'THE PALAEOLITHIC OCCUPATION OF THE HARRAT AL BIRK' PRELIMINARY REPORT ON 2015 FIELDWORK IN ASIR PROVINCE, SOUTHWEST SAUDI ARABIA

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CONTENTS

1. The Palaeolithic Occupation of the Harrat Al Birk

1.1 Introduction

Arabia's Southern Red Sea coast is of high-profile importance in *Homo* dispersals out of Africa. Given its proximity to Africa, and the potential ease of crossing the Red Sea at the Hanish Sill/Bab el Mandab during periods of low sea levels (Lambeck *et al.* 2011), its position is crucial in debates of dispersals of *Homo* populations during the Pleistocene. The wettest and ecologically the most fertile region of the Arabian Peninsula, it afforded both terrestrial and littoral resources to dispersing populations (Bailey *et al.* In Press, 2015). The presence of the latter in the region is of particular relevance as the role of coastlines and the exploitation of littoral resources by dispersing *Homo sapiens* populations has been the subject of recent debate (Boivin *et al.* 2013; Mellars *et al.* 2013).

This debate has highlighted the paucity of data on the no doubt variable occupation of coastal regions by Palaeolithic populations. Since the end of Marine Isotope Stage 5, sea levels, whilst fluctuating, were lower than the present day until sea level rise during the Holocene. Therefore in most areas of the world, late Quaternary coastlines and the archaeology associated with them have been submerged. The possibility of observing terrestrial evidence for Palaeolithic coastal occupations is therefore restricted to: areas with steep offshore topography (where vertical sea level change has had little impact on the position of the coastline); areas with deposits left by sea stands higher than present-day sea levels (e.g. MIS5e beach deposits); and areas where tectonic uplift has outpaced sea level rise (Bailey and Flemming 2008). Added to these difficulties in the visibility of potential Palaeolithic coastal exploitation is the fact that coastlines are attractive areas for occupation and development in the present day. Such development has destroyed many of the locations in which this evidence might have been preserved, further reducing the opportunities to examine Palaeolithic coastal occupation.

The Harrat Al Birk, Asir Province, SW Saudi Arabia, is one area that could allow the examination of the Palaeolithic use of coastlines and occupation of the coastal zone. Following the findings of pioneering work by Saudi Arabia's Comprehensive Archaeological Survey Programme in the 1980s (CASP; e.g. Zarins *et al.* 1980, 1981), recent survey along the Harrat Al Birk coast has identified Palaeolithic artefacts associated with fossil beaches above the present-day sea level, and now under threat of destruction (Bailey *et al.* 2007; Inglis *et al.* 2013, 2014a, 2014b; Rasul *et al.* 2015). Investigation of the relationship of these deposits with the Palaeolithic stone tools that are found around, and in some cases within, them will allow a better characterisation of human-coastal relationships.

The 2015 survey of the Harrat Al Birk region resulted in the cataloguing of 1300+ lithic artefacts that, typologically, span the majority of the Palaeolithic/Stone Age. The majority of the artefacts were produced on aphanitic and porphyritic volcanic rock, with an emphasis on basalts and andesite. Flakes and cores dominated the recovered finds though several bifacial and retouched artefacts (i.e. scrapers and notches) contributed to the overall total of recovered material. The majority of recovered artefacts can be classified typologically as Early or Middle Stone Age (hereafter ESA and MSA respectively), though a notable collection of worked quartz likely dates to the Epi-Palaeolithic or later, generally classified as Later Stone Age (LSA).

1.2 January 2015 Fieldwork

Archaeological and geomorphological fieldwork was undertaken over three weeks in January 2015 in Asir Province. The primary goal of the work was to survey for locations with Palaeolithic stone tools in order to further characterise the distribution, and technological affinities, of artefacts across the Harrat Al Birk Lava fields, beyond the current broad-scale understanding (Bailey *et al.* 2012; Devès *et al.* 2012, 2013; Inglis *et al.* 2013, 2014a, 2014b; Zarins *et al.* 1981). In addition, the survey sought to record further the geomorphological markers of past shorelines, such as fossil coral and beach terraces, and the relationships of these markers to the observed archaeology.

Satellite imagery (LandsatGeoCover 2000/ETM+ Mosaics and imagery accessed through Google Earth imagery) and DEMs (ASTER GDM v2 and SRTM 90m v4.1) were used to identify potential targets for survey. Survey locations were selected in order to produce a sample of landscape settings along the western coast of the Harrat Al Birk, as well as landscapes further inland along wadis that drain the *Harrat*. A particular focus was on the survey of multiple exposures of beach deposits preserved at a height of c. 6–8m recorded during fieldwork with the Saudi Geological Survey in December 2014 (Rasul *et al.* 2015), and, due to their height above sea level, interpreted as deposits from MIS5 (132-75,000 years ago).

A four-wheel drive vehicle was used to access target areas, with further exploration on foot. In the target areas the terrain was slowly traversed on foot by team members spaced at 5–10m intervals walking along transects of up to 1km distance, the distances and tracks varying according to local circumstances. Key geomorphological features for dating landscape evolution, such as raised beach terraces, were described and examined for the presence of artefacts visible *in situ*. Following the methodology established in the 2012–14 surveys, all artefacts and locations of geological interest visited were given a unique Waypoint (WP) number with GPS coordinates. Waypoints were grouped by proximity into Localities (e.g. L0100). As in previous years, all artefacts collected by the survey were bagged in a re-sealable polythene bag and labelled by date of collection, Locality number, GPS co-ordinates, Waypoint number, a brief description of the artefacts and the initials of the collector. Following collection in the field, all artefacts were cleaned, photographs were taken of their upper and lower surfaces, and the artefacts described in terms of their form and technology.

In total, 29 localities (listed in Appendix 2) were visited during the three weeks of field survey, and Palaeolithic artefacts collected from the vast majority of these locations. A total of 1367 stone artefacts, of ESA, MSA, and LSA affinities was observed, collected, and described (Figure 1: Appendix 3). At the end of the season, the finds were archived in the Sabiya Museum stores, Jizan Province. Artefacts recovered from Asir region will be retained in Sabiya until the end of DISPERSE activities in the region (currently March 2016), after which they will be transferred to the SCTA offices in Abha in accordance with SCTA regulations.

