BRONZE AGE SETTLEMENT RESEARCH IN NORTH-EASTERN HUNGARY

BRONZKORI TELEPÜLÉSKUTATÁSOK ÉSZAKKELET-MAGYARORSZÁGON

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Abstract

In this paper we want to provide a brief introduction to our current research on the Early to Middle Bronze Age (Hatvan to Füzesabony period) settlement sites in the Borsod plain of North-eastern Hungary. Our work is based on intensive archaeological surface survey, aerial photography, topographical measurements and magnetometer survey that provide important data both on the intra and off-site level. With the results obtained so far, it is possible to provide a much more nuanced picture of both the internal structure of the tell and tell-like Bronze Age sites of our study area and their development through time than was hitherto possible. As an example of the ongoing research we will discuss some results of our work at the site of Tiszabábolna-Fehérlótanya including the surface finds, magnetometry and archaeozoological results.

Auszug

Nach einem kurzen Überblick über die methodischen Grundlagen des BORBAS Projektes (Borsod Region Bronze Age Settlements) wird in diesem Beitrag der Kenntnisstand zur früh- und mittelbronzezeitlichen Besiedlung (Hatvan- und Füzesabony-Periode) der Borsod-Ebene in Nordostungarn dargestellt. Neue Forschungsergebnisse im Rahmen des BORBAS Projektes erlauben es, ein differenzierteres Bild des Aufbaus der einzelnen Siedlungen und ihrer Entwicklung im Laufe der Zeit zu entwerfen als dies bislang möglich war. Als Fallbeispiel dient uns die Ansiedlung von Tiszabábolna-Fehérlótanya. Die Ergebnisse der nicht-invasiven Prospektionsarbeiten und der archäozoologischen Untersuchungen werden kurz vorgestellt.

Kivonat

A BORBAS Projekt (Borsod Region Bronze Age Settlements) módszertani alapjainak rövid bemutatása után a dolgozat a Borsodi síkság (Északkelet-Magyarország) korai és középső bronzkori településeinek (hatvani és füzesabonyi időszak) vizsgálata során nyert legújabb kutatási eredmények rövid összefoglalása. Ezen eredmények alapján az egyes települések felépítéséről és fejlődéséről, egymáshoz való viszonyukról sokkal részletesebb kép bontakozik ki, mint eddig ismert volt. Esettanulmányként Tiszabábolna – Fehérló-tanya lelőhely roncsolásmentes kutatásainak elemzésére kerül sor, részletes archaeozoológiai értékeléssel.

KEYWORDS: NORTH-EASTERN HUNGARY, BRONZE AGE, BORBAS, NON-INVASIVE METHODS, TISZABÁBOLNA – FEHÉRLÓ-TANYA, ARCHAEOZOOLOGY

STICHWORTE: NORDOSTUNGARN, BRONZEZEIT, BORBAS, NICHT-INVASIVEN METHODEN, TISZABÁBOLNA–FEHÉRLÓ-TANYA, ARCHÄOZOOLOGIE

KULCSSZAVAK: ÉSZAKKELET-MAGYARORSZÁG, BRONZKOR, BORBAS, RONCSOLÁSMENTES KUTATÁS, TISZABÁBOLNA – FEHÉRLÓ-TANYA, ARCHAEOZOOLÓGIA

Introduction

The Bronze Age of North-eastern Hungary has always taken an important position in the archaeological research of the Carpathian Basin. As two classical, extensive monographs (Kalicz 1968; Kemenczei 1984) were dedicated to the Bronze Age period of this region, it is relatively well-known. 40 years after the completion of the first of these, a new comprehensive study has been dedicated to the Bronze Age predating the emergence of the tell cultures within the Upper Tisza region (Dani 2005). Parallel to, and shortly after this, the Middle Bronze Age settlement structure of the Carei Plain and Érmellék (Romania) has been discussed in detail (Németi & Molnár, 2002, 2007, 2012). A joint project of the University of Cologne and the Museum of Satu Mare is currently exploring Bronze Age settlement structures of the same area as well (Kienlin &

Marta 2014, Kienlin et al. 2012; Kienlin et al. in prep; Marta et al. 2010). Furthermore, North-eastern Hungary has been a particular focus of a research program of the Institute of Archaeological Sciences of Eötvös Loránd University entitled Treasures and hoarding in the Late Bronze Age since 2006 (V. Szabó 2009; 2011; 2013). Data collection about tell settlements in the Berettyó Valley, first summarized by Sz. Máthé Márta in 1988, also continued (Sz. Máthé 1988; Dani & P. Fischl 2009; Dani 2012). Lately, the most recent volume of the Archaeological Topography of Hungary shed light on the settlement structure of the Middle Bronze Age along the Galga River (Dinnyés et al. 2011).

Established in 2012, the BORBAS (Borsod Region Bronze Age Settlements) project aims at studying the territory of the southern Borsod floodplain in cooperation of the University of Miskolc, the Herman Ottó Museum of Miskolc and the University of Cologne. Starting at a micro level, the project aims to explore the internal structure of Early and Middle Bronze Age settlements in the study area: to locate specific households, to determine settlement units with specialised functions, and to compare the architecture and activity patterns within them. The macro-level analysis attempts to evaluate the position of these settlements in the social and political landscape, and to define their position in the Bronze Age environment and economic networks.

In order to find answers to these questions, a non-destructive testing methodology is applied. Each element of the survey strategy is well-known in Hungarian archaeology, since numerous research programs were based on the combined usage of similar components. The first application of the survey package in the study area aimed to identify abandoned medieval settlements (see Pusztai in this volume). The BORBAS Project aims to collect data from a large number of settlements using a standardised test protocol, so that the results can be compared, and furthermore to create a basic database of Bronze Age sites (Fischl et al. 2012, 2014; Fischl & Kienlin 2013).

The following methods were applied in the systematic survey:

1.) Geodetic survey. As a result, a 3D terrain model is generated, which provides the basis for professional data mapping.

2.) Aerial photography. On the one hand, archival aerial photographs and pictures made with remote sensing techniques for the Bronze Age settlements of the study area are collected, evaluated and compared. On the other hand, through subsequent processing of oblique aerial photographs made for archaeological or non-professional purposes, orthophotos with geographically identifiable surface phenomena (landmarks allowing accurate georeferencing) are prepared. Since 2013, the project has been conducting surveys using fixed-wing RPAS (Remotely Piloted Aircraft System) equipped with a digital camera and a video transmitter. The camera is placed inside the plane almost perpendicularly to the ground, and it is programmed to shoot at specified intervals. Videos, orthophotos and oblique images are made at the same time during a single flight, while the latter photos are transformed into a digital terrain model by post-processing. The software used for post-processing is called Photoscan, developed by the Russian Agisoft LLC. The program calculates camera position by special algorithms, then builds a 3D point cloud, that realistically visualizes the terrain of the study area. Thus, terrestrial geodetic survey is only necessary if the topographic measurement results are strongly influenced by coverage (e. g. dense vegetation). The photography process can be continuously monitored and controlled using a video receiver that is placed onto the ground. With the help of live images, researchers can make accurate observations and can request amendments to the path of the tool (Balogh & Szabó 2013; Balogh & Kiss 2014). Fixed-wing drone system operating and digital data processing is performed for the project by Pazirik Ltd.

3.) Geophysical survey. Each site is surveyed by geomagnetics using a multiple sensor Sensys magnetometer (line spacing: 0.5 m; sample interval: 0.05 cm) that enables us to cover large settlement areas at reasonable speed and with high precision. The results of the magnetometer survey are given here in the well-established +/- 10 nT greyscale plots, whereby positive anomalies appear dark grey to black, and negative ones light grey to white. The geophysical survey and the archaeological interpretation of the magnetograms are carried out by the University of Cologne team.

4.) Systematic surface artefact collection. An area as large as possible is examined within each Bronze Age settlement by this method. Larger 50x50 meter grids laid out for geophysical survey are subdivided into 100 smaller, 5x5 meter sectors that serve as main reference units. Finds found in the survey grids are collected without exception. Animal bones, shells, metal and slag, stone material and were passed, stone material and burnt daub fragments are separated from the ceramic finds. Potsherds are counted, weighed and then record in tabular form by type and decoration. The field survey grids are recorded in a GIS (Geographic Information System) database, which makes the immediate visual representation of statistical data possible. The evaluation of animal bones, stone material metal artefacts is carried out by specialists. Statistical analysis of the archaeological finds from the systematic surface artefact collection is taking

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place in collaboration with the students of the University of Miskolc.

