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A field methodology for the quantification of ancient settlement in an Arabian context

NASSER SAID AL-JAHWARI & DEREK KENNET

Summary

Most field surveys apply systematic methodologies of field walking and surface survey sampling techniques in order to quantify settlement in a way that allows inter-period and inter-regional comparisons to be made. These methods, which were mostly developed for the ploughed fields of northern Europe, the Mediterranean, and Mesopotamia, depend on a systematic, probabilistic approach that allows the collection of statistically valid data and the ability of the archaeologist to define and to count “sites”. In many parts of Arabia, particularly the cultivated areas of the Arabian Gulf, it is difficult to apply these techniques because of the nature of the geography and agriculture. This paper describes a survey methodology that is capable of taking into consideration the landscape peculiarities of the Oman peninsula and allows the quantification of ancient settlement intensities in an unbiased and testable way. The paper describes a case study survey carried out using this method in the Wadi Andam in the al-Sharqiyah region of the Sultanate of Oman. It sets out the method used, and presents a preliminary indication and discussion of the results achieved.

Keywords: Oman peninsula, Wadi Andam, settlement history, archaeological survey

Introduction

One of the prime objectives of archaeological field survey is to quantify settlement in a way that allows inter-period and inter-regional comparisons to be made. To this end systematic methodologies of sampling, field walking, and defining and counting sites have been developed (e.g. Bintliff & Sbonias 1999; Francovich, Patterson & Barker 2000; Wilkinson TJ 2003: 37–39). Such methodologies have led to a much clearer understanding of settlement history in many parts of the world including the Near East: for example, the seminal work of Adams in Mesopotamia (1965; 1981) has identified periods of growth, intensification, and decline of settlement over long periods of time, adding enormously to our understanding of the history of settlement in that region (Fig. 1).

Most of these methods depend on two methodological assumptions. Firstly a systematic, probabilistic approach that allows the collection of statistically valid data and secondly the ability of the archaeologist to define and to count “sites”, i.e. discreet and definable areas of archaeological scatter or mounding with a discreet and definable period of occupation. This concept of a “site” was developed in the relatively flat, ploughed fields of

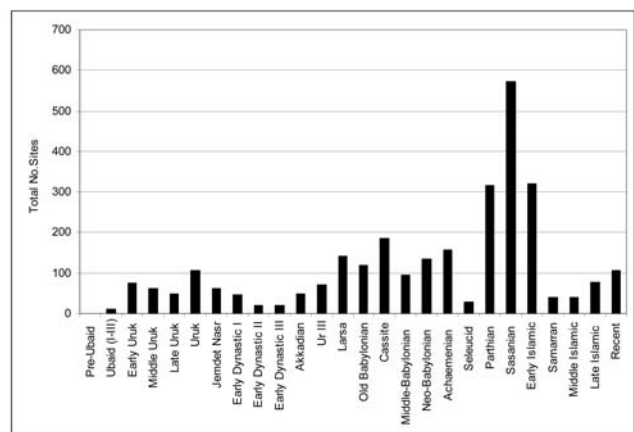


FIGURE 1. A graph showing the total number of recorded sites by period in southern Iraq (from Adams 1981).

northern Europe, the Mediterranean, and Mesopotamia where it is, for the most part, easily applicable. However, the concept is not universally applicable because of regional differences in the nature of ancient occupation, surface geography, and agricultural techniques, all of which may have affected the preservation and recovery of archaeological deposits in a variety of ways.



FIGURE 2. *A typical wadi village on the banks of the Wadi Andam.*

The situation in many parts of Arabia presents particular difficulties for the definition of sites and thereby for the quantification of ancient settlement. This paper describes these difficulties in the specific circumstances of the al-Sharqiyah region of the Sultanate of Oman and presents a field methodology that attempts to overcome them and thereby permit the quantification of ancient settlement intensities in an unbiased and testable way.

