Tanzania

Conservation and archaeological project in Kua, Mafia, Tanzania (July-August 2018)

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Introduction

Up to now, no large-scale excavations were conducted on late Swahili sites and Kua is the perfect candidate to study a site contemporaneous to the Portuguese expansion in the Indian Ocean during the sixteenth and seventh centuries AD. Kua is located on the small island of Juani to the south-west of Mafia Island at the mouth of the Rufiji river in Tanzania (Figure 1). Kua is one of the largest Swahili sites in East Africa, and likely the least studied. Local chronicles related to Kua were recorded and published by Freeman Grenville (1962: 211-215). Although Kua is exceptional, little has been done to study and to preserve it. Just a small portion of the site has been cleared and only an archaeological survey would reveal the buildings through the jungle and below the sand. Physical decay is one of the main problems affecting the ruins. The site was never properly excavated, and our objectives were first to survey the whole site by establishing a new and accurate plan, followed by scientific archaeological excavations to establish the chronology of the site. The only map of the site was completed by Neville Chittick in 1958 (Mafia District, Tanzanian National Archives in Dar es-Salaam). Limited architectural work at Kua includes that completed by Peter Garlake (1966: 164-168) who recorded a few houses and mosques at the site in the 1960s. Finally, a few small test pits were excavated in 2009-2010 for PhD fieldwork by Annalisa Christies (2011: 243-264).

Our project is an opportunity to promote Kua and to bring it the recognition it deserves. Working with our local partners (Division of Antiquities, Ministry of Natural Resources and Tourism, Tanzania; Mafia Island Marine Park; and a community-based organization (CBO) called the 'Kua Ancient Swahili Town Conservation Society'), if handled properly, tourism can bring significant benefits to poor communities living adjacent to heritage sites. Visitor infrastructure at the site will help to draw these visitors to the island, which is one of the poorest places in Tanzania, creating employment and economic opportunities and thereby helping to tackle poverty.

Sustainable conservation in Kua: building local capacities through conservation

In 2016, the site of Kua was added to the World Monuments Watch list, recognizing that the surviving structures could collapse at any time, while the site as a whole is threatened by the continued effects of a harsh climate and destruction at the hands of explorers digging for fabled Swahili treasures. Unmanaged tourism from nearby resorts and potential commercial development put centuries of heritage at risk. Local villagers, mostly subsistence fishermen, were largely unaware of the significance of the ruins and were unable to maintain them. In 2017, the World Monuments Fund was awarded a grant by the Ambassadors Fund for Cultural Preservation to undertake a pilot preservation and community engagement project at the Kua ruins. In 2017 the Aga Khan University research council (AKU-URC) awarded a grant to the ISMC (Institute for the Study of Muslim Civilisations) to start a pilot project in Islamic archaeology on the site of Kua.

Our project at the ancient Swahili ruins of Kua had two main objectives: 1) to engage the community living on the island of Juani, where the ancient Swahili ruins of Kua are located in preservation and future management of the site and thereby develop a custodianship model that is more equitable and sustainable; and 2) to carry out physical conservation at the site based on international best practice in order to preserve it for future generations.

The project established a community-based organization (CBO) called the 'Kua Ancient Swahili Town

