

GIS spatial analysis in the etruscan trading centre of Bagnolo S.Vito (Mantova, Italy)

Cristina Longhi*-Claudia Mangani**

*Civico Museo Archeologico di Bergamo-**Museo "G. Rambotti" Desenzano del Garda

Abstract

Forcello (Bagnolo S. Vito, Mantova) settlement, one of the most important Etruscan trading centres, has been investigated on a 600 sq.m. surface.

In area 'R18' the presence of 7 main phases has been recorded. These are marked with letters (A-G) and dated from the beginning of the 4th century BC until the second half of the 6th Century BC.

The purpose of the present paper is 1. computerisation of paper records and data pertinent to phases F and G finds; 2. their management through a GIS software to test the advantages of a data processing analysis compared with the traditional method. During F phase a fire destroyed 2 houses separated by a canal; the GIS analysis of placing of elements, allowed us to confirm and improve the former hypothesis regarding use of the identified room collapse and placing of archaeological finds dynamics and their subsequent events.

Moreover, computerisation allows us to quickly handle a 20 digging-years data collection and to set up a starting point for the forthcoming researches adopting the new methodologies



figure 1: Geographic localization of the site

The site

The Forcello's farm is located in Northern Italy, about 6 km south of Mantua, in Bagnolo S. Vito municipal district. The site, which was already known from some discoveries made there in the XIXth century, was recognised as being an important Etruscan site only at the beginning of the 1980's, when, owing to the intensive farming, distinctive pottery and inscription in Etruscan language and alphabet were found.

Probably the settlement was set up in the VI century B.C. (around 550 B.C.), during the Etruscan colonisation of the Po plain, and dropped at the beginning of the IVth century B.C.

The topographical and morphological survey of the site and the surrounding areas has been carried out by means of an electronic apparatus Electric Total Station Topcon GTS 212 and the topographic software Meridiana Geotop.

The software has been chosen on the basis of the chance of exporting vector files of dxf type. These files can be related with the main programs for 2 and 3D graphic, without losing the segmentation of the highlighted graphic elements. Moreover, this peculiarity enables us to export, if necessary, the processed data straight in a GIS milieu. The result is a map, which records the existing modern constructions (such as ditches, farmsteads etc.) as well, and points out that the settlement lies on a slight morphologic culmination, rising above the paleovalley of the river Mincio, close to the slope of the paleoterrace on the hydrographical right hand side, was triangular in shape, about 13 hectares in size, oriented NW-SE. On the north-western side was enclosed by an earthen rampart, at least 320 meters long. On the basis of the present morphology of the terrain, the rampart was probably bordering the other two sides of the settlement as well.



figure 2 - Aerial photo of the site.

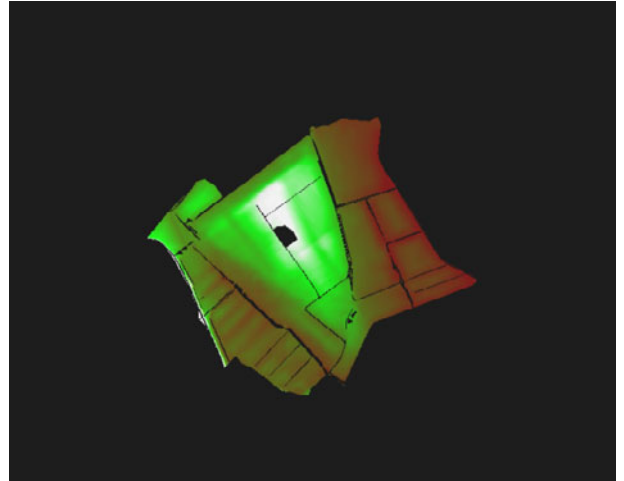


figure 3 – 3 D model of topographical survey of Forcello.

Presumably the settlement had an orthogonal layout, like other Etruscan colonial establishment, such as Marzabotto. One of the main street, 15 metres wide, perpendicular to the rampart, passed through the whole of the settlement; in the middle of it two channels ran, which would act as main sewers for the drainage small canals that bounded the houses.

The houses were rectangular in plan and shared a common orientation (NE-SW); their long sides were parallel to the NW rampart, whereas the short ones were perpendicular to the main street, in accordance with a regular scheme kept during all the phases of rebuilding. These, made up of perishable materials, had wooden posts for walling (of wattle and daub construction) and beaten earthen floors; only during the latest building phase (end of the 5th century - beginning of the 4th century BC) roof tiles replaced thatches.

In the southern part there was an area which probably had a sacred function, since the majority of the inscriptions on pottery were found here, as well as the broken top of a small pillar altar made of trachyte.

The excavation area, of about 600 sq. m, is located in the middle of the settlement, in this point the archaeological deposit has appeared to be 1.8 m thick.

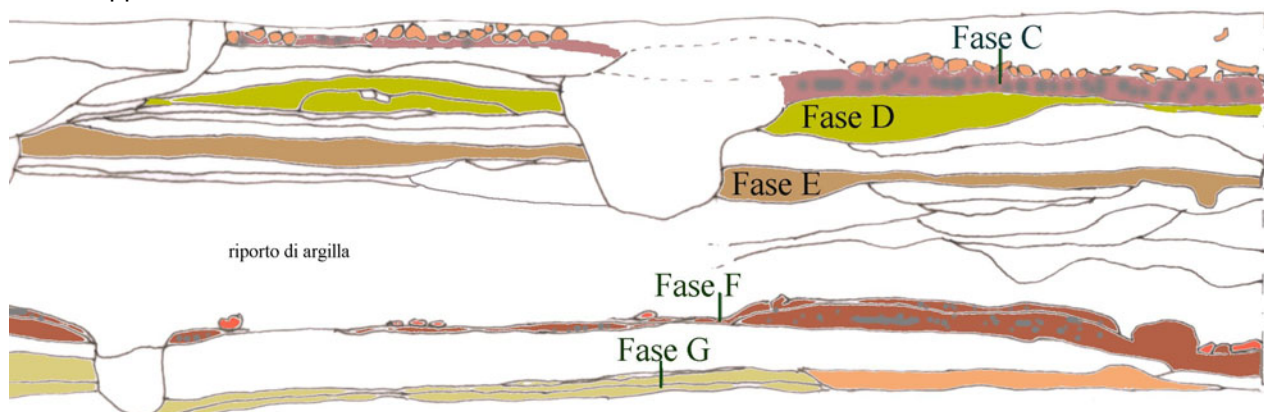


figure 4: Sector R 18: sequence of the phases.

