

Results of the geophysical survey in the swamp fortification of the Gáva culture at Căuaş-Sighetiu in the Ier Valley, North-Western Romania

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Due to its dense occupation and the good preservation of its sites the Ier valley in north-western Romania offers ideal conditions for the study of long-term trends in Bronze Age land-use and settlement organisation. This paper is a preliminary report on collaborative archaeological fieldwork of the Muzeul Judeţean Satu Mare and the Institut für Archäologische Wissenschaften, Ruhr-Universität Bochum, that is carried out on Bronze Age settlements of Ier valley. In five survey campaigns, so far, the fortified settlements of the Late Bronze Age Gáva culture at Căuaş-Sighetiu (*Sziget* in Hungarian) and at Andrid-Corlat (*Korlát* in Hungarian) as well as tell sites of the local Early to Middle Bronze Age were examined¹. The Late Bronze Age or Urnfield period site of Căuaş-Sighetiu reported on in this paper was only superficially known from previous archaeological surveys. The current archaeological research is based mainly on aerial photography, topographical measurements and magnetometer survey that provide important data both on the intra and off-site level². By these methods new information on the fortification system of the Căuaş site as well as on the extent and the intensity of habitation in the settlement has been obtained. Based on such intensive survey techniques the joint project reported on will seek to develop a better understanding of the dynamics and the development of Bronze Age settlement patterns in Ier valley by extending the intensive survey programme to neighbouring sites of this microregion including their wider 'off-site' surroundings. An increasingly closer coverage of the Early to Middle and Late Bronze Age sites of the Ier valley micro-region is aimed at.

Natural environment

The Ier valley is approximately 80 km long and is situated between the Someş and Criş rivers, which are tributaries of the Tisa river (Fig. 1). Although the discharge of the river is currently low, the stream flows through a wide valley (8–15 km) which actually is an old tectonic ditch. The valley used to be very swampy. Before the extensive works of water drainage from 1963 to 1965 it could only be crossed along a few routes. The valley is bounded by terraces c. 10–20 m high that communicate to the southern Tăşnad hills and the plateau of Carei to the north respectively. Pollen analyses have provided important information about the swampy character of the valley during prehistory as well³.

Human settlement in the Ier valley, such as the sites presented here, existed but on a few islands that were inhabited during certain periods in prehistory only. On the other hand, the borders of the valley throughout prehistory and history were densely inhabited, and human settlement concentrated especially along the fringes of high terraces⁴. The number of settlements located in this zone by far exceeds that from the wider surroundings to the south and north, i. e. on the Tăşnad hills and on the plateau of Carei. Comparable numbers of settlements can be found at the border of the Ecedea marsh or along some other river valleys (Someş, Barcău). No doubt, the intense habitation along the Ier valley was influenced by the variety of resources, that people could draw upon from the interface area between the marsh ecosystem and the neighbouring plateau and hilly areas. The favourable conditions to agriculture, which parts of the open lowlands provided in particular for plough agriculture on the softer soil along the border of the marshes, were accompanied by those favourable to animal husbandry. Water plants from the marsh

¹ See Marta et al. 2010.

² See also the results of geomagnetic surveys that were carried out at a small number of other Middle and Late Bronze Age sites: *Túrkeve-Terehalom* (Csányi/ Tárnoki 1996, 31–40), *Héhalom-Templomdomb* (Bácsmegi/ Sümegi 2005, 169–170) and *Corneşti-Iarcuri* (Heeb/ Szentmiklosi/ Wiecken 2008, 179–188).

³ Bader 1978, 12.

⁴ Cf. the archaeological survey and collection of this area by J. Némethi (1990).

provided good conditions for grazing during hot summers – when grass went dry on higher lands – and especially in winter when the animals had the possibility to graze the tall grass that was preserved under the snow⁵. The hilly area and the high plain with forested or steppe zones also offered good conditions for the practise of cattle and pig husbandry. The contact area between the different topographic formations supplied materials such as reed, twigs and soft timber (poplar, osier) for building and construction as well as for the practice of various crafts such as the production of wattle, containers, fish and animal traps or fences. It also provided the possibility of hunting various animal species and fishing⁶. The possibility to take advantage of different ecosystems seems to be the reason for intense habitation in the border area of the Ier Valley over time. Using a wide range of resources provided not only a diversified diet and prosperity to the communities in the area, but also the possibility to overcome (or sometimes survive) catastrophic events or natural phenomena that could affect either one of the food resources: drought or rainy periods, insect invasions, diseases that affected animals.

The subject of this paper is the fortified settlement of Căuaş-Sighetiu, that we hope upon closer archaeological examination will help to illustrate the ways in which communities in the area were trying to take advantage of the favourable conditions provided by this natural setting. By locating their fortifications on islands surrounded by water and marshes, topography also provided protection in situations of conflict, or it may have emphasized a sense of identity vis-à-vis communities on neighbouring terraces.

The Late Bronze Age settlement of Căuaş-Sighetiu

The Gáva site of Căuaş-Sighetiu is located in the upper part of the Ier valley at a distance of some 15 km from the river Crasna further east (Fig. 2). The site is situated on a roundish island in the marshland south of the river Ier that rises above the surrounding floodplain to a maximum height of some 2 m. Căuaş-Sighetiu can be identified on aerial photographs and satellite images that also show the existence of old river beds in its surroundings (Figs. 3 and 4). The topographical measurements show that the site covers an area of about 58 ha and its perimeter is about 3030 m (Fig. 5). At least along parts of its perimeter the settlement was defended by a wall and ditch that are still visible on the surface. The settlement at Căuaş was identified in the 1970s by surface finds⁷. In the close vicinity of the site a gold treasure dating to the Late Bronze Age was recovered⁸. Some small-scale surveys were carried out inside the settlement by T. Bader in 1977, by N. Iercoşan in 1996 and by J. Némethi in 2001⁹. During the latter campaign, that focused on an area crossed by a water drainage canal, J. Némethi observed the existence of a ditch and a defence wall on the western side of the site. According to the pottery finds from the surface large parts of the original island were inhabited, although, of course, from the surface finds alone it is difficult to tell if all settlement activity actually was contemporaneous. So far archaeological traces are missing only from some of the lower parts of the site, which in spring in particular are wet and prone to be flooded. The archaeological material collected from the surface by the authors of the present study date to the Gáva II phase and match the materials that had been previously reported. Geophysical survey was carried out on different parts of the site in 2008, 2010, 2011 and 2012 (Fig. 6), initially by use of a fluxgate gradiometer (Bartington Grad 601) and subsequently by a multiple Foerster type magnetometer system (Sensys Magnetoarch). During the first campaign in May 2008 a small-scale preliminary magnetometer survey only took place on the western periphery of Căuaş-Sighetiu in order to test the potential of geophysical survey on the site. Subsequent work in October 2010 focused on

⁵ Even nowadays flocks of sheep are still driven to the Ier valley from southern Transylvania for grazing in winter

⁶ Archaeozoological studies were carried out on the Early and Middle Bronze Age bone material from three tell sites in the Ier valley and one at the confluence of the Ier valley with the Crasna valley (Carei-Bobald). The proportion of wild animals/game is as follows: 35.74 % at Săcuieni-Cetatea Boului, 13.78 % at Otomani-Cetatea de pământ, 26.25 % at Sălcea-Dealul Vida and 21.6 % at Carei-Bobald. Cf. Bader 1978, 111; El Susi 2002, 252.