Peculiarities of the Arabian environment

The arid landscape of the al-Sharqiyah region, as in much of the Oman peninsula, is characterized largely by high, rugged mountains and rocky hills with very steep slopes and little or no soil cover. These are intersected by wadis which are narrow and steep in their upper reaches and broader in their lower reaches where they are associated with flat, rolling, arid interfluvial areas that have only limited soil cover. Very little of this environment is suitable for agricultural settlement, being too steep, too narrow, lacking in soil cover, or lacking in water. There are only a few places in the landscape that are suitable for agricultural settlement and these are generally found on the banks of the larger wadis in the parts where sufficient space is present between the wadi channel and the hill slopes (Fig. 2). These locations therefore

tend to have been occupied repeatedly, later occupation and agricultural activity having disturbed and obscured the remains of earlier settlements and, for the most part, rendered impossible the definition of sites with a limited chronological or spatial extent (see below). Instead of the landscape presenting a broad canvas onto which a settlement pattern can be drawn, it presents a very limited number of potential locations that have, in many cases, been constantly or repeatedly occupied. This means that single or short-period occupation sites can only rarely be identified and site counting is not possible. This problem has already been noted and discussed by various field workers in the region (e.g. Costa & Wilkinson 1987; Kennet 2002: 154; Wilkinson TJ 1974: 123–132).

This situation is replicated in many other parts of the Arabian Peninsula where a similar geography prevails and where settlements are concentrated in wadis and mountainous areas.

Traditional survey methods

Numerous archaeological surveys have been carried out in the al-Sharqiyah and surrounding regions (e.g. Humphries 1974; Hastings, Humphries & Meadow 1975; de Cardi, Collier & Doe 1976; de Cardi, Doe & Roskams 1977; Doe 1977; Weisgerber 1980; 1981; Yule

& Weisgerber 1988; Orchard & Stanger 1994; 1999; Ibrahim & Gaube 2000; Häser 2000; 2003; Schreiber 2004; 2005; 2007) but none of them have been concerned specifically with collecting quantified data on settlement. They have instead, for the most part, set out to locate, explore, and describe areas or settlements or to answer specific research questions. Many of them provide excellent descriptive data on settlement and, when their results are viewed together, it is possible to gain a picture of longer-term regional trends in the growth and decline of settlement intensity. Unfortunately, however, the lack of systematic, probabilistic methodologies means that such trends are unverifiable and are potentially biased and misleading. Some surveys working in similar environments have attempted to use methodologies that give statistically valid data, but they are in the minority (e.g. Costa & Wilkinson 1987; de Cardi, Kennet & Stocks 1994; Kennet 2002). No tried and tested methodology of quantifiable field survey has yet been established for the region.

Wadi agriculture

Before developing a quantified method that is capable of taking into consideration the nature and peculiarities of this landscape, it is important to understand the most significant post-depositional processes that have affected the archaeological evidence. As has already been noted, the relatively limited number of locations where agricultural settlement is possible appears to have been a major constraining factor in the settlement pattern. It has meant that many locations have been repeatedly occupied through many archaeological periods. This, in turn, has meant that the remains of older settlements will have been disturbed or destroyed by later occupation as well as the natural processes of alluviation and erosion. More importantly, as will be shown below, the high degree of land disturbance caused by traditional practices used in date-palm agriculture destroys, obscures, and disturbs archaeological material creating a confused surface scatter of pottery in which all periods of occupation are represented, although in a very mixed state.

To understand these processes, the various stages of what can be called the “cycle of wadi agriculture” have been mapped out in Figure 3. This shows the fictional example of a settlement consisting of a number of mud-brick buildings that was established during the Umm an-Nar period on the lower hill slopes above the wadi bed (Fig. 3/1). Once the settlement was abandoned its structures and the pottery-containing deposits associated

with them eroded and spread down the slopes and out onto the wadi channel, where they became partly buried by alluvium (Fig. 3/2 & 3). At a later time date-palm groves were established, involving excavation into the alluvium to facilitate irrigation and necessitating the piling up of the excavated earth into bunds and clearance mounds (Fig. 3/4). The bunds and clearance mounds would include traces of buried archaeological materials resulting from the earlier Umm an-Nar settlement, in particular pottery. Temporary abandonment of the settlement will result, in turn, in the date-palm groves and bunds being eroded and buried by alluvium (Fig. 3/5). In due course the cycle will repeat itself with each subsequent abandonment and reoccupation (Fig. 3/5 & 6).