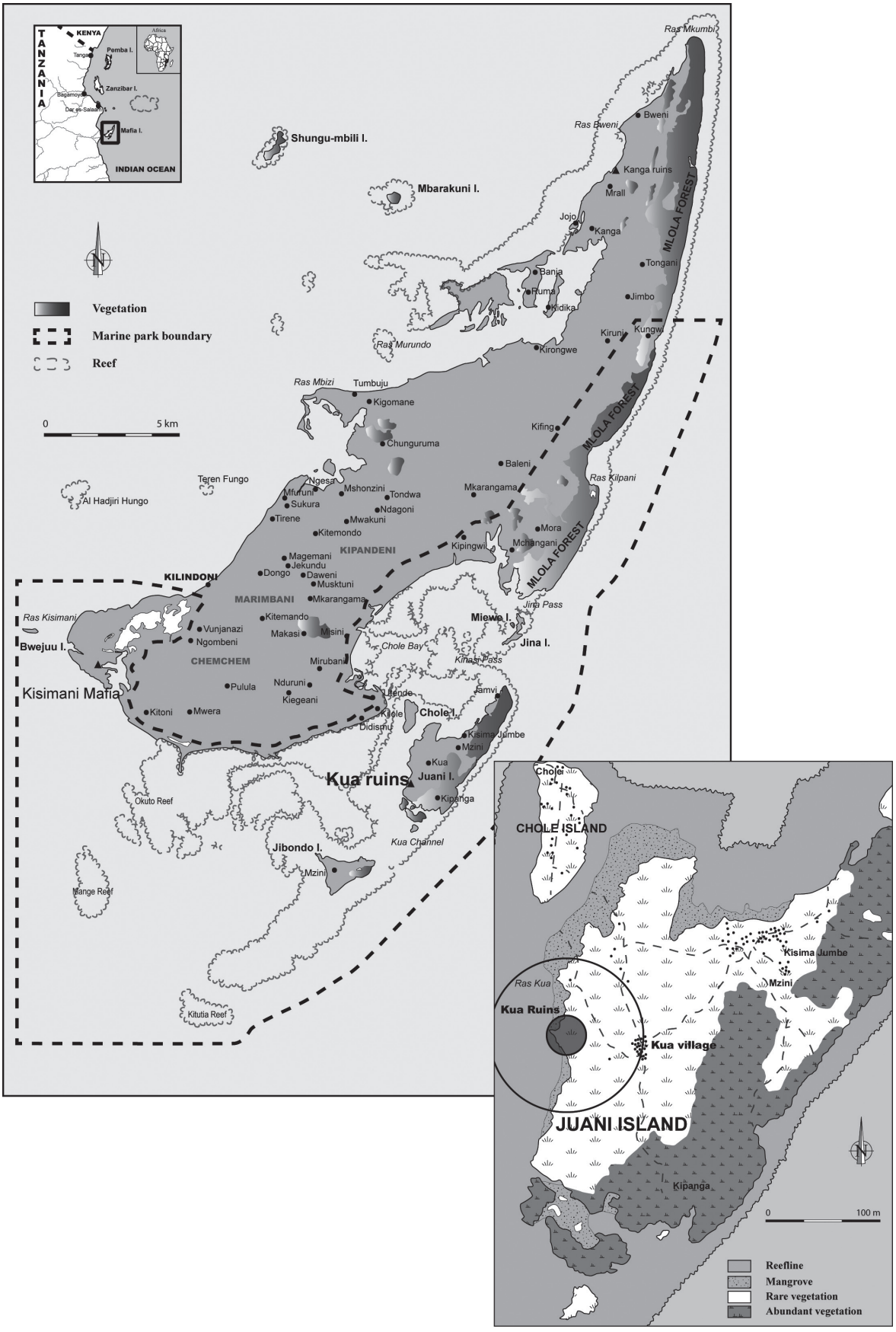

Figure 1: Map of Mafia archipelago and Kua island.

Conservation Society', which is focused on heritage. The purpose of the CBO is to provide the community with a collective voice in custodianship of the site and a vehicle through which they can participate in future management and maintenance. Ensuring that benefits from investment in conservation reach the local population was a key objective of the project. The CBO facilitated the community's participation in the conservation work carried out on the ruins – over 235 people have been employed in some way during implementation of the project, with jobs ranging from seasonal workers and cooks, to carpenters and guards, and more. The entire workforce employed for the project was drawn from communities on the island, thereby maximizing benefits to local residents. The projects were highly labour-intensive operations created to alleviate poverty and unemployment by providing temporary job opportunities.

An additional responsibility of the CBO is to act as tour guides for the site. A training program was developed to provide basic tour-guiding and English skills. A leaflet has also been produced with a map and basic history of the site, which will be handed out to visitors on payment of the entrance fee.

The preservation component of the project had two main components: 1) the documentation of the site and standing ruins to identify their extent and location and create tools to improve management; and 2) the physical preservation of the most threatened structure at the site. Juani Island is remote, even from Mafia Island, and is accessible only by small boat, with no source of potable water or electricity. The logistics were very challenging with construction of facilities for conservation work and a project base camp had to be built as we did in Songo Mnara a few years ago.

The conservation work took the form of training the local community in the necessary know-how in conservation and maintenance techniques of the site. The project was implemented by the Antiquities Division which is in charge of all historic monuments in Tanzania in partnership with the Marine Park using a core team of skilled craftspeople trained in a precedent project in Kilwa. Four teams were created consisting of five workers supervised by one craftsman. Each team was responsible for conservation of one building at a time. The use of foreign experts was limited to missions requiring specific technical skills for preservation and training. In carrying out conservation work, the team followed international standards of best practice with minimum intervention, repairing like with like. Work was focused on removing vegetation from masonry walls; strengthening walls by grouting and stone replacement; renovating top courses and inserting binding stones and mortar caps; insertion of lintels over openings; and (in limited cases) consolidating decorative elements such as carved mihrabs by anastylosis. The quality of work achieved is high and improved during the course of the project. Thirteen structures, including six mosques with adjacent tombs, six houses, and one cemetery have been conserved. The clearance of the site of invasive vegetation, revealed many structures, including the discovery of a new mosque.

