



# CONTINUITY AND CHANGE IN THE NURAGIC RURAL LANDSCAPE: THE CASE OF SA OSA

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## CATEGORY

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## LANGUAGE

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## ABSTRACT

The archaeological findings from the prehistoric settlement of Sa Osa, located in the lower Tirso Valley, central-western Sardinia, have provided new elements to the study of the human landscape of this region of the island. In particular the evidence belonging to the nuragic phase suggests the existence of a peculiar type of productive settlement, probably seasonally occupied, related to the dynamics of the river Tirso. Ceramic and lithic findings show that a number of production and craft activities were carried out in the area. The analysis of ceramics has also revealed important changes through time, which will be discussed in the text.

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## INTRODUCTION

In this paper I discuss my interpretation of the archaeological evidence present in the southern area of the nuragic settlement of Sa Osa, located in the lower Tirso Valley, in central-western Sardinia (39°54'51.37"N – 8°32'32.66").

This important archaeological site, known since the 1980s as *S'Arrieddu* for a few Bronze Age surface collections, was excavated during several seasons from the Spring of 2008 to the Winter of 2009 under the direction of the Soprintendenza ai Beni Archeologici per le province di Cagliari e Oristano (Dr Alessandro Usai and Dr Salvatore Sebis) and the Università degli Studi di Sassari (Dr Anna Depalmas)[1]. Its discovery is due to the construction of a new road between Cabras and Oristano, which exposed the remains of a long-term rural settlement.

The archaeological remains from Sa Osa tell us a story beginning in the Eneolithic (Sub-Ozieri facies) and ending during the last phase of the Nuragic civilization, testifying to the existence and importance of a strong continuity of occupation in the human landscape of prehistoric Sardinia.

## THE LANDSCAPE

The archaeological site of Sa Osa is located close to the Tirso (nowadays the distance is 550 m), the most important river of western Sardinia, in the lower part of its alluvial plain, in a region called *Campidano Maggiore* (Fig. 1). Its distance from the sea is about 2 km – half an hour by foot - but in all likelihood it was far shorter during prehistoric phases, progressively lengthening during the historical ones (Late Iron, Roman and Middle Ages). The locale is 1,97 km (to the NW) from the Stagno di Cabras, a large semi-saline lake of about 2,228 hectares, with a maximum depth of 3 m, which has been the most important economic resource for the whole area since Neolithic times.

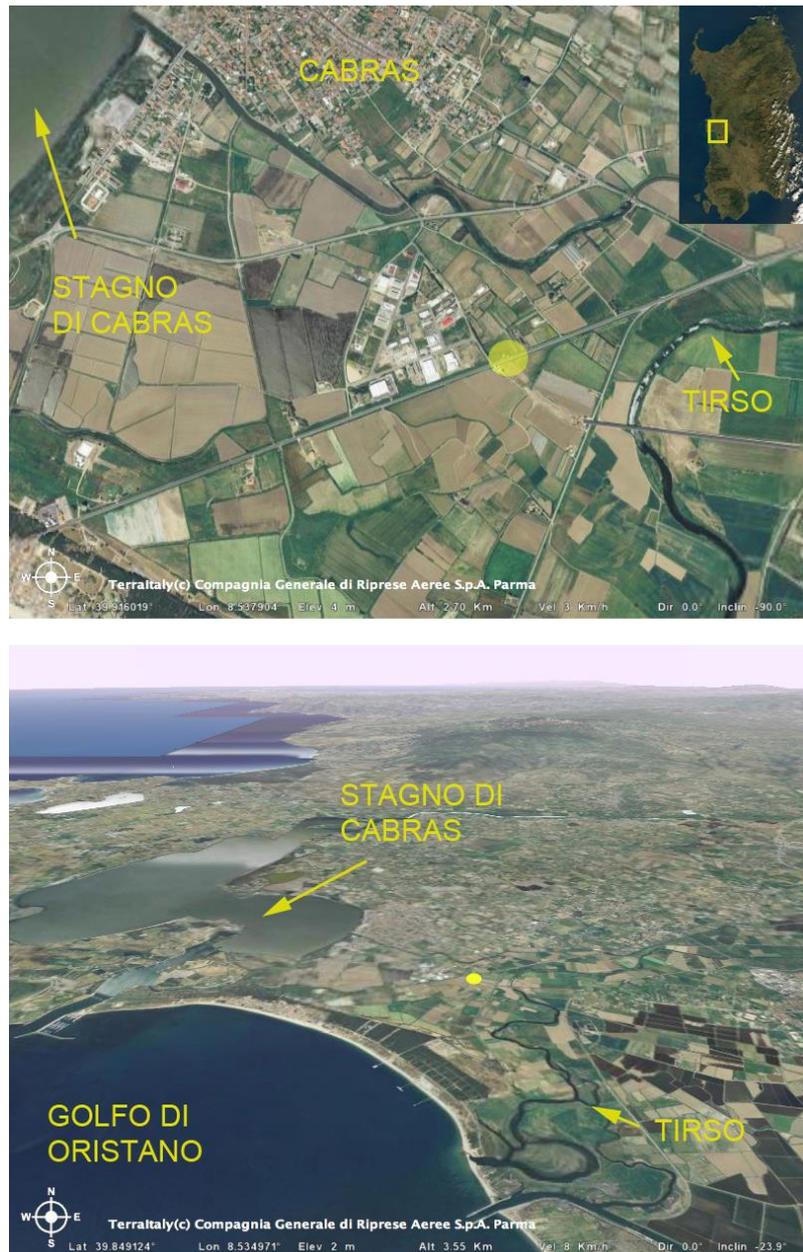


Fig. 1 - Geographic localization of the site of Sa Osa (yellow circle).

The site is located in a landscape dominated, from the Middle Bronze Age (MBA from now on) to the Early Iron Age (EIA), by a number rural settlements formed of sunken and earthen huts, which are linked to the economic system of the Tirso river (Fig. 2): Bidazzoni Noa and Su Sattigheddu – Zeddiani (Sebis 2009), Su Barrocu – Siamaggiore (Sebis 1998), Gribaia– Nurachi (Sebis 1998), Montegonella and Palamestia – Nuraxinieddu (Sebis 1986, 1987, 1992, 1995, 1998, 2009), Santa Vittoria – Nuraxinieddu (Sebis 1995, 2009), Su Cungiau ‘e Funta – Nuraxinieddu (Sebis 1994), Santa Maria su Claru – Nuraxinieddu (Sebis 1995), Su Mattoni - Oristano (Sebis 2009), Lisandru – Tramatzu (Sebis 2009), Sant’Elia - Santa Giusta (Atzori 1992), Cuccuru de s’Arena – Oristano (Atzori 1987), Sipoi – Baratili San Pietro (Pau, Sebis cds). This evidence was first discovered in the 1980s, when a lot of surveys were carried out following indications from local farmers, but the site of Sipoi was the only one to have been excavated. For this reason, the excavation at Sa Osa represents an important juncture in our understanding of the concept of *Nuragic rural settlement*.



Fig. 2 – Nuragic settlements of “Campidano Maggiore” region discussed in the text: n.1, Su Mattoni; n.2, Cuccuru de S’Arena; n.3, S. Vittoria; n.4, S. Maria su Claru; n.5, Su Cungiau’ e Funtà; n.6, Sa Osa; n.7, Sipoi; n.8, Palamestia; n.9, Montegonella; n.10, Gribaia; n.11, Lisandru; n.12, S.Elia; n.13, Biddazzoni Noa; n.14, Su Sattigheddu; n.15, Barrocu.

Atzori argued that these settlements, featured by the absence of any monumental structures and by the presence of sunken structures, were a new form of occupation of the habitat of the low plain in the Final Bronze, at a time when the original function and logistic value of the nuraghi had recently changed (1987). Nevertheless, the research carried out by in the Nuraxinieddu area in conjunction with a re-evaluation of Atzori’s data, suggests that these contexts were common at least since the MBA, and represent a peculiar trait of the human settlement in this region of Sardinia (Sebis 2009: 33).

