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**Understanding the layout of early coastal settlement at  
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## Understanding the layout of early coastal settlement at Unguja Ukuu, Zanzibar

### Introduction

The site of Unguja Ukuu occupies a sandy spit at the southwestern end of the island of Unguja, more commonly known as Zanzibar (Figure 1). In fact Unguja is only one of the islands of the Zanzibar Archipelago, which also includes Tumbatu and Pemba. In this paper we retain the term Unguja for clarity. It has long been recognized as an important trading site dating to the earliest period of coastal settlement in this region and has been subject to successive archaeological projects aimed at exploring the chronology and contacts of this important site. Unguja Ukuu, in common with many sites of this period along the eastern coast of Africa, was first settled in the 6<sup>th</sup> – 7<sup>th</sup> century AD and was from the start connected with networks of Indian Ocean trade. These networks are visible in the archaeology via the record of imported goods and exotic foodstuffs which can be found from the earliest levels of the site.

While previous research at Unguja Ukuu has sought to understand the chronology of settlement and to map connections with particular trading partners, contributing to a geography of trade over many centuries, the current article reports on work aimed at understanding the nature of Unguja Ukuu as a settlement. A programme of geophysical survey and limited test excavations is reported, which together contribute a picture of the general layout of the site and provide a framework in which to understand previous test excavations at the site (Horton and Clark 1985; Juma 2004). In particular, this survey was focused towards understanding the interface between the site and the ocean. The results point to the existence of a larger settlement than previously imagined, with a busy waterfront, bordering a shallow harbour where vessels would likely have been beached. Most notably, the results have revealed the existence of a probable early mosque immediately adjacent to the waterfront.

### Unguja Ukuu

Although evidence for occupation at cave sites on both Unguja and Pemba dates back many thousands of years (Chami 2001, 2009; Sinclair *et al.* 2006), it is from the 7<sup>th</sup> century AD that

a record of consistent settlement can be traced in the Zanzibar archipelago. Sites characterized by 'Tana Tradition' ceramics are found along the coast of both Zanzibar and Pemba (Horton and Clark 1985; LaViolette and Fleisher 1995). From their earliest iterations, these sites were already connected to long distance maritime trade, with imports including ceramics from the Gulf and India, glass, and glass beads; they were significant manufacturing centres of iron and of shell beads. Inhabitants had a mixed diet that involved some hunting, consumption of fish on a substantial scale, and the keeping of some chicken; pearl millet and sorghum were the staple crops (Walshaw 2010, 2015). Architecture in the earliest settlements was entirely of daub and timber. Many sites were substantial even at this early date covering between 4 and 25 ha - and have been described as large villages (Fleisher and LaViolette 2013).

At around AD900 older sites such as Unguja Ukuu were either abandoned or greatly reduced in size and a new settlement pattern emerged favouring remote islands or peninsulas (Horton forthcoming). Some of these settlements may have had their origins in the ninth century, but from the 11th century they took on urban forms based around coral buildings. The period between AD1100 and 1400 was particularly prosperous on the Zanzibar Archipelago.

Archaeology in the archipelago has revealed a great deal about this history of settlement, its chronology, and links with overseas partners. The sites of Unguja Ukuu (Horton and Clark 1985; Juma, 2004), Mkokotoni (Horton and Clark 1985) and Tumbatu (Horton and Clark 1985; Horton, forthcoming) have all been the subject of detailed archaeological excavations. Elsewhere in the archipelago, excavations have been supplemented by systematic settlement survey that has positioned sites in relation to their broader landscapes (Fleisher 2003, 2010). Nonetheless, we still have only a partial understanding of the full layout of these sites, of how they related to the sea and to maritime resources, and of how the excavated portions fitted within the overall site layout.

