

Everyday Life in Mediaeval Uthina

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Abstract. This paper concerns an assemblage of fragmentary ceramics coming from excavations in Uthina, a Roman city in the North of Tunisia. The study has a quantitative and functional perspective and its aim is twofold: to assess the origin of the ceramics supposed to belong to an Islamic house and to detect by exploratory techniques the best parameters for future quantification analyses of this kind of pottery, largely existing on the site.

Keywords: ceramics, quantification, functional analysis

1. Introduction

Uthina is an ancient Roman city in the North of Tunisia, where the Archaeological Mission of Cagliari University and Institut National du Patrimoine –Tunis have excavated since 1995 (Sotgiu, Ben Hassen and Corda 2002).

Uthina rose to its greatness in the Imperial Roman Age and was still inhabited until the Middle Ages, becoming an Episcopal seat during the Late Antiquity, then persisting as an Islamic town (Ben Hassen and Maurin 1998). In the area excavated by our Mission, the structures superimposing on a monumental arch with hydraulic purpose are Islamic houses having small walls built with slabs sacked from ruins.

During the excavations, two rooms have been identified, each with its own equipment. A deep hole between them was full of fragmentary pottery. We believe that its content, the Stratigraphic Unit SU1064, consisting of 1885 ceramic sherds, 205 fragments of animal bones and one bronze coin, comes from a third room, suddenly destroyed when ceramics were still in use. On that hypothesis, we expect to find vessels at a low breakage rate, good for daily needs like storing water and food, preparing and cooking meals, lighting and cleaning. Pottery like that coming from SU1064 is largely represented on the site and to optimize its quantification that particular context is analysed in detail, in order to test the best parameters and sampling rules for further analyses.

Exploratory techniques are applied on the whole assemblage and they are preliminary to further ones.

2. Methodology

A preliminary survey of the assemblage suggests to us how to classify vessel shapes and fabrics represented in a reference table. All sherds have been classified by comparison with the reference; individual registration aims at studying breakage rate. Furthermore, they have been photographed in vertical view, on a plain having a dimensional scale; both surfaces are documented. Pictures have been used to measure the

dimensions of no-diagnostic flat fragments, to verify descriptions of surfaces and use-marks, to detect surface colours then codified as RGB coordinates (Locci, forthcoming). Despite the problems concerning the RGB coordinates standards and the effectiveness of colour in describing pottery (Mirti 1998), the reduction of colour at a numerical code makes statistical processing easier. The wide diffusion of RGB code on electronic devices encourage us to make an attempt to use it. Diagnostic sherds have been measured and drawn. Rim and base diameters have been calculated by a CAD software, starting from a direct measurement of the fragment. However, as coarse ware is handmade and irregular, the arcs corresponding to an angle narrower than 18° (5% of circumference) have already been registered, but the estimation given is not totally sure.

When the whole profile is known, both complete or restored, a 3D visualization of the pot has been made by a CAD (function revolve). Results are looking good, but pictures are taken as an estimate, not a measure of vessel because small irregularities are neglected (Fig. 1).

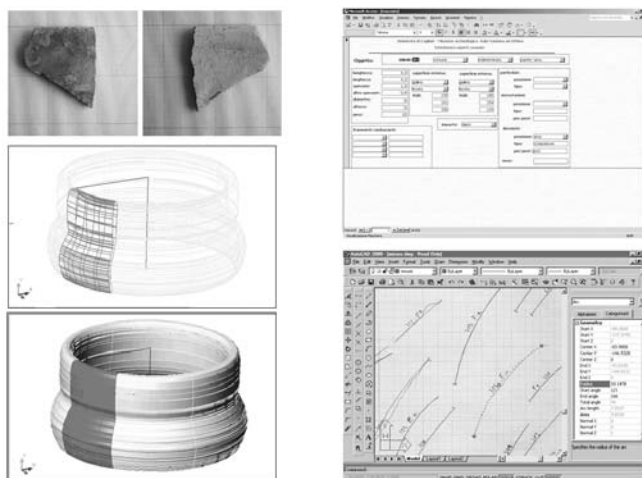


Fig. 1. Sherds are documented individually, photographed, drawn; diameter is calculated by a CAD. A dataset is built in a DBMS software, then imported in statistical packages.

In the same way, capacity has been estimated as the volume of the solid defined by the inner surface and the mouth line. Volumes indicated in this paper refer to vessel filled to the rim. Weight estimate isn't always possible, open forms only allow some attempt.