In regards to the artefacts collected, those classified as ESA usually take the form of flake or core tools (such as handaxes, handaxe roughouts and cleavers) as well as simple and discoidal flake cores made using a hard hammer technique. MSA artefacts include prepared cores and their manufacturing debris (such as radial or convergent Levallois, Nubian Levallois and some flake-blade forms) as well as the flakes from

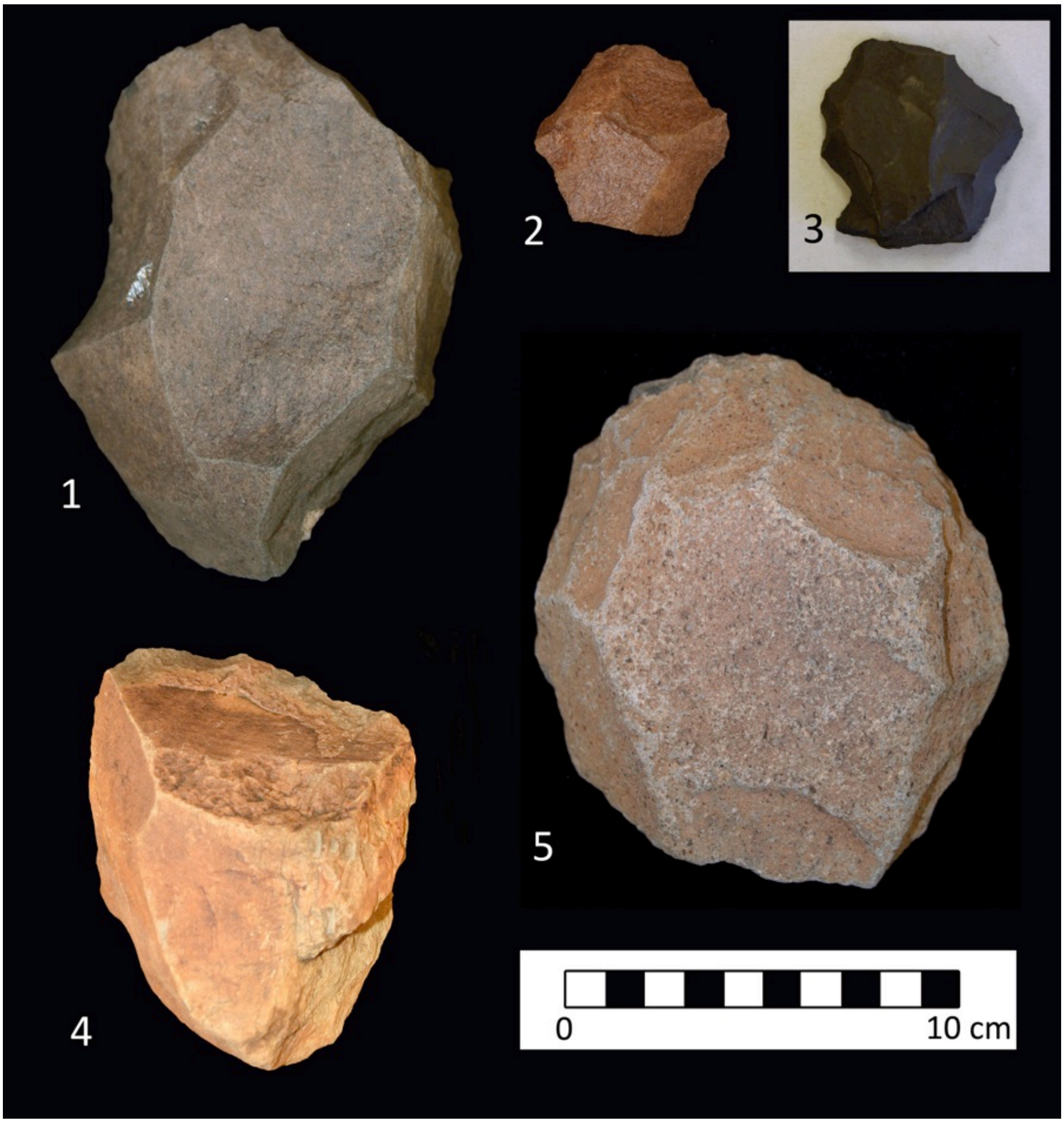

Figure 1: Example lithic artefacts collected during January 2015 fieldwork: 1. Potential prepared core (MSA); 2. Small exhausted discoidal core (potentially MSA); 3. Flake (potential core rejuvenation - tentatively described as Neolithic); 4. Cleaver (ESA); 5. Large flake/scraper (ESA). Photos: F. Foulds/A. Shuttleworth.

such cores that may be radial, convergent or blade-like in form. MSA artefacts sometimes show evidence of use of a soft hammer in their production. In addition there is also evidence that MSA artefacts were retouched into scraper and notch typologies (Dibble 1984, 1995). LSA or later artefacts were sparse, typically made from quartz. Quartz flake industries tend to be represented by flakes and bladelets as well as some cores and rare retouched artefacts (i.e. scrapers). Such artefacts are difficult to identify and characterise, since very few artefacts have been located and reported previously.

The analysis of the recovered artefacts continues to permit a very broad understanding of the age of the pieces given that there is no detailed dating of the deposits in which such materials were found, or under which they lay. In East Africa the very oldest stone tools now date back to 2.4Mya in Ethiopia, with the first hand axes dating from 1.8Mya. Middle Stone Age, prepared cores and flakes have usually been accepted as dating between 300Kya and approximately 60–50Kya (Barham and Mitchell 2008).

Recently, new dates from southern Africa suggest that the Middle Stone Age might start from 500Mya (e.g. Wilkins & Chazan 2012). It is reasonable to assume that the first modern humans crossing into the Arabian Peninsula would have brought and made tools following an MSA technology.

In addition to the artefacts, further samples for Optically Stimulated Luminescence (OSL) dating were collected from L0034, Dhahaban Quarry (Section 2.5). Along with a sample of tufa from L0106, Wadi Dabsa, these were shipped to the UK for specialist analysis by the Scottish Universities Environmental Research Centre (Appendix 4).