The excavation and the study of the artifacts and structures from Sa Osa show the existence of a peculiar kind of settlement, rather different to that expected: it could be defined as a peripheral area in the Nuragic logistic concept of landscape. It was clearly not a simple aggregate of huts, or houses, but a zone utilised for exploitation of natural resources and production processes, in which there were probably some domestic spaces, but in all likelihood only temporary ones. Due to the proximity of the river Tirso, with its regular massive flooding, its occupation was probably seasonal.

## THE ARCHAEOLOGICAL CONTEXT

In the site of Sa Osa, a total of 4900 square meters have been excavated. This amount was divided, at the beginning of the excavation, in two main areas with different topographic features and issues: the Northern Area (3000) and the Southern one (1900), separated by the modern road Oristano (NE) – Torregrande (SW).

In the northern area the archaeological deposit was drastically eroded, because of his higher position upon an ancient pleistocenic sandstone terrace (Usai 2011; Depalmas and Vidili 2011; Fig. 3): the excavation (carried out by A. Depalmas, S. Sebis, S. Vidili, P.F. Serreli, L. Soro, V. Chergia) revealed indeed isolated sunken deposits and pits (alfa, beta, gamma, gamma1, delta, eta, kappa, mi, omicron, pi, rho, sigma, tau, ypsilon, chi, chi3, omega, double alpha, double beta, double gamma, double epsilon, double zeta, double eta), wells (beta1, zeta, theta, iota, lambda, mi1, ni, xi, fi, chi1, psi, double delta), structures (epsilon), all dug in the compact sandstone (Fig. 4). Some context gave evidence of occupation dated to the Eneolithic (pi, rho, omega, ypsilon, double beta), Early Bronze Age (gamma1), Middle Bronze Age (alfa, gamma, delta, beta, mi1, fi, chi2), Recent Bronze Age (mi1, fi, chi2, eta), Final Bronze and Early Iron Age (epsilon, beta, fi, chi, zeta, psi, iota). Interpretation of this evidence in terms of the settlement's structure is challenging, although it is notable that the same building technique, based on the creation of sunken spaces, has been so durable over the millennia. Only one structure could have been used as habitation (beta) because of its dimensions.



Fig. 3 – Geomorphological features of the area: 1 - Coarse pleistocenic floods and terrace; 2 - Lacustrine and marsh deposits; 3 – Sub recent floods; 4 – Ancient river beds.

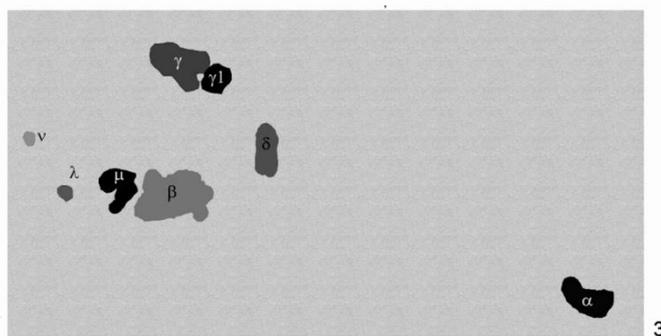
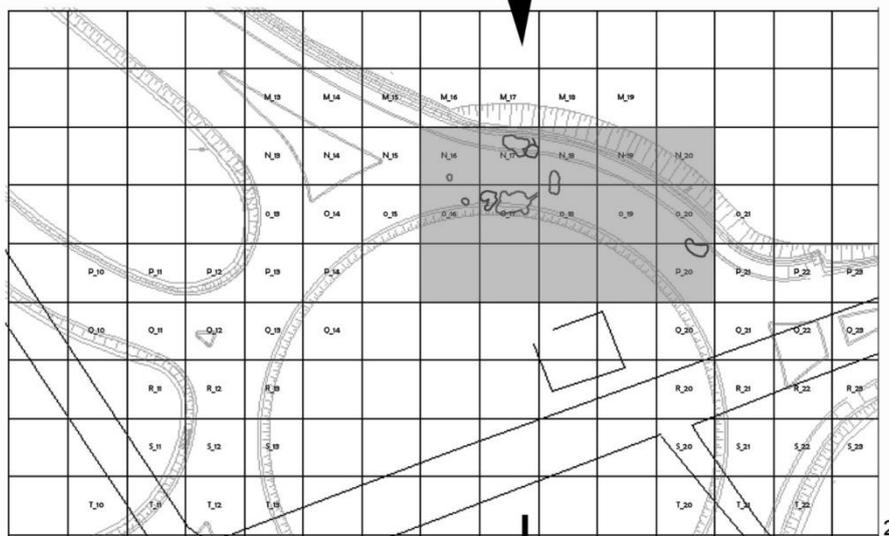
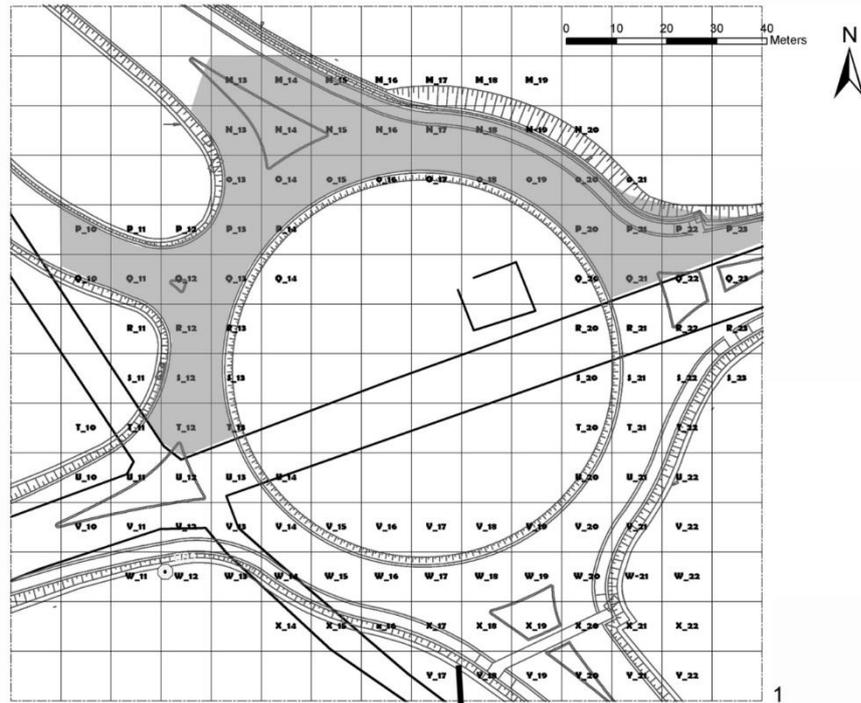


Fig. 4 – Structures of the northern area of the site (after Depalmas and Vidili 2011).



Fig. 5 – Squares X20, X21, Y20, Y21.

In the southern part of the site (Usai 2011; Castangia 2011a; Sebis 2011; Pau 2011; Serreli 2011; Soro 2011; excavation carried out by S. Sebis, P.F. Serreli, L. Pau, L. Soro, V. Chergia and G. Castangia), which is lower than the northern part, the archaeological deposit was much thicker. This is due to: (1) its position, at the bottom of the hill constituting the Northern Area – the products of the erosion of the hill have come down and filled the deposit; and (2) the locale has consistently been submerged by the floods of the river Tirso – the name Sa Osa means “flood plain” – and there are elements that allow us to argue that in prehistoric times the river was even closer (Melis and Sechi 2011). In the southern area 32 main structures were discovered, 4 of which were probably buildings or at least “covered” structures – A, R, S, Y –, 17 were holes (B, C, E1, E2, F, G1, G2, J1, J2, O, P, Q, T, W, X, BB, CC), 13 were pits or wells (D, H, I, K, L, M, N, U, V, Z, AA, DD, EE).