5.) Systematic metal detector survey. Due to time factors, metal detector survey is usually carried out only at geomorphologically frequented parts of the settlements, or within units characterized by a concentration of pottery fragments. The survey is performed in more than one direction, as every investigated area is screened again, transversally to the previous tracks. During the research in the second direction a search head having different parameters from the previous one is used. Working 8 hours a day, the research of one 50x50 meter survey grid can be performed thoroughly enough for the nature of archaeological research. The location of every artefact found during the metal detector survey is fixed with a satellite positioning device, and waypoint locations are recorded in a GPS Tracklog. The penetration depth of metal detector is 30 cm, thus the method only affects the upper, ploughed parts of the sites, artefacts lying in deeper, undisturbed layers with their original find contexts remain intact. Metal detector survey is carried out by István Bacskai (Bacskai 2010, 2013).

6.) Soil drilling. Soil drilling serves two purposes. On the one hand, we aim to determine the stratigraphic conditions of various structural parts of the settlements (layer thickness or trench depth), on the other hand, to collect data for environmental reconstruction. Drilling has only been carried out at two archaeological sites so far, the evaluation of the samples from Tard has already been published (Fischl et al. 2014). Unfortunately, none of the core samples provided well-preserved pollen grains, thus environmental research has to be extended in the future. Soil drilling, core sampling and geological evaluation is accomplished by the University of Cologne.

7.) Archaeozoology. Manually collected animal bones and shells during the field survey of the sites are evaluated by archaeozoologists. Clearly, the fact that no archaeological excavations are available so far, greatly affects the results of the archaeozoological survey. Systematic surface artefact collection can only recover immediately noticeable findings revealed and kept on surface at the time of the research only by ploughing, soil work or natural erosion. Thus, there is very little chance for finding the remains of small mammals indicating certain environmental conditions, or collecting the small bones of fish or birds that could have played a significant role in the Bronze Age diet. After washing the hand-collected find material macroscopic description, detailed definition and measurements (length, biometric points, weight) takes place. Measurement of animal bones is based on Driesch 1976, age profiles of domestic species are established after Schmid in 1972. Archaeozoological analysis for the project is carried out by Beáta Tugya.

8.) Metal analysis. Analysis of artefacts revealed by the metal detector survey is executed by the LISA Laboratory (Laboratory of Complex Image and Structure Analysis), and the ARGUM Working Group (Archaeometallurgical Research Group of the University of Miskolc) of the University of Miskolc. Elemental composition and technological analysis is carried out using an optical microscope (Zeiss AxioImager) and SEM-EDX (AMRAY 1830I equipped with energy microprobe scanning electron microscopy) techniques.

9.) The results of these tests are stored in a GIS database that makes it possible to compare the different elements visually, to layer them onto each other, and to evaluate them.

Outline of the current state of knowledge on Bronze Age settlement in the Borsod region

The BORBAS Project started from the catalogue of sites published in the monograph of Nándor Kalicz published in 1968 (Kalicz 1968). Based on the phase maps created on this basis and by a survey of subsequent literature, our first impression was that the subsequent Early and Middle Bronze Age groups of the study area lived in settlements of similar structure, but that there may have been change in their number and distribution. It was assumed that during the Middle Bronze Age there was a smaller number of larger sites that may have employed a different strategy of land use (control over larger areas) than during the Early Bronze Age (Fischl & Kienlin 2013 Fig. 1). This hypothetical process of settlement concentration was corroborated among others by the observation that excavations at Ároktő-Dongóhalom had shown a refilling of the encircling ditch and an enlargement of the internal settlement nucleus after the Hatvan Period (P. Fischl 2006). A similar observation was described by Márta Sz. Máthé at Polgár-Kiscsőszhalom (Dani et al. 2003, 94–96; Dani & Szabó 2004, 99). Surface survey and magnetometry at Tard-Tatárdomb also seem to imply such an enlargement of the inner core of the site (Fischl & Kienlin 2013, 20–25; Fischl et al. 2014, 344). Moreover, maps of the published Füzesabony sites known from previous research showed a much looser settlement structure than data for the more accurately collected sites of the Hatvan culture. Thus, the results of the first stages of our work suggested that the Bronze Age sites of the region constitute a chain of rural settlements characterized by the same size and internal structure but with an increase in overall size and a reduction in numbers from Hatvan to Füzesabony times.

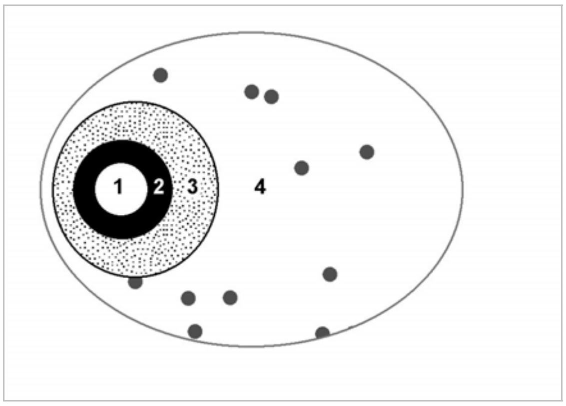

Fig. 1.: Model of settlement structure in Northern Hungary with a central multi-layer part (1), ditch (2) and outer part with houses (3) and pits (4)

1. ábra: Északkelet-magyarországi bronzkori települések belső szerkezete (1) többrétegű településmag, (2) árok, (3) külső települési rész, (4) gödrök

As has already been established by Nándor Kalicz in 1968 (Kalicz 1968, 129-134), the basic structure of the sites consists of a multi-layer inner core surrounded by a wide and deep ditch. A larger part of the settlement is outside this area, and it can typically be divided into two, well separated sub-units: 1) an area of intensive occupation with houses for dwelling, and 2) an area with pits for storage, working or some other purpose (**Fig. 1.**).

Based on past excavations and the thickness of the cultural layers remaining, the inner core of our sites is multi-layered. Due to the relatively limited thickness of their layers (sometimes less than 1 meter in the preserved state) most of them can only be classified into the category of tell-like settlements. This central part, surrounded by the deep and wide ditch, is small, c. 0.5 ha on average. Based on the geophysical survey, an average presence of four buildings can be postulated within this innermost zone (Fischl & Kienlin 2013). Unfortunately, in the central part of many of our sites the concrete base of a triangulation station interferes with the results of the geomagnetic prospection.

The settlements in the river valleys extending southwards from the Bükk Mountains, situated on river terraces and connecting to the nowadays rather steep slopes are sometimes only semi-circular in shape, while those in the immediate vicinity of the plain riverbanks are perfectly round (**Fig. 2.**).

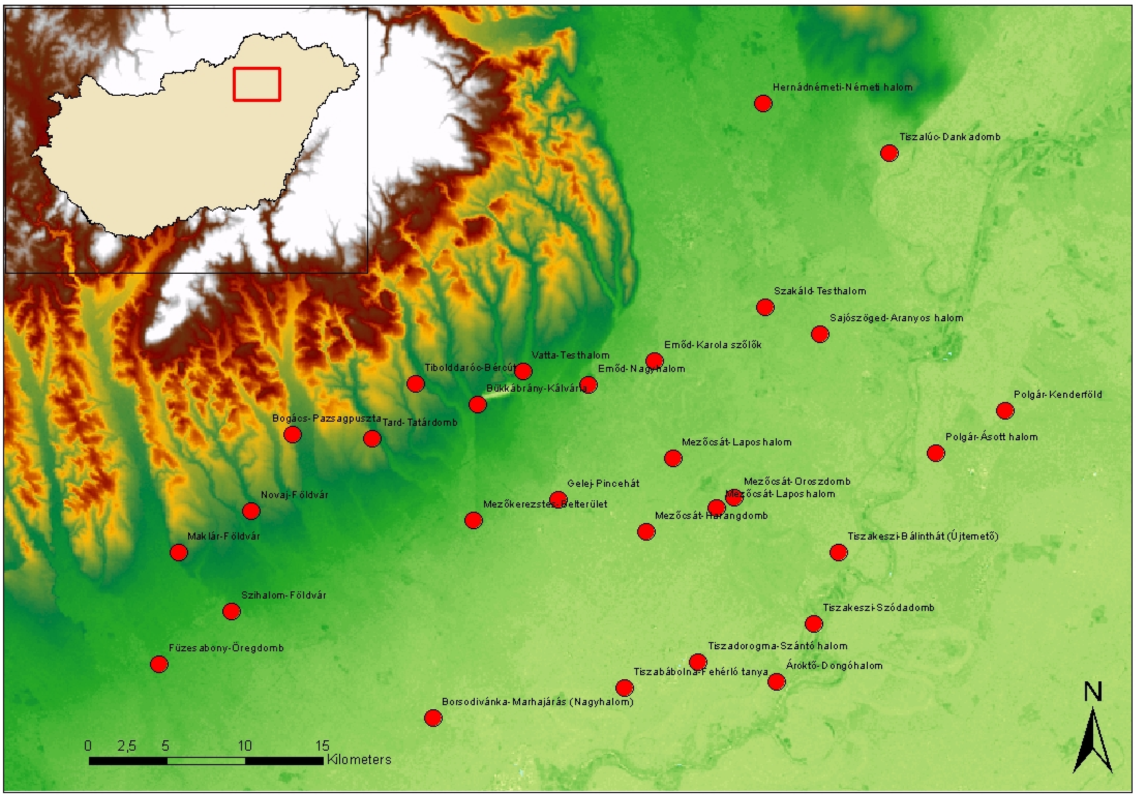

Fig. 2.: The settlement network of the Hatvan and Füzesabony cultures on the Borsod plain and foothill zone of the Bükk mountains