2. January 2015 Survey Results

2.1 Overview

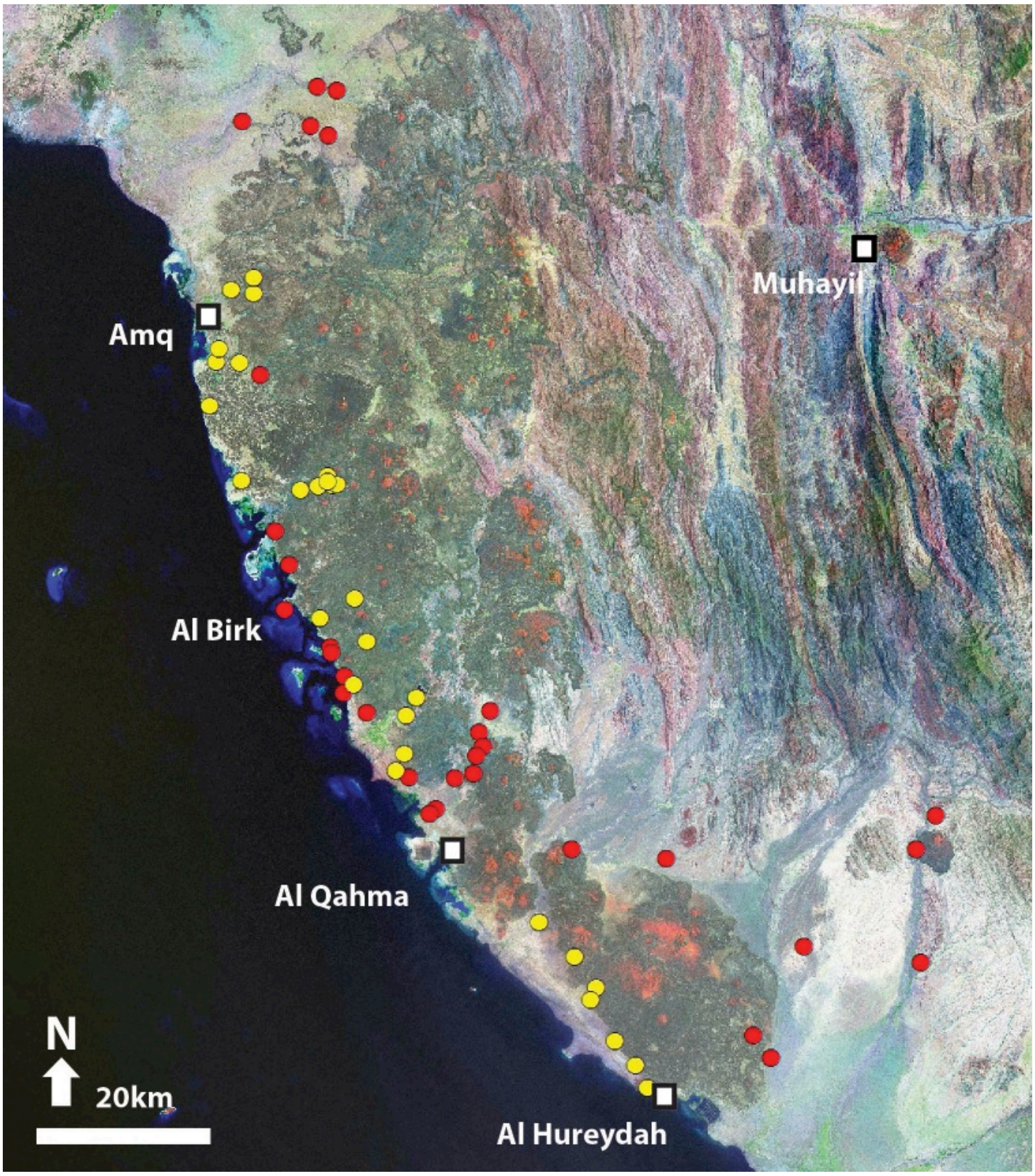

Figure 2: Map of locations showing localities visited in the Harrat Al Birk, Asir region during January 2015 fieldwork (yellow circles) and localities visited by DISPERSE Project 2012–14 (red circles). Satellite Imagery © USGS Landsat ETM+ 2000 Geocover Mosaics.

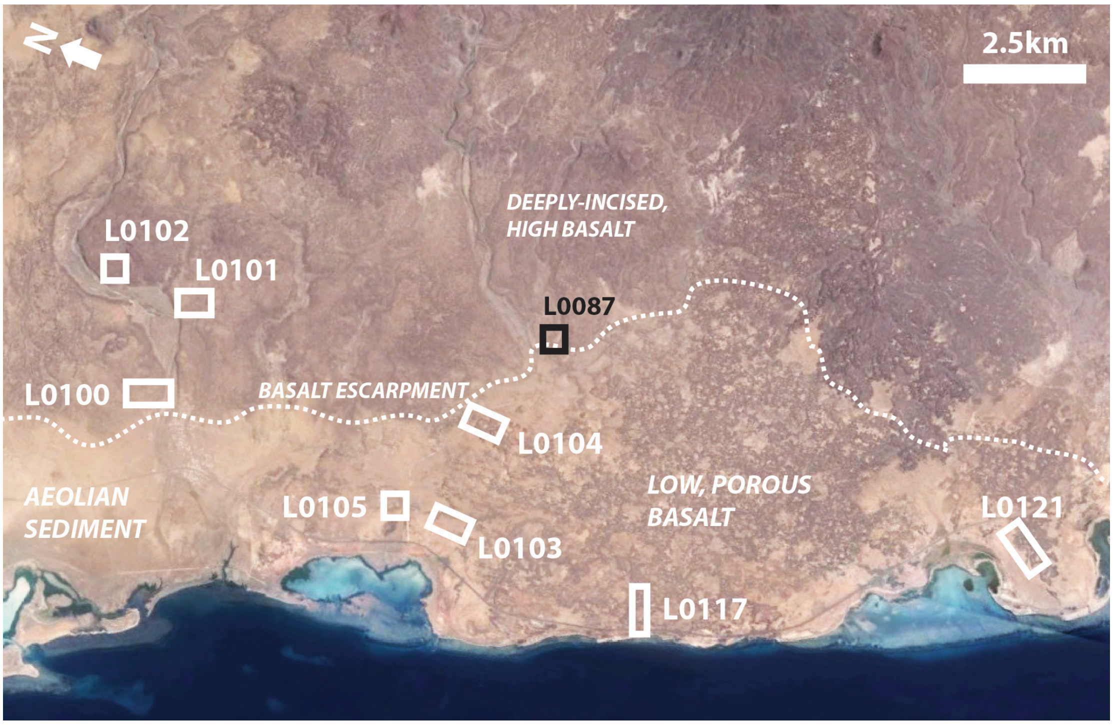

Figure 3: Geomorphological features and localities along the northern Harrat Al Birk coast. Satellite Imagery © CNES/Astrium, imagery date 19/1/2014.

2.2 Wadi Amq and the Northern Harrat Al Birk Coastline

In the northern part of the Harrat Al Birk coastline, to the area south of the town of Amq, a geomorphological distinction can be drawn between an area of relatively low-lying undulating jebels of porous basalt (up to ~50m asl and 13km by 6km at its greatest extent), and a distinct escarpment of basal jebels 3 to 6 km inland and rising to 120m from the present day coastline (Figure 3). This escarpment and the geomorphological distinction between the two areas of landscape may result from a past marine transgression, prior to that of MIS5, with the escarpment marking a coastline, although this hypothesis has not been tested. Locations both near to the present day coastline, as well as further inland along wadis that dissect the escarpment, were visited in order to assess any changes in artefact distribution or cultural affinity associated with this proposed landscape evolution.

Wadi Amq

Wadi Amq enters the Red Sea near the town of Amq, which is situated on the coastal plain just north of the proposed embayment. The wadi deeply incises the lava flows, creating steep cliffs and high terraces above its course through the lava flows, and exposing sediments underneath the lava. The wadi was visited in May/June 2012 (Devès *et al.* 2012, 2013), when tufa deposits (formed during a period of more persistent water flow in the wadi) were observed in the present wadi floor, an observation further underlined during the 2015 fieldwork.