The evidence that I discuss in this paper, dated from the MBA to the Final Bronze Age - FBA from now on (Castangia 2010), come from a multi-phase context of the southeast 10m-squares of this area: X20, X21, Y20, Y21 (Fig. 5 – excavation by G. Castangia, Salvatore Sebis and Laura Pau).

On sandstone bedrock (SU 5) degrading southwards, colluvial and alluvial depositions - SU 27, 31, 255 - fill a depression in the bedrock shape (squares X20,X21,Y20,Y21). They yielded MBA and Eneolithic pottery, but no evidence of any structure or feature. After the deposition of these strata, various processes of preparation of the area took place for the construction of at least 4 structures or spaces: A, S, R and Y (Fig. 6).



Fig. 6 – General photo of the area from NW; detail of the bricks.



The shape of the former natural deposits was modified in order to obtain a quasi-horizontal surface to host the new constructions in (SU 283 and 258). Some artificial levels were added for the same reason, and also to give stability to the new structures (SUs 16, 95, 285 – grey clay with some sandy inclusions – 97, 301, 302 - mixed sandy-loam levels – and 99 – a mixture formed of pieces of sandstone, clay and sand).

The biggest structure has been called “Building A”. Three stone basements, named SU 3A, 3B e SU 289, have been placed on the artificially-obtained surface SU 283, with additional depositions of grey clay and sand used to join the stones. Upon this basal level of medium stones, the evidence of SU 32 and the presence of a number of fired rectangular bricks just south of the wall SU 289 suggest that the walls of the structure were realized in mud-bricks, a technique found in several sites of the same period, such as Monte Zara – Monastir (Ugas 1992b) and Su Cungiau ‘e Funta – Nuraxinieddu (Sebis 1994). The Building A was circa 4x6 meters. The units 280, 281, 284 and also the surface 283 testify a first phase of use dated to the first Recent Bronze Age - RBA from now on (Fig. 7), the other contexts 9, 32, 40, 41, 71, 88, 90, 91, 92 and 300 gave materials datable to a first moment of the FBA (Fig. 8,9). In this latter phase the wall called SU 3 was prolonged with the new 3B segment, which was in all likelihood linked to a kind of wooden structure: this is suggested by the clay trace SU 92, close to the south. SUs 9, 71, 88, 90, 91 and 300 indicate the remains of activities that were limited by such SU to the northern part of the Building A.

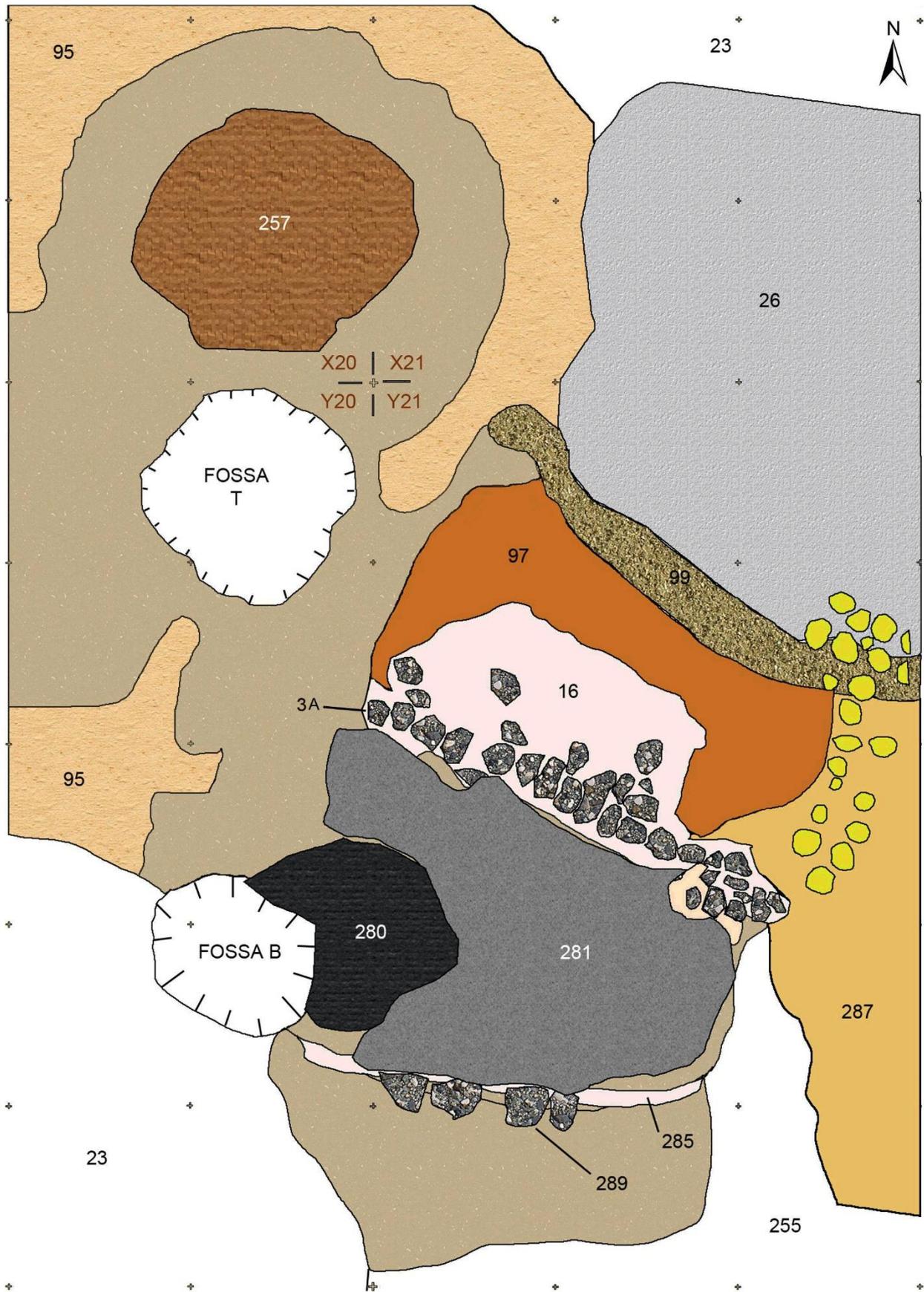


Fig. 7 – I Occupation phase – Recent Bronze Age.





*Fig. 9 – Aerial photo of the area – II Occupation phase of the A building (photo of G. Mancosu).*

To the N of Building A another similar construction has been excavated: Structure S (Fig. 10). It is delimited by the artificial SU 99 to the N – which separates it from another space called Y filled by a dump called SU 41 – and by two rows of stones (SU 42-53 and 72-81) to the E. These have now disappeared: it has been possible to find them only thanks to the traces on the surface, little holes filled by the latter alluvial episode (SU 23). Building S was probably dismantled to re-arrange the area, which is probably why no use-related-SUs were found inside of it besides SU 40, which has been interpreted as a collapse of some structural element (Castangia 2010: 18). At the bottom a surface of burned clay was found. The original floor of this structure may be identified in the so-called SU 27, upon which a number of artefacts were found in the northwestern part of the space (SU 426, Fig.19, 20): it would mean that this SU was a former floor rather than SU 258/283.



*Fig. 10 – Aerial photo of the area – Detail of the S structure (photo by G. Mancosu).*

Some 3 meters N-W of it a different structure named R was discovered: it consists of a circular space with a diameter of 5 m, delimited by an earthen wall (SU 95). This wall covers circa 70% of the perimeter, which is open in the southern part where a large pit called “T” (cut SU 259 – Fig. 11) was excavated.

This hole, circa 2,5 m large and 1 m deep, contains alluvial latter sediment (SU 23, which filled a hole) within which a large tank (Fig. 11) and a limestone mortar (Fig. 12) were found reversed. The amount (119 units) and quality of the stone artifacts collected from structure R (SUs 257 and 258) show a high degree of specialization: many different typologies of instruments are represented (Castangia 2010: 400-401). To the N of the structure, 2 wells (U and V – excavated by P. F. Serreli) dating to the Recent Bronze Age phase - hence contemporary to the building – were found.