Technological characters are described in terms of clay, inclusions, surface treatment, processing.

Typological characters refer to classification literature; shapes identified are: dish, cooking dish, cooking pot, lid, jug, jar, gargoulette, mug, cup, bowl, basin, lamp. To avoid fragments being unclassified or, at least, to reduce their number, a hierarchical classification has been made, with a progressive level of information. The standards concern the rate rim diameter/maximum diameter (open vs closed forms), maximum diameter/height (deep vs shallow forms), change points (simple vs complex forms), details (specialized forms). On each fragment use marks have been optically detected, both of positive (incrustations and dubs) or negative nature (abrasions and scratches). The position of marks have been carefully registered as number of cases per part.

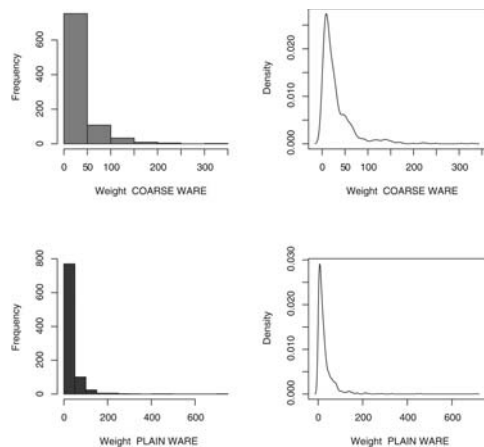


Fig. 2. Densities distributions (weight).

2.1 Software

Software used runs on a Windows platform; a suite Office has been employed for data entry (in a database first, then in a spreadsheet). Digital photo archives have been processed with a photo editing software and drawn with a CAD.

Dataset has been imported in specific packages for statistical data analysis. Software used are the "SAS" and the "R" packages. The first is a multi-purpose well known software distributed by the SAS-Institute; version here used is the 8.2. The second is an open source software, distributed with a GNU licence (www.r-project.org); version here used is the 1.8.1.

The SAS has been employed for getting univariate and bivariate distributions. SAS has also been employed to perform the variable re-coding of some character distributions by collapsing categories with few observations. Moreover the SAS package has been used for the outlier detection with respect to the inner/external surface colour coded in the RGB scale. This analysis has been carried on using the module SAS/Insight and plotting the 3D scatter diagram of the observations.

The R package has been used mainly to get the graphical output of the analysis and to attempt a cluster analysis (not presented here). R package has performed optimally for getting density distributions and box-whiskers diagrams.

3. Annotations on Statistical Techniques

As stated before, the data analysed belong to a set of homogeneous sherds and their depositional conditions have been considered. Such data, obviously, cannot be considered as a result of a random sampling selection. Simultaneously dumped objects derive from a stratified deposit grown in many phases so that the tacit assumption of completely randomness for observations cannot be assumed here. In particular, considering that in this exploratory data analysis we are dealing with morphological characters of sherds, we shall take into account that some of them could have been exposed to non-observable sources of bias such as misclassification. It is also clear that our "sample" observations do not come from a single population; the whole set of n observations cannot be considered a single sample of size n but a mix of samples of size n_1, n_2, \dots, n_k . For the purposes of this contribution, it is worthwhile underlining that at least two large subsets can be spotted, i.e. coarse ware and plain ware; indeed even more families (populations) can be selected if we consider classification criteria that are not based simply on fabrics. With such data, it could be at least dangerous (if not completely misleading) to perform descriptive statistical inference (i.e. estimates of population parameters). For future analysis it would also be necessary to pay attention to using exploratory multivariate analysis techniques without checking carefully if data is matching the model assumptions.

The outlier detection has been performed considering the two broad categories, coarse ware and plain ware. Thereafter, variables belonging to each of the two categories have been split in two subsets: categorical and numerical.

With respect to categorical variables, univariate distributions have been obtained to spot the rate of missing observation, and to define the main categories; the other categories with a few (less than 10% of the total) observations have been collapsed in a new category named "other". The category "other" does not include for each variable more than 15% of the whole amount of observations. Apart the variable referred to vessel fabric ("coarse ware" and "plain ware"), among the large number of categorical variables included in the dataset, the "form" has been preliminarily selected as the main classification variable to perform further analysis.

For the exploratory purpose of this work the outlier detection has been performed mainly graphically on coarse ware and plain ware.