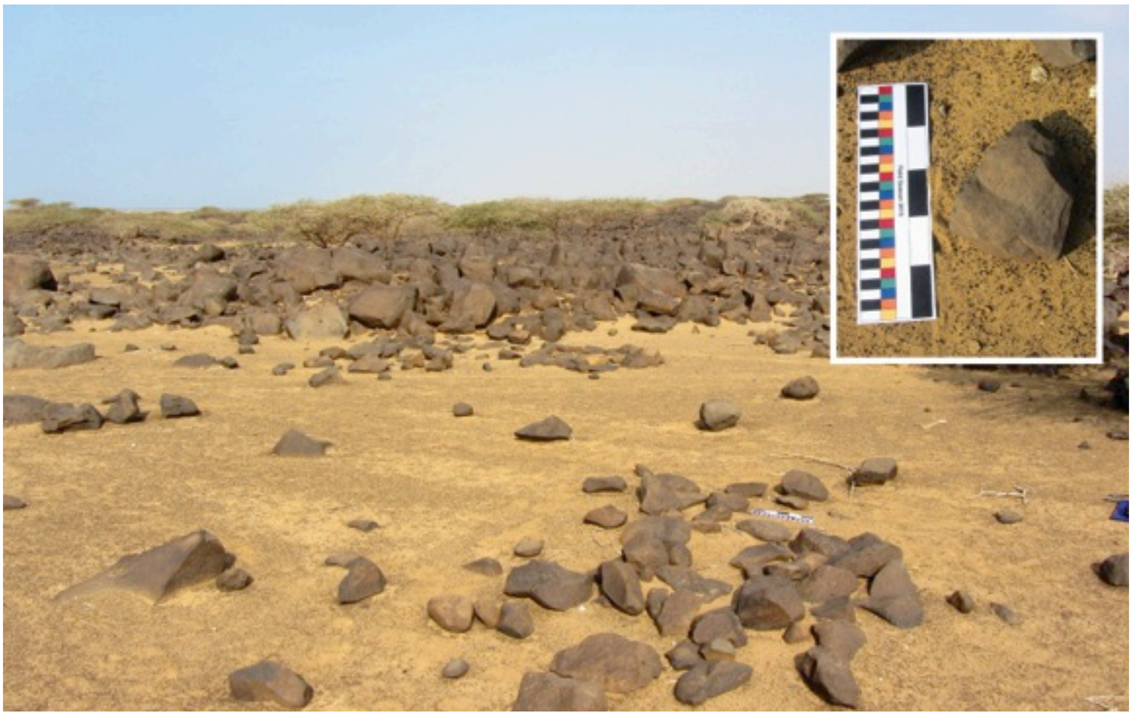

Figure 4: Low cairn of basalt cobbles and boulders at L0100. Cobble directly beyond scale is an ESA basalt handaxe on a flake (inset - scale is 30cm). Photos: R. Inglis.

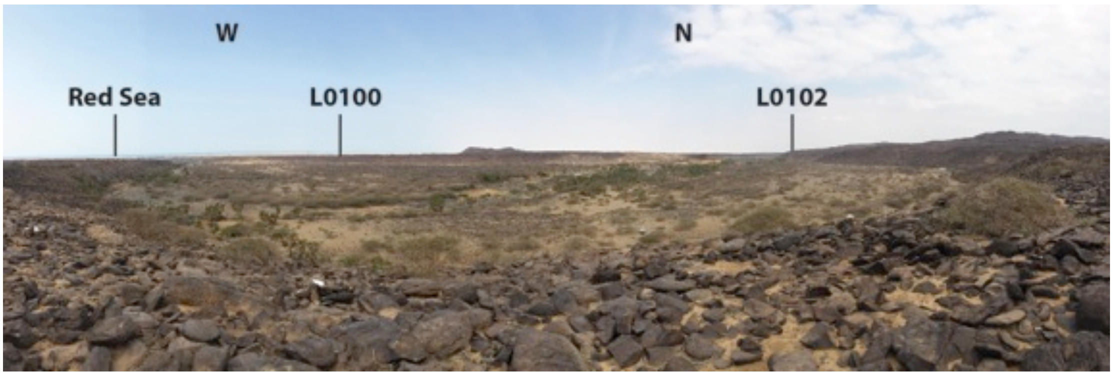

Figure 5: View from L0101 on basalt terrace overlooking Wadi Amq, showing meander of Wadi Amq and the relative locations of L0100 and L0102 and the present-day coastline. Photo: A. Shuttleworth.

Terraces above the wadi were visited at three locations:

- L0100 – A 500m transect walked S–N from the base of Wadi Amq, up onto the basalt terrace that runs parallel to the coastline, ~4km from the present coastline, where the basalt rises up from the coastal plain. On the basalt, sediment has collected in depressions, one of which contained three small, flat cairns. Eight basalt flakes and cores and one handaxe were observed along this surface, suggesting ESA activity, with some pieces showing MSA affinities. The handaxes was incorporated into one of these cairns (Figure 4).
- L0101 – 6km inland from the coast, a 500m transect was walked on the southern terrace above Wadi Amq (Figure 5), NW–SE away from the wadi to the next wadi to the South, and returning for another 500m. In the wadi floor there are extensive tufa/wadi calcrete deposits. Fourteen artefacts on basalt and chalcedony were collected, with MSA and LSA affinities.
- L0102 – 6.5km inland from the coast, a 250m transect was walked on the southern terrace above a large meander in Wadi Amq, but yielded no artefacts.

Figure 6: Beach and coral terraces overlying basalt flow cut by wadi at L0105. Inset: detail of in situ coral terrace, located at white square on main photo. Photo: R. Inglis.

Beach Deposits on the Northern Harrat Al Birk Coast

Three localities associated with beach and coral terrace deposits were visited along the northwestern coast of the Harrat Al Birk, and surveyed for artefacts. From North to South these were:

- L0103 – an 800m transect was walked along a terrace of beach rock surveyed in December 2014 (Rasul *et al.* 2015), and the area of low jebels to the East behind the beach rock. Rare pottery sherds were observed on the surface of the beachrock, but not collected. Only one lithic artefact was observed and collected, a basalt ESA/MSA core fragment. At the foot of the low, undulating, basalt jebels, twenty predominantly quartz and basalt artefacts were collected, including ESA and MSA cores and flakes, as well as potential LSA or later quartz small flakes and cores.
- L0105 – the exposure at this locality probably represents the northwards extension of the shoreline that is preserved at L0103, but is 1km to the North. Here, a wadi deeply incises basalt, which underlies extensive fossil beach and coral reef deposits. A small square structure on the terrace is built out of basalt and coral/beachrock blocks (Figure 6). Seventeen artefacts were recovered from this locality, primarily on basalt but also with some quartz artefacts. The basalt artefacts had mainly ESA and MSA affinities, save for two LSA or later bladelets on very fine-grained basalt. Also present were LSA or later quartz flakes, one with retouch, and a chert MSA or later flake.
- L0117 – An area of low-lying basalt jebels close to the present day shoreline was visited, and, although no intact beach or coral deposits were observed, at the seaward end of the transect, close to the coast road, pebble-sized fragments of coral and beachrock were visible on the sandy surface. A 1km transect was walked inland over the undulating porous basalt, but only two artefacts, one fine-grained basalt flake (potentially LSA or later) and a coarser-grained flake (MSA or later), were observed and collected from the surface of aeolian sand collected in topographic lows between the jebels.