⁷ Némethi 1982, 48–49; 1990, fig. 21/1–9; 1999, 19.

⁸ Popescu 1975, 43–509.

⁹ cf. Iercoşan 1997, 9–10; Némethi 2002.

the eastern part of the settlement where both the perimeter of the original island (fortification?) and stretches of the inside area (settlement?) were examined. In the course of this work both the existence of a fortification and settlement remains could be confirmed. Finally, in April 2011 and 2012 respectively a larger area in the centre of Căuaş-Sighetiu was surveyed in order to gain information on the size of the settled area and its internal organisation.

Results of the geophysical survey I: Site periphery and fortification

There is surface evidence for the existence of a fortification system along parts of the outer periphery of Căuaş-Sighetiu only (see above). The geophysical results may be taken to suggest that most if not all of the original island was indeed fortified at some stage in prehistory. However, it is difficult to tell if all elements of that „fortification” actually coexisted at the same time and if the same elements – for example a wall and ditch – were in fact present along the entire perimeter of the site, that is all around the (present-day) elevation of the (former) island.

So far the best evidence for the existence of a fortification comes from the north-eastern periphery of Căuaş-Sighetiu (Fig. 6). There is a linear dark feature in the magnetometer plot of this area (i. e., a positive magnetic anomaly in the 3 nT to 7 nT range) that most likely corresponds to a fortification system running in north-west to south-east direction through the magnetometer survey area for 160 m (Fig. 7). However, the precise construction of this fortification is only incompletely understood from the magnetometer data. From the shade plot one gets the impression that towards the east there may have been a bi-partite construction (i. e. an interruption of the positive anomaly mentioned above by a whitish negative one in the c. -3 nT to -5 nT range), while in the western part of the area examined there is only one, rather stronger dark (i. e., positive) anomaly. Possibly, these correspond to a system that consisted of a wall and ditch (see below), but the reasons of the differences observed are unclear. Maybe there was a change in construction details, differences in the conservation of the structure or we are dealing with different phases. Alternatively, since in between both parts there is a slightly lighter (i. e., more negative) area it is possible that by pure chance we hit on a gate area here. It is possible, but certainly not proven, that the existence of some kind of bridge or bank is the reason for the different layout of the ditches on either side. Further unclear details include a line of rather strong round dark (positive) anomalies (c. 9 nT to 18 nT) with surrounding white (negative) shadows (c. -7 nT to -9 nT) that seem to accompany the eastern section of the fortification on its inner side. Towards the west there is no direct match but only a slight light shadow. It is unclear whether this finding relates to differences in construction details of the inner part of the fortification such as a wall or palisade. As mentioned above, the fortification in this section is situated on what would seem the original brink of the island occupied by the Căuaş settlement. Some rather large positive features (c. 8 nT to 12 nT) some 10–15 m outside to the north are located in what today is a swampy area unfit for occupation. Their origin and interpretation need to be clarified by future work. Inside the fortification, on the other hand, a large number of pottery sherds is to be found on the surface. They clearly correspond to the presence of a number of positive anomalies (c. 7 nT to 12 nT) in the magnetometer data that are caused by pits etc. Thus, settlement activity in this area is confirmed, but there are no clear house structures such as those that can be identified on other parts of the site (see below).

In order to confirm this interpretation the County Museum of Satu Mare carried out a small-scale excavation in August 2011. A trench of 39.5 x 1.5 metres was excavated, starting on the inner side in the inhabited area, cutting the fortification system in its eastern bi-partite part (see above), and finally reaching the exterior area of the site. In the position indicated by the geomagnetic survey it was possible to identify a complex stratigraphy that possibly corresponds to the remains of a fortification wall. Starting from the outside of the settlement there is a layer of yellowish clay, c. 4–5 metres long and gradually becoming thicker until it reaches a height of still 55 cm. Further inside the yellow layer stops and is replaced by a blackish layer, with yellow and reddish pigments. This layer contains pigments and some isolated archaeological materials; it can be considered as the filling material of the wall. The positioning of the darkish soil towards inside the settlement and that of the clay toward outside can

be explained through their closeness to the extraction places: the dark soil (humus) from inside the settlement, and the clay from outside. On its outside there is, in front of the wall, a ditch or a pit clearly visible in both profiles, with a width of c. 3.2 metres. Even if its depth is not big, its tract parallel with that of the wall and its very soft infill may suggest the interpretation of this feature as a ditch. However, its limited width of 3.2 m and its limited depth are elements that do not sustain a strong defensive role of this feature. It seems more likely, therefore, that the ditch was built only for extracting the earth used for the construction of the wall. In fact, there are indications that the ditch was dug sometime during the lifetime of the settlement, possibly in connection with a re-building of the wall.

Interestingly, none of the above features thought to relate to the presence of some kind of fortification is directly matched in the magnetometer data from other parts of the site. The adjacent survey areas are located at distances of just some 100 m to the north-west and some 200 m south-east of the one discussed above (Fig. 6). The northern periphery of Căuaş-Sighetiu was covered by geomagnetics in spring 2012 (Fig. 8); the eastern stretch had previously been surveyed in 2010 (Fig. 9). Due to the vegetation at the time of our fieldwork in the eastern area the magnetometer survey covered just two long but rather narrow parallel stretches 20 m and 40 m broad respectively (Fig. 10). The work in both areas was mainly targeted at the presence of settlement remains on the northern and eastern part of the site (see below). But in both cases the area examined clearly extended beyond the boundaries of the present-day elevation of Căuaş-Sighetiu and into what still is a marshy area (Fig. 11; see, for example, dummy values at the eastern end of the magnetogram in fig. 9 where the survey had to stop due to increasing wetness).

Along both the northern and even more so along the eastern boundary of the island there are just some rather diffuse darkish (positive) patches. The values obtained tend to be weaker than those discussed above. In the north there is at least along a part of the survey area the indication of an alignment into two darkish lines (c. 2 nT to 3 nT, occasionally 4 nT) divided by a lighter (negative) one in the c. -0.5 nT to -1.8 nT range (Fig. 8). In the east it is difficult to identify any such feature with values in the c. 0.5 nT to 2 nT range, rarely 3 nT (Fig. 9) – but mind the problems with the recognition of such patterns in small survey areas like this. Certainly, however, there are no anomalies directly corresponding to those discussed above. It is possible that such weaker anomalies correspond to subterranean archaeological features. However, if on the northern and in particular on the eastern periphery there was a fortification like that postulated above this would require either of the following assumptions: first, the conservation of the (northern and) eastern „wall” and „ditch” is much worse and/or both were buried underneath a much greater amount of sediment; second, the material used for the construction of the „wall” was different; and – a related point – third, the fortification’s „history” in terms of the processes involved in its abandonment and the backfilling of the ditch was different from the adjacent north-eastern part of the site. Differential impact of (historical and modern) agriculture on the conservation of archaeological features is possible, of course. On the other hand, differences related to their depth and the amount of covering topsoil are unlikely given the topography, i. e. the location of the site in an entirely flat area. Differences in the materials used cannot be ruled out, of course, although one would expect these to be of limited importance if the fortification was planned and carried out within a limited period of time. Finally, differential formation processes should certainly be considered; they may involve, for example, the burning of the „gate area” and much burnt material (high susceptibility = strong positive anomalies) in the infill there. However, it is up to excavations and/or drilling programmes to see if such a „historicist” interpretation holds true.