2. ábra: A Borsodi-síkság és a Bükk hegylábi régió településszerkezete a hatvani és a füzesbonyi kultúrák időszakában

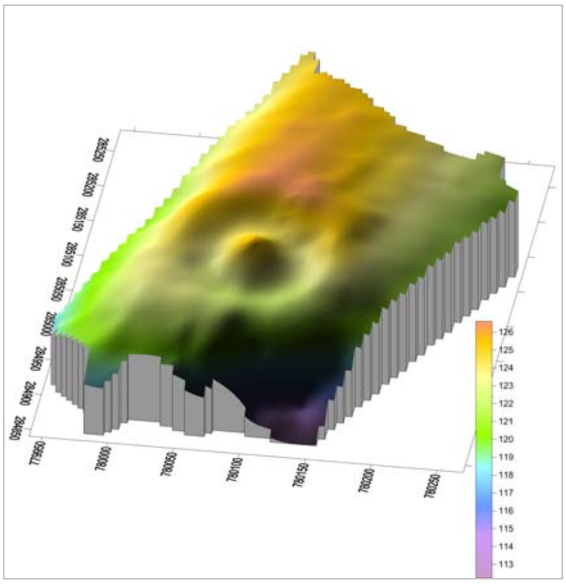

Fig. 3.: Relief model of Emőd-Nagyhalom

3. ábra: Emőd-Nagyhalom domborzatmodellje

Based on current observations, in some cases the area outside the ditch is at a higher altitude above sea level than the central core of the settlement: a land spine or thick cultural layer running around the ditch often forming a concentric circular or semi-circular ring (adapted to the terrain) has been observed in several cases. Such elevations have previously been interpreted as ramparts (**Fig. 3.**). However, the presence of a rampart on the outer side of the ditch encircling the settlement's core seems unfavourable for defensive purposes. Moreover, the geophysical survey has repeatedly revealed the remains of houses standing in this area. In two cases, these houses are located tangentially to the circular ditch (Tard-Tatárdomb, Emőd-Nagyhalom: Fischl & Kienlin 2013, Fig 5–6, 12–13).

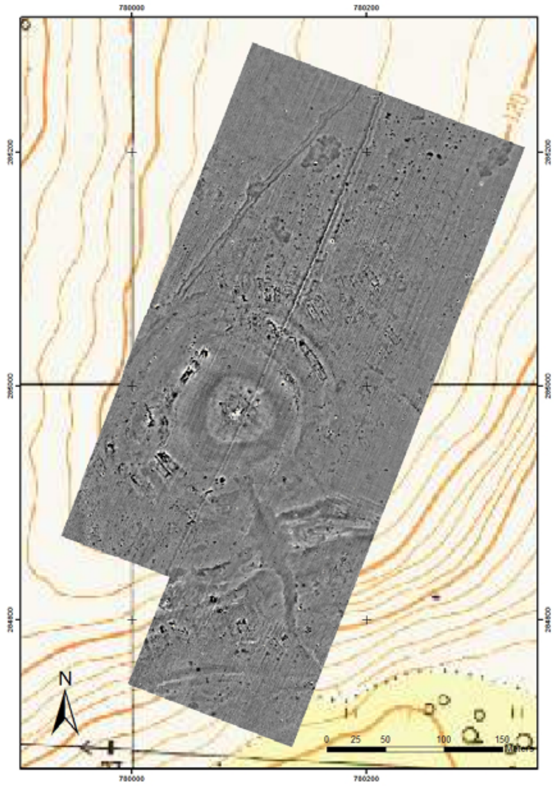

Fig. 4.: Magnetometer data of Emőd-Nagyhalom

4. ábra: Emőd-Nagyhalom geofizikai felmérésének képe

In the other main group of settlements, groups or lines of houses can be seen in the outer settlement, connected to either this elevation or directly to the inner ditch (Emőd-Nagyhalom, Tiszakeszi-Bálinthát, Vatta-Testhalom, Ároktő-Dongóhalom) (**Fig. 4.**). Finally, a rather high density of general settlement pits possibly related to storage etc., but without clear house structures, has repeatedly been indentified in the outer part of the settled area (Mezőcsát-Laposhalom, Tiszakeszi-Bálinthát, Emőd-Nagyhalom) (**Fig. 4–5.**).

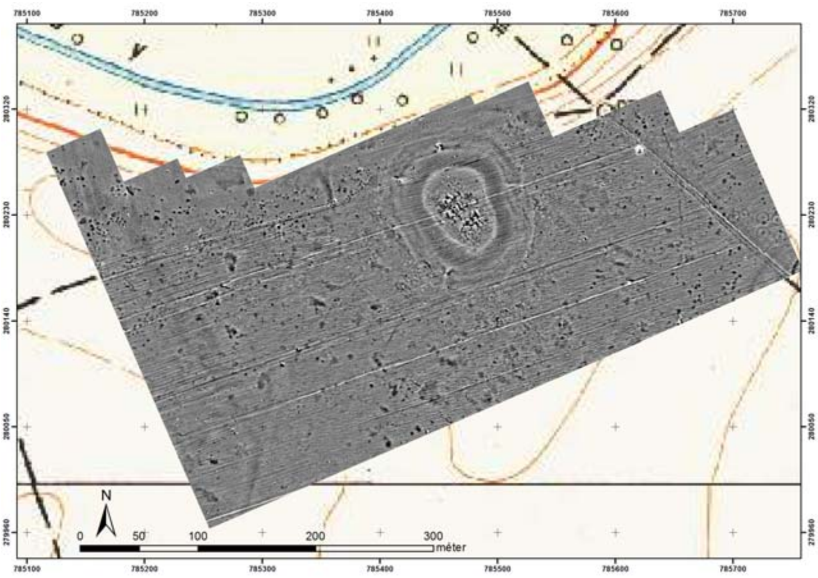

Fig. 5.: Magnetometer data of Mezőcsát-Laposhalom

5. ábra: Mezőcsát-Laposhalom geofizikai felmérésének eredményei

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Fig. 6.: Photo of the „double-tell" from Borsodivánka-Marhajárás

6. ábra: Borsodivánka-Marhajárás "dupla" telljének fényképe

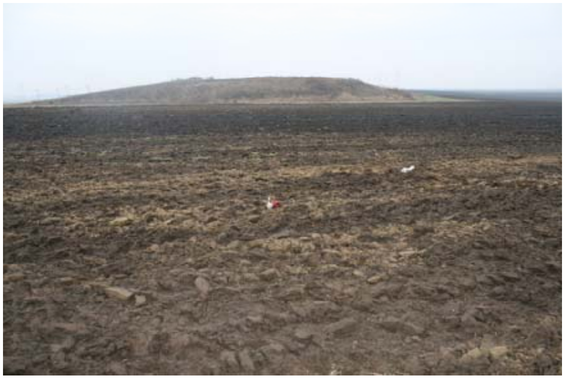

Fig. 7.: Photo of Hernádnémeti-Németi halom

7. ábra: Hernádnémeti-Németi halom telltelepülés fényképe

Fig. 8.: Photo of Szakáld-Testhalom

8. ábra: Szakáld-Testhalom és környékének fotója

The excavation of a similar group of pits in the outer part of the settlement of Vráble (SK) has demonstrated the storage function of such features (Bátora et al. 2012, Fig. 5). Settlements characterized by this complex structure cover an area of 10 hectares or more in total. Thus, although the precise chronology of the features observed in the magnetograms and the internal development of our sites cannot be determined by the research methods employed so far – that is we do not know whether a belt-like enlargement of the settlement territory has taken place due to population growth, or the boundary of each zone had originally been defined at the time of establishment – we do can state that a much larger area of occupation and effective population size can be assumed than previously thought.

The similarities observed in the internal structure of settlements point to shared traditions and notions how to live within the studied area (P. Fischl & Kertész 2013). Based on the settlements examined during fieldwork and the research carried out in the repository and collection of either the Ottó Herman Museum of Miskolc or the National Museum of Hungary, our notions about the temporal dynamics and land use of the Early and Middle Bronze Age settlements need revision. As is seems now, the initial hypothesis of diachronic change in land use strategies and settlement patterns cannot be confirmed, since upon closer inspection all sites previously thought to have been abandoned at the end of the Hatvan period in fact show traces of Füzesabony occupation as well. It is still true, however, that at certain sites listed above a change in size is discernible during the Middle Bronze Age although their location and general layout remain unchanged (**Fig. 2.**).