Previous test-pit excavations at Unguja Ukuu itself (Horton and Clark 1985; Juma 2004) have established the presence of settlement remains stretching more than 300m inland of the peninsula, and deep archaeological sediments running to within around 20m of the

foreshore (Figure 2). These have to some extent been mapped using resistivity survey and coring (Juma 2004) although the results were somewhat inconclusive and were used chiefly as a guide to depth of deposits rather than a means of understanding site layout. The emergent picture is of a site with rich archaeological deposits relating to an occupation from at least the 7<sup>th</sup> – and possibly the 6<sup>th</sup> (Juma 1996) – century. This site was involved with Indian Ocean trade from the start, evidenced by the record of imported beads, glass and ceramics, as well as the presence of exotic plants (Boivin *et al.* 2014: 558). The more mundane artefacts such as ceramics, and the huge majority of the plant and food remains position this site among its contemporaries in the region, with a mixed economy of agriculture, fishing and hunting, and a variety of craft activities.

Excavations at the site have, however, not explored the layout of the site in the kind of detail that would allow us to consider the interface with the ocean, or the ways that settlement here was structured around the resources of land and sea. No attempt has previously been made to identify a harbour area or establish whether the site was maritime-orientated (Fleisher *et al.* 2015). Juma (2004) identified coral-rag architecture and a mosque in the inland urban zone of the settlement, and Horton (1985) reported a possible mosque overlooking the creek to the east. Local reports suggest that a 15<sup>th</sup> century 'Arab' house and a mosque once stood close to the beach of Menai Bay to the west also (Horton and Clark 1985), but beach erosion has damaged the house, and recent construction has buried or destroyed the remains of the Mosque (Figure 2). It has been assumed that the creek was the focus of settlement and harbour activity in the later phases of the site, but the earlier and richer phases remain obscure, understood only through small text excavations.

### **Methodology**

The current research was therefore intended to explore the broader layout of the site, as a means of providing context for the knowledge gained through test excavations. In particular, we were interested in the way the site was structured around the demands of ocean-going trade. Research was conducted under the auspice of the Entrepôt project at the University of York (in collaboration with Århus University, Denmark) which sought to explore the layout of early ports of trade during this period for comparative purposes.

Fieldwork was based on magnetic gradiometry for archaeological reconnaissance, which has proven successful at defining site extent and locating archaeological features elsewhere on the Swahili coast (Fleisher *et al.* 2012; Wynne-Jones 2012; Welham *et al.* 2014).

Magnetometry survey has the potential to recover areas of activity, to pick up on disturbed soils, and to pinpoint industrial activity. Since survey at Unguja Ukuu was based on a particular interest in how the site was positioned in relation to port facilities and the ocean, and how that relationship might have changed over time, the area between the towns and the ocean was explored, with a view towards recovering harbour facilities and identifying anchorages. Magnetic gradiometry is based on the systematic, passive detection of ground magnetic field orientation across a survey area. Anomalous differentiations in magnetic field strength and orientation may be measured as a result of the induced polarisation of ferrous objects such as metals or fired ceramics; by the thermoremanent polarisation of iron oxides in the soil as a result of heating beyond the Curie point; by the magnetic enhancement of soils as a result of disturbance and redeposition; and even because of the presence of objects with an unusually low magnetic signature, such as coral, compared to the surrounding environment. The technique therefore has a wide variety of applications, and allowed the extent of the site to be adequately mapped using trace signatures of sub-surface features and key activity areas.

Without ground-truthing it can be difficult to predict the cause of such anomalies, since the range and amplitude of magnetic anomalies across a given site is in part related to the quantity of iron oxides in the soil. The shape, amplitude, and clustering of anomalies may provide some indication of activity; bipolar anomalies, for example, indicate induced magnetism, but might be the result of either ferrous materials or magnetic thermoremanence. In the case of the site at Unguja Ukuu, we hypothesised that industrial activity such as hearths, kilns, and smelting or iron-working might be identifiable by the clustering of induced magnetic anomalies. The zone of settlement was surveyed in the hope of recovering building plans of wattle-and-daub architecture through the identification of either the magnetic enhancement of structural foundations and postholes, or the thermoremanence of burnt daub structures, as at Songo Mnara (Wynne-Jones *et al.*).