Though much more remains to be done, the site has already been transformed from a few walls covered in dense bush, to a place where the outlines of a town and the traces of a lost community can be easily discerned. Anticipated future work will build on the achievements and momentum of the first phase, focusing on community participation in ongoing care of the site, continued physical conservation and improving the visitor experience. By engaging the community's participation in the conservation work, World Monuments Fund sought to foster positive change in the community on Juani Island and instill a sense of responsible stewardship of the site.

Conservation was highly labour-intensive. To maximize economic benefits for the local inhabitants, a system was agreed upon whereby workers would undergo a rotation every month to ensure that economic benefits were distributed as widely as possible on the island. Apart from directly improving the economic situation of inhabitants, all of whom survive on very low incomes, this system offered the community a direct return from the investment in heritage. However, some facets of the project created challenges. Rotation created some difficulties; workers with little experience of conservation lacked self-confidence and found it difficult to take initiative or responsibility and thus constant supervision was necessary. Eight workers from Juani were selected by the lead craftsmen and trained to become assistant craftsmen. Levels of dexterity, manual skills, analytic capacities, motivation, and professionalism varied among them, but generally the training results are satisfactory.

The only visitor infrastructure at the site before work commenced were a few paths through the dense bush. Improving access for visitors and providing basic information at the site is essential to encourage visitation.

Step one of site work was to clear bush at structures to be conserved and this has dramatically altered the ability of visitors to 'read' the site. New paths have also been cleared which make the ruins much more accessible.

Spatial Documentation Activities on Kua

The Zamani heritage-documentation research group from the University of Cape Town spatially documented the Kua site employing state-of-the-art technologies and methods. The equipment used comprised terrestrial laser scanners for the creation of 3D computer models and DSLR cameras for texturing, scan hole filling and for full dome panoramas. A DJI Phantom 4 Pro drone was deployed for the creation of an ortho-image of the entire site and a Trimble RTK-GNSS instrument was employed to determine the position of control points required to accurately geo-reference the scanned structures and the ortho-image.

Detailed meshed 3D models were derived from cm-accurate point clouds based on high resolution laser scans with a Z+F imager 5010X scanner. Surface point intervals are between 0.5 and 3 cm throughout. The meshed models were textured photogrammetrically. In this way six mosques, several houses and most of the associated tombs were recorded. Further scanning will be required to create models of the yet to be excavated structures. As it was impossible to scan and photograph all building surfaces from ground-based scanner setups or camera positions, the drone was used to capture aerial and oblique views of the structures. The final, photo-realistically textured models were created from a combination of terrestrial photography, drone-based photos, and laser scans. This resulted in practically complete (i.e. hole-free) models of all documented buildings.

Vertical and horizontal sections through all 3D models were generated to create ground and building plans. The scan-derived models also made it possible to produce elevations of the principal building facades. An important question of authenticity versus aesthetic appearance arose while producing the sections. Sections derived by 'cutting' through the highly detailed laser scan models reflect the natural irregular 'as-is' outlines of walls and surfaces. This resulted in plans and elevations which differ from the traditional idealized representation of heritage buildings, where walls are shown as straight lines and most angles are rectangular. This traditional, architectural approach to building diagrams is visually more appealing but less accurate and less authentic. The former is suited for publications and scientific reports describing design and layout of a site, while the latter is required for conservation interventions and restoration projects. Both approaches to representing plans and sections were produced for Kua and introduced into the Kua-GIS project.

A panorama tour combining 136 individual full-dome panoramas has made it possible to visit Kua virtually, increasing awareness and interest in the site. Panorama tours are ideal for visitor centres or for online exposure of a site to tourism. The data generated by the Zamani documentation are sufficiently detailed and complete to create a Virtual Reality (VR) experience, which would provide for an even more realistic virtual visit of the currently recorded Kua ruins.

In addition to the drone flights for texturing and scan hole filling, separate drone flights following a traditional photogrammetric grid flight plan were carried out. Some 700 aerial images captured with the drone served to produce a high resolution ortho-photo of the site. The ortho-photo formed the basis of the Geographic Information System (GIS) generated dataset which combined all acquired data to which previously produced plans and diagrams were added (see Figure 2). The Kua GIS comprises 34 point polyline, polygon and raster layers.