Similar problems apply on the southern periphery of Căuaş that was surveyed in spring 2011 (Figs. 6 and 12). Here the boundary of today’s island corresponds to a faint light (negative) anomaly in the c. -1 nT to -3 nT range. Unlike the east there is at least a clear linear pattern since the anomaly can be seen running along the island in the magnetometer survey area for more than 250 m. Again, different interpretations of our findings are possible: different building materials may have been used, or the material backfilled had different magnetic properties (see above). However, another possibility should also be considered: given that a fortification is likely in the northeast and well defined in our

magnetogram, it is possible that the different anomalies observed on the eastern and southern boundaries of the site stem from some other origin. One such reason could refer to complex processes of erosion in the past, when the whole area was frequently flooded, and the deposition of sediment along the brink of the elevation on which Căuaş-Sighetiu is situated. The fact that we have to expect some geomorphological dynamics in a riverine environment like this is most obvious from both the eastern and the western survey area: in the east there are strong anomalies caused by buildings and other settlement remains (see below) that extent right to the edge of today's elevation and the „fortification” anomalies discussed above.

In the western survey area (Figs. 6 and 13) – alike the east and south – the magnetometer results do not provide clear evidence of a fortification. There is, however, in this part of the site clear evidence of geomorphological dynamics, i. e. signals caused by old river beds or rather frequent flooding of the area in question (Fig. 13; see also below in relation to settlement structure). Hence, clearly we have to consider that a part of the original island was lost by erosion (see Figs. 4 and 5 for old river beds in the surroundings and today's elevation/island). Consequently, if there was a continuation to the fortification still seen the north-eastern boundary around the entire settlement, it may in other parts have been either destroyed, or – given sufficient depth of a postulated ditch – it may have been buried somewhere out in today's swamp with its upper part lost. Clearly, there are limitations to geophysical survey in these matters, and a drilling programme as well as small-scale excavations by the County Museum of Satu Mare are underway to shed more light on the details of the fortification at Căuaş.

Results of the geophysical survey II: Settlement remains in the interior

Even more interesting than the question of fortification is the high quality of data regarding the internal organisation of such Gáva sites that is available from Căuaş-Sighetiu. In total, an area of some 22 ha inside the settlement has so far been covered by geophysical survey (Fig. 6). Our results are preliminary with regard to the extend of the settled area. Nevertheless, some important observations can be made concerning the overall structure and organisation of the settlement that are worth reporting on.

Starting in the western part of the site, where only a stretch 360 m long and 20–40 m broad has been examined, it is quite obvious that there is no evidence of intense habitation in the magnetogram (Fig. 13). This was a trial survey in the first year 2008 of our cooperation that started on the western boundary of the site (on the suspected fortification in this area; see above) and extended well into the central western part of Căuaş, albeit in a narrow stretch only. The survey area is located in the lowest part of the site (cf. fig. 5 and 6). It is hardly elevated above the surrounding plain and turned out an unfortunate choice in terms of settlement remains. Towards the west there is evidence in the magnetometer data of frequent flooding of this area (see above), but even in the somewhat higher inside area further east there are only few discrete positive (dark) anomalies in the c. 2 nT to 5 nT range that may point to archaeologically relevant features such as settlement pits (Fig. 13). Unsurprisingly, from the small survey area there is no clear patterning, but the overall lack of anomalies differs markedly from the neighbouring central part of the site where there is evidence of intense settlement activities (see below). Among the rather few anomalies there are also some clear magnetic dipoles not orientated along the north-south axis that stem from metal/iron objects on the surface of the field rather than from archaeologically relevant features like hearths etc. No systematic surface survey for pottery has been carried out so far, but preliminary work points to a general lack of pottery finds (see above) and underlines the absence of settlement remains in this area¹⁰. Why this area should have remained uninhabited is apparent from its low altitude: if the (Late) Bronze Age situation was comparable to the modern one this area would have been wet, prone to flooding and most likely unfit for habitation. If the Bronze Age climate was different and drier than today, on the other hand, the lack of archaeological remains may also be a result of later erosion that destroyed the evidence of previous habitation in this area. This is thought less likely, but the precise reconstruction of past climate, geomorphology and site formation processes will be subject of future work.

¹⁰ This zone devoid of archaeological remains continues further east into the centre of the site (see below for discussion).

Turning to the central part of Căuaş-Sighetiu – as defined by two small roads that cross the elevation of Căuaş at a distance of c. 250 m –, the impression gained from the magnetometer data is entirely different and points to intense habitation (Fig. 14). There are numerous anomalies of different types that show clear patterning and a predominant orientation of settlement activities along the south-west to north-east axis (Fig. 15). Most obvious, of course, there are rectangular structures made up by different features that can be identified as houses by their shape and size. In some cases there are right angles and lines of more or less strong continuous dark (positive) anomalies indicative of house corners and straight walls. Another kind of structure is made up by discrete roundish anomalies aligned in rows, and it is tempting to interpret these as post holes. The values obtained from these structures differ widely from about 5 nT to 10 nT wherever they appear in lighter grey shades to values in the 20 nT to 30 nT range for dark grey or black parts up to occasional values about 50 nT. A faintish white (negative) shadow (c. -2 nT to -5 nT) may run along the walls and/or „cover” the interior of the houses. In general terms, these anomalies stem from the specific magnetic properties of the building materials used (e. g. clay and wood such as in a wattle and daub construction) and from their contrast in susceptibility from the surrounding soil. The differences in strength and corresponding magnetic visibility may be the combined result of various factors. Both (partial?) destruction by fire and construction details such as more massive walls and/or the decay of a greater amount of wood (used e. g. for different parts of houses or different house types) would have enhanced visibility by resulting in stronger positive anomalies. In case of burning an accompanying fainter whitish (negative) shadow would be due to the reorientation of iron oxide particles at higher temperatures; otherwise the faint negative anomalies inside and around houses may relate to the specific magnetic properties of either the material used to cover the floors and/or of sediment trapped in the ruins after the abandonment of the site. Partial or total destruction of house remains, on the other hand, with less building material present would have reduced the strength of the positive (dark) signal given by the walls etc. Processes involved here may include anything from deliberate clearing of the site of a house after its destruction or abandonment to more or less complete erosion of house remains already in prehistory or in consequence of deep ploughing and modern agriculture.