Four areas of the site were selected for survey (Figure 3). Three were covered during a season of fieldwork in October 2013. A further season in January 2014 added a further area and refined the results with the use of a metal detector to search for modern debris. Limited test excavations were made in 2014 to ground truth the anomalies seen via the magnetometry.

A 20x20m grid was staked out across each area using a Leica Zeno DGPS to locate key grid points, and 2m transect markers were then laid east-west across the edges of these grids using 30m measuring tapes. This grid aided precision in data collection, and allowed us to locate the geophysical data results accurately in the GIS. Survey used a Bartington Grad-601 dual sensor magnetic field gradiometer, and readings were taken at a resolution of 0.125m x 0.5m. This strategy enabled us to gather high-resolution data in spite of the frequent obstacles presented by trees, high grass and thorn bushes. In order to avoid sensor drift in the high temperatures the system was readjusted on a recorded reference point at least once every hour. Surface features of potential interest to survey interpretation or georectification of imagery were planned using the Leica DGPS and hand-measured sketch maps, and added to the GIS in post-processing.

Data from the magnetometer was downloaded using the native Bartington Grad601 download utility, and imported into ArchaeoFusion, a beta-test program published by CAST (Centre for Advanced Spatial Technologies), for processing. Post-processing of the data was kept to a minimum, and consisted of Zero Mean Traverse, Clipping to 3 standard deviations of the mean, and Destaggering. Raw and Interpolated images were georectified and imported into ArcGIS using DGPS data collected in the field. Magnetic anomalies were traced and numbered, and those which could be attributed to modern features mapped during the survey were filtered. The remaining anomalies were then analysed according to shape, size, and form. Distinct anomalies were re-examined in ArchaeoFusion using the raw data to identify signature patterns of field strength and amplitude across an anomaly, in order to help identify ferrous metals or thermoremanence. These comparisons enabled the predictive modelling of the cause and nature of anomalies and clusters of features. These assessments are outlined and discussed below.

## Results

### *Area A*

The strip of land surveyed in Area A stretches north-south from an elevated ridgeline of the assumed zone of settlement, onto a low-lying 'bridge' of land linking to the peninsula (Figure 4). A naval base has been built across the area in recent years, and a road and parade ground have been bulldozed clear, creating a section revealing loam sediments 1-2m thick overlying archaeological materials and degraded daub. The walls of several coral-rag buildings have also been exposed or destroyed by the creation of this road. It appears that the depth of overburden is masking the magnetic signature of buried archaeological materials in much of this area, but in the areas cleared by bulldozers we identified a number of particularly clear anomalies. Ceramics of the Early Tana Tradition (Fleisher and Wynne-Jones 2011) and Turquoise-Glazed imported ceramics recovered from the surface and bulldozed regions of Area A indicate occupation dates of the 7-10th centuries.

Sweeping the area with a metal detector allowed us to rule out significant contamination with modern debris. We also identified a small number of archaeological metal artefacts close to the surface, including a number of fragments of lead fishing weights, copper wire, a copper-alloy tubular container, and a possible flask cap.

In the region of the parade ground we recorded a series of intense bipolar, amorphous magnetic anomalies in an area of general magnetic disturbance, and a small number of weaker linear anomalies (Figure 4). These anomalies are in the region of the previously estimated southern edge of the settlement, an area Clark and Horton have described as a midden, and in which their test-pit UU1 test-pit revealed large quantities of iron slag and possible haematite ore (Clark and Horton 1985; Horton, forthcoming). The broad region of magnetic disturbance indicates a collection or spread of ferrous material, and through its remarkably similar shape to those mapped in 1984 seems likely to represent the middens recorded by Clark and Horton. The larger bipolar anomalies of this group may represent either large ferrous artefacts such as metal objects, or perhaps an overlapping group of thermoremanent areas. A 50 x 50cm test pit (Figure 4, Trench 2) was excavated on the edge of one of these bipolar anomalies, demonstrating that at least 90cm of archaeological contexts still survive beneath the surface. Two distinct phases of activity were recognisable

even within the limits of this small area. The upper, later phase probably corresponds with the midden deposits previously excavated by Clark and Horton, and was characterized by clay deposits, possible daub remains, local ceramics, and ash. Beneath this phase was an almost barren context, separating the upper midden deposits from a dense shell midden. Time constraints and the limiting size of the test-pit prevented excavation to the base of this shell midden, but its presence speaks to an earlier use of this site.