For the numerical variables (namely length, width, thickness and weight) histograms, kernel smoothing densities and box-whiskers diagrams have been obtained (Figs. 2–3). There is a subset of numerical variables that have needed special care. It is the one referred to the attribute "colour" of sherds. It has been considered, for each sherd, with respect to the inner surface (si) and for the external surface (se). Each colour

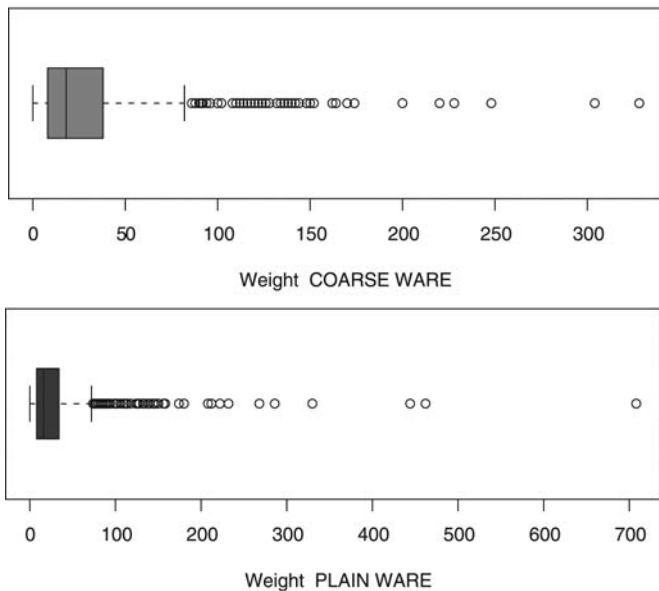


Fig. 3. Outlier detection related to weight underlines a distribution skewed to right.

category has been translated in the RGB colour coordinates so for each sherd we get two vectors (triplets) of three elements (it is worthwhile stressing that it does not make sense to explore the vector components considering them separately: each of them is a part of the single character colour). For the triplets representing the translation of the category colour a three dimensional scatter diagram has been plotted, both for the inner surface and for the external one. Observing the plots it has been possible to note that most observations lie around the line that connect the spatial coordinates (0,0,0) and (256,256,256). Such evidence states that, in general, none of the vector components take values that are highly different from the remaining ones.

Some (152) of the analysed sherds have sides that link. Their combination has allowed to partially reconstruct a total of 15 different objects. However, it is necessary to underline that approximately 25% and 14% of the total of the linking sherds are attributable to two single objects, respectively a jug and a cooking dish. Remaining sherds, from a minimum number of 2 (5 cases) to a maximum of 16, join to form combinations reported to different objects.

4. Quantification

Association between variables have been detected to better describe ceramics; in order to obtain results useful in future comparison with other contexts of the site, the assemblage has been quantified by fabric and by form, according to a procedure known in literature (Orton and Tyers 1990, Orton, Tyers and Vince 1993, Orton 2000:40–66).

The first analysis carried out on ceramics is the frequency distribution of fabrics, both as count of sherds and as weight. The assemblage appears homogeneous: vessels are 97.77% of ceramics and between them coarse ware is 47.72%, instead plain ware is 47.86% (percentages refer to weight).

The amount of other ceramics is extremely low. Only few fragments of bricks and bits of African Red Slip ware are

present. That is surprising because Uthina was a famous production centre and sherds of ARS ware are today dispersed everywhere on the site. Glazed ware, quite common on the site in the Middle Age, is rare and modern ware is lacking.

Typological analysis concerns the two broader classes, one at a time. Recognition of sherd-links and consequently of sherd families (sherds belonging to the same vessels) have been the first step. Individual vessels have been identified, even if flaking of broken pieces due to the crumbly fabric makes recognition hard.

Another concept is taken into account, the vessel shape family (Buko 1995). It implies that many vessels of different shape share one or many morphological, technological or functional details. In the coarse ware both cooking pots and cooking dishes have a base coated, on the external side, with grits; pieces of base don't allow distinction between the two shapes. In the plain ware, both jugs and jars have grooved bodies, umbilicate bases and thick handles between neck and shoulder. So, in many cases fragment can't be assigned to a definite shape, e.g. we can't decide if it belongs to a cooking dish or to a cooking pot, but vessel shape family, namely cooking vessel, can be identified. The group is wider, nevertheless the information is correct and useful if processed at the right level of significance.

Two types of coarse ware fabric have been defined in the present work, but according to archaeometrical analysis (Cara, Carcangiu, Sangiorgi and Tamanini forthcoming) the differences are due more to the firing than to the chemical composition, that indicates a CA-rich paste.

