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Quantifying shape: African Red Slip Ware and eating habits

Peter Durham and J.J. Hawthorne

Abstract

African Red Slip Ware (ARS) is a particularly common late Roman fineware and has been extensively studied. However few previous studies have examined the artefacts' shapes for any purpose other than the generation of typologies. In addition, such studies have tended to concentrate on particular diagnostic parts of the shape rather than the shape as a whole. The problem with using shape as a whole is that it is difficult to quantify. In the past, this difficulty has been tackled by quantifying aspects of a shape and comparing those rather than the shapes themselves. The current work uses a methodology developed by Durham, based on well-known pattern matching algorithms to quantify shape, to enable artefacts' shapes to be compared directly. We have analysed the shapes of the entire ARS form range in relation to economic trends, and this has highlighted a hitherto unsuspected relationship between these factors. Specifically, it has been found that the vessels of the third century cluster strongly together, all having a flat bottomed profile which is different to both earlier and later vessels. These third century pots are also of substantially greater capacity then the others, and these features together suggest that the comparative dearth of pots in the third century is more related to size and shape than economics.

1 Introduction

African Red Slip Ware (ARS) is one of the most common later Roman finewares. The standard works of reference are by Hayes (1972) and Carandini (1981). ARS was produced from the late first century AD until the mid seventh century in the area of modern Tunisia and exported around all of the Mediterranean, reaching even to Scotland in the north and Ethiopia in the south at the peak of its distribution (Carandini 1981:11). The form repertoire consisted of a series of bowls, dishes and plates, with some closed forms which were not commonly exported.

The importance of ARS in later Roman archaeology is that its frequent presence on sites has allowed its use as an indicator of fluctuations in trade and demography. This is especially true of field surveys. In recent years, attempts have been made to quantify the fluctuations in the quantity of ARS found on several surveys over time (Fentress and Perkins 1988; and Cambi and Fentress 1989). The results of these analyses show that there is one particular pattern which was almost always found on the sites; this is the peak of ARS in the later second century and subsequent massive decline in the third, with sporadic recovery in the fourth (Fig 1).

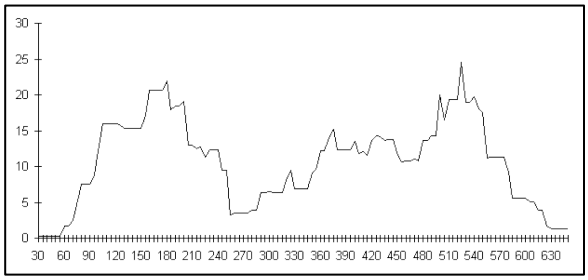

Figure 1: Numbers of ARS vessels.

Until it was discovered that this pattern was common to all sites, its occurrence on individual sites was interpreted as the result of local economic and demographic crises (cf. Potter (1979) on the South Etruria Survey). More recently, in the wake of the work of Fentress and Perkins (1988) and Cambi and Fentress (1989)., interpretations have focused on the possibility of an economic crisis in the production area, North Africa, which then had a knock-on effect at the consumption sites.

2 Analysis of the shapes

The initial aim of this study was quantify the difference between the shapes of ARS forms from the earlier period of the production of this ware, and also the differences between forms from the later period of production. Many more different forms have been identified for the later period than the earlier, although fewer examples of each of the later forms had been recovered. The analysis was intended to examine whether there was indeed a greater range of

forms in the later period of production of ARS , or whether in fact this greater range is due to finer divisions being made between forms for the later period.

Traditional quantitative analyses of stylistic change in pottery (and indeed in artefacts in general) have concentrated on the change in certain 'characteristic' attributes such as the widths and angles of various parts of the vessel. Such analyses are useful in as far as they go, but they implicitly assume that the chosen factors are the *only* ones that will change, as changes in any other attributes are ignored. It is important to measure the *whole* shape if you want to measure the change of the *overall* shape of the vessel rather than the change in specified parts of the vessel. The SMART methodology developed by Durham (Durham *et al* 1996a, and Durham *et al* 1996b) is intended to provide just such a measurement and was employed here. The methodology can be used to measure and compare any type of shape, including surface decoration and photographs of objects, but is particularly well suited to line drawings of vessel profiles. Without going into too much technical detail, the methodology consists of two parts: extracting shape information from the artefacts and classifying them on the basis of this information. A variant of the Generalised Hough Transform (GHT) is used to compare every profile to each of the others in the set. The properties of the GHT are such that a relative similarity can be calculated for each comparison. The relative similarities are then further processed using Principal Component Analysis (PCA) and the resulting principal components are suitable for further analysis using multivariate statistics. In our case hierarchical Agglomerative Cluster analysis is used to group together artefacts with similar shapes.

3 Results

In the past, ARS had always been divided into two groups on the basis of form, an earlier group consisting of narrow, deep bowls and a later group consisting of wide, shallow dishes. However this division was not present in the results of our analysis. As can be seen from the dendrogram (Fig 2),

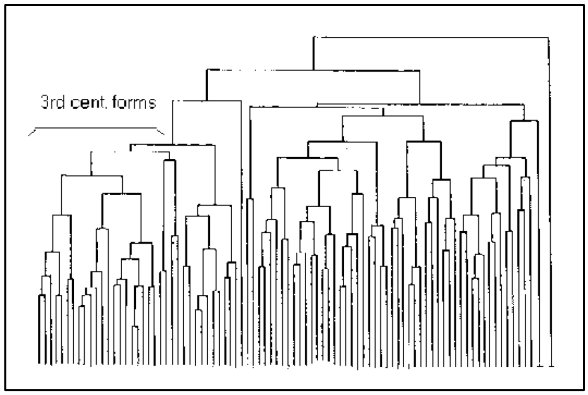

Figure 2: Dendrogram showing the relationships between the different ARS forms.

those forms from the 3rd Century AD form a distinct, relatively homogeneous group, while the earlier and later forms are more similar to each other than to those of the 3rd century group. It should be pointed out here that the forms were all normalised (i.e. stretched) to a standard diameter so that differences in size would not affect the shape comparison.