Figure 7: Aerial view of L0121. Satellite Imagery © CNES/Astrium, imagery date 19/1/2014

Figure 8: Differentially weathered, fractured soft-hammer basalt flake. Photo: F. Foulds/A. Shuttleworth.

- L0121 – 3km North of Wadi Dabsa's confluence with the sea, a low basalt peninsula extends into the sea, with extensive beach and coral terrace deposits and *sabkha* on its southern and northern sides (Figure 7). From a 1km transect across the eroded reef, beach rock and onto the basalt, 42 artefacts were collected. All of these artefacts were made on basalt, save for a single undiagnostic quartz flake, these cores and flakes had ESA and MSA or later affinities. Two pieces of basalt, found ~1m apart on the sandy surface at the juncture between the beachrock and basalt, can be refitted into one soft-hammer flake, with differentially weathered faces, indicating a fracturing of the flake in antiquity (Figure 8).

In addition to the areas with fossil beach and coral deposits close to the present-day coastline, a basalt ridge mid-way between the coastline and escarpment was visited. 3km from the coast, at L0104, a 400m transect was walked along the top of a flat-topped basalt ridge, before returning along its western face. Small cairns were observed on top of the basalt ridge, and 18 artefacts were collected from the basalt surface and on its slopes including ESA, MSA, and LSA artefacts on basalt and quartz.

2.3 Wadi Dabsa and Tributaries

Wadi Dabsa, and then a major tributary of the wadi, was followed inland from the coastline along a track for approximately 6km to an area identified from geological maps as a basin in the basalt containing Quaternary deposits (Prinz 1984). On arrival at the location, these deposits were revealed to be extensive tufa deposits, covering ~2km^2, thus marking a past period in which there was a significantly greater amount of water moving through the wadi system, on a near-perennial or perennial scale, potentially forming a series of low waterfalls and pools.

The area of tufa was investigated by a number of transects (Figure 9) and a 40x50m area pickup at L0106. The transects walked were assigned different locality numbers, but should be considered as part of an entire local landscape of artefact deposition.

- L0106 – A transect was walked for 500m from the southern edge of the tufa exposure in the present-day wadi course into the tufa exposure (Figure 10). 51 basalt ESA/MSA artefacts were observed on the surface of the tufa. The transect was ended where the scatter of artefacts on the surface of the tufa became too dense for recording by GPS. Here, a grid was laid out for collection with 10x10m squares. These squares were divided into quadrants, and all artefacts from within the 5x5m quadrant were collected and bagged together (Figure 11). In total, 913 basalt artefacts, ESA/MSA in character, were collected from the 40x50m area, including potential handaxes, cores, scrapers and flakes. These artefacts form part of a scatter of material across c.100x100m of the tufa surface, and represent an unprecedented concentration of activity which, in terms of artefact number, surpasses any of the localities previously recorded by DISPERSE.
- L0107 – A 250m transect from the northwestern edge of the tufa to the top of a basalt jebel overlooking the basin (Figure 12) and wadi yielded 20 basalt artefacts with predominantly ESA affinities, including cores, flakes, a large handaxe roughout (Figure 13) and a large cutting tool.
- L0127 – A 600m transect extending South–North from L01027 across the tufa to the basalt at the southern edge of the exposure yielded five basalt artefacts, four flakes and one core, with ESA/MSA affinities.

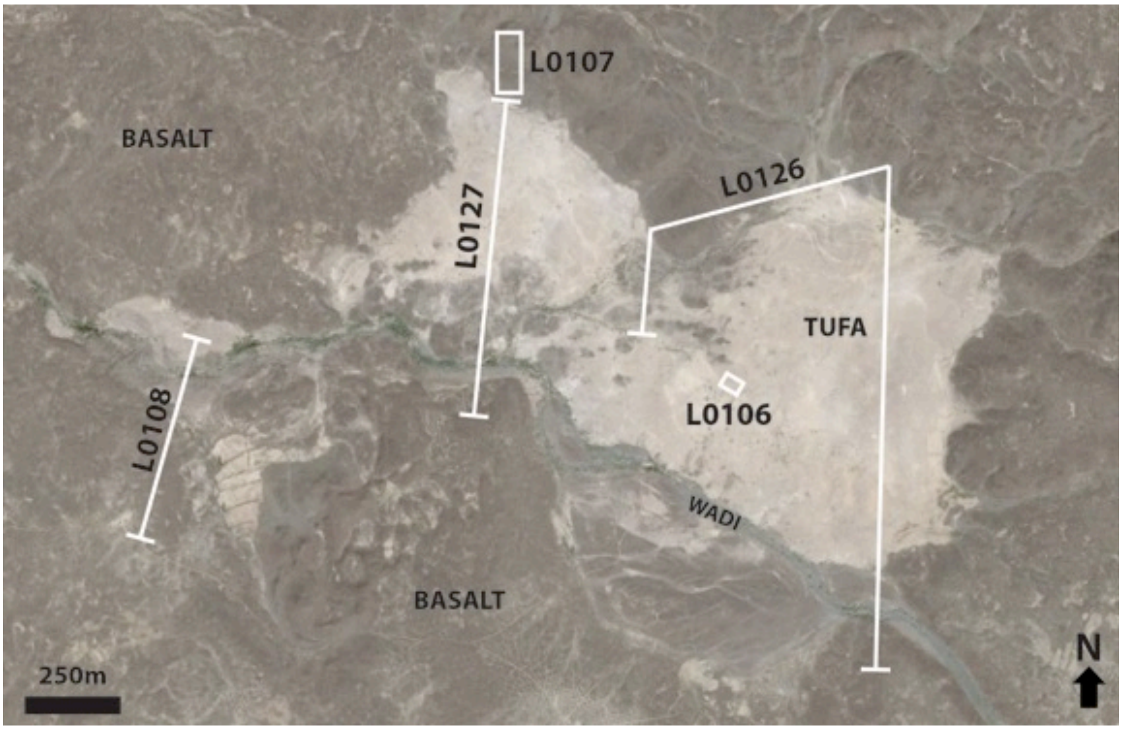

Figure 9: Overview of Wadi Dabsa tributary tufa exposure. White lines and boxes indicate areas surveyed and corresponding locality numbers. L0106 is location of 40x50m pickup. Satellite Imagery © CNES/Astrium, imagery date 19/1/2014.