A problem arose when establishing heights above sea-level (orthometric heights) for the site. GNSS (GPS) measurements provide height with respect to the WGS84 ellipsoid while heights above sea level are referenced to the geoid. The difference between the two systems, known as geoid undulation, varies with geographic location. Benchmarks with known sea-level heights, which normally serve to determine heights, were not available for Kua and the Zamani team had to revert to two different approaches to approximate sea level heights, one relying on known values for an international geoid (WGS84), the other on sea surface measurement and tide tables. The values for the geoid undulation in Kua based on the international geoid and sea surface as observed by the Zamani team were 28.22 and 27.02 respectively. A height correction constant (geoid undulation) for the site of 27.02 was subsequently adopted for the documentation and all GPS heights were corrected by adding this amount to the heights established by the GPS survey. Any future GPS derived heights should be adjusted by the same constant to guarantee consistency. The absence of an accurate sea-level height benchmark does not have a negative practical

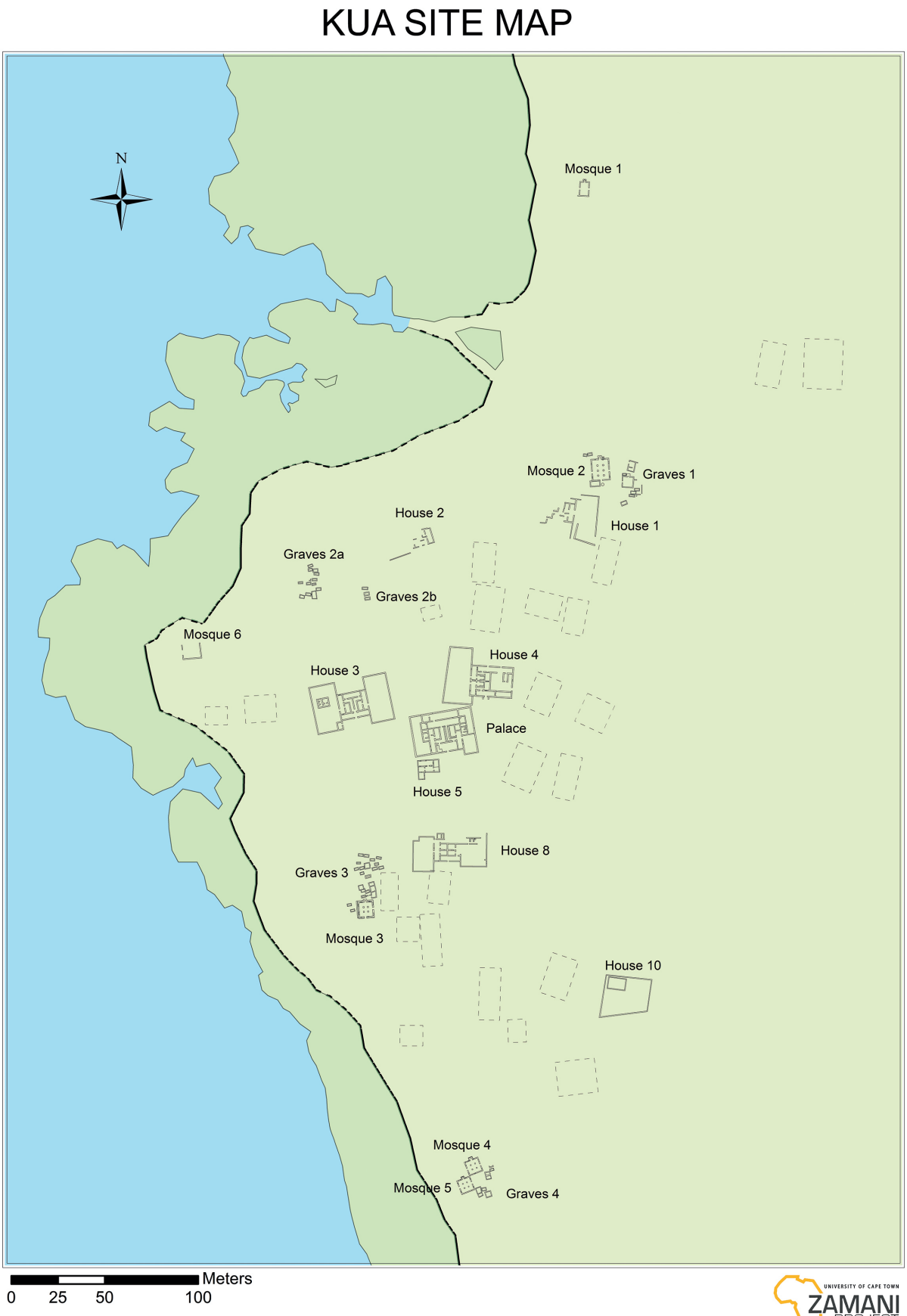

Figure 2: Plan / GIS of the site of Kua.