It is tempting to interpret the different types of anomalies in terms of different building techniques (and phases? see below), but the potentially complex formation processes involved must always be considered. Thus, more or less continuous lines of anomalies *may* refer to more massive walls, while lines of discrete roundish „pits” *could* point to postholes and wattle and daub construction. However, such differences may also relate to the preservation of individual houses and their magnetic visibility. Excavations, therefore, are necessary to be more precise on the construction details of houses at Căuaş-Sighetiu. Caution is also required with regard to another type of anomaly, namely the large number of more or less clearly visible positive (dark) anomalies not obviously related in spatial terms to the walls of houses or to the (postulated) location of house units in general. Typically, these are roundish features of variable size (c. 0.5–1 m, or occasionally more) and – like the house remains proper – of widely different strength (c. 10 nT to 30 nT or more) that one would tend to interpret in general terms as various kinds of storage and/or refuse pits¹¹. Whenever such anomalies are situated inside or around a clearly identifiable house unit it is possible that they are actually related in functional and chronological terms to the life cycle of this house and the activities of its inhabitants (Figs. 14 and 15; but see below on questions of chronology). Given the present conditions one would expect storage pits to be problematic in an environment like Căuaş, where the groundwater table stands high, and from the magnetometer data no estimate can be given on their volume, depth and true function – all of these require an excavation. When filled with burnt settlement debris such pits may give a rather strong signal, not easily distinguished from hearths that should ideally be situated inside or around a clear house structure and may develop a more clearly bi-polar anomaly. Some such hearths – located right in the middle of houses – may be present at Căuaş, but they are hard to tell apart from general „pit” anomalies and there certainly is no clear evidence so far of furnaces or other „industrial” installations. In systematic terms of geophysics such „pits” often

¹¹ e. g. Kienlin et al. 2010.

do not differ in size and strength from anomalies thought to belong to the walls of houses by their spatial arrangement (i. e., larger „post-holes”, see above). Since the chronological relation of such anomalies is beyond magnetometry, either of the following options must be considered: when found inside or near a house a number of such anomalies could actually belong to different building phases of a house rather than being storage or refuse pits related to it in functional terms. On the other hand, whenever such „pits” are found away from clearly identifiable house units, which is the case in some parts of the survey area at Căuaş, they may themselves indicate the location of a house – either by providing evidence of storage etc. or by actually being architectural remains. In this way the occupation at Căuaş-Sighetiu can be shown to have been even denser than suggested by the remains of clearly identifiable house units alone.

In Fig. 16 a tentative plan of the distribution of houses in the survey area is given, based on the above outlined principles of identifying building remains in the magnetometer data. In the central area of the site there are at least 170 house units, whose general location and orientation is thought secure although details in the „reconstruction” of some houses remain unclear. Thus, some house units are depicted with internal walls, while in fact these may be separate phases of houses that were enlarged or reduced in size by rebuilding or adding new walls and tearing down old ones. Clearly, all the houses were rectangular in shape and most range in size from c. 4–6 m on 8–12 m. It is not suggested that there was a standard house size. However, it should be noted that some houses markedly smaller or considerably larger (typically: longer) indicate difficulties in „reading” the magnetometer data rather than provide unambiguous evidence of widely different house sizes. Some of the small ones may actually have been larger, but their precise length could not be determined from the magnetometer data, so just the minimum size was marked. And some of the large ones may actually be the remains of two separate house units, that stood close by either at the same time or during subsequent settlement phases but cannot be told apart from the magnetogram. Furthermore, both the presence of anomalies thought to relate to settlement pits (see above) and faintish white (negative) shadows that follow the general orientation of the building remains suggest that there was a denser pattern of houses than indicated in Fig. 16.

Starting in the northern part of the central area of Căuaş-Sighetiu there is the dense pattern already mentioned of houses orientated along the south-west to north-east axis (Figs. 14 and 16). Here, more clearly than elsewhere on the site one gets the impression of some small paths running along between the rows of houses. This is particularly clear where a linear darkish (positive) anomaly in the c. 2 nT to 10 nT range accompanies what is thought such a path or „road” – possibly an effect of some kind of depression (from trampling?) or a small ditch where sediment of different magnetic properties was trapped. It is difficult to tell for sure, but one gets the impression that by these paths and small open spaces certain groups or clusters of houses are set apart and defined as being related more closely than others. However, this interpretation certainly requires an excavation to establish that houses that are thought spatially related in fact are contemporaneous. Towards the north-east it is quite clear that our magnetometer survey of the central part of Căuaş-Sighetiu has not yet reached the limits of the settled area. It is supposed that the occupation continuously extended towards the area of the north-eastern „fortification” discussed above. The same possibly holds true for the north-western part of the island of Căuaş-Sighetiu. From the magnetogram it is obvious that the limits of the settled area in this direction have not been reached so far; and from the elevation as well of this part of the island – comparable to the north-eastern side – the presence of an occupation seems likely. Future magnetometer work will establish the limits of the settlement in this direction.

Occupation more or less continuously extends further south in the central area of Căuaş-Sighetiu. There are, however, two patches of ground in the middle of this central part of the site devoid of any clear traces of settlement remains (Figs. 14 and 16). They are located in continuation of the depression noted above in our discussion of the western part of Căuaş. The southernly of these areas where it is not possible to identify any clear house structures connects to a small pond that could not be surveyed because even in summer it was still wet. If today’s climate and geomorphology reflects the Bronze Age situation, it is suggested that a small stream or frequently flooded swampy area may

have divided the central part of the Căuaș-Sighetiu settlement into two. However, houses on both sides share the same general layout, and their orientation along the south-west to north-east axis is broadly the same. They seem to stand in the same broad tradition or point to the same „village” community.

A notable exception is found right south of the central „pond”, where a number of house units has a slightly different orientation with their main axis turned slightly in east-west direction (Figs. 12 and 16). As far as the evidence from our geophysical survey goes, these buildings otherwise do not differ from the rest. The interpretation of this finding remains unclear. It is possible that we see different chronological horizons and a shift in house orientation, or different „identities” and building traditions. Equally likely, however, we see a pragmatic solution, and these houses in their orientation simply take stronger reference to the adjacent boundary of the elevation on which their „village” was founded and were arranged parallel to the edge of the original island.

Finally, the most difficult to understand is the situation encountered in the eastern survey area (Fig. 9). This part of the site was surveyed in 2010 with a different and more coarse line spacing of 1 m than the central part, so the data quality is not directly comparable. In addition, we only covered two narrow stretches 20 m and 40 m broad, but even so there seems to be a difference in the density of anomalies observed. The general orientation of settlement remains along the south-west to north-east axis is the same. But there is a very dense pattern of strong positive (dark) anomalies in the c. 10 nT to 30 nT range with occasional values up or above 50 nT related to either building remains or general „pits” inside and around possible house units. In fact, it is difficult to distinguish houses in this area at all, so decidedly the reconstruction offered in figure 16 is just an attempt to give a feel for the different pattern of the anomalies encountered.

The reasons of these differences are unclear. Without excavations and more precise information on the lifespan of the settlement, in the central part of Căuaș-Sighetiu too it is impossible to tell just how many houses were coexisting at the same time. In our reconstruction there are no obvious cross-cuttings of houses, but clearly some house units stand very close and may imply different building phases. The occupation may even have been much denser if one considers the evidence of pits and unclear house structures (see above). So here as well there may be an indication of different phases. The overall pattern is suggestive of more or less densely packed houses that shared the same basic orientation. Yet, depending on chronology these may either have been arranged into distinct rows of contemporaneous houses, or they may have formed a looser arrangement in consequence of individual household units that through various building phases occupied „their” stretch of land. The former, of course, is the pattern assumed for Late Bronze Age sites throughout large parts of central and southeast Europe, but it is only in some wetland sites of the northalpine region that there is real evidence by dendrochronology of contemporaneity of houses. Hence, even if one narrows down Gáva II to a hundred years or so, with our present state of knowledge the latter option needs to be considered for the central part of Căuaș-Sighetiu as well. In the eastern part, on the other hand, even a Biskupin-like pattern of detached houses sharing the same side walls would seem possible. Again, there are limitations to geophysical survey in these matters. For the time being either of the following options should be considered: the eastern part of Căuaș may have been the one with the longest history of occupation, and for this reason we see in the magnetogram the combined features from repeated re-building and overlying settlement phases. Alternatively, it may just have been more thoroughly burnt than the rest, resulting in a stronger magnetic signal and more complete visibility of the „normal” pattern of houses that is less well discernible in adjacent parts of the site. There may also have been true differences in building technique compared to the rest of the site; or the greater density of pit features inside possible houses points to functional differences in the use of these houses and different activities carried out here. Excavations are required to bring light to these issues.