*Fig.11 – Tank found inside of the T pit.*



*Fig.12 – Mortar found inside of the T pit.*

The alluvial deposits SU 23, 256, 282 seal all the building's occupation. They are probably the result of medium-to-high-energy flood events that took place during the Final Bronze Age. The sediment is formed of coarse sand, clays, loams, very rich in small and medium-size quartz and organic inclusions; sometimes small artifact concentrations were identified. The direction of the stream seems to have been NE-SW (Castangia 2010: 429-431). Some clues indicate the high level of energy of these events: inside of the T pit, filled by the alluvial sediment SU 23, were found the reversed large



limestone basin and a limestone mortar mentioned above. Besides, a series of grindstones were found piled up close to the northern part of 3B wall – they probably were originally located in the structure R and were eventually moved southwards by the current.

On the top of such alluvial depositions some other evidences of occupation were found, later sealed by SU 1 (SU 20, 55, 250 and B pit): SU 20, which is a very dark clay-sandy unit, probably formed of the remains of some burning activity; SU 55, a dump (circa 2x2m); SU 250, a burned surface associated with grindstones and mortars; and finally, the pit called “B” (excavated by Laura Pau), that was likely a little dump cut, located in the south western limit of the former A Building. The pottery from these contexts dated from Final Bronze Age to First Iron Age. Everything was finally covered by the alluvial superior unit (SU 1), which represents in all likelihood the remains of several different and more recent alluvial episodes.

## **STUDYING THE MATERIALS: SOME NOTES**

In this paper I consider the pottery and lithics (except flint and obsidian tools, see Caruso and Zupancich 2011) that I analysed during the fieldwork I carried out for my dissertation – from SUs 3, 9, 23, 26, 32, 40, 55, 71, 90, 91, 88, 97, 257, 258, 280, 281, 282, 283, 300 from the squares X20, X21, Y20, Y21 (Structures A, S and R) – and also 30 ceramic objects from the hypothetical floor of Structure S (SU 426). In other words:

- 7634 potsherd and 127 lithic instruments catalogued in my dissertation
- 30 fishnet weights (see below) and fragments thereof, unpublished so far. I decided to include them in this work in order to better define the category they belong to, but all the other analyses herein were carried out without taking them into account [2].

I arranged vessels by their morphological features, setting apart first the fragments of dolii (81 units), massive storage jars, and dividing the remaining potsherd in rims (873), handles (94) and other diagnostic elements – such as decoration (84). I tried to find pieces belonging to the same vessels on these selected fragments, but I failed in about 90% of the cases.

Eventually I have obtained a M.N.V. (Minimum Number of Vessels) considering the total number of rims: 714 (744 with the 30 fishnet weights). Therefore it was necessary to make a further selection, rejecting all the potsherd impossible to reconstruct with drawing or computer graphic procedures. The final result of the entire selection is a catalogue of 173 vessels published online with the entire dissertation (Castangia 2010).

## **POTTERY TECHNOLOGICAL FEATURES**

In order to highlight the main technological features of the pottery, I analysed all the selected potsherd by visual macroscopic examination. I also calculated the dimension of inclusions (little - diameter < 1mm, medium - d ~ 1mm, large - d > 1mm) and their percentage in the paste. Then I studied surface treatment, color, and any other notable feature of the selected potsherd.



It has been possible to distinguish five main paste classes, named A, B, C, Z1, Z2. The latter two were exclusive of the *dolii* category (see tables). Identified differences in the paste are due to both different raw materials and production processes. They have also a chronological value.

Paste class A and Z2 are both very coarse, with intensively polished surfaces. In a number of cases the vessel seems to have been smudged (only on the internal surface or both on internal and external) and fire clouds are also quite common. Sections often show a black core. These features suggest relatively unstructured production conditions in which vessels would have been fired in holes or little pits, such as T hole. Temperatures inside of these structures would have not reached 900 °C.

The very coarse paste composition can be due to such firing conditions: rapidly rising heat and direct contact with fuel readily cause cracks or other kind of damage on vessels (Gibson and Woods 1990: 27). In all likelihood the clay was provided from the near fluvial deposits of the Tirso, and it was already rich of sandy quartz inclusions. Nevertheless the heterogeneous nature of the inclusions can be the result of an artificial, though coarse, selection. Paste classes A and Z2 have been utilised for manufacturing vessels belonging to all the functional categories identified. Their main features are compatible with a domestic production of pottery, with a low degree of specialization and organization of the production process.

Paste Class B often shows evidence of a complete oxidization or reduction, and the inclusions in the paste – quartzes and micas – are small-sized, arranged with a greater homogeneity degree rather than in Past Classes A and Z2. Walls are usually thinner and the surfaces are often only smoothed rather than polished. The potsherds show traces of wheel. This Paste Class represents the result of a more controlled and complex production. Technical processes ought to be different from the former paste classes: pottery was in all likelihood fired in closed ovens after a proper preparation of the temper. It has been noted that above 970° burnish will not be retained (Kelso and Thorley 1943), and since one of the most evident differences from the PCA is the rarity of burnishing, it is feasible that firing temperature was higher than in the production process of PCB.

Paste Class C lays somewhere between A and B. That is to say, although it does not show any traces of wheel it has a very homogeneous texture. On the other hand, all the potsherd are very strongly polished (PC-A-like). Firing conditions were probably similar to PC-A ones, but in all likelihood the clay was different.

Paste Class Z1, belonging to the *dolii* category, seems to be the result of an intense and controlled firing, because it shows a maximum degree of oxidization in all the fragments. There is evidence of the use of chamotte within the temper.

Differences between the five Past Classes do seem mostly to have a chronological value: A and Z2 are associated to pottery dated from the MBA to the first part of FBA, B and Z1 appear during the FBA, C belongs to an Eneolithic pottery tradition (Sub-Ozieri phase).

In the early 1980s, Sebis first noticed this chronological trend in the technology of pottery in the artifacts from the settlement of S.Barbara – Bauladu (Sebis 1985: 273). In the last 30 years, it has become evident how the same differences can be found in the pottery from several nuragic contexts in the Sinis region, such as Su Pallosu – San Vero Milis (Castangia 2011b), Corrighias – Cabras (Sebis 1998), Cuccuru is Arrius – Cabras (Sebis 1982), and generally in the region of the lower Tirso: Pidighi – Solarussa (Usai 1996; Usai 2000), S.Barbara – Bauladu (Sebis 1989), Nuraghe Nuracraba – Rimedio (Santoni and Sebis 1985).



Such a trend must be interpreted as a linear technological progress in pottery production from the domestic level (PCs A,C and Z2), to a more specialized production on a wider scale (PCs B and Z1). The wheel, introduced in Nuragic Sardinia during the Recent Bronze Age in the southern part of the island (Ugas et al. 2004: 402) and adopted in the central-northern area in the Final Bronze Age (Depalmas 2009), is one essential element in this development, together with a more controlled firing and preparation of the paste.

As mentioned above, in Sa Osa no structural evidence can be related to the more specialized production, except for the products themselves. This could signify that the production was more centralized during the FBA, the functional value of the site having subsequently changed.

## FUNCTIONAL OBSERVATIONS ON CERAMICS

In my dissertation I defined a number of main functional categories of vessels, and, referring to the work of many scholars as such as Peroni 1994, Campus and Leonelli 2000, Recchia 1997, Henrickson and MacDonald 1983, Juhl 1995, adopted a mixed approach that considered the presence/absence and the different value of the following main parameters: Open/Close shape, Maximum Diameter/Height ratio, Maximum Diameter/Rim Diameter ratio, Rim shape (Castangia 2010: 66 – 118).