- *phase A*. Remains of negative evidences pertinent to a rectangular room, dating back to the end of the Vth – beginning of the IVth century B.C.;
- *phase B*. One house rectangular in shape. Only the hearth and some outer negative evidences are preserved. This phase is dated to the second half of the Vth century B:C;
- *phase C*. One house rectangular in shape (12,3 x 5,2 m) with a perimeter of post-pits. It was destroyed by a fire during the second quarter of the Vth century B.C.;
- *phase D*. Badly preserved as the house of phase C was built directly on it. We recognised only some hearths and negative evidences like pits and small canals;
- *phase E*. The investigated area was devoted to metallurgy. Fire-ditches and hearths mark out this phase, dating back to the beginning of the Vth century BC.;
- *phase F*: two houses bounded by a canal were destroyed by fire. The plenitude of pottery sherds from Greece indicate that they belong to the end of the VIth century B.C.
- *phase G*. One house with perimeter and rooms' division corresponding to the NW house of phase F. A black figure *lekythos* of the *Cock Group* found, let us date this phase around 525-520 b.Ch.

Nowhere the virgin soil has been reached, which makes impossible to say when the settlement had been established, but we think that a date around VI century b.Ch. could be appropriate: in fact, in this period, we see the Etruscan colonization of the Po plain.

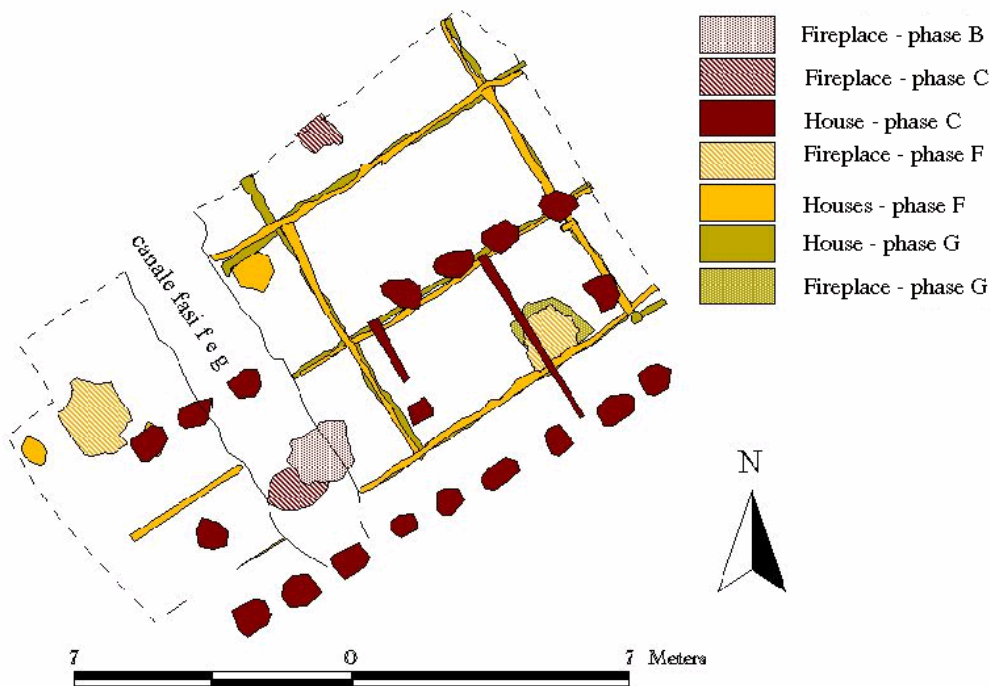


figure 5 - Overlay of structures related to phases B, C, F e G houses

The spatial analysis

The paper lists (for contexts, recorded finds, plans, sections, etc.) have been inserted in Excel tables. In our opinion, this format allows a quick management of this kind of data and, moreover, it is perfectly consistent with Access and Arcview (the GIS software in use). Besides, using the software Arched, we produced a new matrix, that gave aid to rectify some inner discrepancies, such as impossible circles or relationships, included both in lists and context record sheets. Last, but not least, a relational data base, regarding contexts and their finds, was processed last year.

All the paper maps have been converted into digital images, brought to the same scale and georeferenced. This process forced us to convert the alphanumeric coordinates, which indicate each square meter on the dig, into the corresponding Cartesian coordinates. Plans have been added to an Arcview project, to gain a mosaic. This mosaic allows a global picture of the structures unearthed in sectors R 18 and R19 of the dig

The first outcome was the implementation of thematic map about finds layout. These maps confirmed or even increased our knowledge about the role of the structures recognised during the dig.

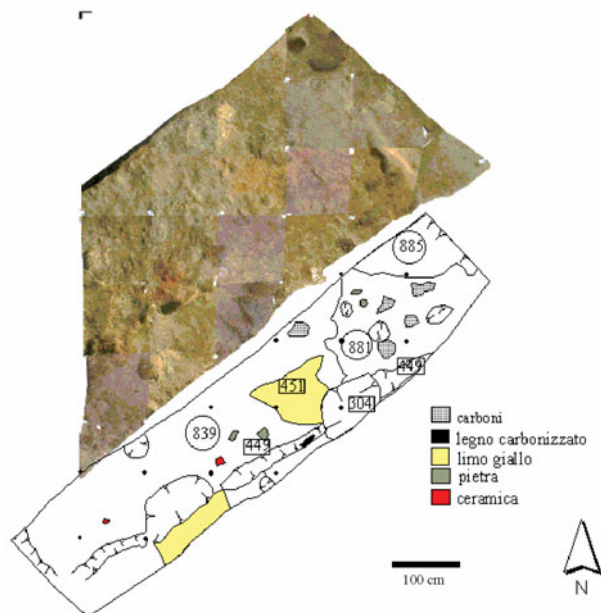


figure 6 – photographic plan and handmade plan georeferenced with Arcview

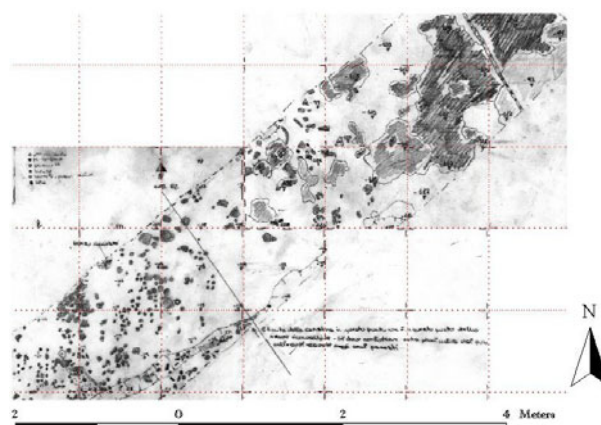


figure 7 - Plans' mosaic georeferenced with Arcview

Phase E. The first case here analysed concerns the layers of the beginning of the Vth century. As already mentioned, the area was devoted to metallurgy. We identified hearths, burnt areas, pits (whose use remains unknown) and small oval ditches, marked by burnt inner side and coal fill. These ditches have been explained as small furnaces to forge metal objects. They were ranged in groups and had often a small hearth or a burnt area nearby.