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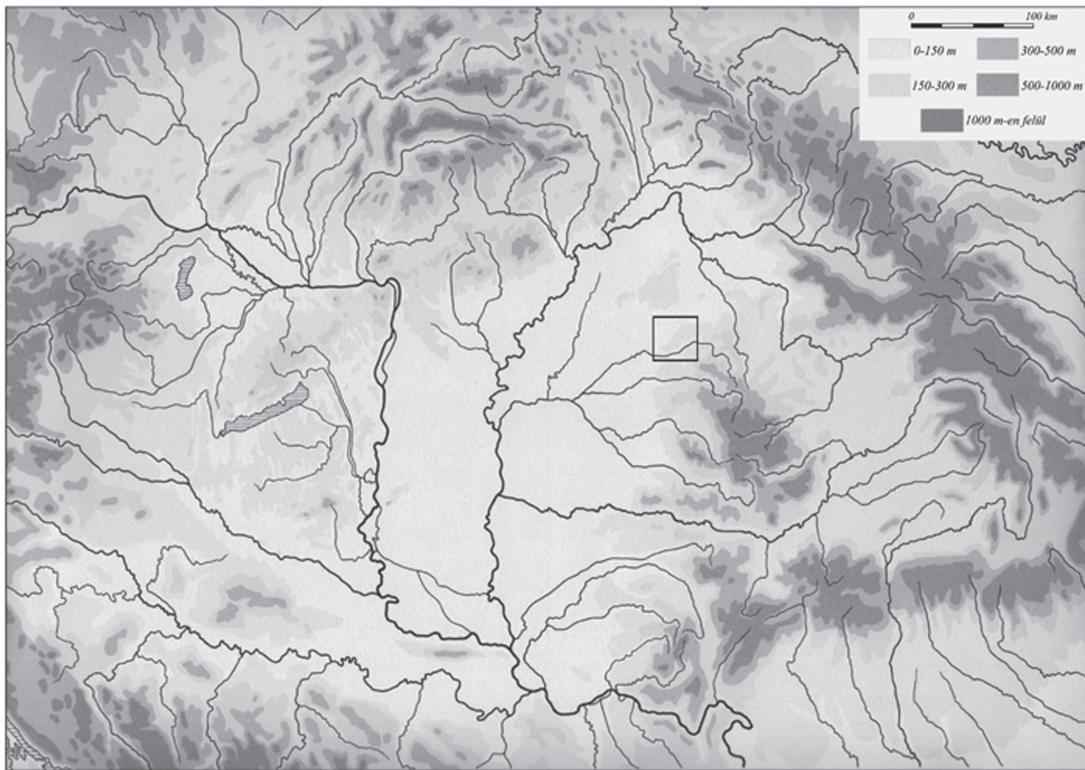


Fig.1

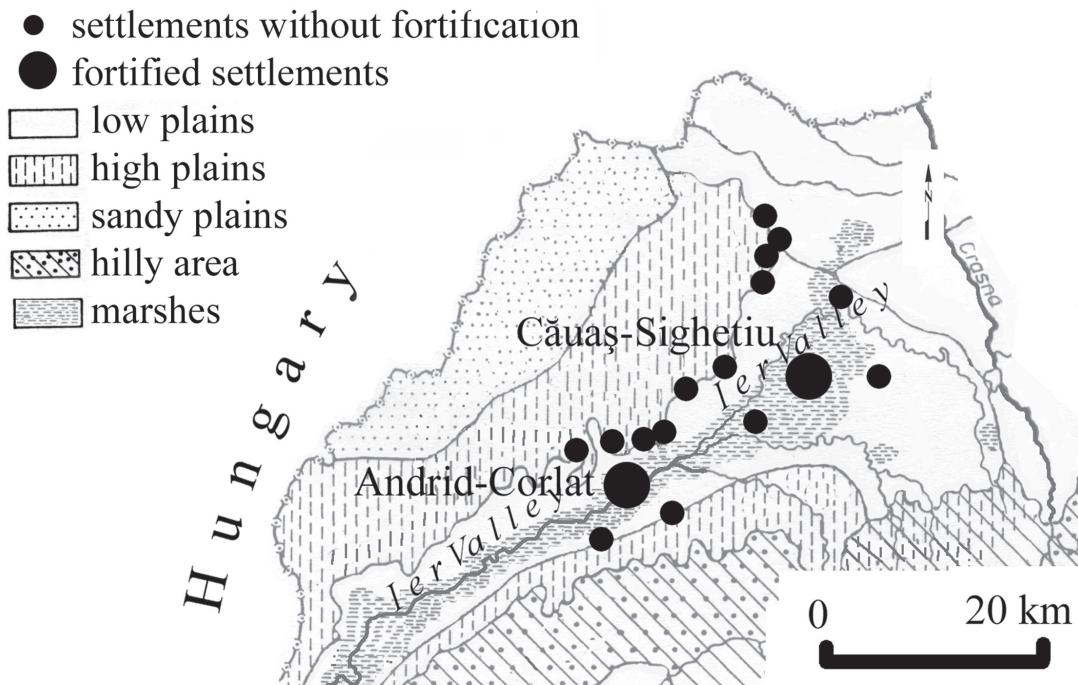


Fig.2

Fig. 1. Map indicating the position of the Ier valley in north-western Romania.

Fig. 2. Settlements of the Gáva culture in the Ier valley.



