Endangered Archaeology in southern Arabia: the work of the EAMENA project in Yemen and Oman

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Introduction

This brief paper introduces the work of the Endangered Archaeology in the Middle East and North Africa (EAMENA) project in documenting threatened heritage sites in Yemen and Oman. Since January 2015 the Arcadia Fund has supported a team of archaeologists at the Universities of Oxford and Leicester, and joined by a team at Durham from 2017, has been digitally documenting heritage sites across the MENA region, primarily using open-source satellite imagery to identify and monitor heritage sites across the region. This article will cover the reasons we focussed on Yemen from an early stage in response to the threat posed to the country's rich heritage by the ongoing conflict, before considering some of the important new datasets created by the project. It will then move on to a description of more recent survey in Oman, where contrasting circumstances has allowed the development of a more detailed aerial survey of archaeological sites. While these two aspects of the EAMENA project detail significant variation in levels of endangered archaeology across southern Arabia, they both highlight aerial and satellite-centric survey methods can make major contributions to understanding the rich historic environment of this region.

Remote-sensing Endangered Archaeology in Yemen

When work on the EAMENA project began in January 2015 it had not been part of the initial strategy to focus on Yemen. However, the rapidly evolving political and military situation in subsequent months led to a change in staff deployment and a rapid process of collecting heritage site data for monitoring. While we add heritage site data from published gazetteers, our primary methodology used is the systematic analysis of the landscape using high-resolution satellite imagery hosted on open-access platforms, principally Google Earth. Recording sites of any period or type, often covering areas that have not previously be investigated systematically, the project has created a significant new historic environment dataset for Yemen.

The early stages of the conflict was marked by significant damage to a number of major heritage sites in Yemen as a result of aerial bombardment by the GCC coalition in support of President Hadi. This included sites at Baraqish, the northern slipway of the great dam at Marib, and the citadel at Taizz, although the project has recorded other damage sites such as a small coastal fort north of the town of Midi in Hajjaz governorate (Fig.1). In spite of this initial wave of damage, the number of major monuments damaged directly by military activity has dropped in frequency and scale. One notable exception to this has been damage to the historic buildings of many major settlements in the main conflict zones such as Sana'a and Sa'dah. While the historic centres have been infrequently been targeted by air strikes, the bombing of more modern complexes on the peripheries of historic settlements has led to damage to historic buildings through the impact of reverberations from explosives, shrapnel and poor targeting.

More broadly the project has recorded evidence of different types of disturbances and threats to heritage sites across Yemen. This documentation has started to show that the most common factors affecting heritage sites are small-scale incidental actions, such the construction of new buildings, limited expansion of fields systems and development of local infrastructure. These type of incidents are far more common across the country that intentional damage such as the looting of antiquities or conflict-related damage, as discussed above. There are also regional variations in the issues affecting heritage sites. For instance, in the sparsely populated al Mahrah governorate in eastern Yemen, many

stone cairns and trilith features are impacted on by the development of dirt vehicular tracks along wadi channels.

A more positive outcome of the current remote-sensing survey work undertaken by the EAMENA project is the identification of a whole range of previously undocumented archaeological sites from across the country. The potential of these new datasets to significantly enhance understanding of areas that have previously been the focus of study on the ground has already been demonstrated in re-analysis of areas of al-Bayda' and the Wadi Hadramout regions[1]. More recent survey by EAMENA in areas such as the Tihamah Plain and in eastern part of Dhamar governorate has further highlighted the wealth of undocumented archaeology in parts of Yemen.

The Tihamah Plain alongside Yemen's Red Sea coast is not in general an area that is easily surveyed for archaeological sites using satellite imagery. The small-scale of many sites in this region, the lack of distinct building material and the shifting nature of modern agriculture makes observing sites particularly difficult. An exception has been the identification of two large sites enclosed by embanked ramparts that the project has identified in this region, and which have not been recorded by previous international ground surveys. The first, near the modern settlement of Hays, consists of an enclosed area, backing onto the an area of foothills, with extensive evidence of internal structure inside the 'ramparts', on the lower slopes of the foothill, and with a single structure at the crest of the nearest hill. The second site (Fig.2) is further north, on the Wadi Mawr, and is comparable in the form of its rampart and the fact that both sites sit in the angle of a major and and a minor wadi junction. While fewer internal structures are visible at this second site, probably due to the impact of more recent agricultural clearance, there are the remains of some form of central citadel, as well as a pair of apparent gate towers along the southern course of the rampart. It is not possible to assign a clear date to either of these sites, which in scale could reasonably interpreted as city settlements, due to a lack of clear comparison sites in Yemen and that they cannot currently be safely visited on the ground. However, there can be little doubt that they represent major new additions to the documented corpus of archaeological sites in Yemen.

In eastern Dhamar the project has built on earlier field survey and research by international missions to significantly expand understanding of later prehistoric settlement across this region. Beginning with the improbable identification of a major hilltop settlement (Fig.3) to the west of the well-known archaeological landscapes around Baynun, the project has subsequently identified a raft of settlements, boundaries, routeways and extensive cairn cemeteries along the lava flows that make up much of the border area between the governorate of Dhamar and al Bayda. Basalt-rich areas such as these are particularly productive areas for survey via satellite imagery, as the overall geological landscape inhibits the spread of intensive agriculture, while structures built of the basalt are often visually distinct on satellite images. The use of these remote-sensing survey techniques are allowing a complete reappraisal of the archaeological landscapes of Yemen, where regions such as eastern Dhamar are transformed by the scale of new data generated by the EAMENA project. However, the full value of these newly-documented sites will only be realised when they can be investigated more fully on the ground, and could form the basis of a raft of new research for archaeologists in Yemen as part of a process of cultural reconstruction in a future, post-conflict Yemen.