Leaving out a few fragments of a baking pan and a lid, probably related to bread baking, only two open forms were produced in coarse ware. They are shallow and lacking of change points, so percentage of diagnostic sherds (namely rims and bases) vs immeasurable is high (57.88% cooking dishes, 33.09% cooking pots; percentage refers to the weight of sherds).

Estimated vessel equivalent (EVE) and estimated vessel represented (EVREP) have been calculated (Orton, Tyers and Vince 1993). Elements available for quantification are rims, bases and weight. Some diameter values out of range don't derive from mistake nor belong to exceptionally large vessels; they are probably due to deformation of arc in the very small part remaining. This problem in calculating diameter is taken into account, so rims and bases corresponding to an angle narrower than 18° are distinct. This way diagnostic fragments useful to calculate EVE are 50.37% cooking dishes and 39.88% cooking pot.

As shown in the graph, almost four individual vessel are evident, but EVREP based on rims gives 125 elements. Rim EVE are calculated with regard to different diameters (see Fig. 4), but merging all dish rims regardless their diameter, it sums 365.97% for arc >5% and 639.22% for all preserved rims. Estimates derived from bases shows lower values, EVREP =19 and base EVE 151.21%, shifted to left (bases have diameter smaller than rims). There isn't a different degree of preservation, but a higher amount of immeasurable base sherds, abraded or used up.

Estimate on cooking pot rims gives EVREP =52 and shows values (total EVE =235.02%) lower than bases (total EVE =

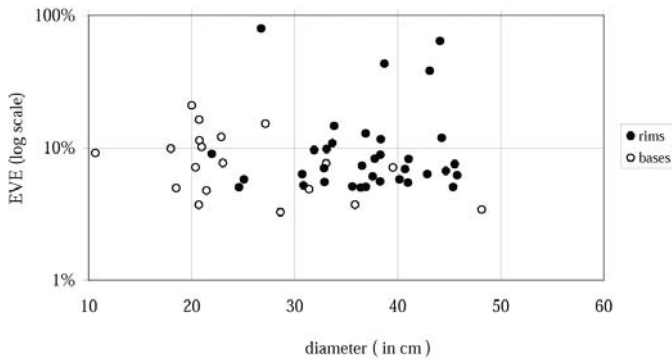


Fig. 4. Rim EVE and base EVE of cooking dishes.

388.72%) (see Fig. 5); that's obvious because cooking pots have rims thin and easily broken.

Moreover, bases of cooking vessels family give a total base EVE=255.38% that can mask the missing cooking dish bases. Twelve profiles have been employed to approximate the weight EVE. The correct procedure divides the pot weight by the weight of the remaining part, but, for lacking of complete vessels, we can only attempt a different approach starting from the percentage preserved. Wall and basis are estimated separately because they don't have the same specific weight, due to thickness and surface treatment. Difficulties in calculating percentage on irregular walls and variety of diameters bias this estimate and a mean value of ca. 2.5 kg is a very rough approximation that, related to total weight of 28,118 gm, don't allow the drawing up of valid conclusions. Only, as a rule of thumb, we can underlie the over-estimation of EVREP, likely biased from unrecognisable links.

Four types of plain ware have been identified (called dep1–dep4), but two of them are respectively 9.34% (dep2) and 2.44% (dep4). Dep2 is similar to dep1, but richer in inclusions. Dep4 is definitely different through its physical characteristics, consisting of thin walls, a particular yellowish colour and an excellent control over the firing process; shapes made on this fabric are exclusive and don't exist in different ones.

Dep1 (56.19%) and dep3 (30.15%), the most represented, are similar in composition, but dep3 shows a cross section without core and a higher porosity.

Plain ware has an amount of closed forms (90.10%) larger than coarse ones, vs open forms (4.64%) and uncertain (5.25%), so the rate of diagnostic elements is low. Recognisable shapes are jugs, jars and bowls.

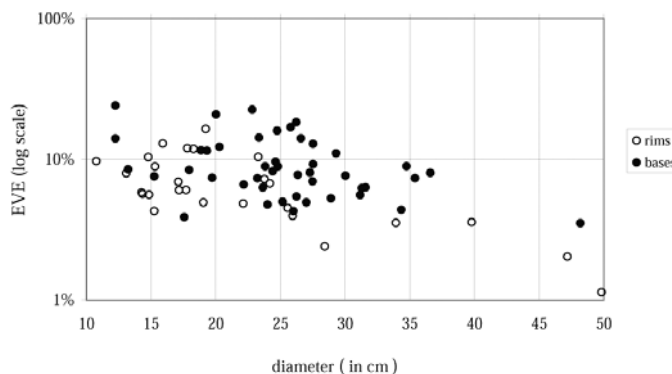


Fig. 5. Rim EVE and base EVE of cooking pots.