Fig.3

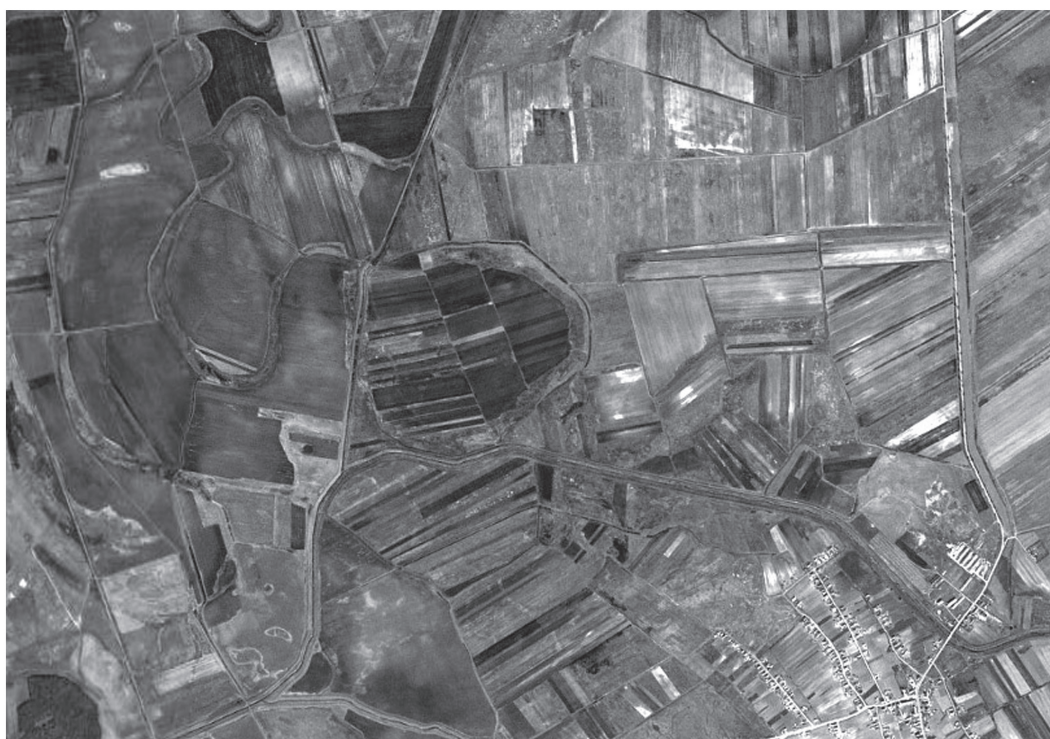


Fig.4

Fig. 3. Aerial photograph of the Late Bronze Age fortified settlement of Căuaș-Sighetiu.
Fig. 4. Satellite image of the fortified settlement of Căuaș-Sighetiu (source: Google Earth).

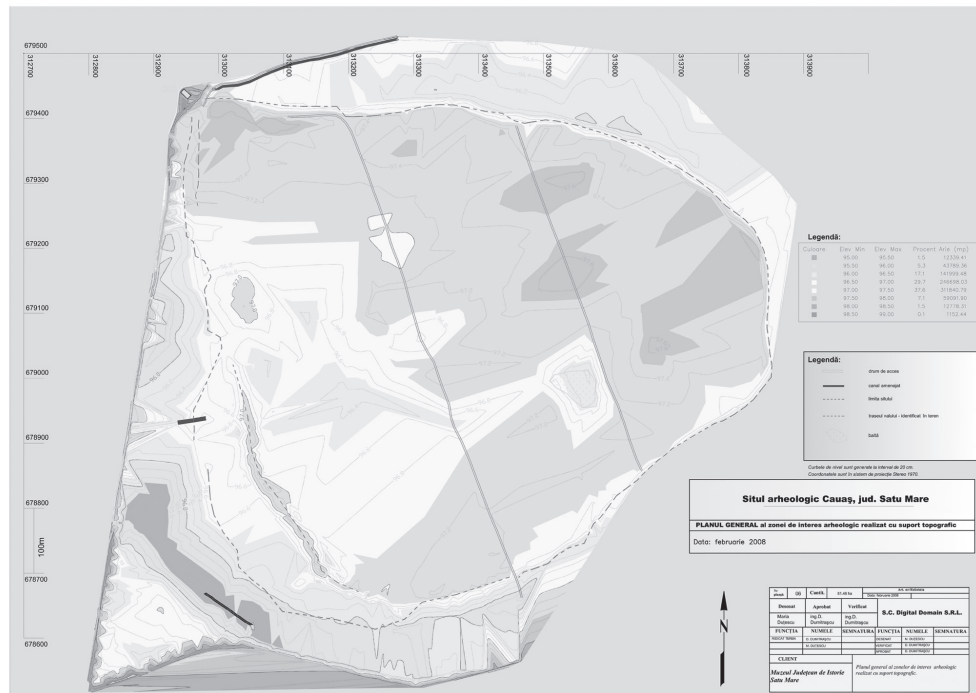


Fig.5

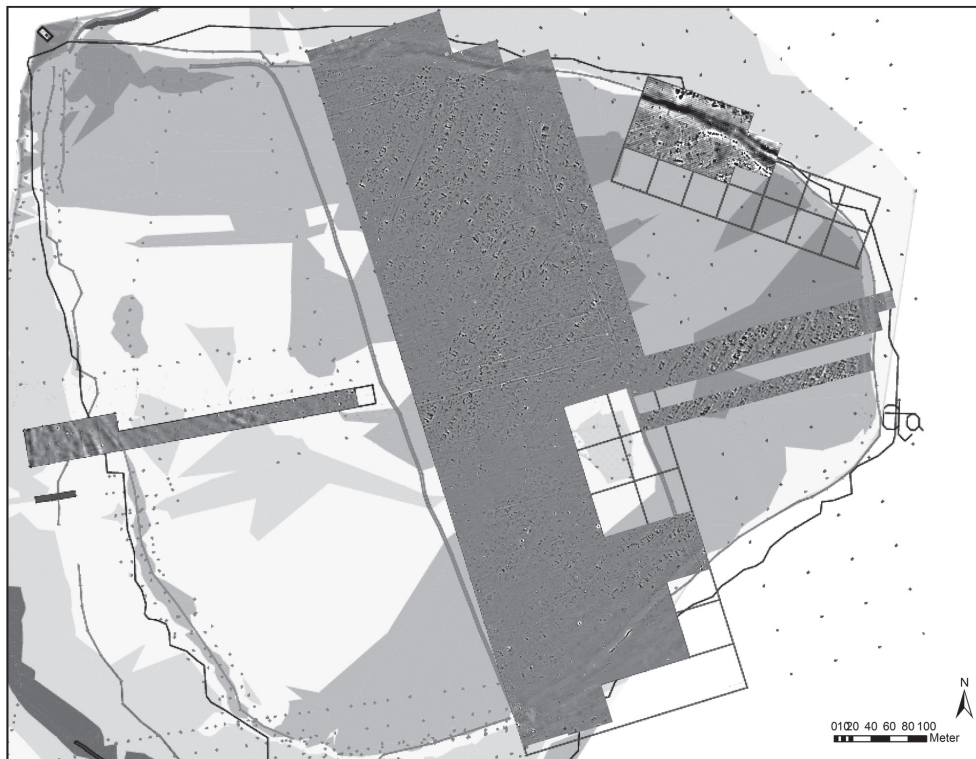


Fig.6

Fig. 5. Topographical plan of the elevation and former island of Căuș-Sighetiu.
Fig. 6. Greyscale plot of the magnetometer survey at Căuș-Sighetiu overlying the topographical plan.

