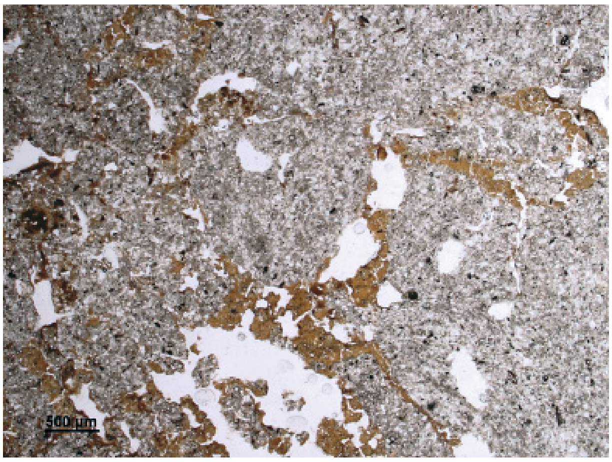

Fig. 10 Phosphatic coatings oriented on pores (PPL) (thin section 6) (photo by D. Fritzsch)

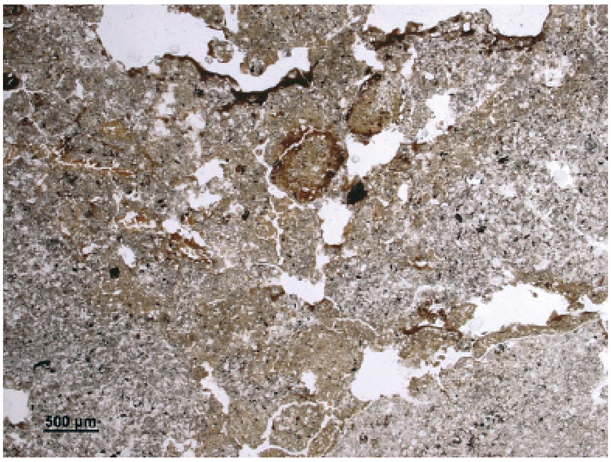

Fig. 11 Phosphatic impregnation of matrix (PPL) (thin section 6) (photo by D. Fritzsch)

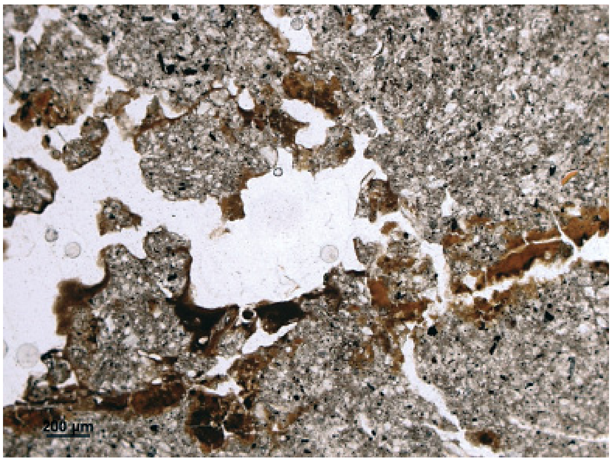

Fig. 12 Dark clay coatings (PPL) (thin section 6) (photo by D. Fritzsch)

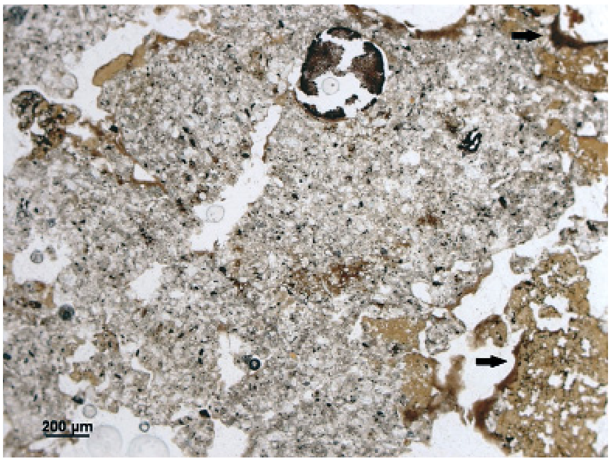

Fig. 13 Phosphatic impregnation covered with clay coating (arrows) (PPL) (thin section 6) (photo by D. Fritzsch)

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