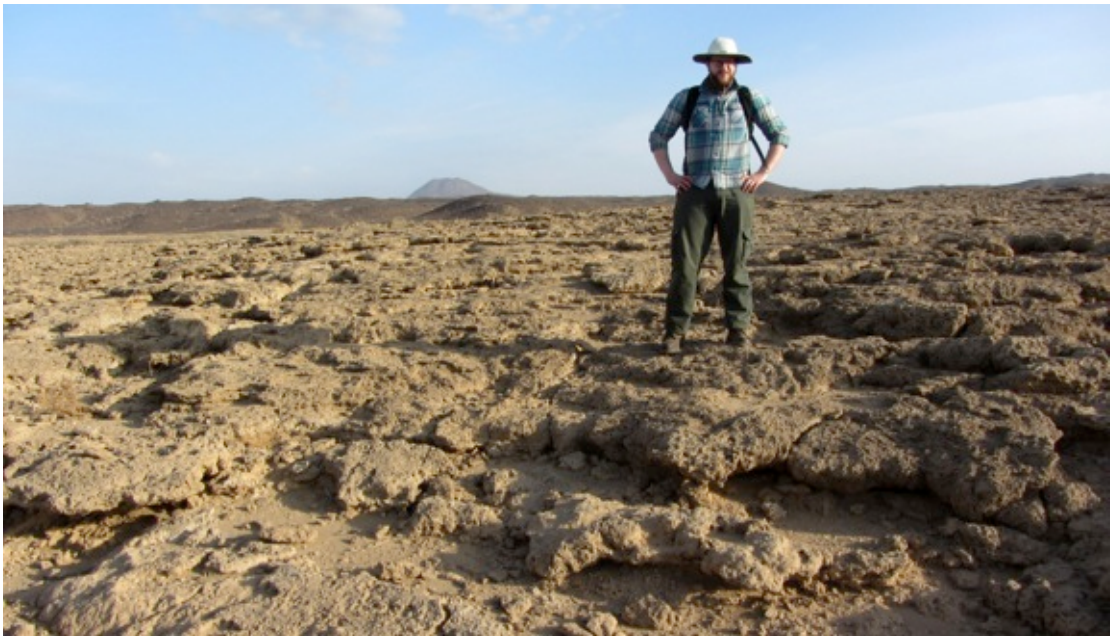

Figure 10: Gently-sloping surface of tufa exposure at L0106. Photo: R. Inglis

Figure 11: View from top of basalt jebel at northern extent of L0107 looking S over tufa exposure. Photo: R. Inglis.

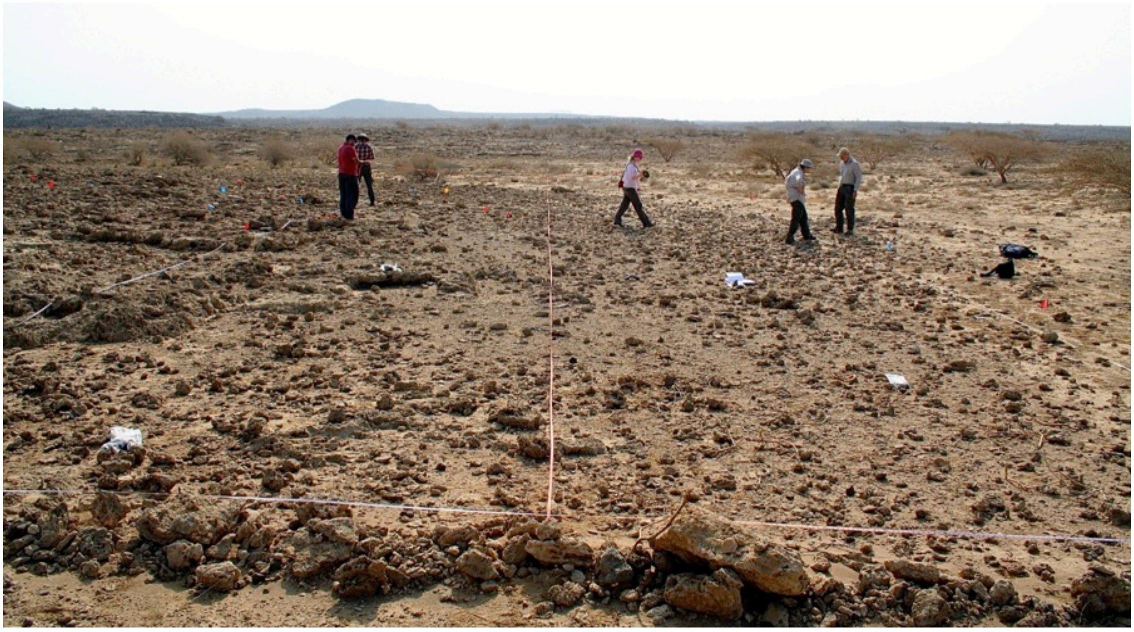

Figure 12: 40x50m pickup in progress at L0106. Photo: A. Shuttleworth.

- L0126 – This locality number consists of three transects starting on the edge of the basalt at the southern extent of the tufa, and travelling 1km north to the northern edge of the tufa in the eastern portion of the tufa exposure. From here, a transect was walked along the interface between the tufa and underlying basalt for 500m, before turning south and once more crossing the tufa for 250m to an area close to L0106. A total of 32 lithics was collected during these transects, predominantly basalt ESA and MSA flakes and cores, as well as a few LSA or later quartz bladelets from the basalt at the southern edge of the exposure of tufa, overlooking the steeply-incised present-day wadi.

Figure 13: Large basalt ESA handaxe roughout from L0107. Photo: F. Foulds/ A. Shuttleworth.

The presence of large amounts of tufa, and the extraordinary number of artefacts from the localities around the tufa basin holds major potential for elucidating environmental proxies and tool manufacture. The surrounding basalt raw material is characterised by an apparent dichotomy between finer grained materials on the northern edge of the tufa area and more porous material on the southern edge. Distribution of the basalt artefacts along the transects represents an increase in deposition towards the north. This may reflect a deliberate raw material acquisition strategy given that higher quality materials are found along this edge of the area surrounding the tufa deposits (reflected in the relatively high quality material used to produce the artefacts recovered), but may also be linked to the main wadi running along the southern edge of the tufa potentially removing material from the southern contact between the basalt and tufa. Patterning of material around the tufa exposure requires further systematic investigation, dating and interpretation.