Apart from the tell-like sites hitherto discussed, another type of settlement, different in size and structure can be distinguished. The inner core of these settlements is not much larger than on the sites discussed above. However, based on the thickness of their cultural layers we can actually classify them as tell settlements. Accurate data concerning the stratigraphy is not yet available due to the lack of excavations, but according to the topographic survey their inner core stands 4-5 meters high above their environment. Alike the tell-like settlements, in this group as well Bronze Age finds can be collected on several hectares surrounding their central tell part and ditch.

In the area studied only three sites can hitherto definitely be classified into this category. The 'double' (probably in consequence of post-Bronze Age damage) mound of Borsodivánka-Marhajárás (Nováki et al. 2007, 24) falls into this group. Here unlike the other sites, detecting a surrounding trench so far has failed, probably due to the relatively poor field conditions (**Fig. 6.**). In the case of Hernádnémeti – Németi-halom the eastern and western part of the site have been destroyed by recent construction works. What remains clearly has to be classified as a proper tell, which covered c. 0.5 hectares within the arc of the inner ditch surrounding the site (**Fig. 7.**). Due to previous geoarchaeological research, we have much more information about the third site, Szakáld-Testhalom (**Fig. 8.**). According to the profile the surrounding ditch had been dug three meters deep into the subsoil.

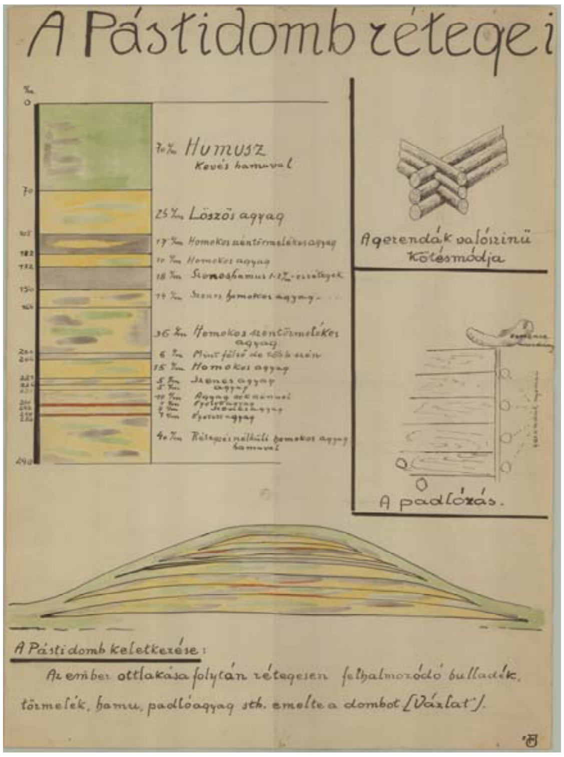

Fig. 9.: Aquarelle of the layers from Mezőcsát-Pástidomb. Drawing by Géza Megay.

9. ábra: Mezőcsát-Pástidomb többrétegű település rétegsora. Megay Géza akvarellrajza.

At the time of occupation water had stood c. 1.5-2 meters deep inside the ditch, which connected to the cut-off meander of the so-called Kerengő stream. The abandonment of the settlement is indicated in the core sample by an ash layer between 240 and 260 cm depth. However, the 2 hectares of inhabited area mentioned in the study is correct only if one includes the width of the trench as well, the actual central part is smaller and more like the other sites discussed. Based on the geodetic survey, the maximum size of the central part of the settlement within the ditch is c. 1 hectare. A core section available from drilling shows a cultural layer c. 3 meters thick (Sümegi et al. 1998). For these places, the external settlement area suggested by surface finds is plain and by no means higher than the central tell.

Another site which should probably also be included into to group of proper tells is Mezőcsát – Pásti-domb which still had 290 cm of stratigraphic sequence in the 1930's, based on an aquarelle by Géza Megay (**Fig. 9.**). Its size and height cannot be determined today because the location is in the present village and was built upon (P. Fischl & Rebenda 2012a). Similarly, Ferenc Tompa in 1936 established a stratigraphic sequence of 270 cm during his excavation of Tiszakeszi-Szódadomb.

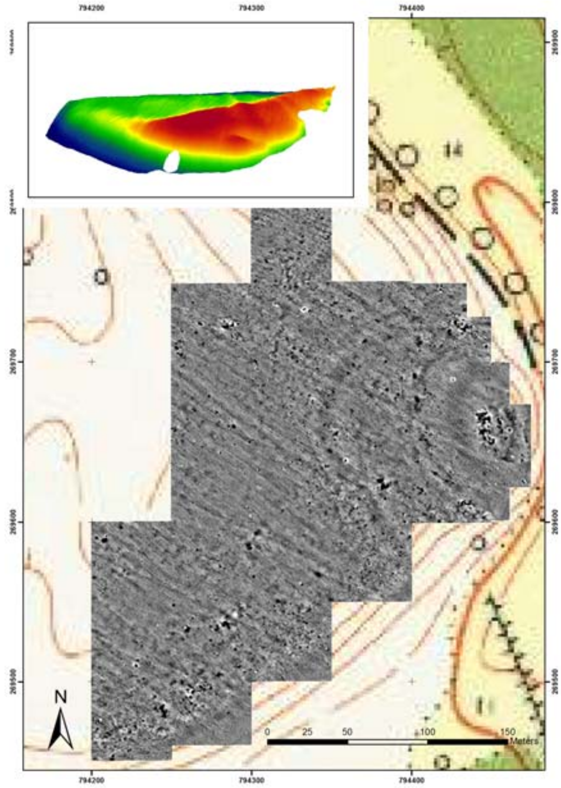

Fig. 10.: Relief model and magnetometerdata of Tiszakeszi-Szódadomb

10. ábra: Tiszakeszi-Szódadomb domborzat-modellje és geofizikai felmérésének képe

However, during the surface and magnetometer survey in 2014, the outer concentric residential area was located in a higher relief than the highest point of the tell (Fischl & Kienlin 2015) (**Fig. 10.**). At Tiszakeszi-Bálinthát, the external settlement ring consisted of a street-like arrangement of houses positioned at a much lower altitude than the protruding central core of the site. According to the excavations of Tompa, the stratigraphic succession here was 170 cm (**Fig. 11.**). The thickness of layers within the inner ditch at Tard nowadays is down to only 100 cm (Fischl et al. 2014, 369).

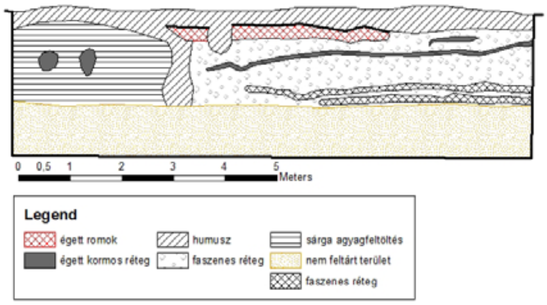

Fig. 11.: Profile of the trench excavated by Ferenc Tompa in Tiszakeszi-Bálinthát

11. ábra: Tompa Ferenc Tiszakeszi-bálinthái szelvényének metszetrajza

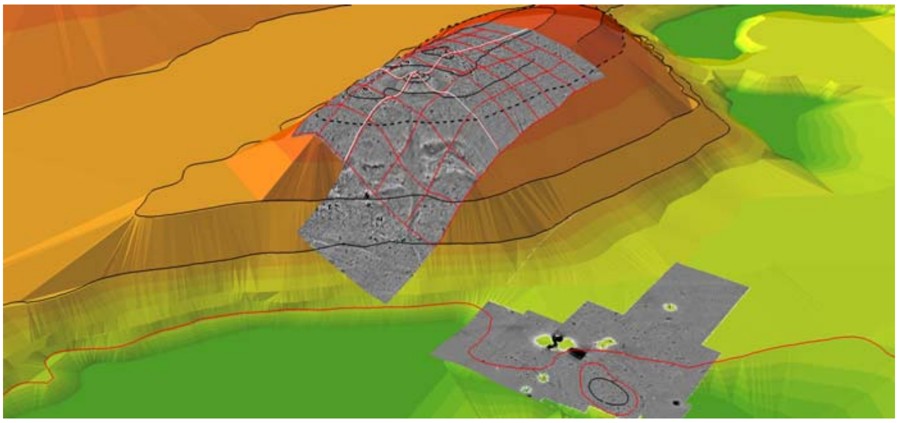

Fig. 12.: Magnetometer data of Emőd-Nagyhalom and Zsedény applied on the deformed surface model

12. ábra: Emőd-Nagyhalom és Emőd-Zsedény geofizikai felmérésének eredményei a domborzatmodellre vetítve.