To corroborate this interpretation, as small furnaces to forge, we decided to work out a map. In this map, we represented the layout of slags, bronze and iron bars etc. on the basis of their weight: the metal wider concentration is by the small furnaces and hearths. We have got the same result when considering the selected finds layout (in this case, we have been able to georefer each single finds, because we had all the coordinates).



figure 8 - Detail of some small furnaces

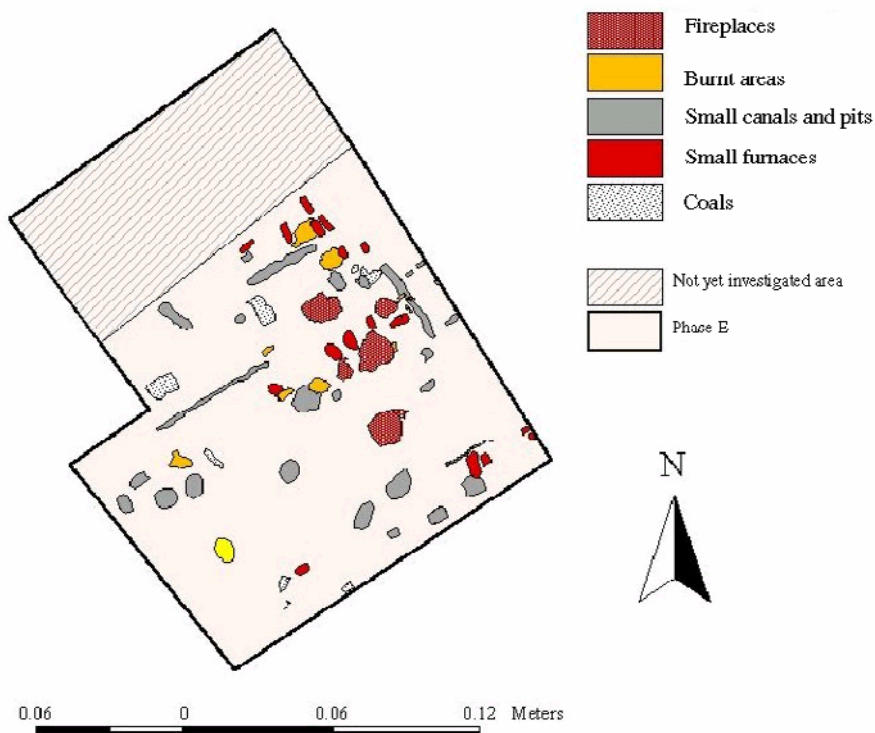


figure 9- Phase E structures

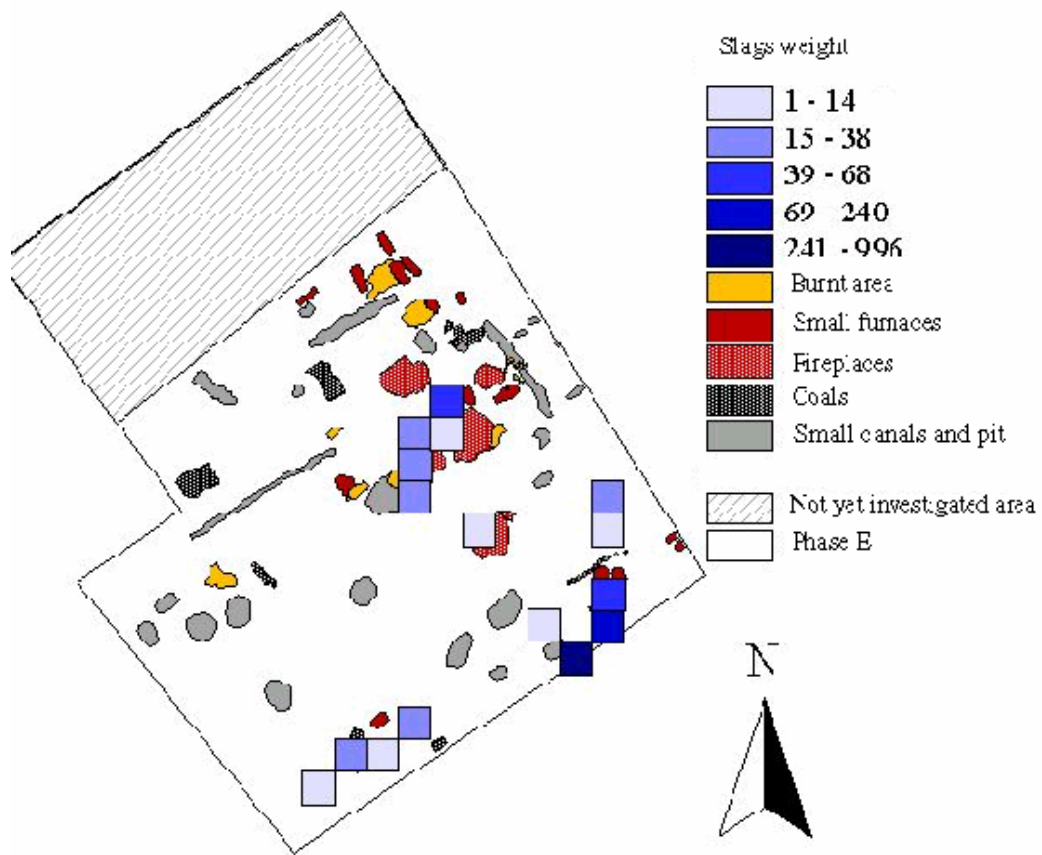
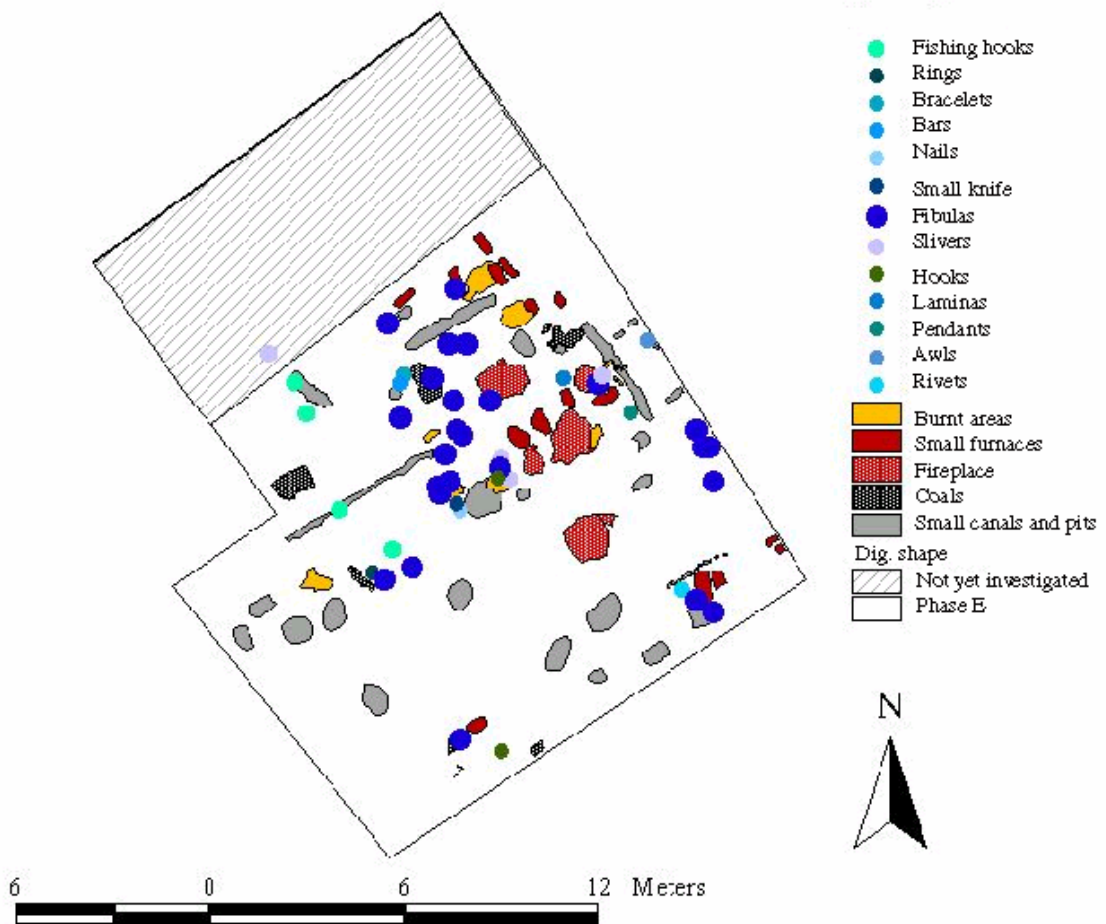


figure 10 - Layout of slags, laminas and iron bars based on weight (grams).



Phase F. At the end of the VIth century, a big fire destroyed at least two houses, whose perimeter has not been yet completely brought to light. One of them (house F I) has been more intensely investigated. It has an extension of about 78-79 m² and it is divided into 8 rooms. Thanks to the sudden fire, most of the objects in the house remained on the paleosurface, even the carpological and wooden finds; usually this kind of finding are not preserved in the site.



figure 12 – House 1 plan.



figure 13 – fire layer.

Having no doubts about practical interpretation and stratigraphic position of these structures, the purpose of the analysis was to test efficacy and benefits of the data processing systems.