This cycle destroys and obscures archaeological remains and leaves only very limited and fragmentary evidence, such as tombs on the fringes of occupied areas and perhaps occupation deposits in the sections of wells dug into the alluvium. However, the process does have one important advantage for the archaeologist: the constant churning of the mixed alluvium and archaeological deposits caused by the agricultural cycle will bring to the surface buried archaeological material resulting from earlier periods of occupation. This will present itself as a very mixed surface scatter, which is likely to contain some traces of all periods during which the site has been occupied, even if only in very limited quantities.

Large-scale pottery collection

In order to exploit the archaeological potential of these pottery scatters, large-scale surface pottery collection is necessary. This is a method that has already been used in this region, for example, at Siraf (Wilkinson TJ 1974), Suhar (Costa & Wilkinson 1987) and in Ras al-Khaimah (de Cardi, Kennet & Stocks 1994; Kennet 2002). It was further developed, tested and perfected by one of the present authors (N.S. al-Jahwari) during the course of his PhD research in the Wadi Andam (below).

The method is very simple: on arrival at a settlement location, which in most cases is also the site of a modern wadi village with ongoing occupation and agriculture, the first step was to make a rough sketch plan of the entire location, using a few fixed points from a hand-held GPS for increased accuracy (Fig. 4). This sketch plan could potentially be combined with a geo-corrected satellite photograph if available. The locality was then divided on the sketch plan into a number of arbitrary pottery collection areas (PCAs) of varying shape and up to about 4 ha in size, each of which was numbered (Fig. 5). The

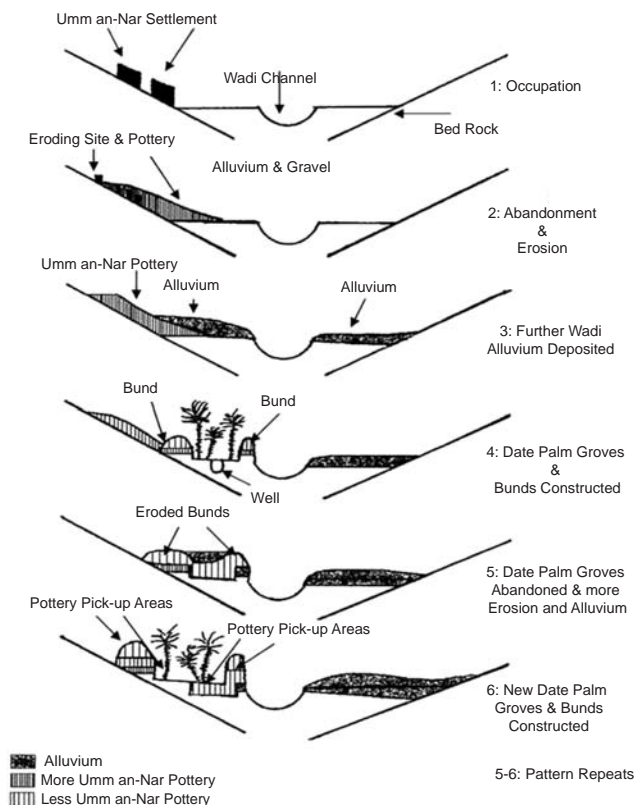


FIGURE 3. The “cycle” of wadi agriculture

PCAs are normally irregularly shaped because features such as tracks and field boundaries were used to delimit them. In theory pottery from the entire location could be collected and mixed together but the PCAs offer the opportunity to locate surface collections with a slightly higher degree of precision, and also allow a limited degree of spatial comparison across the wadi village location.

A large collection of surface sherds was then made from each of the PCAs; normally pottery was collected by one individual for between twenty and thirty minutes, picking up all visible ceramics. This resulted in large sherd collections of up to about 600 sherds from a single PCA in some cases. The pottery was then taken back to base camp, washed, sorted, and identified by ware and archaeological period. All sherds were recorded on an electronic database to facilitate interrogation and analysis of the data. In order to gain a quantifiable impression of the amount of activity or settlement, two approaches can be taken: counts can be made of the number of sherds of each archaeological period in the assemblages, either

from individual PCAs, from individual wadi villages, or from all or a number of wadi villages, in order to give an impression of the changing levels of activity. It is also possible to use what might be termed a “ubiquity” or “presence-or-absence” analysis to count the PCAs or wadi villages at which sherds of any particular archaeological period were found.