The data collected so far clearly indicates that the Bronze Age sites of our study area fall into different categories with regard to the thickness of their cultural layers, but without a systematic drilling sequence neither the remaining height of their internal part nor their precise lifespan and stratigraphic sequences can be compared precisely. Unfortunately, the surface of all the sites has undergone significant deterioration since the beginning of the previous century. For example, although the site of Tibolddaróc-Bércút is completely flat nowadays, in 1905 it still stood some c. 70-80 cm high, and some of the finds recorded were recovered from pits at a depth of 120-140 cm, according to the excavation report of Béla Balázs (Balázs 1905, 410).

As the case study below illustrates geomagnetic data must not be used to establish the absence of houses since it is heavily biased towards burned structures. Remains of houses and constructional features with little or no exposure to fire do not show up as a strong magnetic anomaly like the heavily burned ones do. When houses are visible in the magnetometer data there is often a good match between the results of the systematic surface survey and the geophysical prospection, with the density of finds increasing where the geomagnetic survey, too, suggests the presence of a building. In the absence of conclusive magnetometer data the number of artefacts and the distribution of special find material (burnt daub, grindstones, portable stoves) may at least be taken to indicate the possible location of houses (e.g. in the middle of the Grid 12 at Tard). The information obtained by different non-destructive methods complement each other. Their combined interpretation is required in all cases to obtain a more precise reconstruction.

Our knowledge of the 'dual' settlement network of proper tells and tell-like sites outlined above needs to be expanded by further research in the future. Already on the current state of our knowledge, however, a lot of variability is apparent both with regard to details of the layout of specific sites and their development through time. Based on the data of a small-scale excavation at Mezőcsát-Oroszdomb, for example, this rather small settlement situated on a natural hill was probably a single layered Hatvan culture site, although a casting mould found there may also suggest a Middle Bronze Age use (Kalicz 1968, 117–118; Koós 1991). A single layered Hatvan culture settlement was detected below the Füzesabony strata by the excavation at the settlement at Ároktő as well. In other words, we have to reckon with single layered settlements established during the formation process of the settlement network as well. Another interesting situation may be encountered in the village of Emöd, where we collected Hatvan culture finds from an area surrounded by a circular ditch at Emőd-Zsedény below the nearby tell-like settlement of Emőd-Nagyhalom. The site extended to the area outside the ditch as in the case for the nearby larger Nagyhalom. Also, in an unexpected topographic situation on the southern slope of the Nagyhalom, presumably as a result of a former terracing or a different profile of the slope than today, houses could also be observed (**Fig. 12.**). The interpretation of this dual site raises a number of possibilities.

1) A village originally founded in the low-lying area was relocated to the top of the hill in order to leave the wet environment and enjoy a better strategic position.

2) The Zsedény site is to be interpreted as a satellite of the hilltop settlement, different in function (exploiting water resources, fishing, livestock watering, using the water as a communication channel). In this case, it should be noted that the distance between the two enclosed settlement cores is only 500 meters as the crow flies, and the difference in the altitude above sea level is 20 meters.

3) Both sites are part of the same, contemporaneous settlement exploiting the different opportunities of the immediate vicinity.

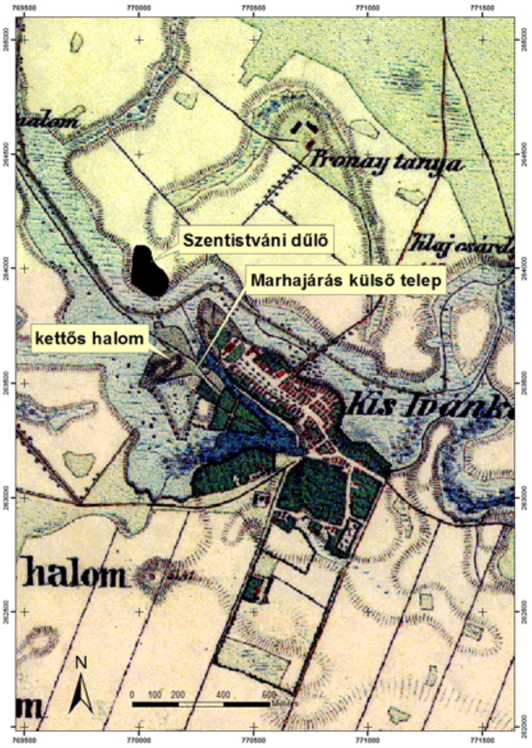

Fig. 13: The cluster of settlement parts from Borsodivánka (Borsodivánka „double tell"; Borsodivánka-Marhajárás, Borsodivánka-Szentistván dűlő)

13. ábra: A borsodivánkai településklaszter (Borsodivánka-Marhajárás "dupla tell", Borsodivánka-Marhajárás külső telep, Borsodivánka-Szentistváni dűlő)

It is important to note here that the exclusive presence of Early Bronze Age and generally prehistoric pottery fragments on the surface does not necessarily mean the lack of Füzesabony Period settlement in the Zsedény area. The first on-site inspection of the BORBAS Project at Tibolddaróc-Bércút presented only Hatvan-style ceramics as well, but old excavation data clearly demonstrate the original presence of the Füzesabony culture at the same site. As potsherds can be collected in the entire area between the two settlement cores in Emőd, the hypothesis that both sites formed part of a larger whole cannot be excluded.

The case of the site in Borsodivánka-Marhajárás raises similar questions. The distribution of Bronze Age find material around the 'double' tell covers the entire area of the island formerly surrounded by an ancient bed of the Eger stream. Sherds dated to the period under study have also been collected on the further side of the confluence of the present-day Rima and Kánya creeks (these days diverted to a canal) at the site called Szentistváni dűlő (**Fig. 13.**). This area was separated by water from the main site Marhajárás back in the Bronze Age as well. According to the nomenclature used in the literature it cannot be decided at the moment whether these are to be interpreted as two separate settlements (tell and satellite) or different parts of a single settlement used at the same time by the same community.

A similar situation has been observed in the case of the Körös valley Bronze Age settlements. Adapted to the geographic conditions created by the meandering river, there a single settlement may be formed by multiple clusters of habitation, among them the tell itself. By the non-invasive research methods employed by the BAKOTA Project studying the Körös valley Bronze Age settlements it was not possible to determine functional differences between the settled areas, but they deem the interpretation of the sites as a single village proven (Duffy 2014, 203–206) (**Fig. 14.**).

Based on its structure and size, the site of Emőd – Karola-szőlők belongs to our first type of small, rural settlements, but it is characterized by a more complex layout. Not far (500 meters) from here, at site 36 of the M30 motorway, excavations revealed parts of a single layered Füzesabony settlement of which only some pits remained (Fischl et al. 2011; Fischl et al 2012) (**Fig. 15.**). On the ploughed surface between the two sites not even a single artefact could be collected. Without more detailed investigation, it cannot be decided if the situation encountered equals a 'tell'/satellite relationship or if we see an external part of a single settlement expanding in time.

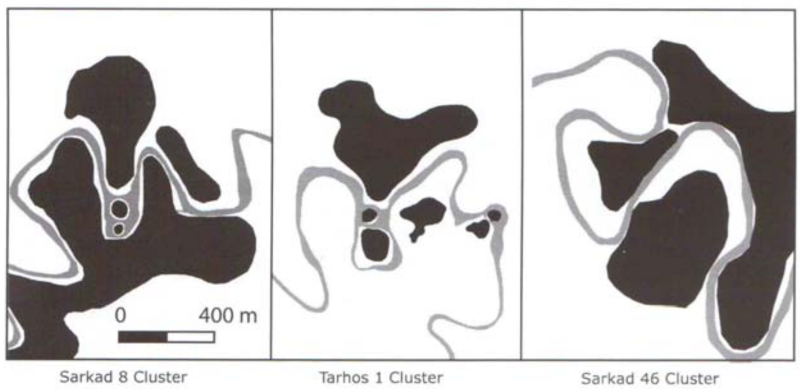

Fig. 14.: Bronze Age Settlement clusters from the Körös Region after Duffy 2014, Fig. 9.7.