To better understand the rooms' functions and the collapse's trends, we analysed the layout of different type of finds, on the base of the number of sherds presents in each square meter.

The plan of burnt areas and the layout of the doub and wattle gave us more information about the house's structure. The big doub and wattle sherds by the south side of the hearth in house F I show that the wall behind it had been insulating with a thick layer of clay; on the other hand, the few sherds in the rest of the house seem to point out that no coating was on the others walls.

Around the hearth, in house F II, we have not found big quantity of burnt clay, probably it was in the middle of the room.

The presence of red coloured burnt areas shows that in house F I-room 4 the heat was very intense; it is possible that the fire propagated right from this area. Besides that, a stove, totally warped by the fire, has been found.

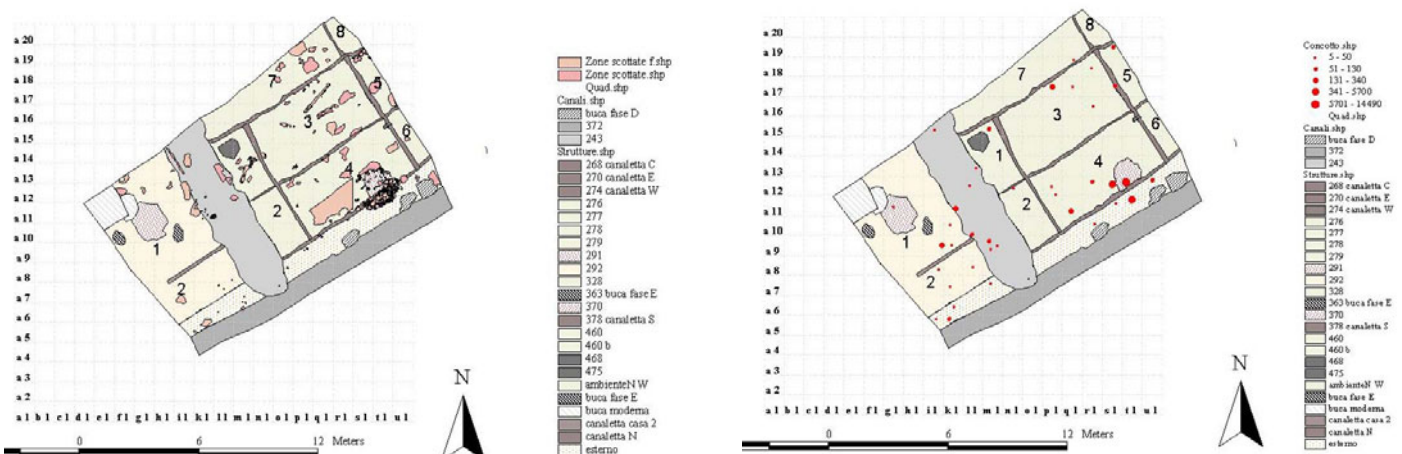


figure 14 - Burnt areas plan with doub and wattle distribution

Thanks to the layout maps, we received confirmation that room 2, where carbonised seeds and pulses heaps but no pottery sherds have been found, was used to storage dry supplies in vegetal cases (such as baskets). This room was used for textile works as well, as here we found carbonised remains of the loom's bars and a great concentration of loom's weights.