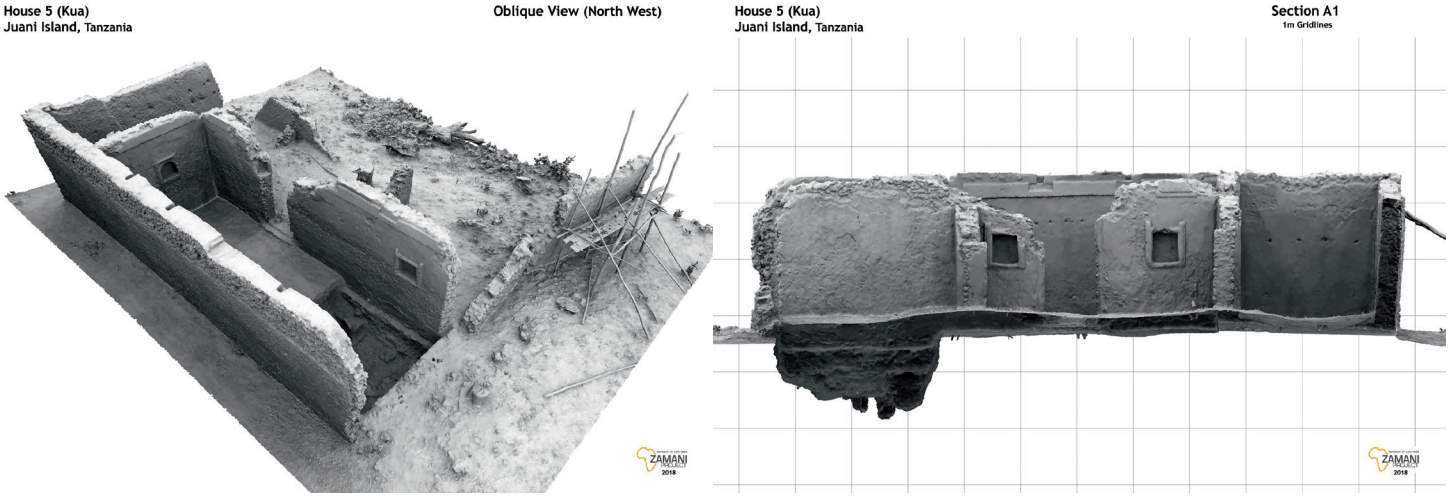

Figure 3: 3D scan of House 5 and elevation/ section (a & b).

impact on the heights on site as provided in the Zamani dataset. Relative heights for all structures on site are cm-accurate and the uncertainty of about 1 m for the absolute height is unlikely to be relevant in an archaeological context or for conservation interventions. The total spatial data volume acquired during the eight-day field campaign is about one terabyte.

Excavations and archaeological field school in Kua

During our first field season, six test pits were dug between 24 July and 22 August 2018 and it enabled us to reveal different phases of occupation on the site from the twelfth to seventeenth century AD. The placement of our excavations was decided with our colleagues, Heritage Architects, prior to their conservation work as is always the case in such collaborative projects. Our goal was to document the occupation layers of houses and mosques before restoration as well as to document the stratigraphy of the whole site. Prior to this effort, limited clearing work to expose the monuments was done by Neville Chittick in addition to a limited shovel test survey by Annalisa Christies that did not develop an in-depth chronology for the site. Our main objectives were to document the life of a Swahili site during the Portuguese era and to explore the changes in African material culture during this period, changes in Swahili architecture but also changes in the economic networks in the Indian Ocean through ceramic studies.

Although evidence of an early occupation was quite modest, at least one occupation layer in room 5 of House 5 (Figure 3), layer 112, provided specific fragments of hatched sgraffiato pottery from the eleventh to twelfth century AD. One structure, a pit latrine, was associated with this early period, in room 1 of House 7. Nevertheless, other pieces of hatched sgraffiato were found during our surveys attesting the foundation of the site at least from the twelfth century.

The settlement gained prominence from the fifteenth century onward and several subdivisions were noticed in the different construction phases in room 1 of House 7. Our team did not find artefacts or occupation layers belonging to the 'break-period' between the twelfth and the fifteenth century in the middle of the site, but we did only two excavations to the North of the site and no test pits to the Southern part so maybe the twelfth and fifteenth century town is located in these areas. Plus, the absence of archaeological material from this period in the middle of the site might be due some erosion processes as recorded in the Comoros (Pradines, 2019: 111-113). Layers from the fifteenth century phase were observed in House 5 room 1 where some pieces of celadon wares were discovered in layers 131 & 133 (Figure 4). In Mosque 1, both architectural elements and decoration, in particular the inserted bowls within the *mihrab*, connect this religious building to the fifteenth century. During our surveys we identified a new large mosque built very close to the shore. Unfortunately, due to marine erosion, the qibla collapsed onto the beach and it was not possible to observe any *mihrab*.