I have identified categories of vessels as such as trays, bowls, cups, footed-cups, reverse-cooking big bowls, amphorae, jars, dolii and categories of ceramic objects like spindle whorls, fish net weights, others. I carried out a detailed descriptive study of each category based on their main functional tasks: trays have been used essentially as cooking vessels, such as probably the so called reverse-cooking big bowls and some jars; bowls could have had a number of different uses, such as such as consumption of liquids, semi-liquids, or lids for jars, or preparation of complex foods (or other substances which were not necessarily food); cups and footed cups are related to the individual consumption of liquids; amphorae are usually used for the transport of liquids, jars for cooking, short and medium term storage, serving. Other categories are discussed in greater detail below. The functions that I identified are not exclusive, but are the most feasible for every category of vessel.

The analysis of the distribution of the categories on the only residual floor (SU 258/283) of the area shows that most of the categories – and most of the potsherd – are concentrated in the western area of Building A (Fig. 13).

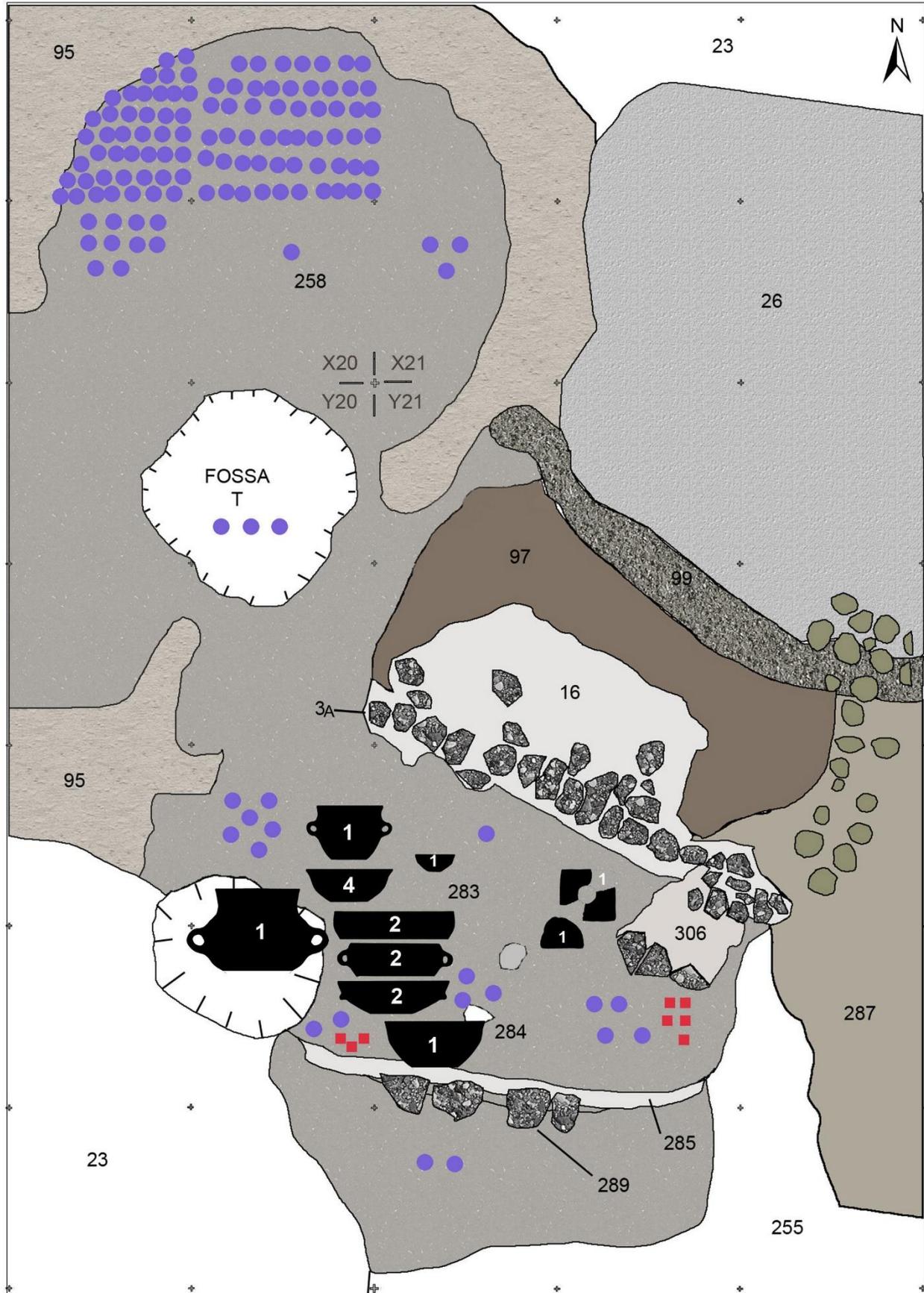


Fig. 13 – Distribution of the archeological finds on the floor 258/283 (I occupation phase ): black - category of pottery; violet – number of stone artifacts per square; red – number of dolii fragments per square.

I compared every category with the published pottery available for Bronze and Iron Age Sardinia to arrange the ceramics of Sa Osa in a precise chronological framework and to assess whether there has been any recognizable or important changes in the typologies/function of vessels during the Bronze/Iron Age (Castangia 2010: 119 – 399). This allowed me to date the former occupation phase to the Recent Bronze Age and the latter to the first part of the Final Bronze Age. It is noteworthy that a number of potsherd from the MBA are spread all over the later floors and SUs.

In this paper I am particularly interested in some specific categories: footed-cups, dolii, spindle whorls, fishnet weights and other objects. These categories could help us discuss a number of economic features of the nuragic world, both through time and space.

### *Footed cups*

This category of artifacts is formed of open-shaped small cups with a cylindrical shaft (Fig. 14). Only one of these cups (SU 40-1) comes from the area of the Building A, most of them come from the N well (Serreli 2011: 235). There the cups were found – inside of the N well – together with jars containing significant amounts of grape seeds (both domestic and wild) and a large number of other organic remains probably related to the wine production (fig seeds). The jars can be dated to the Recent Bronze Age (Serreli 2011). The same association of grape and fig seeds in a Nuragic locale comes from Duos Nuraghes (Webster 1996 and Bakels 2002).

Although a number of these cups can be interpreted as lamps (Serreli 2011: 228; Usai 2011) for their swallow basin, it is feasible that at least the deeper ones were linked to the consumption of small amount of drinks, maybe wine.

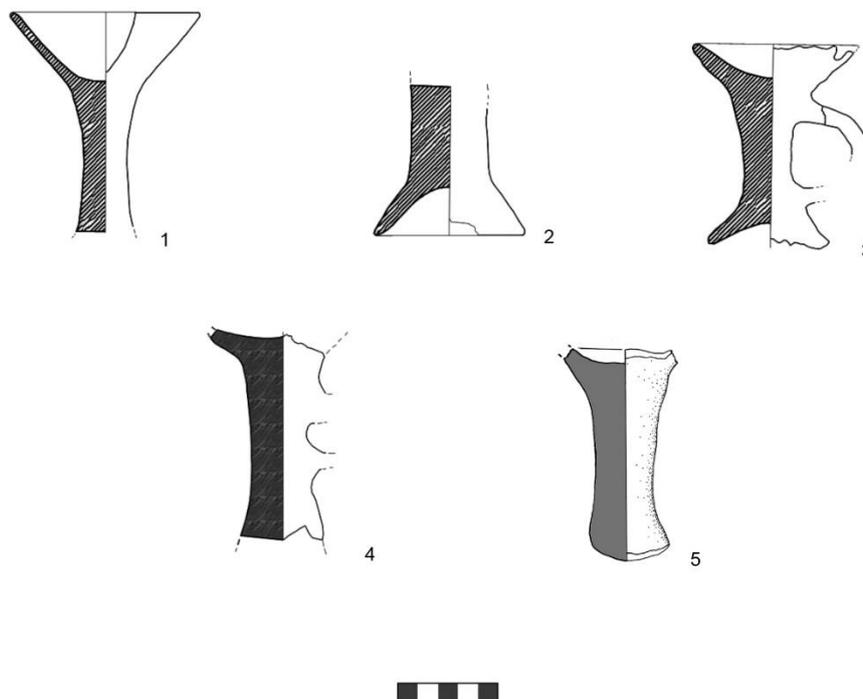


Fig. 14 – Footed cups: 1,2,3,4 from N well (drawings by P.F.Serreli); 5 from SU 40 (drawing by G.Castangia).