Although Horton was concerned that this part of the site had been entirely destroyed by the bulldozing, it now seems likely that although it has been extensively damaged, an unknown quantity of stratified remains may still be preserved. The broad area of induced magnetic material highlighted in the gradiometry results may represent remains inadvertently exposed and spread by the bulldozers, but the similarity of shape between 1984 and 2013 suggests that the archaeological contexts are be surprisingly intact, and large overlapping bipolar anomalies indicate the possibility of *in situ* thermoremanent material. The linear anomalies are difficult to explain without excavation, since the parallel positive and negative magnetic signatures could be explained by archaeological structural remains, or by the more prosaic banking of earth in front of a bulldozer.

North of this region the ground has not been cleared, and a bank at the edge of clearance rises to sloping ground. On this higher ground, the only anomalies clearly identifiable relate to modern features such as coral pieces lining the road, waste metal, recent burning activity in rubbish pits, and agricultural ridge and furrow, presumably predating the construction of the camp, and possibly related to the 19<sup>th</sup>-century occupation of the site described by Juma (2004). From the clearance of the road, we believe that this lack of magnetic anomalies is due not to an absence of archaeological activity but, as described previously, to the masking effect of deep soil sediments overlying the site.

#### *Area B*

Area B, south of Area A and the presumed location of the main settlement, covers the narrowest point of the Makime peninsula and is perhaps the most exciting area surveyed (Figure 5). From the narrow 'neck' the peninsula rises in a steep ridgeline, widening to the east and west, and runs away to the south for around a kilometre. On the eastern side of the

ridge the extensive remains of modern agricultural ridge and furrow are still visible running down the steep slope to the mangroves, and these show up clearly as linear disturbances in the results. Erosion or quarrying on the western side of the ridge has created a trough at the base of the slope, which appears to act as an occasional tidal pool behind the relative bank of the beach on the seaward side. The results of the magnetic gradiometry indicate an area of mixed magnetic material across this bank, a short distance from where undiagnostic local ceramics are being exposed by tidal erosion. The magnetic anomaly is likely the result of mixed ferrous materials, but does not correlate with debris on the surface, and it is not clear whether it represents modern or archaeological waste. Survey of the foreshore was hampered by incoming tides, but some faint traces of anomalies indicate that further work in this region may be useful, if only to establish archaeological, modern or geological origins of these features.

The most interesting feature lies under the break of slope at the top of the beach, at the northern edge of Area B. Here we have identified a distinct rectangular structure, approximately 18 x 13m on an alignment of 328° (Figure 6). This feature may represent the remains of a mosque, since the orientation of the structure falls within an acceptable degree of error for the relevant period (Horton 1991), and matches the alignment of Juma's Unit M house (2004), which Horton has again suggested may represent a style of mosque previously unknown in East Africa during this period (Horton forthcoming). This new anomaly/structure is south of Area A, and outside the limits of settlement estimated by Clark and Horton based on middens identified and partially excavated in 1984.

The anomaly is located just above the beach, and although faint traces on its western side appear to indicate the erosion of the structure along with the beach slope, a parallel linear on the eastern side of the feature were interpreted as a double wall or an aisle. In order to test this, we laid out a 1 x 4m trench (Figure 5, Trench 1) running east-west across the eastern wall of the anomaly from the interior of the feature (Figure 6). Excavation revealed that the double linear appearance of the magnetic anomaly was caused by two lines of porites coral fragments whose orientation – as indicated by the magnetometry – was roughly 330°. The porites fragments are not as large as the building blocks reported by Juma, falling between 2-10cm in diameter, but may represent the remains of larger, robbed out

blocks, a hypothesis supported by the excavated sections. There were few finds associated with these contexts, and no diagnostic potsherds, but fragments of glass from the coral contexts may conform to similar finds from Juma's Period Ib, between 750-900 AD.