14. ábra: Bronzkori településklaszterek a Körös vidékéről (Duffy 2014 Fig. 9.7 alapján)

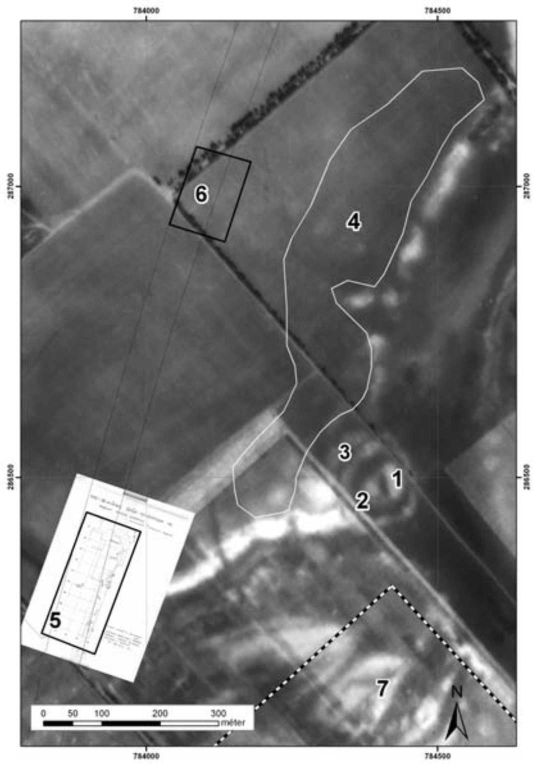

Fig. 15.: Archive aerial photography of Emőd-Karola szőlők and M30/36 site

15. ábra: Archív légifotó Emőd-Karola szőlők és M30/36 lelőhelyekről

It is clear, however, that the site of Tard – Rét-oldal (situated 2.5 kilometres away from the composite settlement of Tard-Tatárdomb) is a separate settlement. During the systematic field research carried out in the valley of the Lator stream finds from Füzesabony times were collected at this precise location of a multi-period, waterfront site (Kleszó 2014).

As a result of the research conducted so far, apart from the ones described above no further open settlements are known in this region that would allow the reconstruction of a multi-level settlement system consisting of tells and open settlements as it is well known from other Bronze Age micro-regions (Szeverényi & Kulcsár 2012). Instead, an alternative 'network' can be described, which consists of a fairly densely settled 'composite' village with a multi-layer, tell-like core and surrounding open settlement on the one hand, and a smaller number of structurally similar, proper tell sites with an external, plain settlement unit on the other.

These settlements are located on the shores of streams, following each other at a distance of 5 kilometres in average. This kind of spatial distribution is well-demonstrated in the valleys of the Lator, Csincse and Rigós (Énekes) streams, along the Tisza and the Hernád rivers (Fischl & Rebenda 2012b) as well as in the Szerencs Stream Valley (Bakos & P. Fischl in press). As our work is still in its initial stages, there are several blind spots in the system along the Hejő and Sajó Rivers. However, settlements from this region are mentioned in the 1968 site list of Nándor Kalicz. Although they could not be (re-)identified to this day, their exploration is still in progress.

On the basis of the geophysical survey, the size of the houses found both within the internal and the external residential areas is identical. The two-aisled buildings are typically 10-16 meters long and 4-6 metres wide. The surface finds at Tard did not indicate any difference between the inner and the outer part of the site either in the quality of the artefacts or in the distribution of the special findings (fragments of miniature clay axes and wheel models) (Fischl et al. 2014). Thus, currently a hierarchical explanation for the separation of the inner and outer residential areas cannot be supported.

The defensive role of the deep and wide trenches enclosing the inner, multilayer core of the sites is unclear due to the small size of the inner space, and because the external settlement zone was actually located at a higher altitude than the core in some cases. For the time being a broadly speaking demarcating function of the ditches appears more likely than strictly defensive needs.

At the current state of research, both tell-like sites and proper tells seem to rank on the same level of importance and to have functioned along broadly the same lines. For example, traces of local metal production (moulds, nozzles, melted bronze droplets) have been revealed at every site investigated by metal detector survey so far, and the position occupied by both kinds of settlements in the contemporaneous landscape seems to corresponds to the same pattern.

Case Study: Tiszabábolna – Fehérló-tanya

The following case study presents the non-destructive research carried out at Tiszabábolna – Fehérló-tanya, a site slightly different from those demonstrated above.

The site is located on an island, created in the Bronze Age by cutting off a former bend of the Csincse stream. The size of the island is 140x100 metres (Kalicz, 1968, 118, 134). Due to groups of trees and bushes on the outer edge of the island our study area covered only 0.5 hectares. This most likely corresponds, however, to the space available for settlement during the Bronze Age because of the flatter coastal relief of the remaining parts (**Fig. 16.**). The area of the island is thus broadly identical in size to the tell-like nuclei of the settlements mentioned above.

Fig. 16.: Photo of the island of Tiszabábolna-Fehérló-tanya

16. ábra: Tiszabábolna–Fehérló-tanya bronzkori településének fényképe

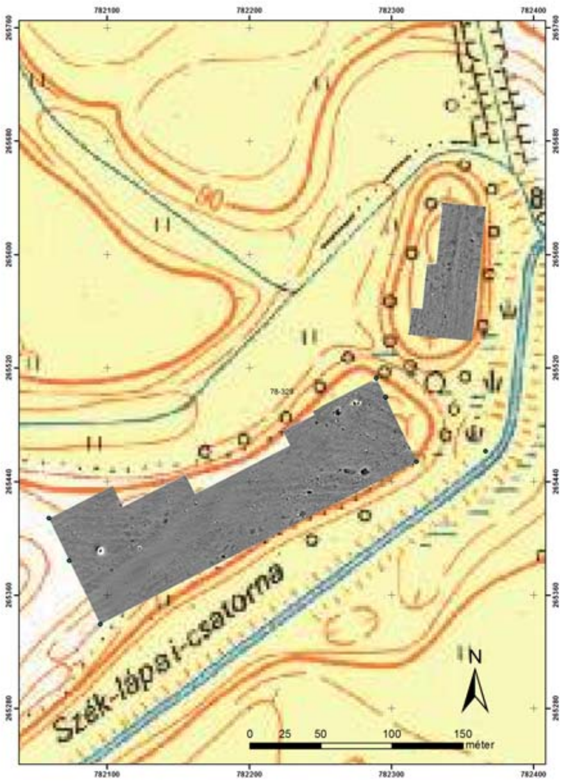

Fig. 17.: Magnetometerdata of Tiszabábolna-Fehérló-tanya

17. ábra: Tiszabábolna–Fehérló-tanya geofizikai felmérésének képe

Based on the previously described basic settlement scheme, it was assumed that we may find traces of habitation in the outer part of the settlement just in front of the ditch cutting off the bend and inner section of the site. As this area is covered by grassland, we scarcely found any Bronze Age find material (only some of them in boar rootings) during our field survey. The geophysical survey, too, failed to reveal any information concerning either the inner or the outer segment of the settlement, i. e. the magnetogram did not produce any anomalies that may be interpreted as archaeological features (**Fig. 17.**). The entire inner area of the island is cultivated and had been deep ploughed shortly before the survey. As a result, patches of yellow soil could be observed at several spots that were interpreted as traces of subsoil turned off by the plough. If this is true, the cultural layer remaining at the site is only about a single plough track deep (around 30 cm). This means that basically the entire archaeological stratigraphy had already been destroyed, which may have caused the inefficiency of the geophysical survey. However, the results of the systematic surface artefact collection provided a lot of complementary information about the use of the island/inner part of the settlement.

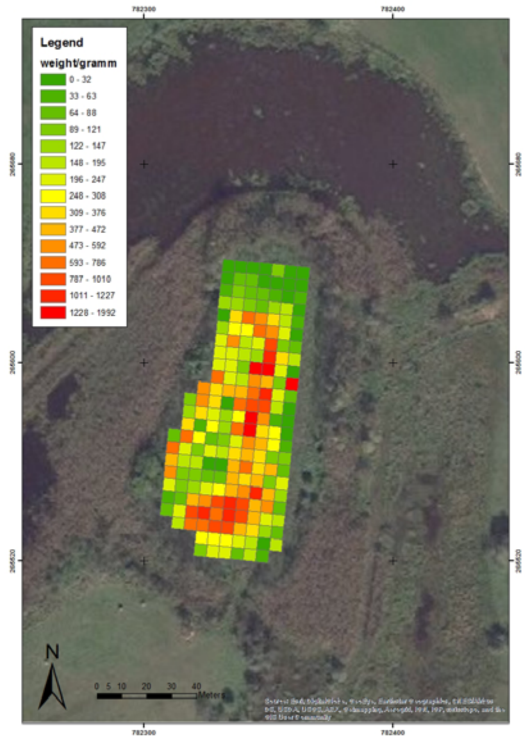

Fig. 18.: Distribution of ceramic weight collected in the survey on the insel part of the Bronze Age settlement in Tiszabábolna

18. ábra: Kerámialeletek súlyának eloszlása Tiszabábolna–Fehérló-tanya lelőhelyen

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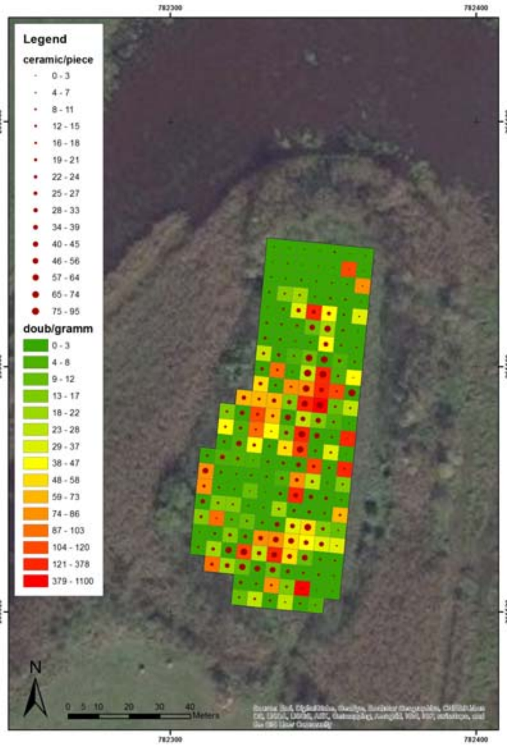

Fig. 19.: Disperse of mud-flake weight and ceramic (piece) in Tiszabábolna

19. ábra: Kerámialeletek darabszánák eloszlása a paticsleletek súlyának eloszlási ábrájára vetítve. Tiszabábolna–Fehérló-tanya

Fig. 20.: Disperse of stone weight and portable hearth projected on the mud-flake dispersion in Tiszabábolna

20. ábra: Kőanyag és hordozható tűzhelyek eloszlási értékei a paticseloszlásra vetítve.