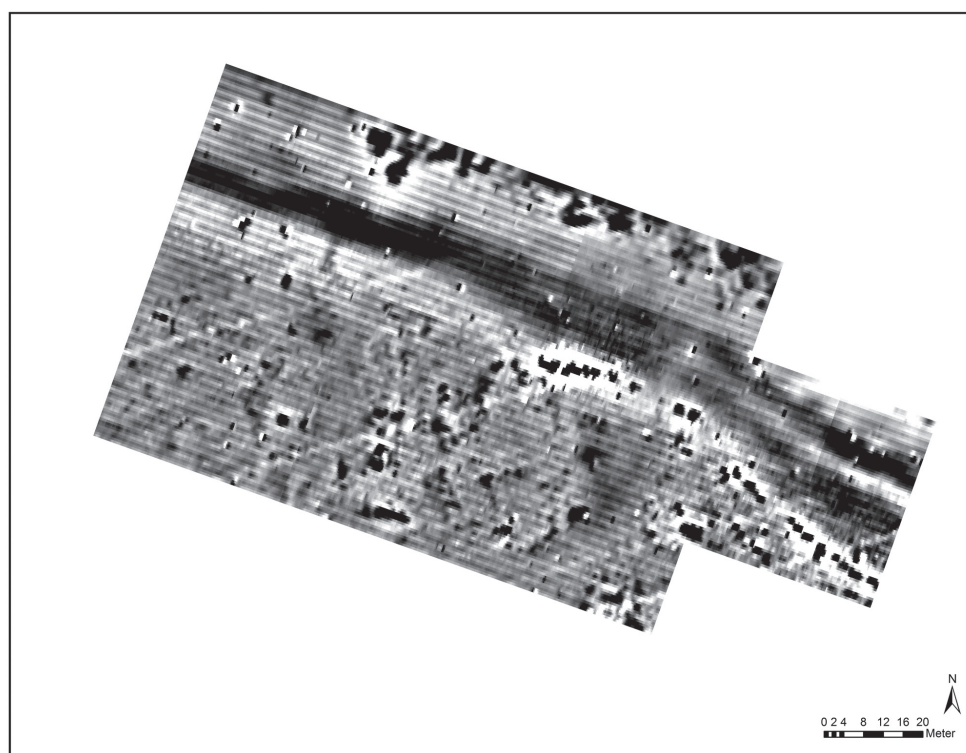


Fig.7

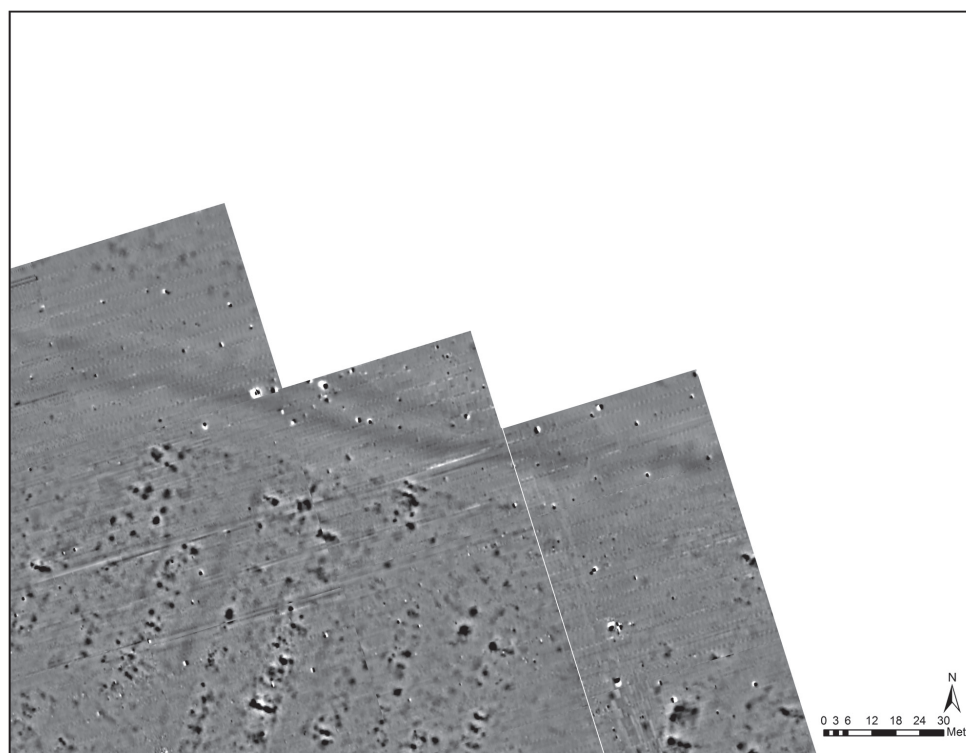


Fig.8

Fig. 7. Magnetometer survey of the north-eastern periphery of Căuaș-Sighetiu.

Fig. 8. Magnetometer survey of the northern periphery of Căuaș-Sighetiu.

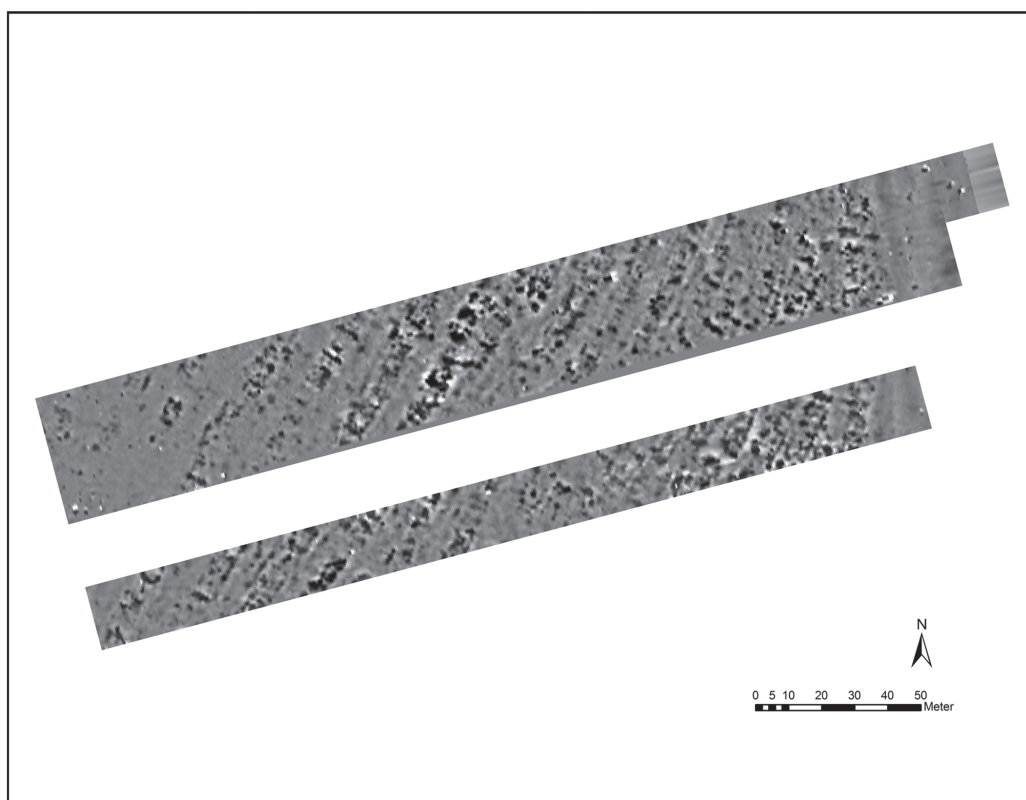


Fig.9



Fig.10

Fig. 9. Magnetometer survey area in the eastern part of Căuaș-Sighetiu.

Fig. 10. The survey area in the east of Căuaș-Sighetiu in October 2010.