The artefact scatter at L0106 appears to be an area of high intensity lithic manufacture, evidenced by the high number of cores (n=149) and flakes (n=742). Given the much lower proportion of retouched and bifacial tools (n=22) there is potential that these were manufactured and then removed from the site. This area would have acted as a significant water source in the past, therefore this location would have been an attractive setting for both hominins and their prey to seek food and fresh water. The presence of a possible manufacture site could therefore be indicative of deliberate hominin exploitation of these environments in regard to both raw material acquisition and tool production as well food resource acquisition. Given the presumed limited home range of ESA hominins there is an expectation that some form of 'home base' would be within the vicinity of this site. L0106 therefore strongly suggests early hominins in the Arabian Peninsula displayed a range of adaptive behaviours that allowed them to survive in this particular landscape.

The course of the tributary of Wadi Dabsa through the basalt fields, westward towards the sea, was explored at two locations to characterise the density of artefacts across the wider landscape away from the tufa exposure.

- L0108 – A 500m transect was walked from the track through the basalt boulder fields to an outcrop of tufa filling bordering the present-day wadi course, approximately 500m downstream of the main tufa exposure, yielded four basalt artefacts, two handaxes and two cores with ESA affinities.
- L0109 – A 100m transect a further 1.5 km west of L0108 was walked across a basalt bolder and cobble surface near the headwaters of a small tributary of Wadi Dabsa. Six basalt artefacts were collected, including cores, flakes and a worked biface indicating a mixture of MSA and ESA affinities.

The relative lack of artefacts at these areas, as well as the general low numbers of artefacts recovered from the lava flows indicate that the area of tufa outcrop was a major focus of tool manufacturing activity in the Wadi Dabsa catchment, and will be subject to future intensive investigation to fully characterise this important site.

2.4 Al Birk

The area around Al Birk has been subject to rapid development over recent years, and already the vast majority of the coastal landscape and the archaeology it contains has been destroyed. This season, fieldwork aimed to survey the last few remaining areas of basalt preserved along the present-day coastline between Al Birk and Al Qahma, as well as to expand the area of survey to areas further inland, along the wadis that drain into the sea (Figure 14).

The localities visited were:

- L0110 – 3km South of the centre of Al Birk town, a transect along the basalt terraces above a wadi close to the present-day coast road was walked inland along the northern wadi terrace for 400m before returning for 300m along the southern terrace. The transect began 200m from the present-day shoreline, where the wadi contains extensive but weathered tufa deposits in its base. On the surface, nine artefacts, on basalt as well as an unidentified greenish coarse mineral, were collected, including a large scraper and two handaxes, indicating ESA activity at the locality.
- L0111 – The wadi visited at L0110 was targeted 4km inland at L0111, an area of tufa cut by the present-day wadi and rendered accessible by extensive bulldozing marking future imminent development of the landscape. The tufa area was less extensive than at L0106/L0107, and a 1km transect across both the lava flows and tufa exposure only yielded three artefacts, a basalt flake and cleaver (ESA) as well as a potentially MSA or later soft hammer flake made on coarse-grained green material.
- L0112 – A 1km transect was walked perpendicular to Wadi Dahin 3km east of the present-day coast. The wadi is over 20km long, and deeply incises the basalt landscape forming high terraces. The transect yielded four artefacts, a basalt ESA core, two MSA flakes on a coarse green material, and a potentially LSA quartz flake.

Figure 14: Overview of localities visited in Al Birk area. Localities in white surveyed during 2015, localities in black were visited in 2013–2014. © CNES/Astrium, imagery date 19/1/2014.

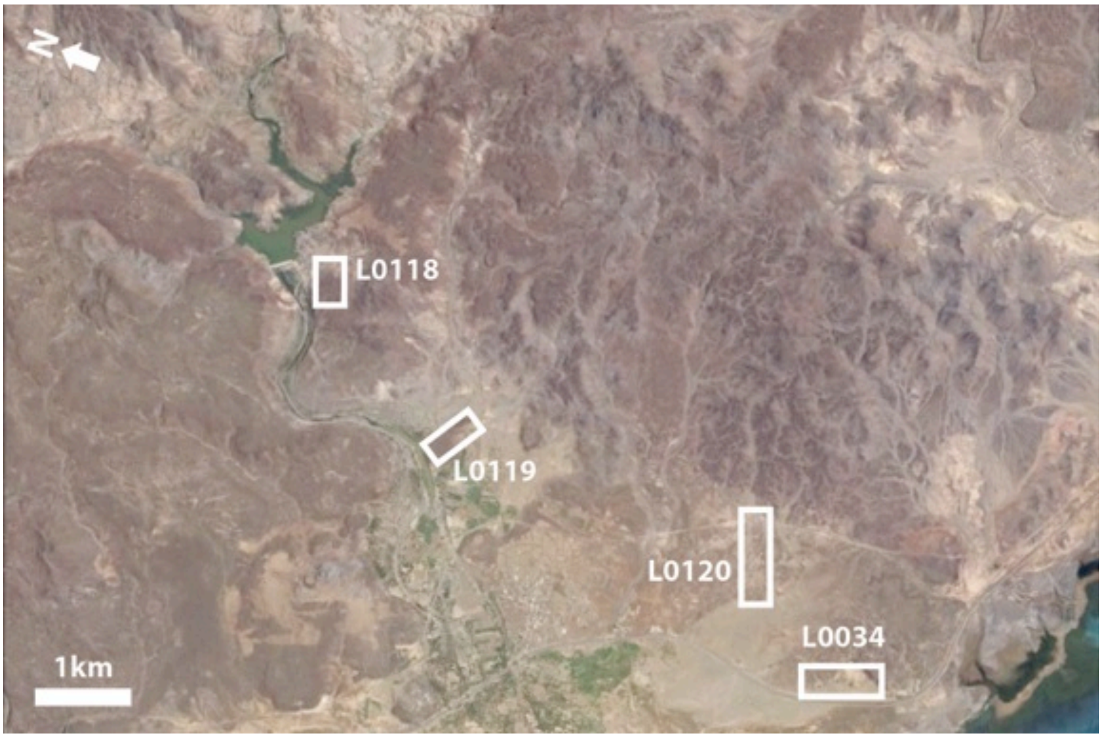

Figure 15: Overview of localities visited along Wadi Dhahaban. © CNES/Astrium, imagery date 19/1/2014.

Figure 16: View from L0119 over Wadi Dhahaban, looking SW towards coastline. Photo: R. Inglis.

- L0122 – The edges of a triangular terrace of basalt (700m total) at the confluence of Wadi Dahin, a smaller wadi, and the present-day coastline, 9km SE of Al Birk, were surveyed. L0122 is 1km NE of the ESA/MSA locality of L0038 (Inglis *et al.* 2013), equivalent to the CASP site 216-208 (Zarins *et al.* 1981), which has been bulldozed for the construction of a coastguard station. L0122 yielded nine artefacts, including ESA basalt flakes and LSA or later quartz flakes.