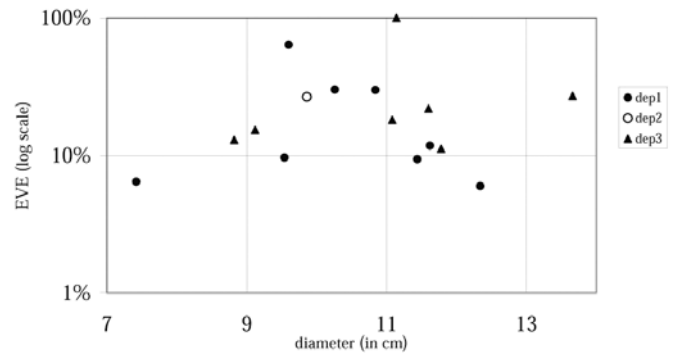


Fig. 6. Rim EVE for jugs, by fabric.

Quantification of jugs start from a quite disperse table, due to differences in fabric, rim profiles and diameters. EVREP amounts to 16 and rim EVE, merging all jugs, is 400.10%. Rims results are indicated in Fig. 6. Bases are not available for calculation and isolated pieces can't be distinguished from jar bottoms.

Weight can't be used for lack of almost a complete vessel that acts as a reference. The one quite well preserved is a jug of uncertain height, weighing 1,180 gm.

20 handles are deceptive information, because, even if rarely, one handled jugs are known on the site, beside the more common two-handled ones.

Jars too have to be attributed to different fabrics, rim diameter and rim profile. Rims, in a diameter range between 10.36 and 36.3 cm, give EVREP = 13 and, after merging, rim EVE = 222.81%. Lack of complete vessels makes total weight (1,700 gm.) scarcely useful. However, an amount of grooved walls (3,844 gm) not attributable to jugs or jars, indicates that the shape family of jug/jar is more largely represented than the diagnostic elements can suggest. Closed handled forms have an importance comparable to coarse ware.

Open forms in plain ware are instead poorly represented. Shallow bowls with a diameter between 9.98 and 38.76 cm, suggest an EVREP= 18 and after merging rim EVE =104.61% with one bowl preserved at 31.97%. Total weight of 848 gm and rate between diagnostic and no-diagnostic elements are suspect. Parts of vessels are supposed to be missing, both because dumped in another place or still in use and taken away.

5. Functional Analysis

Functional analysis considers morphological characteristic of reconstructed vessel shapes, estimated capacity and use marks.

Functions are examined as relationship that vessel has with its content, both in a static and dynamic way, its user and the space it is used into.

In the first case contents can be introduced into the vessel, manipulated (or preserved from manipulation) and extracted, and the shape can make it easy or difficult to do (Recchia 1997). In the second case, capacity and handles define how the vessel can, or cannot, be moved by one or many people. Morphological elements to recognize function are mouth diameter and profile, deepness, change points of profile, handles or lugs. Finally, the way the vessel interacts with the

ambient leaves marks on it (Fig. 7). However, on finds of SU1064, a lot of postdepositional deposits mainly of calcareous nature, interfere with the mark recognition. Thick deposits cover walls and breaks too, so they must have taken place after the vessel had been broken. Thinner and coloured incrustations possibly due to mineralization might derive from contact with buried organic remains. Once again coarse ware and plain ware appear to be definitely distinct.

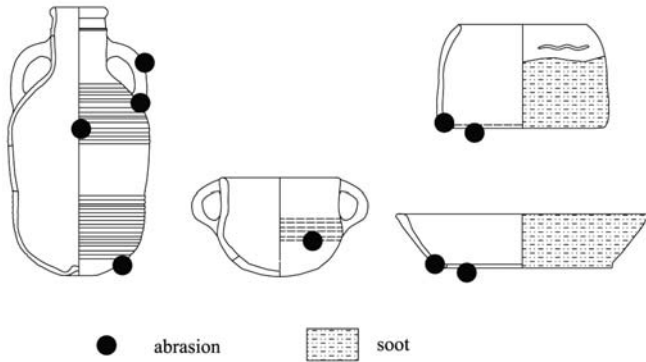


Fig. 7. Use marks position related to shapes.