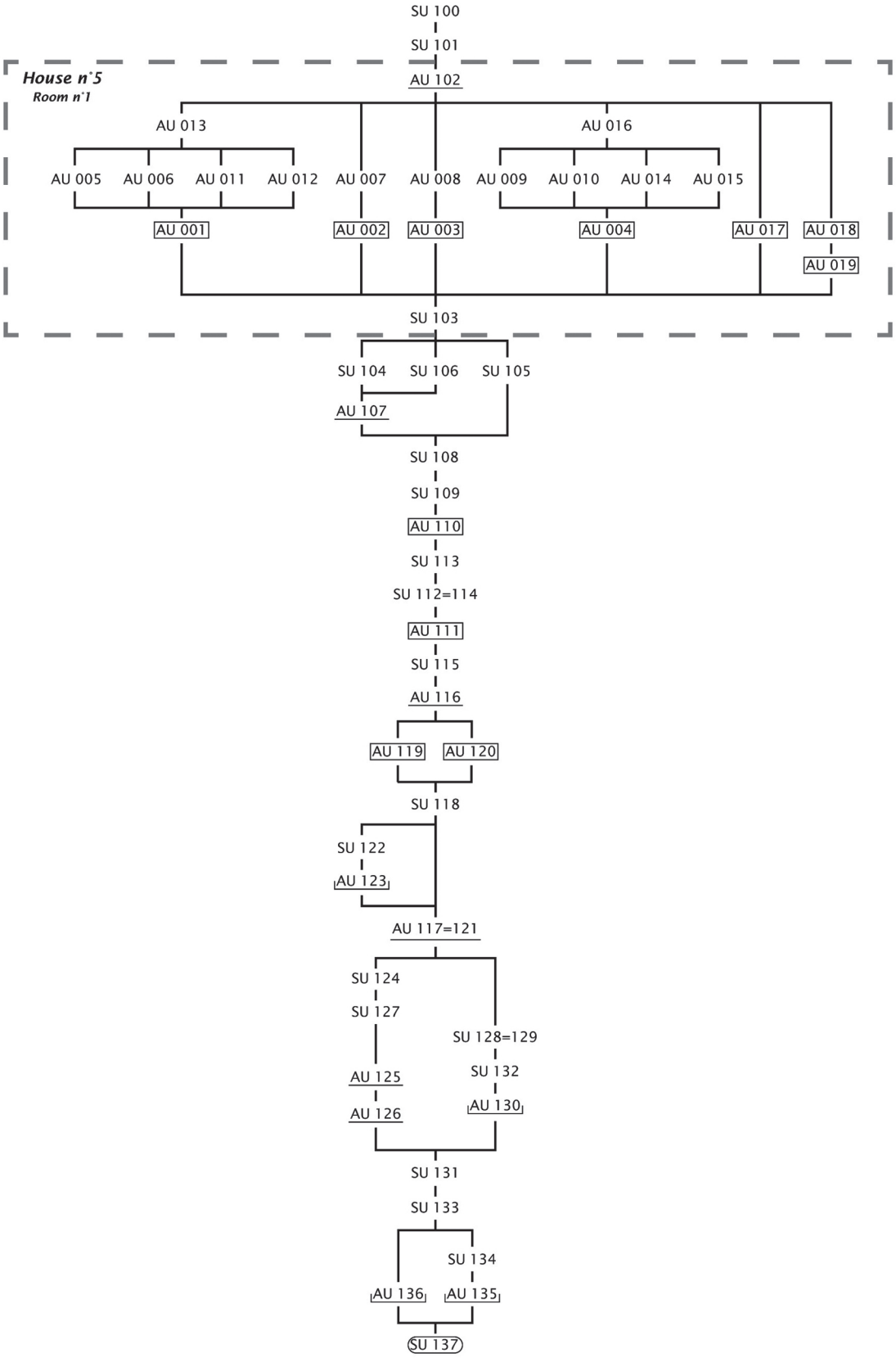

Figure 4: Harris matrix, House 5, room 1.