Prior to the Recent Bronze Age, there is most little evidence of grape processing in the Nuragic economy (Sanges 2008). Vice versa, the archaeobotanical evidence of this activity is continuous from the RBA (Badas 2000; Bakels 2002), and the context of Sa Osa shows a surprising richness in this regard (Lovicu et al. 2011).

The footed cup is distinctive of central western Sardinia from the same period (Serreli 2011). It acquired through the FBA and EIA peculiar symbolic traits, which are clearly testified by the exemplars from Su Pallosu in northern Sinis (Falchi 2006). They present a shape that reminds that of a nuraghe model, a decoration made of circles and lines, and are polished and manufactured from a very fine paste. They carried an evident strong symbolic value, but their original function may not be very different from the ones from Sa Osa.

### *Dolii*

The use of the dolii in the nuragic community of Sa Osa displays some interesting features. The dolii are massive jars, with a wall thickness up to 3 cm, primarily utilised for long-term storage (Fig. 15). This is clear from the dimensions, which permit the storage of massive volumes, and the wall thickness, which provides the necessary thermic isolation. Both features indicate an impossibility of displacement. This primary economic function was highly relevant within the nuragic communities as long-term conservation means planning and some degree of centralization.

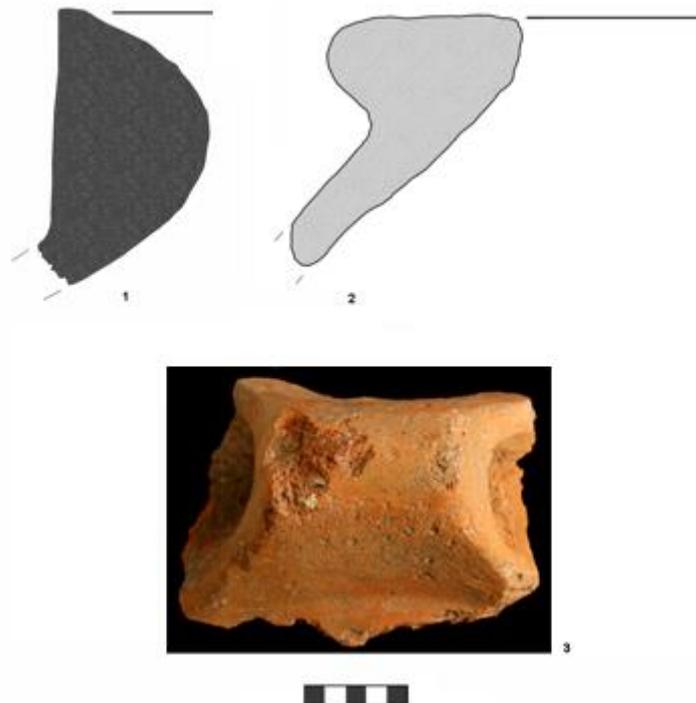


Fig. 15 – Dolii fragments : 1 from SU 23; 2,3, from SU40.

The secondary function is their use as structural parts of walls, well documented in Building A: here they have been located inside or at the bottom of the earthen walls (inside SU 32), or close to them to strengthen clay preparations on the floor (SU 285 e 92).

However, the primary function does not appear at Sa Osa. Here broken fragments were indeed recycled and used for the construction of new buildings or as raw material for the production of ceramics (chamotte). This behaviour is well documented among ethnographic case studies, where it can be seen how even different parts of the vessel are riutilised for different purposes (Deal 1998: 108).

### *Spindle whorls and other ceramic objects*

Spindle whorls are very common within nuragic archaeological monumental sites, especially villages or even nuraghes. These whorls are little ceramic discs – circa 5 cm large and 1 cm thick – which give the spindle a dynamic force in its circular movement. On the spindle, they can be set in 3 different positions (Mistretta 2004): at the bottom - the movement of the spindle produces a S-twisting thread (Barber 1991), at the top - the thread is produced with a Z twisting, in the middle.

The first and the second positions can be utilised together to carry out different operations on the same thread. Weight and diameter of the spindle whorls are essential features, because they influence the kind of thread that can be produced by the spindle. Indeed, the heaviest ones (100-150g), that usually have the greatest diameters, are generally utilised to produce long fibres, while the lighter ones produce thinner fibres (Mistretta 2004). The pieces that I was able to study from Sa Osa have mostly the same weight of 50-52g (Fig. 16 n. 1,2,5,6), only one was 25g (Fig. 16 n.3): they are quite small, and their dimensions are compatible with a production of thin fibres.

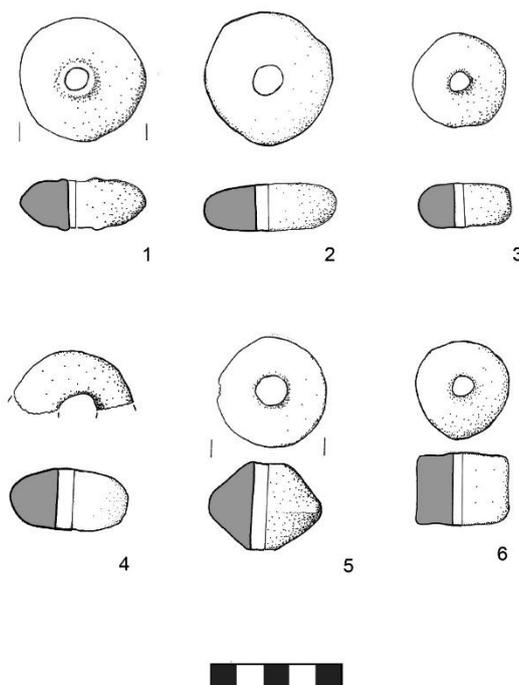


Fig. 16 -Spindle whorls: 1,2,6 from SU 23; 3,5 from SU 55, from SU 280.

It is quite difficult to find out if there were been any chronological change in this category of objects through time. The 6 exemplars that I have analysed come from the area of Structure R: SU 23, containing mixed materials dated to the RBA and FBA, and SU 55, containing materials dated to the FBA. There are little differences in the shape but this is probably for stylistic reasons (Castangia 2010). Usually the design of such objects is very conservative over space and time, especially between Bronze and Iron Age (Barber 1991). Other objects coming from structure A can probably be related to weaving processes (Fig. 17): two entire objects, parallelepiped-shaped, which could be easily interpreted as loom-weights (n. 4, 5), two oval ones with a flat base (n. 6, 7), another broken one with a circular base and a narrowing just above it (n. 3), a squared object with a 3-cm hole in the middle and a kind of cube with a hole in one of the faces (1 cm diameter, 1 cm depth, n. 1), another clay parallelepiped with a little hole on the top of one of the short sides (n.2). These objects were concentrated inside of the A Building. The presence at Sa Osa of this weaving-kit suggests the existence of some domestic space, perhaps Building A. Evidence, such as the dimensions of the internal exploitable area and the ceramics, lithics and bones on the internal floor SU 283, suggests that it may have been the only potentially domestic space of the area, at least during its I phase.