The data processing analysis makes it clear that there was a second area devoted to textile works, by the wall facing the hearth; probably in this area there was another loom.

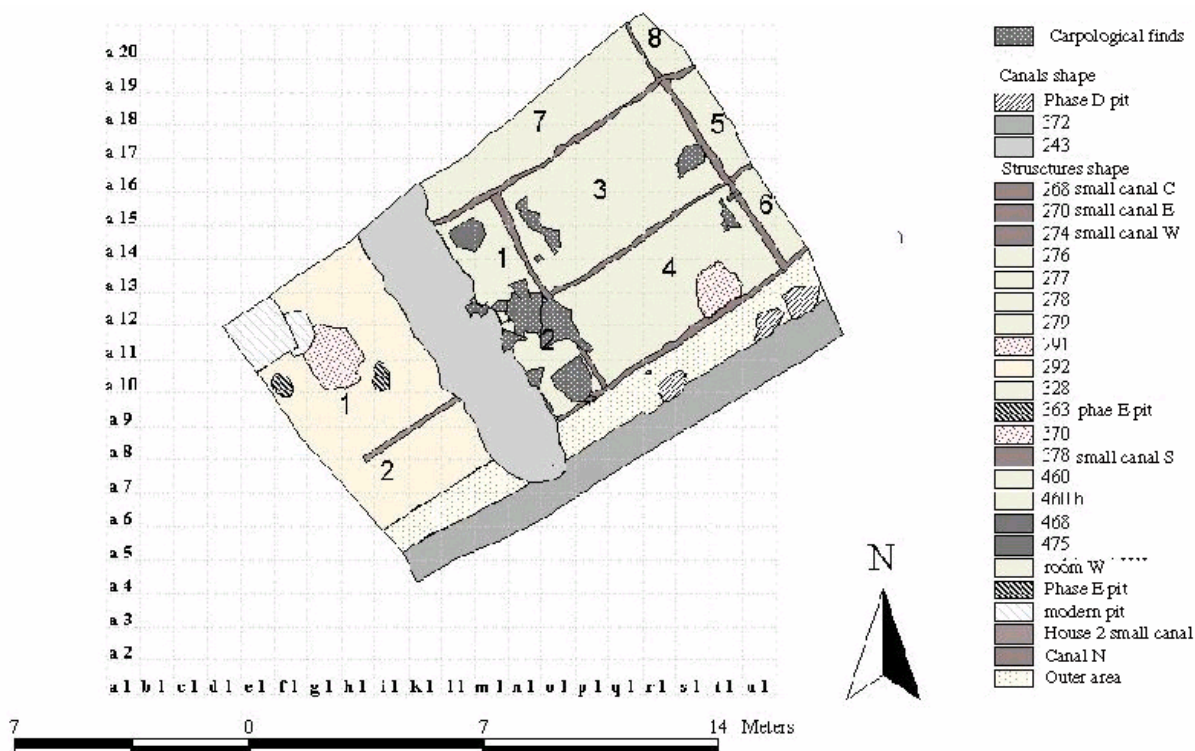


figure 15 - Carpological finds layout

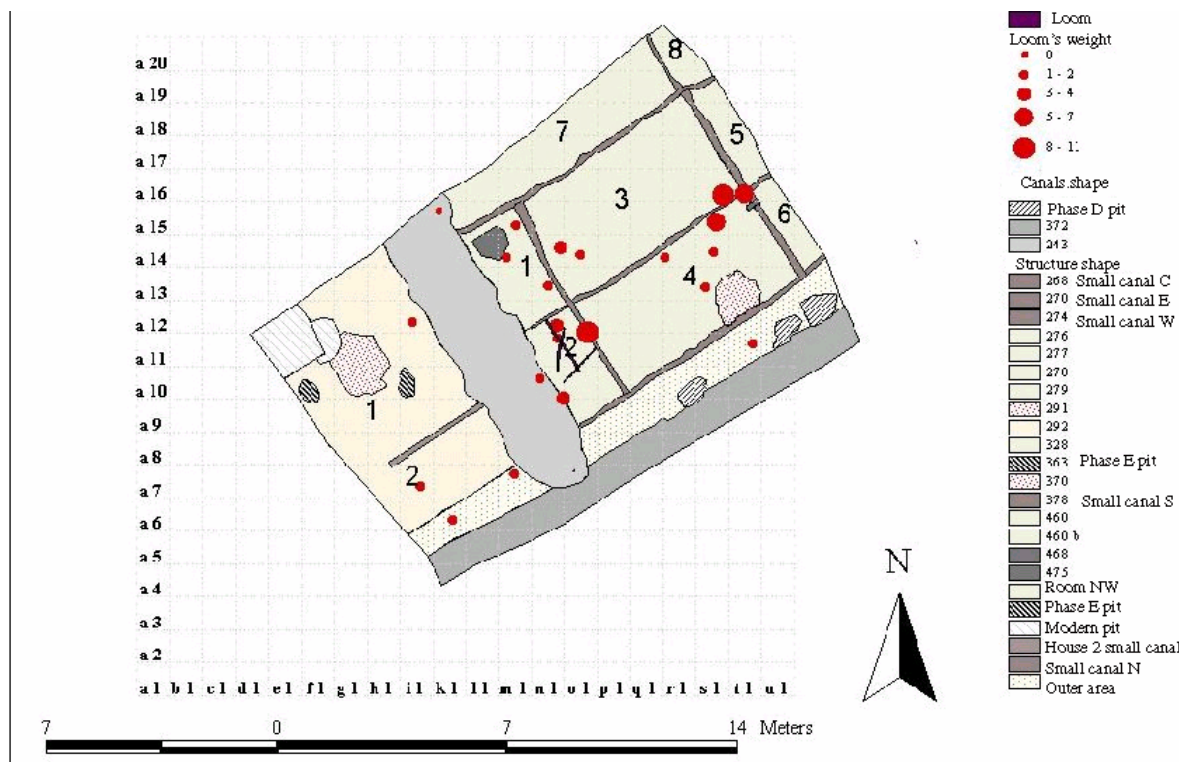


figure 16 - Loom's weights layout.