Excavation also recovered evidence of wattle and daub architecture below and immediately adjacent to the coral debris. The interface between the two was confusing and difficult to define, but it seems that a roughly contemporary wattle and daub house, associated with a dense concentration of artefacts was to be found next to the robbed-out coral structure. At the lowest levels, postholes and a sandy floor delineated the area of this structure.

Associated artefacts position it within the 7 – 10<sup>th</sup> century occupation of the site, evidenced by diagnostic ceramics of the Early Tana Tradition.

#### *Area C*

Area C, to the west of the main site, covers a ridge behind the beach of Menai Bay and a small area of low-lying land beyond (Figure 7). This area is currently turned over to cultivation and pedestrian survey returned a large number of semi-fired daub fragments, along with ceramics which appear to have belonged to the 11th-13th, and 19th centuries. We also recovered a single coin from the ridgeline close to Ras Kigomani, illegible but similar in size and shape to East African coins minted at sites such as Kilwa Kisiwani or Tumbatu during the early second millennium AD (Wynne-Jones and Fleisher 2012).

Gradiometry results from Area C revealed a cluster of bipolar and linear magnetic anomalies on the southern, beach-facing side of the ridge, which might be the remains of burnt daub structures or industrial activity. The signatures of these features are not as intense as those found in Area A, and the anomalies do not extend inland, in spite of the partially-fired daub fragments recovered in that area. Some of the anomalies seem to relate to ancient activity, and gave no result with the metal detector; however, some did give positive readings, and shallow excavation revealed a series of thick iron posts and degraded concrete buried upright in the ground. Several early-20th century coins were also found in the area, including 4 British shillings, one of which was identifiable as a 1930s George V, and it seems that an unidentified structure or shelter was erected here in the early- to mid-20th century.

### *Area D*

This area to the west of Area C was sited in order to give context to the find of a Swahili coin (Figure 7). Magnetic gradiometry revealed faint traces indicative of coral structural remains in the ploughed field where the coin was found, and two clear linear features under the roadway past the field. The latter features were partially visible on the surface and identifiable as coral rubble, probably the remains of buried walls, but the magnetometry results demonstrate a greater extent not visible on the ground. Further surface finds and those identified with the metal detector included a fragment of a flat bronze disc, possibly a mirror, with script decoration; 4 coins; and a small number of other non-ferrous artefacts. No diagnostic ceramics were found at this location, but on the basis of the coins it is estimated that this area of the site is likely to date to the 13th-15th centuries AD.

### **Discussion**

The results from this pilot season of geophysical survey add significantly to our information on the site of Unguja Ukuu. The identification of dipolar anomalies in Area A, around 15-20m from the creek, suggests that this may be a site of industrial activity as well as middens, and the iron ore and slag recorded in this area by Horton may indicate iron-working in this zone. The fact that this is in close proximity to the assumed position of the settlement raises several questions about who was working the site, and the relationship between urban/ritual/industrial spaces in this early Swahili port.

In Area B, we have identified structural remains comprising a significant quantity of porites coral, forming a linear feature on an alignment of 330°. These indicate the former presence of a mosque. The fragmentation of the coral indicates the robbing of larger coral blocks from this structure, and small fragments of imported ceramics suggest this robbing may have occurred in the 13th-14th centuries. We have also identified a previously unknown timber or wattle-and-daub structure adjacent to this mosque, which appears to date to an early period in the 7th-10th century phase of occupation at Unguja Ukuu. The relationship between this timber structure and the coral phase of the mosque is presently unclear, but on the basis of the small area excavated so far three hypotheses are put forward here;

- 1) The timber structure predates the mosque, and is part of an unrelated structure
- 2) The timber structure was contemporary with the earliest phase of the mosque, but was physically unrelated;
- 3) The timber structure represents the earliest phase of the mosque, which was later redeveloped as a coral building.