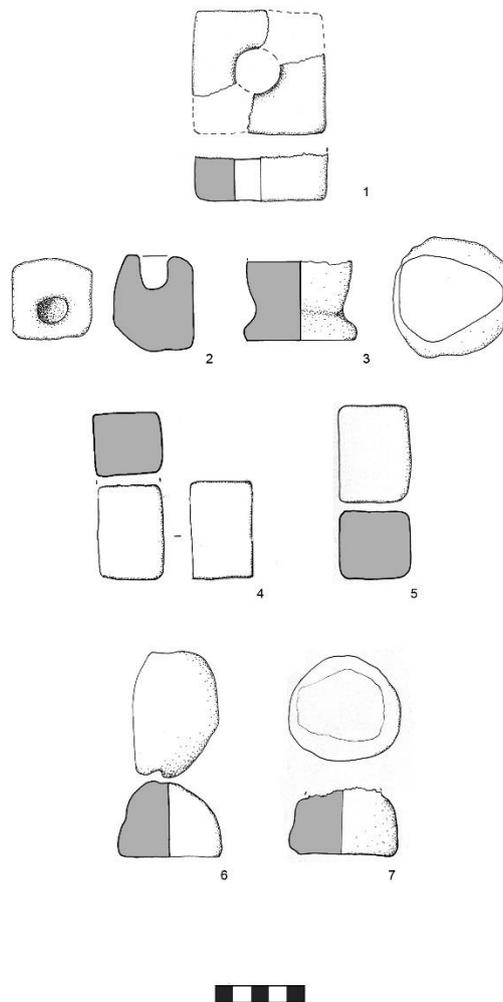


Fig. 17 – Clay objects from building A: n. 1 from SU 281/283, 2 from SU 38, 3 from SU 40, 4 from SU 23, 5,6,7 from SU 283.

*Fishnet weights*

Such little pierced ovoid or cylindrical clay objects represent one of the most notable features of the entire archaeological records of Sa Osa. Five of them come from the SUs I analysed during my dissertation fieldwork (Fig. 18), and can be dated to the Late and Final Bronze Age; 19 entire pieces and 11 fragments showed in Figure 17 were instead found together in a small hole close to the R Structure (SU 426, which can be interpreted as a floor, maybe contemporaneous to US 283), associated with potsherd from a little necked jar and a tray datable to the end of the Middle Bronze Age (Fig. 19, 20).

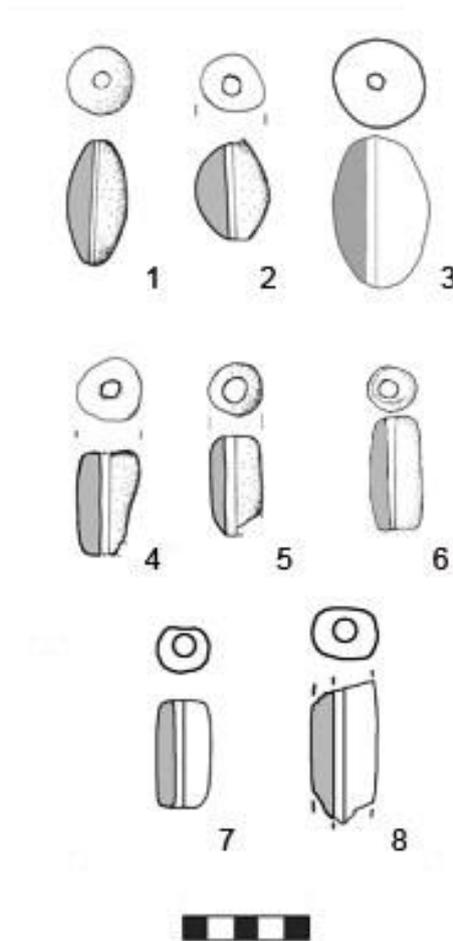


Fig. 18 – Fish net weights: 1 from SU 55; 2, 3, 5 from SU 23; 4 from SU 88; 6 from B hole; 7, 8 from K hole.



Fig. 19 – Fish net deposit SU 426, on the floor SU 27.



Fig. 20 – Fish net deposit SU 426, on the floor SU 27 (particular).



They can be interpreted as weights, tied to the fishnets to pull them underwater.

Published comparisons for this kind of object are not common, probably because there is not enough knowledge of those contexts which are located in fluvial, lagoon or coastal habitats: the same kind of object was indeed discovered in the sites of San Marco – Settimo S. Pietro (Nuvoli 1990), Cuccuru Ibba – Capoterra (Santoni 1986) and Tanca ‘e Linarbus – Elmas (Santoni 1986). These sites are located in southern Sardinia, in wetland ecosystems.

The evidence at Sa Osa testify that their use in this context was continuous at least from the Middle Bronze Age to the Early Iron Age: they come from SUs 23 (mixed materials from MBA to FBA), 55 (FBA-EIA), 88 (first part of FBA), 426 (end of MBA), from B Hole (end of FBA-EIA – Pau 2011), from the D well (mixed, from Eneolithic to FBA – Usai 2011).

Furthermore, many fish remains were found in the wells N, U, V at Sa Osa, associated with nuragic pottery (Usai 2011).

## LITHICS

A total of 127 lithic instruments were found in the area. I catalogued and typologised these tools in 8 main functional categories: smoothing tools, potter's scrapers, pestles, percussors, grindstones, upper grindstones, mace-heads, whetstones.

Thirty two percent of them were made on a basalt support, 21% on pebbles, 11% on trachite, 10% on granite, 7 % on quartzite, 3% on limestone, 2% on schist, 2% on sandstone. I was not able to determine the type of stone of 12% of the tools. A number of instruments show traces of utilization, in particular two pestles (Fig. 21 and 22): the analysis of these remains is currently in process.



*Fig. 21 – Pestel from SU 55.*



*Fig. 22 – Pestel from SU 55.*

However, these instruments could have been useful to a great number of activities: the smoothing tools can be utilised to smooth or polish surfaces, usually during pottery preparation process (Fig. 26); the potter's scrapers have a retouched edge used to shape the clay during the same process; pestles and percussors are used to beat and/or crumble a great number of materials, together with grindstones and upper grindstones (clay, seeds, limestone, sandstone, sand, etc. – Fig. 25); mace-heads could be very useful in beating, breaking, crumbling or treating some hard or difficult material (timber, stone – Fig. 23); whetstones are used to sharpen metallic tools (Fig. 24).



Fig. 23 – Mace head from SU 55.



Fig. 24 - Whetstone from SU 23.

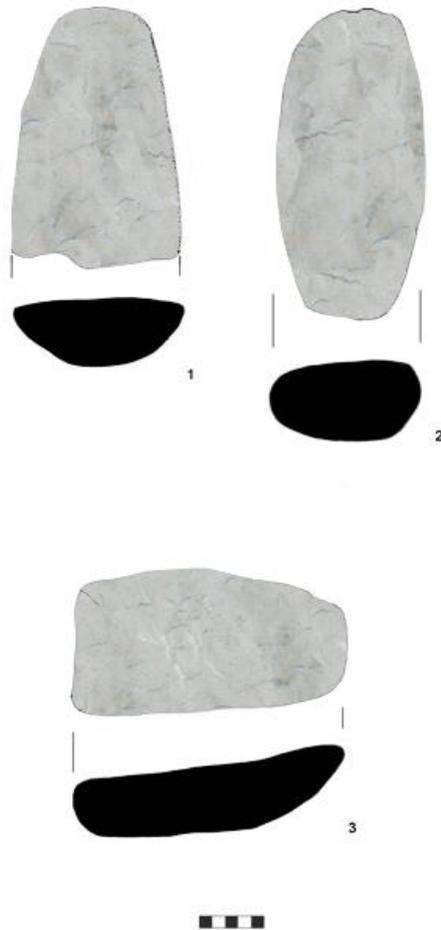


Fig. 25 – Upper grindstones and grindstone : 1 from SU 283; 2 from SU 55; 3 from SU 282.