The Greek-amphorae sherds layout gave us excellent results to understand their original location in the two houses. The two amphorae from Taso, almost completely rebuilt, were one by the NE corner in house F I-room 3 and the other by the NE corner in house F II-room 2. Two or three amphorae, from Corinth and Milieth, were by the SW corner of house F I-room 7: in fact most of the fragments lied on the slope and the bottom end of the canal. The amphorae, almost certainly containing wine, were kept in rooms separated from the kitchen, may be in a room devoted to the banquet.

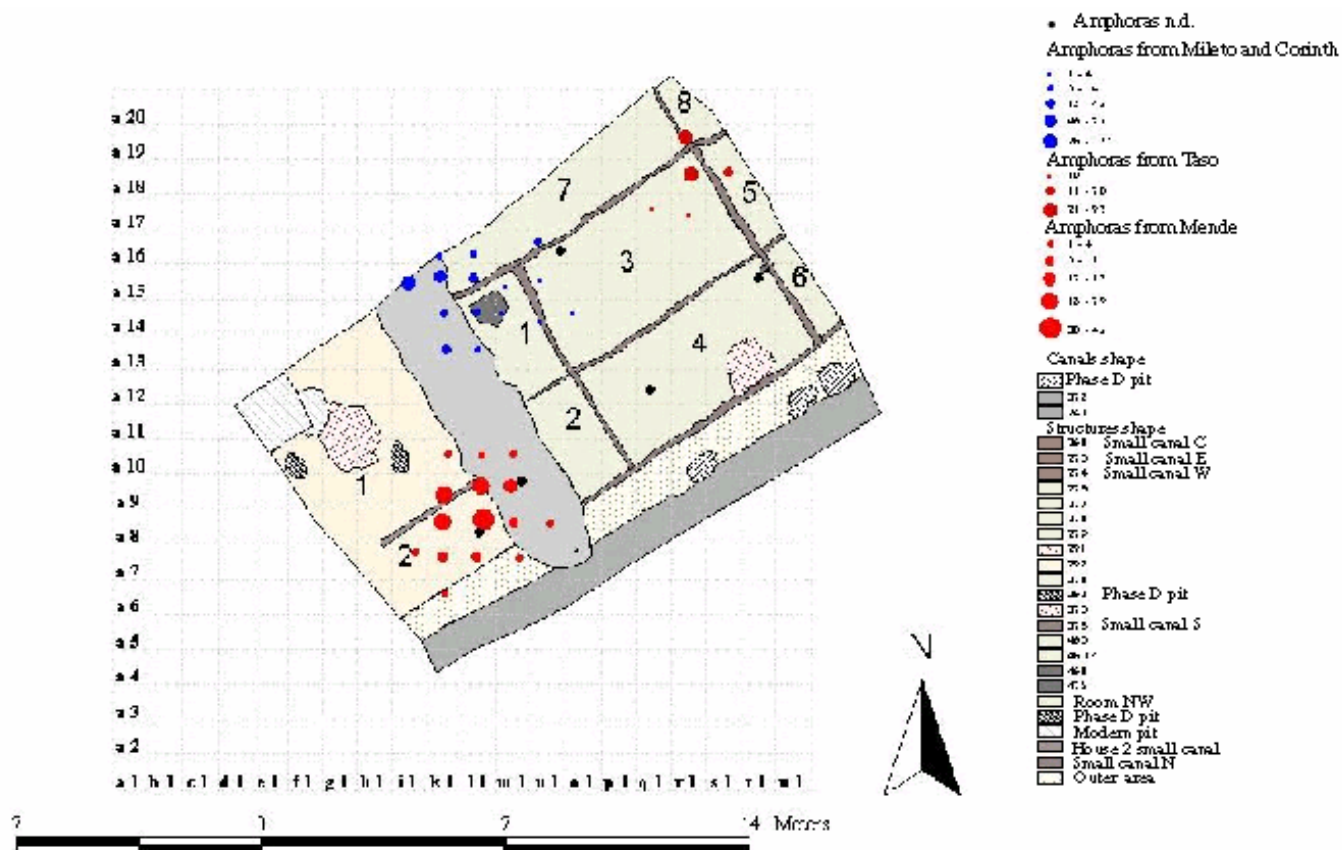


figure 17- Amphoras' layout.