3.1 Change in shape

Inspection of the profiles themselves (Fig 3)

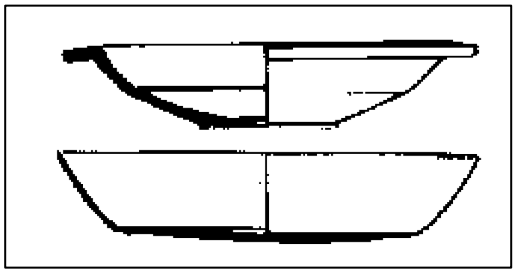

Figure 3: Typical ARS forms showing the difference between 3rd century forms (lower) and others (upper).

revealed the reason for this clustering. The third century vessels have flat bottoms and upright walls, with a sharp distinction between them, whereas the earlier and later forms curve smoothly from the base to the rim. In addition, the latter much more commonly have feet.

The analysis of the whole shapes of the forms has revealed a hitherto unsuspected phenomenon - that the ARS vessels from the 3rd century have a distinctively-different shape to those of earlier and later periods. Interestingly, this change in shape coincides with the drop in recorded numbers of sherds/vessels of ARS vessels recovered from this

period mentioned above. Now, the distinctive shape of the 3rd century vessels means that, for a given diameter, they have a substantially larger capacity than the other forms, having three to four times the volume on average. This suggests that although there were fewer ARS vessels in circulation during the 3rd century, the *overall capacity* of the total of the vessels in circulation during this period did not decrease as much as the lower number of vessels might imply. In fact, the peak of average vessel volume coincides remarkably closely to the low point in ARS production, around 300AD (see Fig. 4).

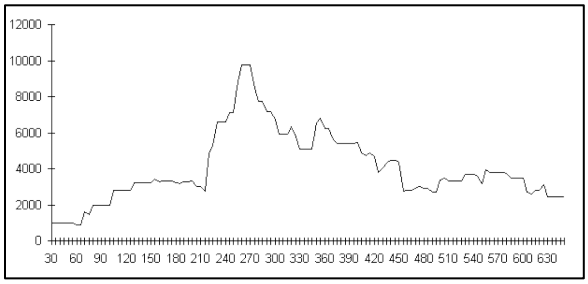

Figure 4: Mean vessel volume.

Indeed if the mean vessel volume is multiplied by the number of vessels present, this value is found to increase gradually over the whole of the main period of ARS production (Fig. 5).

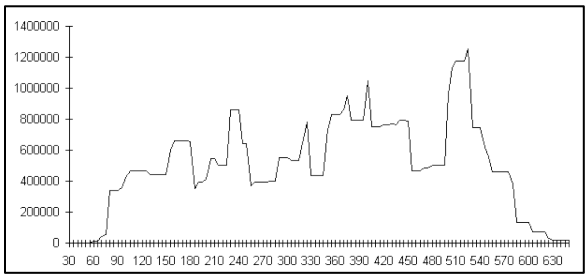

Figure 5: Total vessel capacity.

In other words, the massive drop in ARS vessels in the 3rd century does not mean that there was a similar drop in the total carrying capacity available in such vessels at this time. For a fuller discussion of these calculations, see Hawthorne (1996, and Hawthorne 1997, and Hawthorne forthcoming)

3.2 Change in eating habits

What possible reasons can we suggest for this phenomenon? Although an economic crisis cannot be ruled out, the fact that the size and shapes of ARS on sites in the western Mediterranean from the second to third centuries change while the overall capacity stays roughly constant suggests a change in eating habits. It is most likely that the nature of this change is a move from individual dining to communal dining as Carandini (1981:15) has previously suggested. This explanation is given further weight by the fact that as the most common ARS pots of the third century are nearly half a metre in diameter, it seems unlikely that they were intended for use as individual pots.

4 Conclusions

Two important points were reinforced by this analysis. The importance of examining the whole of the shape of the form, not just the diagnostic parts, was highlighted. In this case, a hitherto-unsuspected change in the shape and volume of ARS vessels during the 3rd century was revealed. We have suggested that this reflects a change in eating habits, probably a change from individual to communal dining, at that time.

The other important point is that you have to know your data. "You're not comparing like with like" is one of the most overworked phrases in statistics, because time and again statistical analyses are undertaken without a clear and explicit understanding of exactly what is being analysed. In general terms, this means it is important to evaluate previous research in the field critically rather than to automatically repeat what has gone before. Specifically, in the traditional analyses of ARS production it was assumed that ARS pottery was a homogeneous entity and hence any change in the numbers of sherds recovered must indicate a change in the amount of this type of pottery that was produced at that time. Once this reasoning is accepted, it is quite justifiable to postulate economic reasons for the changes. However, closer examination of the raw data (the pottery forms themselves) has shown that there was in fact a qualitative change in ARS pottery during the 3rd century, and therefore ARS production over the whole period cannot be compared on the basis of simple counts of sherds alone.

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