In order to illustrate the method and to present some preliminary data, a summary of the work and the results of two seasons’ work in the Wadi Andam are briefly described below.

A test case: the Wadi Andam survey

Methodology

In the winter of 2004–2005 and 2005–2006, a survey was carried out in the Wadi Andam in the al-Sharqiyah region of the Sultanate of Oman. This wadi lies approximately between 22° 45’ N and 57° 98’ E, and is one of the major wadis crossing the Wilayat al-Mudaybi and Sinaw,



FIGURE 4. A sketch plan of the wadi village al-Rawdah.

extending for hundreds of kilometres in the Sharqiyah region (ElMahi & al-Jahwari 2005: 57). It passes most of the villages in al-Mudaybi and runs into the Wadi Halfayn basin, reaching the Arabian Sea close to the Hijj area in Wilayat Mahuwt in the south. There are several tributary wadis joining the Wadi Andam, all of which are dry for most of the year but, along with the Wadi Andam, these tributary wadis are the only locations with surface and subsurface water in the area (2005: 57). The survey transect measures 40 km x 100 km and covers four geographical zones: 1) watersheds and upper wadi in the far north; 2) lower wadis; 3) gravel hills and broad wadis; and 4) gravel flat interfluvial zone in the south (Fig. 6).

The first archaeological investigations in the Wadi Andam occurred during the early 1970s when the Harvard Archaeological Expedition carried out a rough survey using a traditional methodology with the aim of locating early settlement sites, particularly those dated to the third millennium BC (e.g. Pullar 1974; Humphries 1974; Hastings, Humphries & Meadow 1975; Meadow,

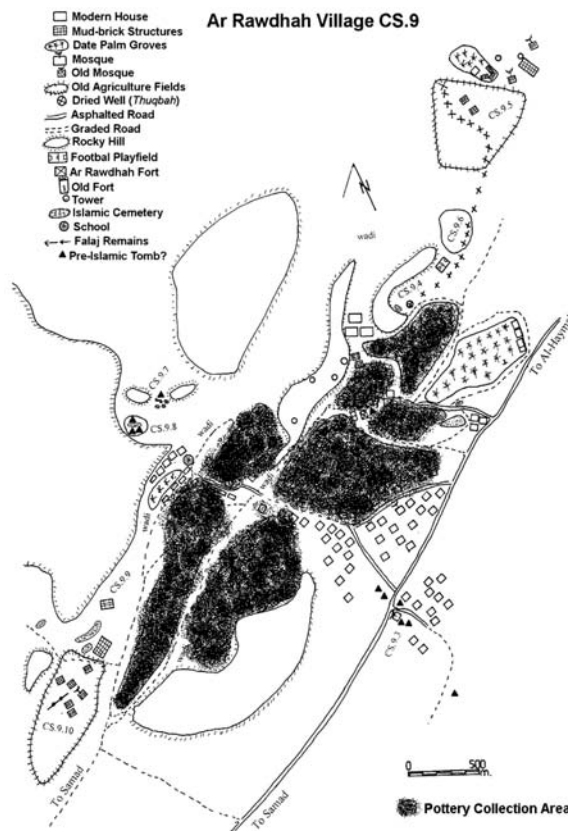


FIGURE 5. A sketch plan showing the Pottery Collection Areas in the wadi village al-Rawdah.

Humphries & Hastings 1976). Other investigations were carried out in this wadi by the British Archaeological Mission (e.g. de Cardi, Collier & Doe 1976; de Cardi, Doe & Roskams 1977; Doe 1977) as well as the work carried out by the German Archaeological Mission in the al-Sharqiyah region, mainly the Samad-Maysar area (e.g. Weisgerber 1980; 1981; Yule & Weisgerber 1988; Yule & Kazenwadel 1993; Yule 1993; 2001). The latter project focused on recording specific types of sites, namely Late Iron Age/Samad tombs in order to understand the distribution and chronology of activity of this period. It is important to indicate, therefore, that at least two of these surveys were focused principally on recording sites of a specific archaeological period, which may lead to a biased picture of settlement history if the results are used in a quantified way.