Charcoal samples have been obtained from various contexts in this excavation, and will be submitted for dating, and further excavation will be necessary across the interior of the structure. At this stage however, it is worth noting that discovery of this timber structure indicates the possible extension of the settlement into this area adjacent to the ocean, and perhaps a southern extension of early Unguja Ukuu onto the peninsula from the mainland. The evidence from this area therefore extends the limits of the settlement as currently understood, to encompass a busy waterfront including a mosque, perhaps for the use of sailors and merchants arriving at the site. Port facilities on this waterfront seem to have faced the open water of Menai Bay, rather than the shelter of the tidal creek. This alters our interpretation of the orientation of the public waterfront, and therefore the relationship between the whole port and its surrounding maritime context. It also raises questions over current theory suggesting that early mosques were centrally sited within urban zones in Swahili towns and might point to multiple processes of Islamicization in different areas (cf. Horton 1991).

In Area C we were able to rule out present-day debris and interference as the cause of the magnetic anomaly identified in 2013, but the recovery of several British coins of the 1930s, and discovery of concrete and metal posts near the shoreline indicates that it is likely to be related to 20th century activity. It is possible however that these remains are unrelated, and that an earlier phase of activity is still preserved in this area.

The discovery of further early Swahili coinage in Area D, along with various other metal artefacts and identification of several coral rag walls, indicates that this area was occupied around the 14th-15th century. It seems that the settlement at Unguja Ukuu may have shifted over time, or was redeveloped on several occasions, although the nature of these moves, their purpose or consequence is as yet unclear. Further work will need to be done to

investigate the size of the settlement in this period, especially given the recent development of buildings in the area.

Collectively, these results indicate that during the early occupation period of Unguja Ukuu, between the 7th-10th centuries, the town occupied a prominent coastal location which enabled maritime access to the site from the sea via Menai Bay, and exploitation of the various resources of the mangrove creek east of the peninsula. In this scenario the newly identified mosque found in Area B is likely to have marked the end of harbour area of the town, as seen at other Swahili coastal towns in later periods (Fleisher et al. 2014), and may have had a counterpoint further west along the beach. As well as providing the hint of a local Islamic community at this date, this would have served as a beacon to passing or incoming maritime traffic. The contrast between the position of this mosque, on the edge of the settlement near the ocean, and the central mosque of similar date at Shanga, may illustrate differential routes by which Islam was welcomed into coastal East African society.

The location of an industrial area in Area A suggests that this activity is likely to have been related to the working of the harbour. Furthermore, the position of the mosque 'beyond' this area relative to the known occupation zone draws this harbour/industry area into the orbit of the known settlement and positions it as an integral part. It may therefore be that, as well as the usual necessities of boat building and repair, fishing and trade, industry formed a key component of harbour activity at Unguja Ukuu.

The successful identification of so many previously unknown archaeological features demonstrates both the potential for further work at Unguja Ukuu, and for geophysical survey in East Africa in general. We have been able to extend the known limits of Unguja Ukuu, identified a necessary re-orientation of the site in relation to its harbour facilities, and raised questions about the relationship between public and working spaces in an early Swahili context.

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### Figure captions

Figure 1: Map of the Zanzibar archipelago, showing islands of Unguja and Pemba, and the location of Unguja Ukuu

Figure 2: Map of previous excavations and interpretations of Unguja Ukuu

Figure 3: Areas selected for survey

Figure 4: Area A results, showing anomalies and location of Trench 2

Figure 5: Area B results, showing mosque and Trench 1

Figure 6: Plan of trench across eastern wall of mosque. Contexts (005) and (007) are lines of coral debris.

Figure 7: Area C and D results, with anomalies

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