Tiszabábolna–Fehérló-tanya

Based on the ceramic material from the topsoil, the island has been inhabited both in the Hatvan and in the Füzesabony periods. The distribution of the pottery according to the number and cumulate weight of the sherds showed outstanding values in two foci (**Fig. 18.**). There was a significant amount of burned daub and relatively intact grindstones lying on the surface. Overlying the distribution of burnt daub and ceramic fragments confirmed our notion that small groups of houses consisting of maybe two buildings only stood at these two spots within the island (**Fig. 19.**). The grindstones and fragments of portable stoves concentrated around the find concentrations interpreted as house clusters (**Fig. 20.**). This may indicate a slight displacement of the finds caused by ploughing. Alternatively, some household activities like grinding grain, baking or cooking were located directly around the houses or along the walls.

The metal detector survey of the entire area of the island revealed a Copper Age dagger, a medieval knife handle end, a three-riveted triangular bronze dagger and several metal droplets. Archaeometallurgical investigation of the objects has not been carried out yet. The presence of the bronze droplets may indicate local bronze casting. The triangular dagger is heavily worn, and had been shortened by use and re-sharpening. This kind of bronze artefact is the most common type of daggers during the Early Bronze Age 3 period, but it was still used during the Middle Bronze Age. However, the late copies were generally produced with a central rib added to the blade. Furthermore, similar daggers have been found by metal detector survey at the composite settlements of Mezőcsát-Laposhalom and Tiszakeszi-Szódadomb (P. Fischl et al. in press).

Fig. 21.: Wave band decorated bone fragment from Tiszabábolna-Fehérló-tanya

21. ábra: Hullámszalag díszítésű csont tárgy töredéke. Tiszabábolna–Fehérló-tanya

Another unique find worth emphasizing is a fragment of a secondarily burnt bone object decorated with carved ornaments (**Fig. 21.**). The wave band decoration of the object is the most common motif of the Carpathian Bronze Age, based on which it can be classified into the group of finds connected to horse equipment or insignia of rank belonging to elite warriors fighting on horseback: cheek-pieces of horse-harnesses, discs, and pyxides or handle-shaded cylindrical objects (David 1997, 2007). As the size of the fragment from Tiszabábolna is very small, its original shape and function cannot be reconstructed.

A parallel to the situation at Tiszabábolna – Fehérló-tanya may be found in the Bronze Age settlement located at Onga – Heinlein-tanya which structured similarly to the site of Tiszabábolna. At Onga the dissection of the sharp river bend could not be observed as the land owner had already levelled the multi-layered settlement mound. The spread soil made further investigations impossible (P. Fischl & Rebenda 2012b). The tell site with an outer settlement at Borsodivánka-Marhajárás is situated in a different setting, however, it is also surrounded by water. According to the results of the geoarchaeological survey of Szakáld, it is clear that the ditch enclosing the tell settlement was filled with water while the settlement was in use. Given this variability, it seems inappropriate to define a separate, island-like type of Bronze Age tell or tell-like sites. The dimensions of the settlement at Tiszabábolna – Fehérló-tanya, too, correspond to those of the inner core parts observed on the other sites on the Borsod plain discussed above. Based on the systematic surface survey in the island's inner part, it is still possible that despite the negative geophysical results, the inhabited area of Tiszabábolna in fact extended west out of the island, in accordance with the general layout described above. Unfortunately, due to bad preservation the pollen material from core sampling of the Bronze Age settlement's ditch did not provide any conclusive results.

The animal bones recovered by surface survey at Tiszabábolna – Fehérló-tanya are highly disarticulated and the shells are always fragmented. This is confirmed by the physical length of these findings: 53% of them are shorter than 5 cm, 42% is sized between 5-10 cm and only 5% of the find material is at least 10 cm. The undeterminable fragments are mainly the ones with a length less than 5 cm.

From the moderate amount of the assemblage consisting of 1225 pieces, 907 pieces could be determined as animal bones, 316 pieces as shells and 2 pieces as snails. The total amount of determinable bones were 673 pieces.

The distribution of animal bones according to the species is the following:

Domestic animals: cattle (*Bos taurus* L.) 372 pcs. (55.27%); sheep, sheep/goat (*Ovis aries* L.; *Caprinae* G.) 151 pcs. (22.44%); domestic pig (*Sus domesticus* Erxl.) 65 pcs. (9.66%); horse (*Equus caballus* L.) 27 pcs. (4.01%); dog (*Canis familiaris* L.) 8 (1.19%).

Hunted species: red deer (*Cervus elaphus* L.) to 25 dB (3.71%); European roe deer (*Capreolus capreolus* L.) 9 pc (1.34%); wild boar (*Sus scrofa* L.), 2 (0.3%); aurochs 1 (0.15%) (*Bos primigenius* Boj.); hare (*Lepus europaeus* P.) 1 (0.15%); rodent (*Rodentiae* sp.) 1 (0.15%). Domestic pig or wild boar: 7 pc (1.04%).

Most of the animal bones belongs to domestic animals: 623 pcs., 92.57%. A number of species had been hunted, but the amount of their bones are rather small, only 43 pieces in total, 6.39%. The most common species was cattle followed by small ruminants, domestic pigs and horses. The most frequently hunted species was the red deer, but roe deer and wild boar bones have also been found in smaller quantities, while the number of aurochs and hare bones was only 1-1.

Among the cattle bones young and adult individuals could be identified almost in equal amount. The youngest calf was less than 1 year old. The cumulate proportion of small ruminants was 22.44%: 7 finds belonged to sheep, and 144 fragments could be determined as sheep/goat. Among the determinable bones, pieces deriving from two very young individuals were found, one of them was only half year old, the other was slightly younger than 1 year old. Some of the finds referred to the presence of animals died at a nearly adult (subadultus) age, while more fragments belonged to adult individuals (more than 3.5 years old). Apart from domestic pig bone fragments some fragments (7 pieces) belonged to domestic pigs or wild boars (indefinite). These two species crossbreed easily in nature as well: based on the bony remains, several individuals with transitional size and indeterminate traces of racial identity can be observed even in the medieval assemblages. A joint age distribution of domestic pigs could be observed as juvenilis, juvenilis/subadultus, subadultus and adultus individuals could all be inferred. The single adult individual was female. Relatively little horse bones were found within the survey area, the remains suggest the presence of young and adult individuals either. Based on an entire metacarpal bone (metacarpus III.), the shoulder height of this adult individual was 138-140 cm, so it was medium-sized (Kiesewalter 1888; Vitt 1952).

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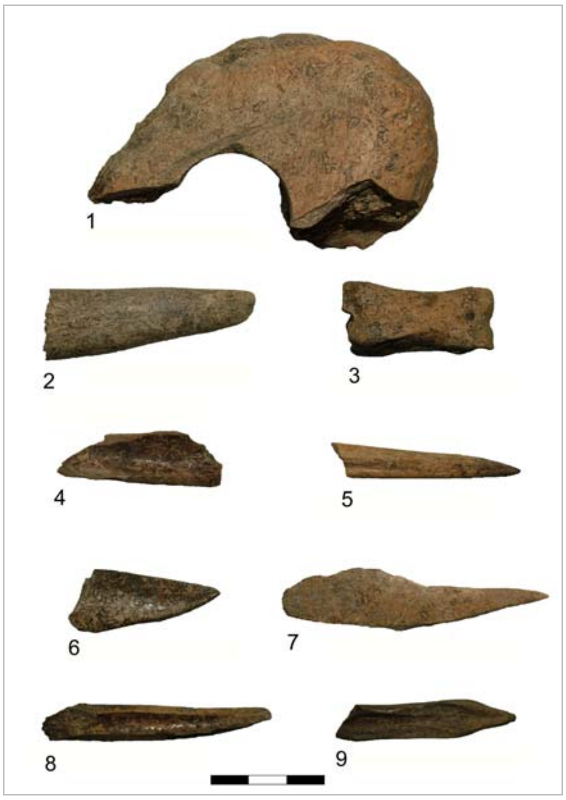

Fig. 22.: Bone tools from Tiszabábolna-Fehérló-tanya

22. ábra: Csonteszközök Tiszabábolna–Fehérló-tanyáról

The dog bones derived from an adult, non-elderly individual. The presence of this species was also suggested by some bones with traces of chewing by dogs.