The aim of carrying out the Wadi Andam survey was to employ a rigorous, probabilistic sampling technique in order to collect data that is free from period bias, testable and suitable for quantified analysis, and that in turn allows

analysis of activity and settlement intensity over time. To achieve this, the Wadi Andam survey involved surveying six selected wadi village locations along the banks of the wadi and its tributaries, each representing at least one of the wadi's geographical zones (Fig. 6). (1)

A number of control surveys of around 5 km² were carried out by car and on foot in randomly selected locations away from wadi villages, in order to check for evidence of different types of occupation in locations other than those under discussion here. Next, a preliminary "surrounding survey" was carried out by car and on foot around each selected wadi village to a distance of between 1 and 2 km², in order to check for peripheral archaeological features and to collect pottery. This included checking all agricultural areas, and areas of land disturbance such as wells.

Each wadi village was then divided into pottery collection areas (PCAs) and pottery was collected exactly according to the method described above. All areas of the village, including date-palm groves and modern occupation, were included.

Results

A total of 19,240 sherds were collected from the whole survey, of which 9,702 come from thirty-six PCAs in six wadi villages. It was thought that a sample this large would be necessary in order to increase the possibility of finding pottery from periods which are not generally well represented, such as the Wadi Suq period.

Figure 7 shows the total number of sherds by period from all sites recorded by the survey, i.e. the wadi villages as well as the control surveys and other locations visited by the survey. (2) It shows that the majority of sherds are from the Islamic period, mainly the Late Islamic period. Among the pre-Islamic sherds, Late Iron Age/Samad sherds are the most common, followed by the Umm an-Nar period. This figure also shows that there are very few sherds from the Wadi Suq and Sasanian/Early Islamic periods. Table 3 shows the sherd counts only from the PCAs from the six surveyed wadi villages. It shows the same trends as the whole survey, i.e. that the most common sherds are those dated to the Late Islamic period. To have a clearer idea of the pre-Islamic periods, Table 4 shows sherds only from these periods from the PCAs in the six wadi villages. It shows that sherds of the Umm an-Nar period are by far the most common, followed by the Late Iron Age/Samad, while the least common are sherds of the Wadi Suq, Early Iron Age and Sasanian/Early Islamic periods.

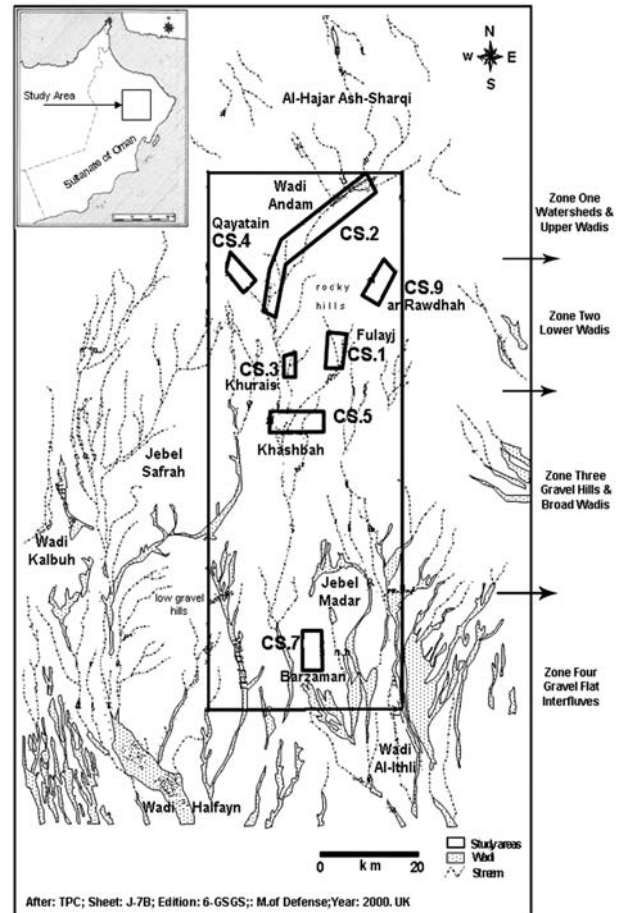


FIGURE 6. A map showing the survey transect and the location of surveyed areas.