Fig.11

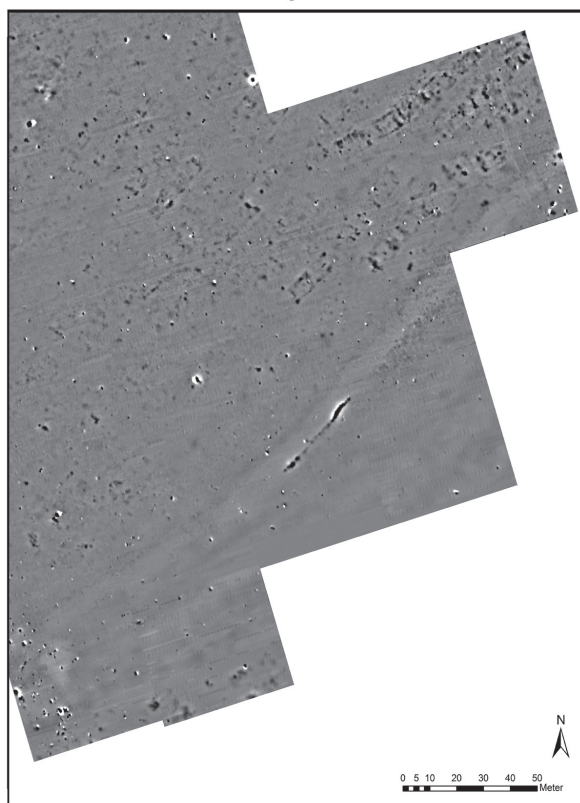


Fig.12

Fig. 11. The eastern boundary of the elevation of Căuaș-Sighetiu.
Fig. 12. Magnetometer survey of the southern part and periphery of Căuaș-Sighetiu.

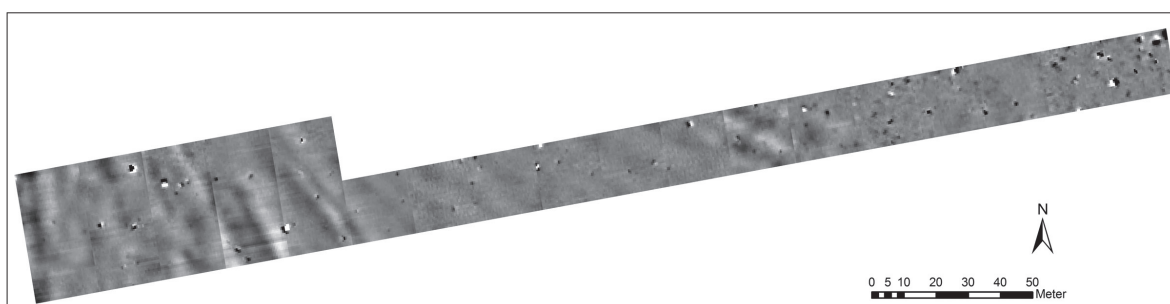


Fig.13

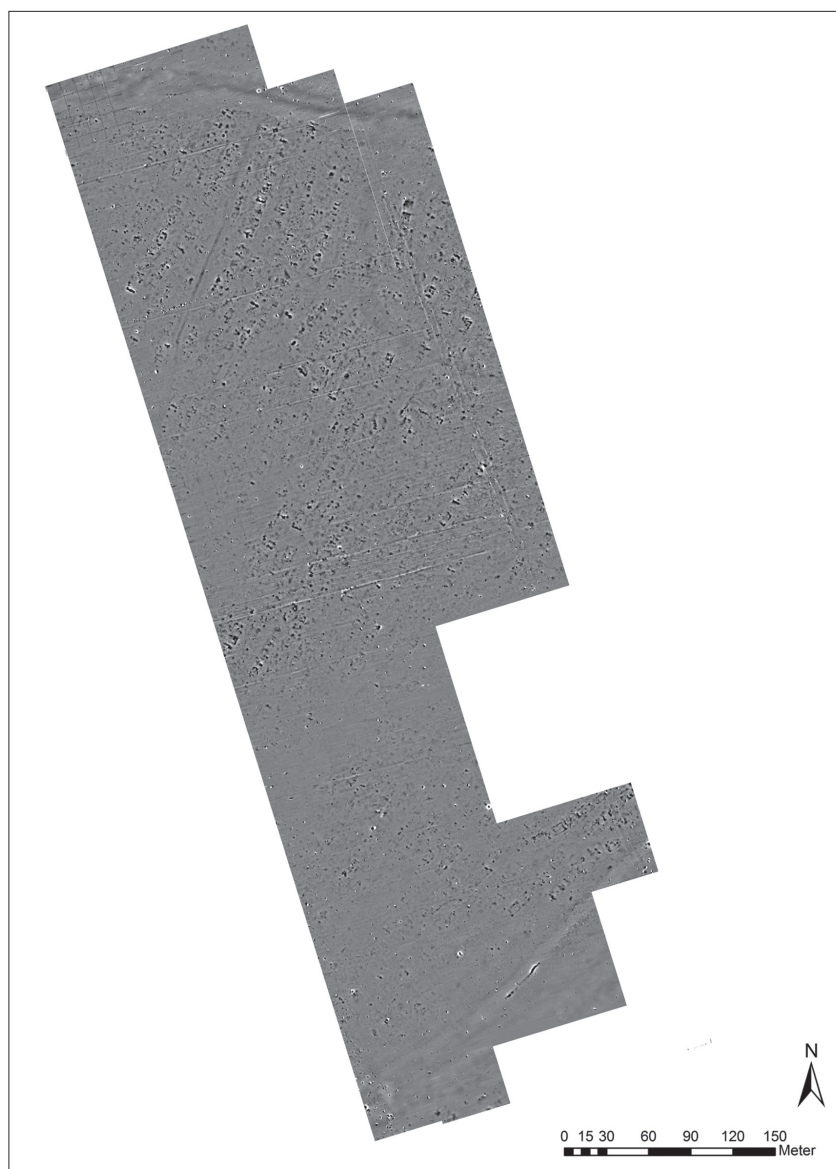


Fig.14

Fig. 13. Magnetometer survey area in the western part of Căuaș-Sighetiu.

Fig. 14. Magnetometer survey area in the central part of Căuaș-Sighetiu.

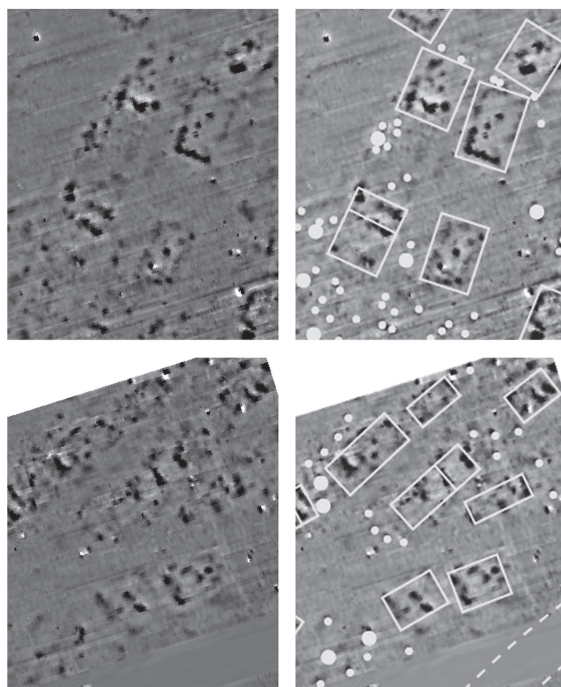


Fig.15



Fig.16

Fig. 15. Example of the identification and interpretation of houses and settlement pits in the magnetogram of Căuaș-Sighetiu.

Fig. 16. Interpretation and tentative plan of the distribution of houses in the survey area at Căuaș-Sighetiu.