[1] Rebecca Banks, Michael Fradley, Jérémie Schiettecatte, Andrea Zerbini, 'An integrated approach to surveying the archaeological landscapes of Yemen', *Proceedings of the Seminar for Arabian Studies* Vol.47 (2017), pp.9-24.

Beyond the use of satellite imagery, in order to provide a deeper time-depth of analysis the EAMENA project has also been gathering historic aerial photography created by the RAF during the period of British occupation in southern Yemen, and the later work of the Directorate of Overseas surveys over the Yemen Arab Republic. The project has already digitally scanned *c.*40,000 prints held at the Bodleian Library covering the period 1952-73, as well as pioneering mappings surveys of the Aden hinterland in 1928 and western Abyan governorate from 1933-4. In addition the project has run a campaign to gather aerial photography from the area held in private collections. Smaller collections held in archives such as the British Library, the National Archives and St. Anthony's College, Oxford, have also been analyzed. In bringing together much of this imagery in the EAMENA database, the project can identify archaeological sites lost under subsequent development, as well as open up this material to a wider audience of researchers in the long-term.

The next step of the project in Yemen has been to begin development of a bespoke version of the EAMENA database for the General Office of Antiquities and Museums (GOAM) in Yemen, with the support of UNESCO Doha and members of various international missions that have operated in Yemen over previous decades. This system, known as the Yemen Heritage Management Platform (YHMP), will provide the GOAM team with a digital platform that can be utilized across their regional offices to document heritage sites and the issues affecting them. It will also house the data collected by the EAMENA project, including the historic aerial photograph archive discussed above.

Aerial Archaeology in Oman.

The contrsting political situation in Oman has enabled the EAMENA project to develop a very different research approach to that described above for Yemen. In February 2018 one of the co-authors (Bewley) and his colleague Sufyan al Karaimeh (Leiden University) undertook the first flight of the *Aerial Archaeology in Oman* project. This was a significant moment in the development of aerial reconnaissance in the Middle East as it represented an expansion of the twenty-two years undertaking similar work in Jordan[2].

The two primary objectives for this aerial reconnaissance project are:

1. To discover and record archaeological sites from the air, highlighting the breadth and range of the archaeology of Oman.
2. To monitor and record, through photography, the condition of sites that under threat from damage.

Our first year, 2018 was a pilot season in which we undertook only 5 hours flying, in a Puma helicopter very gratefully provided by the Royal Air Force of Oman (RAFO), taking a total of 1,381 aerial photographs, from north of Muscat and flying down the coast to the Ras al Jenz area. For this trial season we targeted c. 21 sites to explore the potential of the technique for recording existing sites as well as reconnoitring for new discoveries. It was successful on both counts. All the imagery was assessed after the flight by a senior representative of the National Survey Authority (NSA).

In late 2018 we were authorized to return to fly again and in January 2019 undertook three flights totaling 9.6 hours and taking 3,349 photographs. We concentrated in the Batinah governorate – combining with existing field survey teams, as well as continuing to photograph the numerous castles and towers, on the coast and inland too. We rounded off the 2019 season with a workshop at the Ministry of Heritage and Culture to discuss the

[2] See David Kennedy and Robert Bewley, *Ancient Jordan from the Air* (2004), London, CBRL.

preliminary results and discuss the next steps. We have agreed on a three-year proposal for the project (subject to funding) 2020 to 2022 and the intention is to publish a book highlighting Oman's archaeology and rich cultural heritage from the air.

From the two short seasons we have so far recorded approximately 160 sites, in 14.6 hours and taken 4,730 photographs. All the photography has been securely copied so there are archives of the photographs in the Ministry of Heritage and Culture, Oman; in Leiden University and the University of Oxford, and will soon be available on the APAAME website (http://www.apaame.org). Further research is needed to confirm how many 'new' sites have been photographed, but the reconnaissance did show the potential of this aerial survey methodology for documenting heritage sites in Oman (Fig.4).

Conclusion

The work of the EAMENA project in Yemen and Oman reflects the different political and economic conditions of the two countries. In Oman, the project has been able to undertake detailed aerial survey work in conjunction with the Royal Air Force of Oman (RAFO), producing in many cases the first oblique aerial photographs of heritage sites across the country, many of which have not previously been documented. In Yemen the project has focused on the use of rapid assessment of satellite imagery, in some cases surveying areas that have not previously been subject to archaeological investigation. In spite of the differing circumstances, the results of these two projects has been to generate a range of new data for southern Arabia, which has the potential to form the basis of a range of future research projects and transform our understanding of these historically rich regions.

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Figures

Fig.1. Composite of satellite images showing a small Islamic fort north of Midi, with the first showing the ruins prior to the current conflict (16 June 2010) and after its apparent occupation and damage from explosive ordnance (18 January 2017). Map data: Google, DigitalGlobe.

Fig.2. A newly documented undated ‘city’ on the Tihamah Plain, the interior of which has been largely disturbed by modern agriculture from a satellite image (16 February 2011). Map data: Google, DigitalGlobe.

Fig.3. A satellite image (8 June 2009) of potential Bronze Age settlement documented in Dhamar governorate. Map data: Google, DigitalGlobe.

Fig.4 A selection of sites photographed by the Aerial Archaeology in Oman project. Site referenced from top to bottom are: APAAME_20180215_RHB-0361, APAAME_20190114_RHB-0107, APAAME_20190114_RHB-0082. Photo: Robert Bewley.