Table 1 shows how many of the wadi villages and PCAs yielded sherds of each of the pre-Islamic periods. This is a "ubiquity" or "presence or absence" analysis. It shows that, without any doubt, almost all the villages were already occupied by the Umm an-Nar period and that, whilst occupation appears to have ceased or diminished drastically at most villages during the Wadi Suq period, they were almost all reoccupied by the Late Iron Age.

If we accept that the amount of pottery picked up from each period in the PCAs will be a rough reflection of the amount of settlement activity in those periods — in other words, that it can be used as a "proxy" for settlement activity — then Figures 7-9 show the broad pattern of change in the amount of settlement activity through time in this area and in these wadi villages. However crude, this is already a very useful set of data presenting a quantifiable and comparable yardstick with which we can begin to take a more systematic approach to changes in

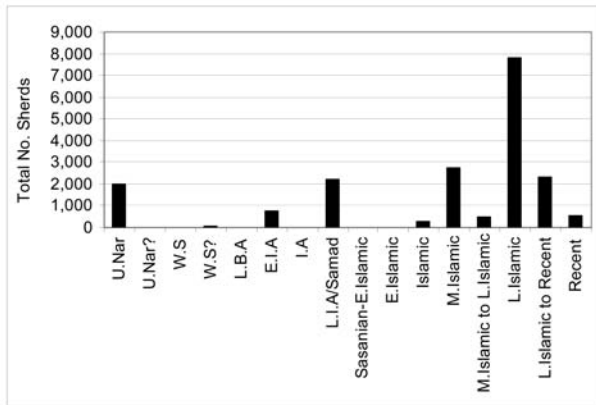


FIGURE 7. A graph showing the total number of sherds by period from the whole survey.

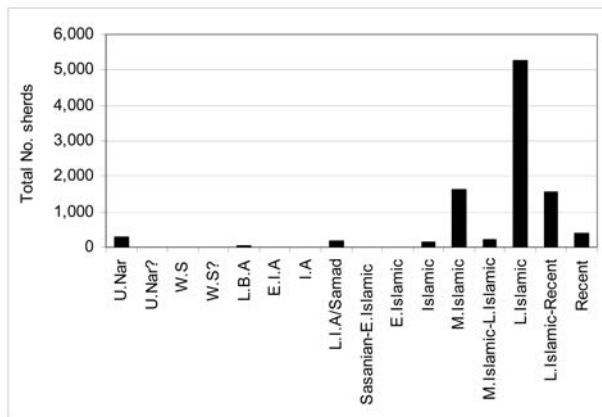


FIGURE 8. A graph showing the sherds count by period from all the Pottery Collection Areas within the wadi villages.

the amount of activity in this archaeologically difficult environment. It should be noted that the pattern within each wadi village is only relative. That is to say that the amount of pottery is not an absolute quantification of the amount of activity in any particular period, but only a number which can be roughly compared to other archaeological periods, so that it is possible to say, for example, that there was considerably more Umm an-Nar activity than there was Wadi Suq activity at a particular location. At a broader level, beyond individual wadi villages, the data can be used in an absolute sense, in that it can be stated, for example, that only one out of six wadi villages shows any evidence of settlement activity during the Wadi Suq period.

These initial conclusions rely upon the fact that pottery was in common use during all of the periods under

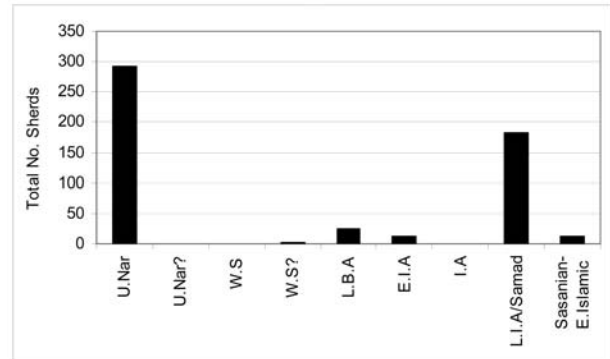


FIGURE 9. A graph showing the total number of sherds of the pre-Islamic and early Islamic periods from all the Pottery Collection Areas within the wadi villages.

consideration, that it was of a consistent, robust quality, and that there were no major fluctuations in the amount of pottery that was produced or used at any time. There is increasing evidence from excavations elsewhere in the region that this was indeed the case. It is of course possible that there may have been some fluctuation in the amount of pottery that was produced and used by individual groups at a very localised level, and that such fluctuations may be partly responsible for the changes in pottery deposition that have been detected using this methodology. Such issues remain to be resolved but can only be investigated through the collection and quantification of pottery from both survey and excavation.