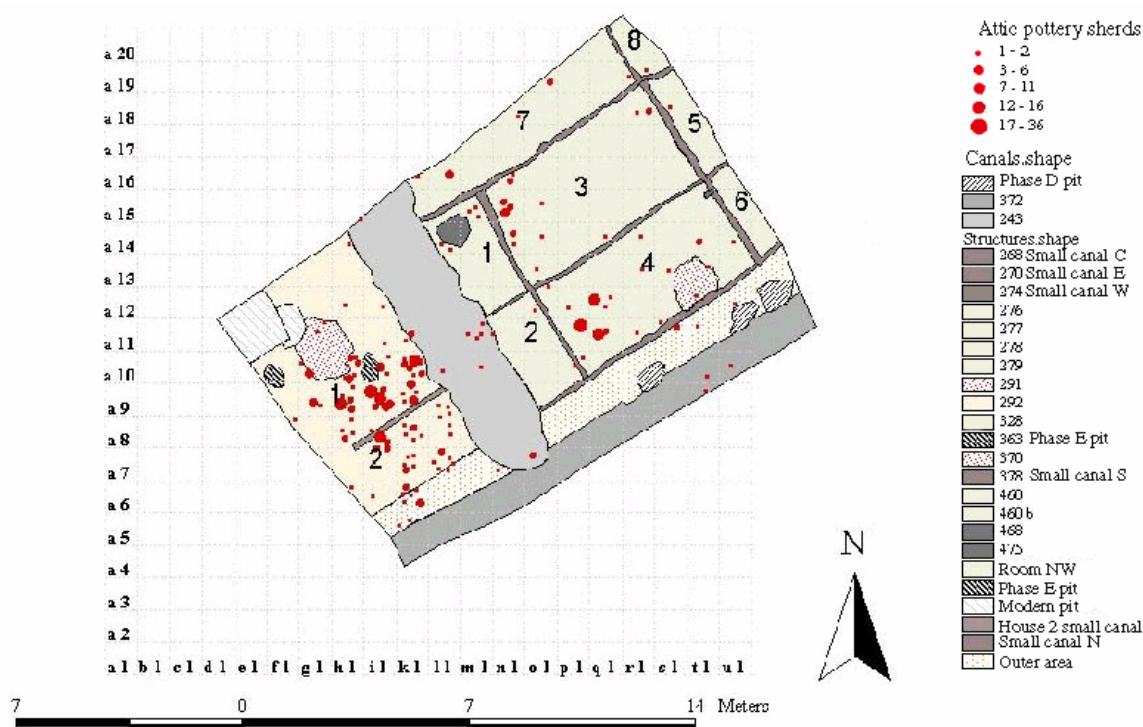


figure 18- Attic pottery sherds' layout

This supposition is backed up by the attic pottery sherds layout (fig 2). The attic pottery, in house F II, gathers especially, both in the big room with the heath and in the contiguous small one, in house F I by room 3 SW wall. Information about social customs of the residents can be deduced from fibulas layout. The male ones (*Schlangenfibeln* and *Bandbogenfibeln*) and the female ones (*Sangusugafibeln*, *Navicellafibeln*, *Certosa fibeln*) have been found in different rooms. The female fibulas gather in house F I-room 4, that is the kitchen.

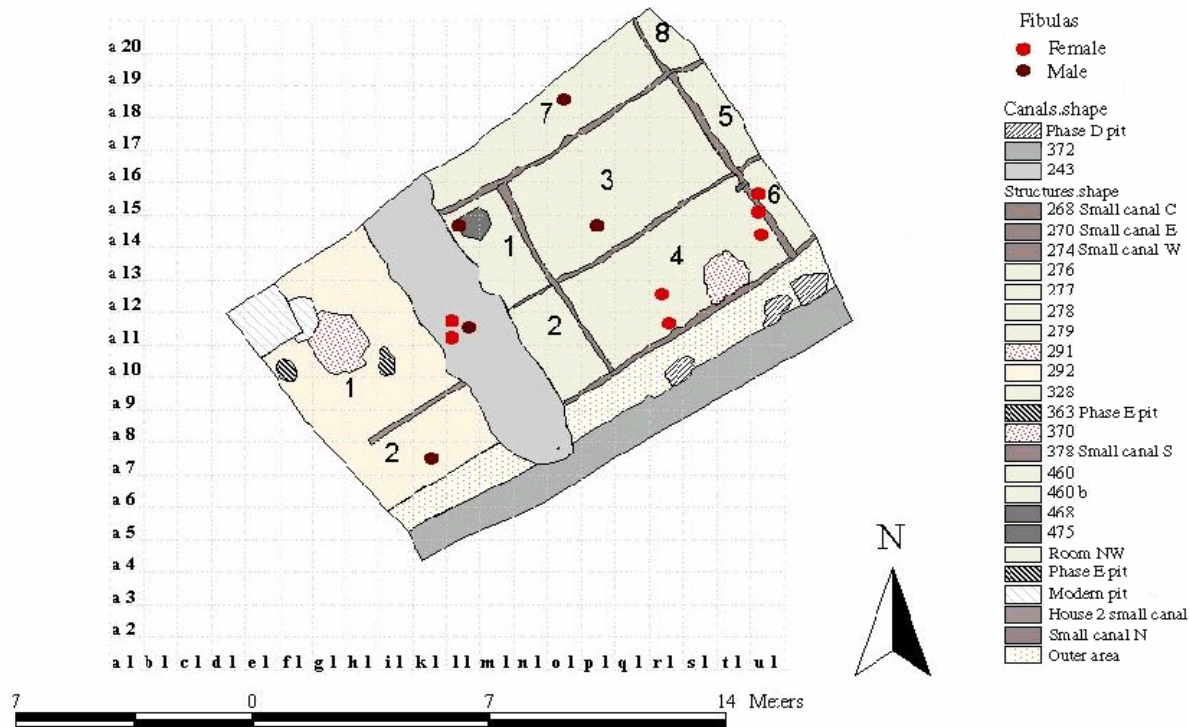


figure 19- Fibulas' layout

The thematic maps were useful also to point out the dispersions' trends:

In some cases pottery “exploded” because of the great heath or felt from wooden shelves, while they were burning. In this circumstance the sherds remained in situ, as the bowl in room 3: all the sherds gather by the wall.

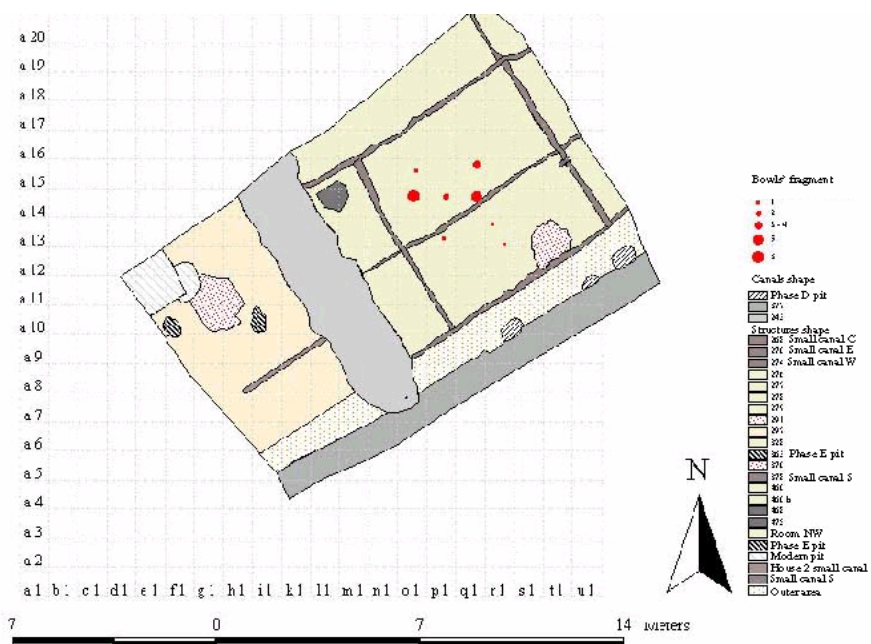


figure 20 - Scattering dynamics' examples: bowl

The sherds' displacement can be due often to the levelling and renewal of the collapse surface after the fire, as well as to the need of fill the canal difference of level. As a vase at source probably in house F I kitchen, whose fragments have been found, for the most part, in the canal; also the scattering of the fragments of big vase for provisions can be linked up to the renewal activities.