Not only bones, but fragments of antlers used as a raw material for tool production have also been found among the red deer finds. Despite a larger amount of the bones of this species compared to other species hunted, only one adult individual can be assumed. The chased red deer must have been transported to the site unprocessed which is indicated by the presence of meatless dry limb bones and bones remaining in the skin.

In terms of the number of bones, the second most commonly hunted species was the roe deer, however, the investigated remains allow us to reconstruct a greater number of individuals than the red deer bones: some bones of either a nearly developed or an adult individual could be identified. Only bones were found, antler fragments were missing from the assemblage, so the hunting of this species is unquestionable. Hunt of wild boar, aurochs and hare was confirmed by only a few findings. Among the bog turtle remains, only tortoiseshell fragments were found. An insufficiently determinable rodent jaw fragment derived from an adult individual. As the find was revealed by field survey instead of archaeological excavation, there is a chance for it is a recent object.

Larger quantities of mussels and 2 pieces of calcareous snail shells were collected. The snail shells may be recent findings, but the mussels were definitely collected and consumed by Early Bronze Age people. Most of the 316 mussel shells are fragmented, including very small pieces too. They were neither processed nor burned.

9 pieces of bone and antler tools could be found in the assemblage: 2 pieces made of antler, 7 pieces made of bone. A handled axe or hoe was made of red deer antler (H: 82 mm). Place of the handle can be clearly seen, the tool is extremely worn by usage at the rose tree of the antler so it may have been used for ramming (**Fig. 22/1.**). Red deer antler was the raw material of the fragment of a chisel-like tool as well (H: 53 mm) (**Fig. 22/2.**). An object was made of an intact first phalange of a domestic pig (H: 37.6 mm). The lower part of its back side was worn. However, made of a ruminant phalange, a similar tool has also been found at the site Mezőcsát-Laposhalom (**Fig. 22/3.**). A bright, slightly pointed end of a 42 mm piece of a sheep/goat tibial diaphysis may be defined as an ad hoc tool. It can be interpreted as a tool just because of its shiny surface (**Fig. 22/4.**). A pointed tool was made of a dog cubit by sharpening it on one end (H: 48 mm) (**Fig. 22/5.**). Two pricker tools made of large ruminant bones could be found within the assemblage. One of them is made of a long bone (H: 38 mm) (**Fig. 22/6.**), and the other of a flat bone (H: 68 mm) (**Fig. 22/7.**). Of the diaphyses of small ruminant long bones, two tools were made. One of them is a bone chisel (H: 62 mm) (**Fig. 22/8.**) and the other one is an object pointed at one end with a worn/polished side (H: 47 mm) (**Fig. 22/9.**).

Summing up, a moderate assemblage of animal bones consisted mostly of cattle remains, followed by bones of small ruminants, domestic pigs and horses. Remains of hunted species could also be identified: all prehistoric big games of the Carpathian Basin (red deer, roe deer, wild boar, aurochs) and even small games (hare, marsh turtle) had been chased. Despite the proximity of the Tisza River, fish remains have not been recovered, however, it is clearly due to the survey method (surface artefact collection).

Within a particular area, in squares 1B6-1B7-1A6-1A7-1A8-3J8, animal bones were present in a greater density than at the rest of the site, however, outstanding results concerning specimen or anatomical analysis could not be achieved. Although the geophysical survey in these areas did not show any archaeological features, burnt daub, pottery fragments, portable stoves and stones were found here in somewhat larger quantities than at other parts of the site too.

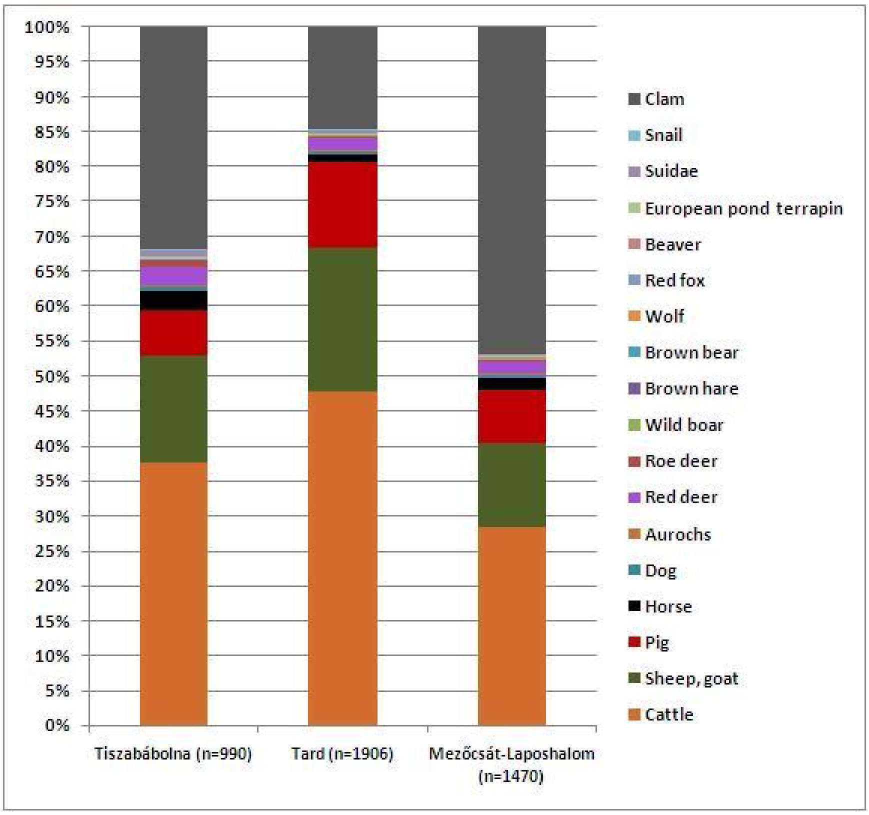

Fig. 23.: List of species from Bronze Age sites

23. ábra: Bronzkori lelőhelyek állatcsontanyagának eloszlási diagrammja

	Cattle	Sheep	Sheep or goat	Pig	Horse	Dog	Aurochs	Red deer	Roe deer	Wild boar	Brown hare	Suidae
Antler								5				
Horn core	5	1	1									
Cranium	9			3		1		1				1
Maxilla	2			2		2						
Jaw (Mandible)	25		10	10	1	1		1	2			2
Tooth	19		18	6	6							
Atlas	2											
Axis	2				1							
Cervical vertebrae	6				2							
Thoracic vertebrae	3											
Pelvic vertebrae	9		2			2						
Costa	43		2	4	1			6		1		1
Scapula	11		2	3								
Humerus	17	5	8	6					1	1		
Radius	12		16	2	1	1		1	2			
Ulna	9			4		1						
Carpus	4				1							
Metacarpus	12		6	1	2			1				1
Pelvis	8		5	2								1
Femur	18		15	3	1			1	1			
Patella	1											
Tibia	19		20	11	1			1	1		1	
Fibula												
Astragalus	6		2	2	2			2				1
Calcaneus	12		1					1				
Tarsus	3		1					1				
Metatarsus	26	1	10	1	2			3	1			
Metacarpus/metatarsus	7			2								
Phalanx I	12		1	2	2			1				
Phalanx II	6				1		1		1			
Phalanx III	4				3							
Long bone	60		24	1								
Total	**372**	**7**	**144**	**65**	**27**	**8**	**1**	**25**	**9**	**2**	**1**	**7**

Fig. 24.: Anatomical distribution of bone finds

24. ábra: A Tiszabábolna– Fehérló-tanyai állatcsontanyag anatómiai megoszlása

The results of archaeozoological analysis are similar to those concerning the animal bone assemblages of Mezőcsát-Laposhalom (Tugya 2015) and Tard-Tatárdomb. In the case of domestic species, the order of frequency is the same, the quantity of hunted animal remains similarly low, although the site of Tard is specified by a greater species abundance (P. Fischl et al 2014, 361-367). Collecting mussels is characteristic to all the three sites, however, burnt tortoiseshells were also found at Mezőcsát (**Fig. 23.**). The anatomical distribution of the bones can be see on **Fig. 24**.

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