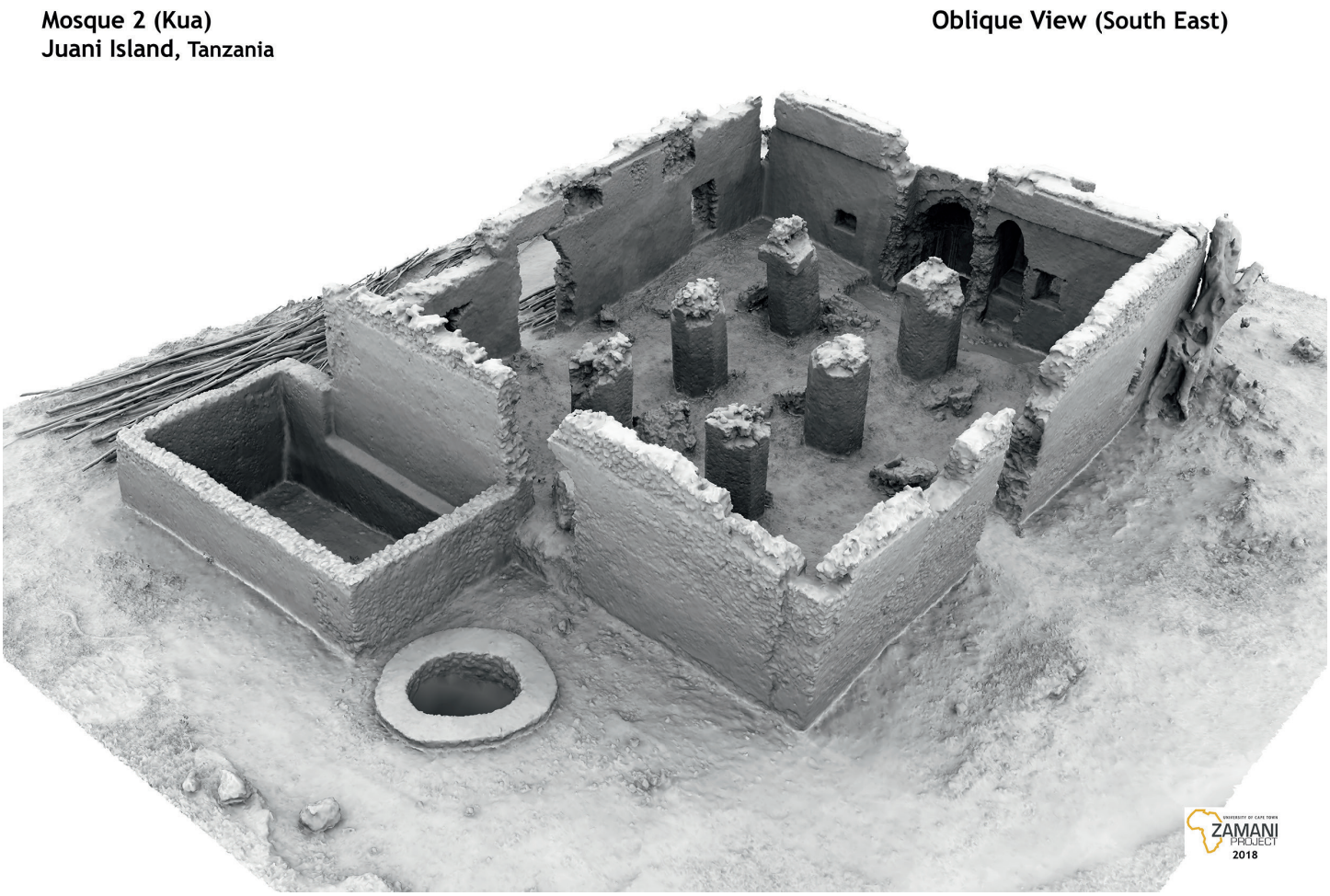

Figure 5: Mosque 2 and water tank.

The main and principal occupation phase in Kua occurred during the sixteenth to the seventeenth century in many areas of the site. It was during this period, under the Portuguese era, that the town knew its biggest expansion with the creation of various compounds such as Houses 5 & 7 within the area of Mosque 3. The excavation enabled us to expose not only the occupation layers and floor levels, but we also recorded *in situ* pottery such as architectural unit 104 in House 5 room 5. This group of independent dwellings or compounds with large enclosure walls created the plan of the town visible nowadays. In addition to this urbanisation process, inhabitants built more small mosques such as Mosque 2. We recorded 6 mosques on the site, including the great mosque from the sixteenth to seventeenth century (Figure 5). A large water tank was added against the southern wall façade of the great mosque. Furthermore, the latter was filled with abandon layers 100/101 which contained huge numbers of imported Chinese porcelain as well as a few complete pots showing pieces from local manufacture (Figure 6). Finally, our excavations exposed the well-preserved floors of House 5, Mosque 2 and floor 105 in House 5. All the archaeological material found in our test pit house 1 Northern sector is also from the sixteenth-seventeenth century.