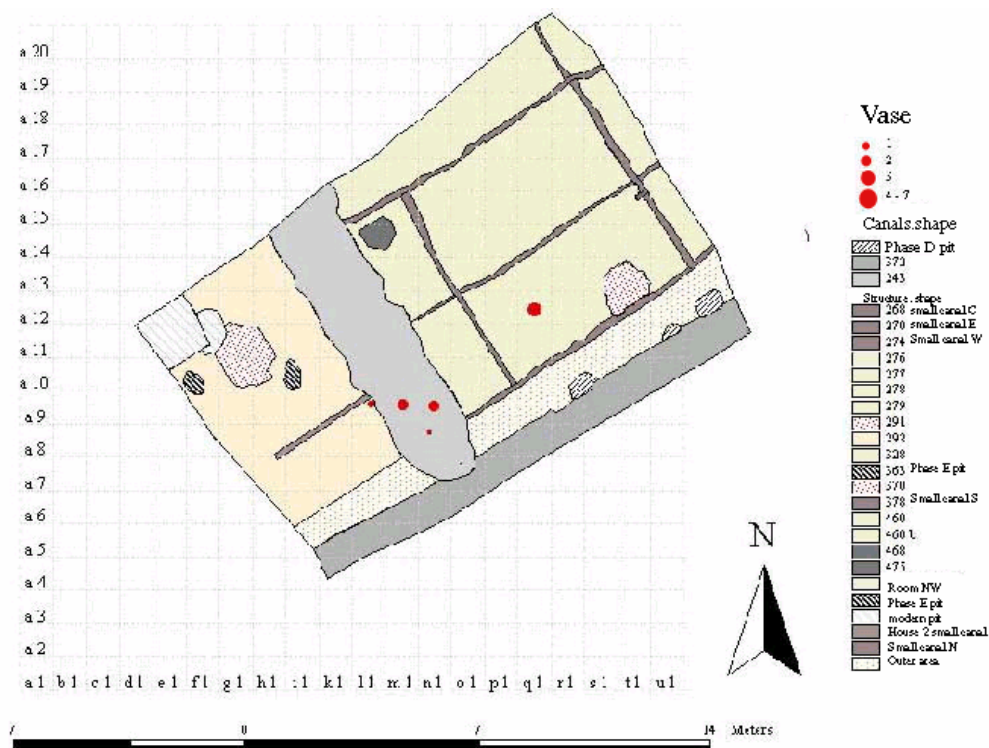


figure 21- Scattering dynamics' examples: vase

In others cases the pottery located by the wall by the canal, when the wall felt down, "slipped" in the canal. Most of the she

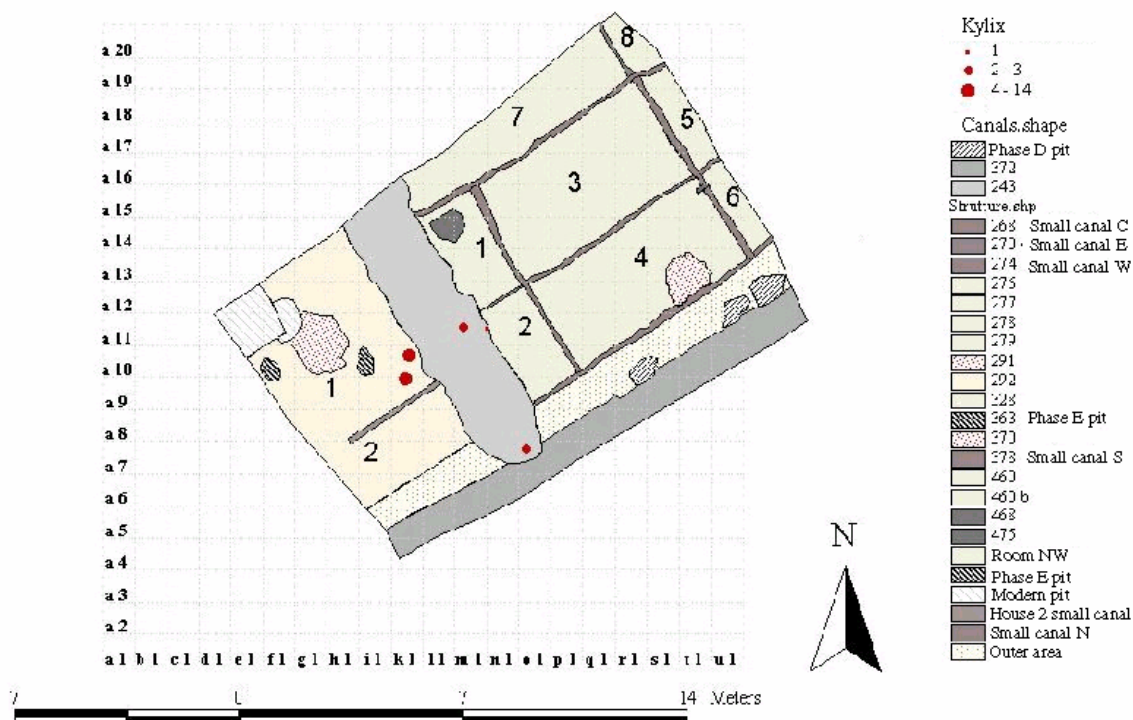


figure 21- Scattering dynamics' examples: eye cup

Conclusions

The processing of the previous documentation helped us in corroborating and reviewing in details the information we've got with traditional research methods.

For example, about phase E structures, we already knew the use of the oval ditches, but we didn't notice that the metals findings gathered by these structures. For phase F, we have been able to focus and distinguish in details the dispersions trends after the collapse thanks to the analysis of the different layouts.

Anyway, in our opinion, the most important benefits must be singled out within the documentation's management and query. We have more than 1500 context and more than 700 plans and sections, as well as thousands of recorded finds.

The high expenses, to talk of the time spent digital recording the paper documentation, have been fully rewarded by the quickness in data searches.

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