Forms in coarse ware, cooking dish or cooking pot, makes putting meals into them, inspection and manipulation easy. Cooking dishes rim thickness seems related to a frequent use and the subsequent danger of damaging it, instead cooking pot rims are thin. Both forms are completely devoid of handles and clay ribbons applied on the upper part of cooking pot are useless to keep it. Moreover large mouth and flat bottom don't match with transport of full container whose capacity varies from 2.5 to 7 litres.

A soot layer, the most common deposit observed on coarse ware (510 fragments), covers cooking dishes from the bottom to rim, instead cooking pot have soot until point where the wall curves to form the mouth. Bases don't have soot at all; this fact suggests that they were directly placed upon embers. For lack of handles, hot vessels must have been dragged or turned on the hearth and this fact caused the loss of grits from bases (117 fragments) and abrasions at join between wall and bottom (73 fragments).

Chemical analyses haven't yet been carried out to find traces of fat on the internal surface, but shininess and smoothness often observed in the lower part of wall and bottom (179 fragments) might be related as well to meals as to the use of a mixture of ash and clay employed to washing them, accordingly to an ethnographic example (Lugli, Vidale 1996) or possibly to a coated surface (Skibo, Butts and Schiffer 1997).

Plain ware shows a different situation. Shapes are less well defined, but closed handled forms. Jugs with cylindrical narrow neck, handles, capacity roughly estimated not greater than 10 lt. can be defined a handy form especially dedicated to storage of short term and transport.

Jars appear of more general use; according to their small (0.33 litres) or medium size (1.80–2.40 litres) and a high rate of diameter/height, storage, transport and manipulation are all possible. The list of closed forms is completed with two shapes extremely specialized, the gargoulette, a jug with the neck closed by a filter, to draw water, and a lamp.

The bad preservation of open forms allows us only to distinguish carinated bowls with rounded lips (upper part only is known) and shallow smaller dishes with moulded rims and capacity of about a half litre.

Use marks on plain ware are frequently scratches (40 fragments) on handles, at largest expansion of body and at the bottom. Little shocks can be taken responsible of chips on rim (4 fragments). This evidence suits well with vessels standing, often handled and stored with similar ones. No use marks have been observed on bowls.

If observation of function is quite intuitive, defining proportion between them raises problems, concerning the life expectancy of vessels and a number of them simultaneously in use.

Coarse ware has a quite low technological level (hand made and low firing) and can be produced without specialized equipment. Moreover, it is breakable and lasts a short time. All pieces in assemblage belong to used vessels, but a single use is enough to soot external surface (Beck, Skibo, Hally and Yang 2002). Dimensions of cooking dishes have several formats, so they must be employed according to the variation of content. So, we can think at a quite large pottery equipment, with a quick turn over due to frequent breaking.

Plain ware requires a better technological standard: pottery is wheel-thrown and fired in a kiln at a high temperature. An excellent fabric (dep4) coexists with another (dep1) with blemish like bubbling and spalls, so different productions are represented, coming from purchase more than from domestic manufacture.

Vessels are often moved, so shock danger is high, but they resist better and marks on them prove a normal use. Breaking is an accidental event and when it makes vessel useless, sherds remaining break again, but not easily because of their hardness.

Finally, the cycle of production, use and destruction of vessels has a different speed, faster for coarse ware, slower for plain ware. Maybe that is the reason why we find residual sherds in plain ware instead only recent vessels in coarse ware are present.

6. Conclusions

Exploratory analyses confirm problems yet known in literature, concerning fragmentary ceramics assemblages, mainly recognition of sherd families. Quantification parameters (EVREP, EVE) have been employed, but they can't be disjoined from archaeological evaluation about object nature. EVREP seems over-estimated with reference to shapes scarcely differentiated and in open forms more than in closed ones. EVE estimation better describes assemblage, particularly rim EVE with weight EVE that seems smooth the effects of a high breakage rate.

This kind of quantification and related pie-slice technique (Orton and Tyers 1993) can be applied to other contexts of the site, possibly to other classes of materials too (Moreno Garcia, Orton and Rackham 1996), taking into account the variability of fabrics that can bias classification, and applying bootstrapping techniques (Cochrane 2003) to test the most suitable dimension of a sample for the pottery we are working at.

Our archaeological question is partially solved assessing that assemblage, according to the stratigraphy, is homogeneous and all sherds in SU1064 have the same postdepositional history. However, the context they come from must have been a stratified one, even if of a short period, because residual fragments have been detected.

On a functional point of view, the main functions of a kitchen are represented, with quantities suitable to a family in daily needs.

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