The pattern is complicated by tombs, which appear to indicate a slightly different trend. Tombs of the Umm an-Nar, Wadi Suq, and Iron Age periods can be found in and around many of the wadi villages as well as in the surrounding areas, although they can be difficult to date and many have been reused much later than their original construction. Table 6 shows the total number and percentage of sherds by period from all types of sites: PCAs, tombs, and other types of structures. It makes clear a very important point, which is that, compared to other periods, a very high proportion of the pottery for the Wadi Suq and Early Iron Age periods is associated with tombs, whereas very few of the sherds from these two periods come from probable settlement locations such as PCAs.

The evidence for the continued use of tombs during the Wadi Suq period is intriguing. All of these tombs are located on the fringes of the wadi villages that the PCA evidence suggests had been largely abandoned during this period. The most likely explanation for this seems to be that these tombs continued to be used, either by very small residual communities who have left hardly

Period	Total number of wadi villages yielding pottery from PCAs	Proportion of wadi villages yielding pottery from PCAs
U.Nar	5	83 %
W.S.	1	17 %
L.B.A.	1	17 %
E.I.A.	2	33 %
L.I.A./Samad	5	83 %
Total	6	

TABLE 1. *Counts of wadi villages yielding pottery from PCAs.*

Period	PCAs	Tombs	Total sherds	
U.Nar	292 (20.1%)	630 (43.4%)	531 (36.5%)	1453
W.S.	3 (12.5%)	18 (75%)	3 (12.5%)	24
L.B.A.	25 (100%)	0	0	25
E.I.A.	12 (3.3%)	271 (74%)	83 (22.7%)	366
L.I.A./Samad	182 (31.4%)	180 (31%)	218 (37.6%)	580

TABLE 2. *The number and percentage of sherds by period from PCAs, all tombs (most of which come from the “surrounding surveys”), and “surrounding surveys” (including some tombs) (% based on the total number of sherds by period).*

any trace in the archaeological record, or by nomadic or semi-nomadic populations who continued to use the old abandoned settlements as camp sites and cemeteries. This might indicate some sort of cultural attachment to ancestral lands, or it might simply indicate that these locations continued to be attractive due to the natural resources they offered, or for other reasons. Whatever the explanation, the evidence indicates at least some degree of continuity through a period of very low settlement intensity.

Clearly much more could be done with these data and a fuller analysis will be presented in the forthcoming PhD

thesis of N.S. al-Jahwari. The intention here has simply been to demonstrate the potential of the method through illustration of a detailed case study.

Interpretation

The patterns of change that emerge from the Wadi Andam data serve to confirm and add detail to the general understanding of cultural and economic changes that have affected the Oman peninsula through time. For the pre-Islamic period particularly, a number of interesting and important points emerge.

For example Tables 1 and 2 show that there is a large amount of evidence of the Umm an-Nar period from both PCAs and tombs and that, when both PCAs and tombs are taken into consideration, all modern wadi villages have yielded evidence of the Umm an-Nar period. This indicates that the Umm an-Nar period was one of the most intensive periods of occupation, and also that the study area was extensively inhabited during this period for the first time.

Most of the evidence comes from agriculturally viable locations suggesting a sedentary way of life. With the exception of a few Hafit period beehives/cairns surrounding some of the wadi villages, the Umm an-Nar material is the earliest evidence for the occupation of these villages, suggesting that it was at this time that these settlements first came into existence. If this pattern is shown to be true elsewhere in the Oman peninsula, then it suggests that a fundamental change in settlement and economy took place at the beginning of the Umm an-Nar period, with widespread sedentary occupation being accompanied by the emergence of a single distinctive culture over the whole region as well as specialized production of pottery and other artefacts. Since this time, settlements have remained largely in the same locations suggesting that more or less the same constraints affected settlement location in the Umm an-Nar period as they have done for much of the past. Since the Umm an-Nar period these settlements have only really varied in the intensity of occupation from one period to the next.