Conclusion

To conclude, one important aspect of our project was the two field schools: archaeology and conservation. The Aga Khan University in East Africa supports research, education, heritage, tourism, sustainability and local development. Our activities were implemented in partnership with Tanzanian Antiquities, which is the government body responsible for heritage in Tanzania and the theoretical custodians of the site, the Marine Park and the WMF (World Monument Fund).

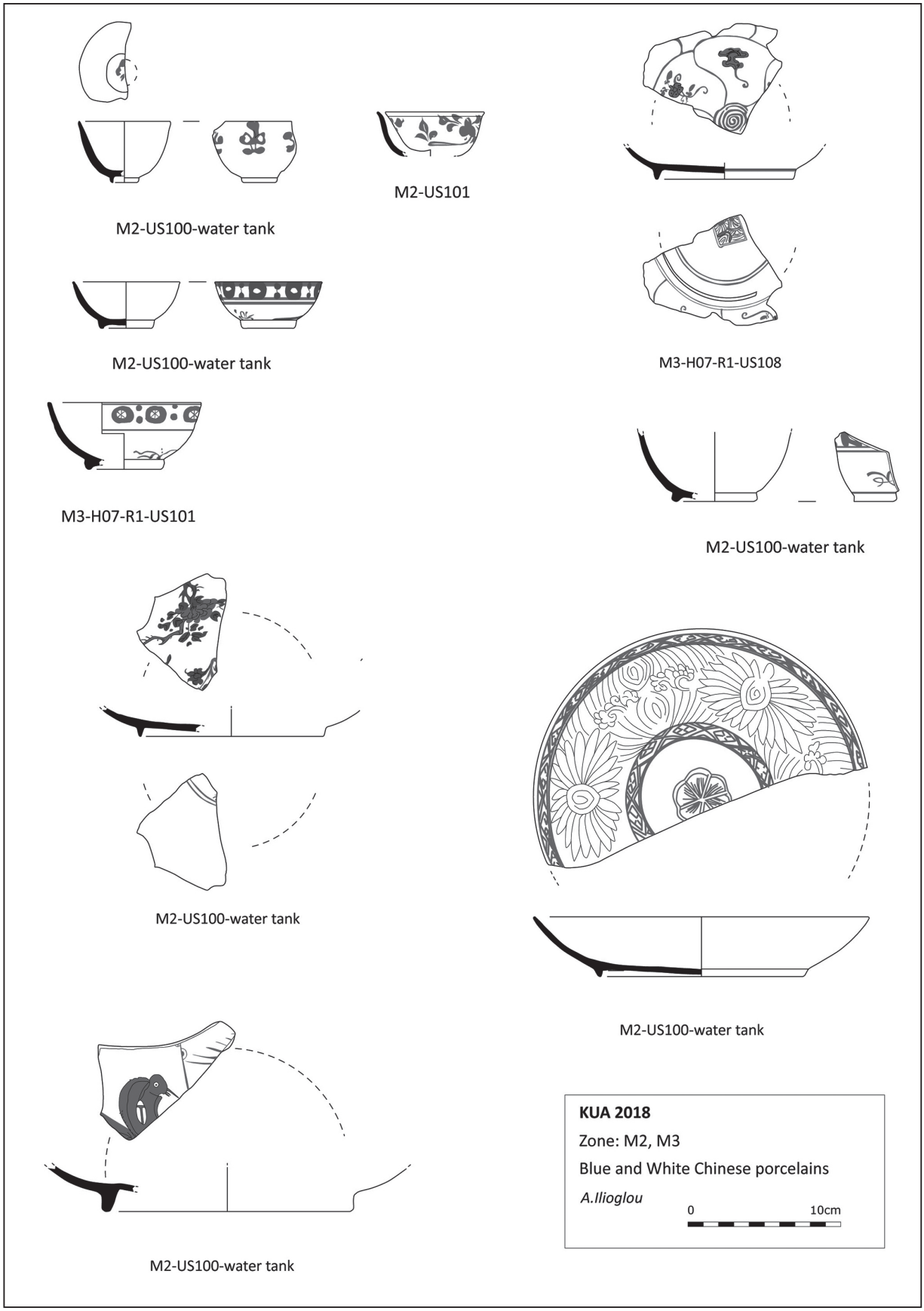

Figure 6: Chinese Blue and white porcelains from the water tank.

Acknowledgments

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Figure 7 a & b: Photos of the field school (by Pradines).