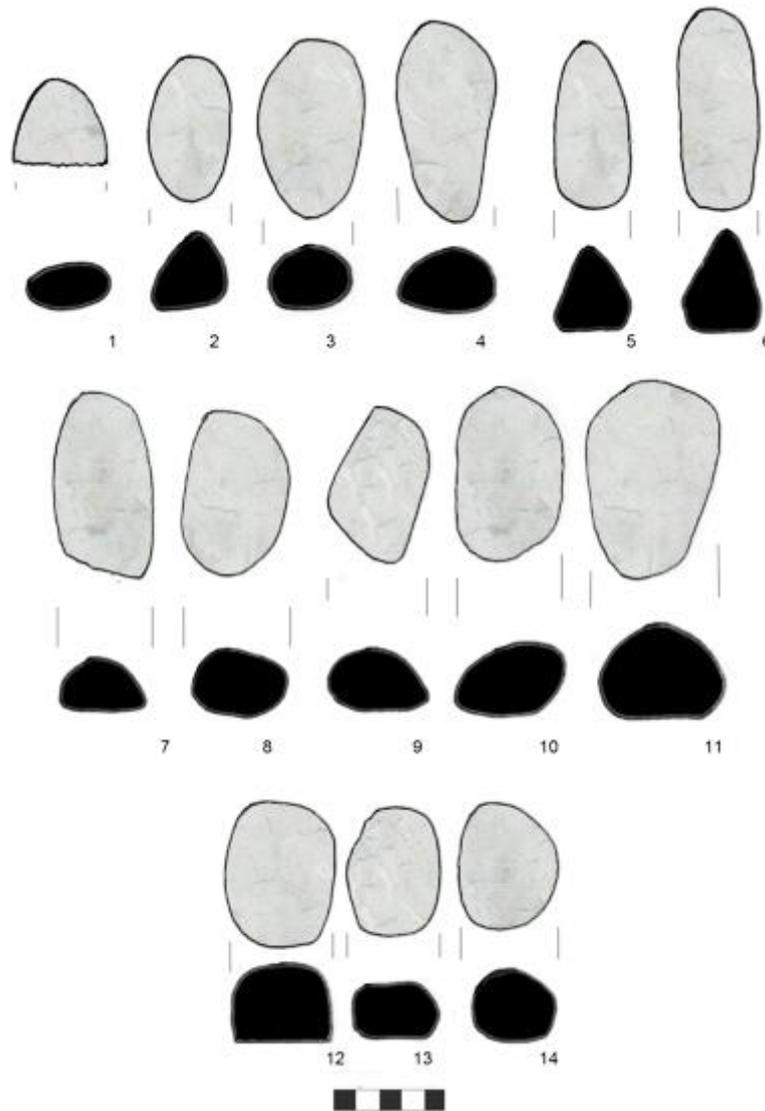


Fig. 26 – Smoothing tools : 1, 3, 4, 7, 11 from SU 55; 2, 5, 6, 10, 12, 13, 14 from SU 23.

One hundred and nineteen instruments come from the floor 258 and the thin layer 257 of the R structure; 2 other particular objects were found inside of the filling of the T Hole in front of that structure: a biocalcarene tank (50x40x30 – Fig. 11 and 12) and a mortar made of the same stone.

Such a space was most probably connected to more than one craft activity, one of which was pottery-making, or at least clay manufacture. The basin could have been used as a decantation tank, the mortar inside of the T pit may have been useful in the processing of the raw material, the presence of the T pit could be linked to its utilisation in firing processes. Furthermore, elsewhere I discussed the discovery of some unworked clay lying on the floor of the structure (Castangia 2010).



## CONCLUSIONS

The southern sector of the site of Sa Osa gave us essential clues to understanding both transformations that took place within the local community and the strong continuity in the occupation and exploitation of the landscape. We must consider the fact that its occupation was not short at all, and ephemeral constructions like A, R and S buildings were occupied and re-arranged for at least 2 centuries.

Unfortunately, the site is featured by a topographically discontinuous evidence that does not allow to undertake any study or discourse on the structure of the whole settlement during the various phases. Nevertheless, analysis of both pottery and lithics provides interesting account of a range of activities carried out during this period in the settlement and in its area: fishing, weaving, pottery making, and probably wine production.

Fishing in particular must have been one key factor of occupational continuity in the area, although it was naturally not the only one: archaeozoological evidence of fish bones from several wells of the southern area of the site (N,U,V) testify for the first time in a nuragic context the high degree of exploitation of this kind of resource, alongside the remains of a large amount of other habitual terrestrial fauna. Fish must have had an important strategic value in the economic system of this region, similarly to the southern part of the Campidano plain. The site of Sa Osa is located between the big “Stagno di Cabras” to the north and the Tirso river to the south, in a very convenient position for the exploitation of fish resources. Besides, about 30 km to the north, in the northern part of the region of the Sinis, are located a number of medium-sized and large salted ponds. These were undoubtedly exploited for obtaining salt during the nuragic period, an essential element in the conservation and trade of fish: many nuraghes were built around them, testifying to the interest people had in this resource.

The evidence of grape processing of at Sa Osa is also of great interest, because of its economic and social implications. The study of biological remains is now underway and will surely reveal important features of the process. Moreover, the evidence of consumption of wine is suggested by the so-called footed cups, a new vessel shape which appears in the Recent Bronze Age, becoming increasingly fine and specialised through the centuries until the geometric Early Iron Age, when we find cups with symbolic decoration and shape from Su Pallosu (Falchi 2006). This type of vessel is not widely spread in Sardinia: it is typical particularly of the central-western region (although some exemplars come from Santa Vittoria di Serri).

*Dolii* fragments and their re-utilisation testify both to the opportunistic and the productive status of the settlement. Indeed, no complete jar was found in the site, and most of the fragments were utilised in the construction of earthen walls. Although it is feasible that this type of storage vessel were utilised for storing in the settlement, no proof were found in this regard.

In spite of the strong continuity of this settlement throughout the centuries, important transformations within nuragic society during the second part of Final Bronze Age are also recognisable at Sa Osa. They are evident in the ceramic technology, the features of which indicate a deep change within the production. An initial small-scale production, carried out in spaces like the R Structure, with open and not-controlled firing, is visible in the paste classes A and Z2 and belongs to vessels from the Middle Bronze Age to the beginning of Final Bronze.

The later potsherd with B Paste Class show a finer preparation and a more controlled firing, together with traces of wheel; inside of the Sa Osa settlement there is no structural remain that can be linked



to this different kind of production, which was more centralised. This phenomenon is the same in all the region of low Tirso – Sinis – high Oristanese during the Final Bronze Age, and it is an indication of the important economic and, therefore, social changes that took place at that time. This was the time when the construction of nuraghi came to a halt, and the nuragic society began deep internal transformation that has been an important matter of discussion among scholars over the last decades. At Sa Osa, it is a matter of fact that no structural evidence – buildings or huts – can be related to this period, and the pottery comes only from pits, dumps and similar contexts, testifying perhaps to a change in the functional value of the site.

## NOTES

[1] Other participants in the project (excavation and laboratory analysis): Laura Pau (Independent Researcher); Silvia Vidili (Univerista degli Studi di Sassari); Pietro Francesco Serreli (Universita degli Studi di Cagliari); Laura Soro (Universität Wien); Valentina Chergia (Universita deli Studi di Cagliari); Rita Teresa Melis and Serafina Sechi (Universita degli Studi di Cagliari) – geoarchaeology; Marco Zedda (Universita degli Studi di Sassari) and Gabriele Carenti - zooarchaeology; Gianna Giachi (Soprintendenza per i Beni Archeologici della Toscana) – wood treatment and analysis; Nicoletta Martinelli and Olivia Pignatelli (“Dendrodata” s.a.s., Verona) – analysis of the traces on wood; Giovanni Lovicu (Agris Sardegna - DIRARB), Gianluigi Bacchetta (Universita degli Studi di Cagliari) – study of grape seeds; Philippe Marival (CNRS Tolosa) – seeds analysis; Marco Marchesini and Alessandra Maccioni (Universita di Ferrara) – pollen analysis; Giuseppina Sechi (Universita di Ferrara) – analysis of bone-tools; Dominique Frère (Univ. de Bretagne-Sud, Lorient), Laurent Hugot (Univ. La Rochelle) and Nicolas Garnier (“Lab. N. Garnier”, Vic-le-Comte) – gascromatographic analysis on pottery; Stefano Caruso and Andrea Zupancich (Universita di Roma ‘Sapienza’) – lithic analysis.

[2] I would like to give thanks to Salvatore Sebis for his courtesy regarding to the publication of these materials. Indeed, the wheights were found in the last campaign of 2009, at a time when I was no more involved in the excavation, and they ought be published firstly by him. For this reason, I decided not to publish drawings but just two pictures taken on the field

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