By contrast, the PCA evidence indicates a significant decline in both the intensity of occupation during the Wadi Suq period, and also in the number of settlement locations that were in use. As has been noted above, this may reflect a significant decline in the population or a move towards nomadism, or perhaps both. Of course, it may also reflect a change in the way that pottery was used and deposited, although evidence from Wadi Suq period settlements elsewhere in the region, such as Kalba and Tell Abra, suggests that this was not the case.

A decline in activity during the Wadi Suq period has long been debated by archaeologists, based on an assessment of the number of sites that are known from the literature and the fact that Wadi Suq layers are absent from a number of key sites (e.g. Cleuziou 1981). The data presented here are the first to give a quantifiable indication of the relative scale of this decline at the lowest level of the settlement hierarchy. A much clearer picture, possibly showing regional variations, would emerge were further studies of this kind to be undertaken more widely across the peninsula.

At present it is difficult to give an explanation for the Wadi Suq decline. It has been argued that it might be related to a change in climate at the end of the third millennium BC (Brunswig 1989: 37–38) but radiocarbon evidence from playa lake beds indicates that the peninsula witnessed progressive aridity from as early as the end of the fourth millennium BC (e.g. McClure 1988; Parker *et al.* 2006: 474). It has also been argued that the decline of the wealth of the Oman peninsula during the first part of the second millennium BC was a result of changes in the economy of the Arabian Gulf at that time (Crawford 1996; 1998). However, whether these events can be linked to changes in settlement intensity in areas such as the Wadi Andam has still to be demonstrated.

The PCA evidence from the Wadi Andam Survey supports the idea that there was an increase in settlement intensity at the beginning of the Iron Age after the Wadi Suq decline. In addition, a relatively large amount of Early Iron Age pottery has been found from the “surrounding surveys” and control surveys outside the wadi villages, suggesting that activity may have emerged in these areas for the first time during this period. This material may result from Iron Age sites in defensive locations of the type that are known from elsewhere in the region at this time. It has already been argued that this period is one of increasing population and a developing social hierarchy and that the intensification in settlement might be related to the introduction of a *falaj* system (Wilkinson JC 1983: 177–194; Potts 1990: 354; al-Tikriti 2002: 117–140; Magee 1998: 51–54; 2004: 41; 2005: 225–228; Häser 2004: 417–419).

The evidence suggests that the Late Iron Age/Samad period saw a continuation of the revival of settlement intensity, reaching levels that were, perhaps, not far below those that had been achieved during the Umm an-Nar period. A decline in activity during the Sasanian period, followed by an increase in activity throughout the Islamic period has already been argued elsewhere (Kennet 2002; 2007).

There is unfortunately no space here for further discussion of these data and the trends that they suggest, but it is hoped that enough has been said to demonstrate the usefulness of this method of survey and the relevance of the data that it can yield to current debates.

Conclusion

To conclude, it can be argued that the methodology presented here, which is based on large-scale surface pottery collection, can be shown to be effective in providing quantifiable data on settlement activity and intensity that has a greater degree of statistical validity than data collected in a traditional, non-probabilistic fashion. The methodology also allows a more reliable comparison between sites and regions to be made and potentially provides a degree of detail and insight that would be missed by other survey techniques. The method takes into consideration the nature of the geographical environment as well as post-depositional processes such as traditional agricultural techniques. On the down side, the method is very time-consuming and labour-intensive as it depends on the collection of large quantities of pottery that require study, catalogue, and storage.

It seems sensible to suggest that this methodology might best be used judiciously to support traditional survey techniques in a way that will allow more detailed and robust conclusions to be drawn without creating an undue strain on project resources.

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Notes

1. For a fuller outline of the survey methodology see the forthcoming PhD thesis by N.S. al-Jahwari to be submitted to the Department of Archaeology, Durham University.

- ² U.Nar = Umm an-Nar; W.S. = Wadi Suq; L.B.A. = general Iron Age; L.I.A./Samad = Late Iron Age/
Late Bronze Age; E.I.A. = Early Iron Age; I.A. = Samad.

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