2.5 Wadi Dhahaban

The massive number of finds recovered from L0034, also referred to as Dhahaban Quarry and previously investigated in 2013 and 2014, had highlighted the neighbouring wadi, Wadi Dhahaban, as a priority for exploration to place L0034 in local context and to identify any similarly large concentrations of artefacts. In 2015, three locations along the wadi course were visited (Figure 15). From the furthest inland, these are:

- L0118 – A 1km transect was walked along the southern basalt terrace surface ~60m above Wadi Dhahaban and 300m downstream from the dam lake (8km inland from the present day coastline), but yielded no artefacts.
- L0119 – A basalt jebel is isolated in the alluvial plains at the confluence between Wadi Dhahaban and a tributary, 5km from the present-day coastline. At this location, and all along the wadi below the dam there were large pools of standing water in the wadi bottom (Figure 16). A 600m transect was walked along the top of the jebel. Low circular basalt structures were observed on the basalt surface, and 12 artefacts were collected. These included LSA or later quartz microliths, a chert flake, and a fine basalt bladelet; MSA or later basalt blades; and ESA basalt flake and core.
- L0120 – A 2km transect along a low-lying, porous basalt lava flow, ~2km NW of Wadi Dhahaban and ~3km from the present coastline yielded five basalt flakes with ESA affinities, and a possible MSA discoidal core.

Figure 17: Locations surveyed along the Western edge of the Harrat Al Birk between Wadi Hamid and Al Hureydah. © CNES/Astrium, imagery date 27/2/2014.

In addition to other areas along Wadi Dhahaban, Dhahaban Quarry itself (L0034), was revisited in order to collect further samples for Optically Stimulated Luminescence dating from the marine units that overly the cobble unit from which MSA lithics were recovered (Inglis *et al.* 2013, 2014a, 2014b). Two sections were cleaned back in darkness under tarpaulins, and four sealed tubes of sediment collected, along with two more blocks of cemented sediment for analysis by researchers at the Scottish Universities Environmental Research Centre, East Kilbride, UK. In addition, multiple photos of the section where the lithics were recovered from stratified contexts were taken for 3D photogrammetry to aid interpretation and presentation of the context of the finds.

2.6 Wadi Hamid to Al Hureydah

Between Wadi Hamid and Al Hureydah, the present-day coastline comprises a coastal plain of sabkha and dunes to the west of the Harrat Al Birk edge. This plain narrows from around 3km at the southern edge of the mouth of Wadi Hamid, to less than 100m at the cinder cone of Jebel Ar Raqabah near Al Hureydah to the south – the cinder cone rises from the coastal plain at the present-day shoreline. This area of the Harrat Al Birk had not been previously explored by DISPERSE, but the CASP surveys reported ESA and MSA material from this area (Zarins *et al.* 1981), although these sites were not located in the present survey.

From North to South, the localities surveyed were (Figure 17):

- L0113 – A terrace overlooking the cultivated alluvial plain of Wadi Al Hamidah yielded 82 quartz flakes, cores and bladelets (Figure 18), as well as three chert/chalcedony flakes from around low circular basalt structures, indicating LSA activity, as well as an MSA basalt flake and a potential ESA handaxe roughout on basalt.

Figure 18: LSA quartz flakes from L0113. Photo: F. Foulds/A. Shuttleworth.

- L0114 – A transect walked inland for 1km along a porous basalt lava flow along the NW terrace of a wadi draining the slopes of Jebel Huwwah, before crossing the wadi and returning on the SE terrace. Whilst the majority of the basalt surfaces and boulders at this locality were porous, the wadi had exposed fine-grained columnar basalt that was consistent with the basalt artefacts observed. A total of 31 artefacts was recovered, a mixture of quartz flakes and a basalt blade with LSA affinities, as well as ESA and ESA/MSA basalt flakes and cores, including a discoidal core.

Figure 19: Beach and coral terrace at L0123, with (inset) detail of coral reef sediments observed 100m to the SW. Photos: R. Inglis.

- L0115 and L0116 – A wadi drains the slopes of Jebel Khurmah, reaching the coastal plain close to Wadi Bashit. The basalt in these areas was visited at two locations. L0115 is a high lava terrace, rising around 12m from the wadi floor below. Six basalt artefacts were collected from the top of the terrace, including ESA flakes, as well as a potential ESA/MSA flake and core. At L0116, 1km to the SW of L0115, a transect walked across a low-lying, porous basalt flow partially covered by aeolian sand sedimentation yielded 13 artefacts. These include LSA quartz flakes and microliths, as well as ESA and ESA/MSA basalt flakes.
- L0123 – A basalt flow below Jebel Ha'il, and close to the town of Moath bin Jebel, was surveyed by walking an 800m transect from the edge of the basalt inland over low undulating porous basalt jebels. At the southern extent of the transect, a 150m long fossil beach terrace ~8m asl is preserved (Figure 19). An ESA basalt core and flake were recovered from the surface of the beach terrace, and 4 large, undiagnostic basalt cores with one or two flake removals were observed in the field but not collected.
- L0124 – The same basalt flow as L0123 was visited 3km to the SE, where a 400m transect and return across low-lying porous basalt jebels yielded no artefacts, but identified small circular structures on the basalt, 6–7m cross.
- L0125 – The SE slopes of Jebel ar Raqabah, at the present-day shoreline, were explored by a 1km transect across the footslopes and a basalt terrace, yielded a quartz LSA core as well as two cores, potentially ESA or ESA/MSA and an ESA/MSA biface.

Investigations along the southernmost extent of the Harrat Al Birk have therefore shown that there is a relatively low density of material along the basalt flows, in contrast to some of the concentrations of artefacts found further north along the Harrat Al Birk coastline.

3. Summary and Conclusions

The results of the 2015 survey have vastly expanded our understanding of the Palaeolithic record of activity in the Harrat Al Birk, as well as indicating the ongoing potential of the area to provide data in the form of stone tools on the Palaeolithic occupation of the area.

- A total of 1367 new artefacts, primarily from the ESA and MSA but also from the LSA and later periods has been collected and catalogued, increasing the number of artefacts from this region collected by the DISPERSE project by over 200%.
- The 20 new localities surveyed have expanded the understanding of the spatial variation of this material across the landscape, highlighting the uniqueness of sites such as Dhahaban Quarry (L0034) and the Wadi Dabsa tufa exposure (L0106) which have yielded large numbers of artefacts, and which should be protected from development or destruction.
- The pace and scale of development along the coastline has highlighted the need to carry out detailed archaeological rescue work before the record is permanently destroyed.

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