

Pastoralists, travellers, and miners in the Atbai Desert (Sudan): surveys and excavations at Khor Rafit

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ABSTRACT

Owing to the remote terrain and difficulty of logistics, archaeological investigations of the Atbai Desert of Eastern Sudan are in their infancy. As part of a larger project aimed at surveying and documenting sites at threat from modern gold mining, in 2019 the Atbai Survey Project investigated the site of Khor Rafit, a multi-period site with importance both to ancient nomadic groups and foreign urban states (Rome, the Arab-Islamic Caliphate, Nubia) that were involved in gold extraction there. Surveys and excavations at the site revealed extensive gold-mining operations and a large cemetery exhibiting the burials of local pastoralist nomads, as well as Neolithic burials and rock-art sites. The local archaeology bears witness to the as yet unexplored interactions between nomads and foreigners in the gold mines of the Atbai Desert. Moreover, Khor Rafit was a vital watering station and strategic stopping-point on the long-distance trade route known as the Korosko Road, an important desert bypath shortening the route between Lower and Upper Nubia. With ongoing destruction at such sites from unregulated gold mining, archaeological operations at Khor Rafit and other sites in the Atbai should be conducted with urgency.

RÉSUMÉ

En raison du terrain isolé et des difficultés logistiques, les recherches archéologiques dans le désert de l'Atbai à l'est du Soudan en sont encore à leurs tout débuts. Dans le cadre d'un projet plus vaste visant à recenser et documenter les sites menacés par l'exploitation minière moderne de l'or, le projet de prospection de l'Atbai a étudié en 2019 le site de Khor Rafit. Il s'agit d'un site multi-période de grande importance pour les anciens groupes nomades ainsi que pour les états urbains étrangers (Rome, le Califat arabo-islamique, la Nubie) impliqués dans l'extraction de l'or. Les prospections et les fouilles menées sur le site ont révélé d'importantes opérations minières aurifères, un grand cimetière contenant les sépultures de

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pasteurs nomades locaux, des tombes néolithiques et des sites d'art rupestre. L'archéologie locale témoigne d'interactions encore inexplorées entre nomades et étrangers dans les mines d'or du désert de l'Atbai. De plus, Khor Rafit constituait un point d'eau vital et une halte stratégique sur la route commerciale à longue distance connue sous le nom de route de Korosko, une voie désertique importante qui raccourcissait le trajet entre la Basse et la Haute Nubie. Compte tenu de la destruction en cours de tels sites par l'exploitation minière aurifère non réglementée, les opérations archéologiques à Khor Rafit et dans d'autres sites de l'Atbai devraient être menées de toute urgence.

Introduction

The Atbai Desert of Sudan, the region between the Nile and the Red Sea, is a vast space characterised by nomadic habitation, gold mines and trade routes that connect the Nile Valley to ports on the Red Sea. Historical texts from every epoch of Egyptian and Nubian history illustrate how this vast desert was the home of pastoralist groups, variably termed Medjay, Blemmyes and Beja in ancient Egyptian, Greco-Roman and Arabic documents respectively (Barnard 2012; Cooper 2020, 2022). Despite the region's importance as the origin of much of the Pharaonic, Greco-Roman and Arab world's gold supply, as well as the seat of indigenous nomadic polities, very little systematic archaeological research has taken place in the desert, although this is slowly changing with more survey work (Castiglioni *et al.* 1998; Reinold and Ahmed 2003–2008; Davies and Welsby 2020; Krzywinski *et al.* 2020; Krol *et al.* 2022). Ancient gold mines are encountered in almost every part of the Sudanese Eastern Desert (Klemm and Klemm 2013), but most sites are poorly described and dated, giving them limited utility in broader discussions of the gold mining and the history of the desert. One of the key issues for researchers addressing the regional archaeology and the gold industry is one of social dynamics and the questions of how indigenous nomads and urban foreigners interacted in this gold industry: was it a relationship of co-operation, conflict, or, as seems more likely, a highly varied localised pattern of constant negotiations? Sites such as Khor Rafit are of relevance not only to the indigenous cultures of the Eastern Desert, but also to our understanding of the nature of the vast gold industry, which affected all urban regimes across Northeast Africa and brought foreign interlopers into the nomads' desert.

In 2019, the Atbai Survey Project set out to investigate and survey a complex site on the southern escarpment of Jebel Rafit, a 20-km-wide granite plateau rising 200 metres above the desert plain. This massif stands out as a salient point in the deserts east of the Nubian Nile, being a midpoint on the bypath routes in the large S-bend of the Nile and in the midst of a well-known north-south trade route called the 'Korosko Road' (Figure 1). The Khor Rafit, or 'El Medina' on official maps, is a ravine on the southern side of the jebel and one of the few locales with a generally reliable water source in what is an otherwise barren and completely dry desert.¹

The site was chosen for intensive work on account of its unique archaeological and environmental characteristics, features first identified through satellite remote sensing in 2018, which then proceeded to formal fieldwork in 2019. Uniquely for the archaeology of the Atbai, the site of Khor Rafit shows the coincidence of mining activity with a large

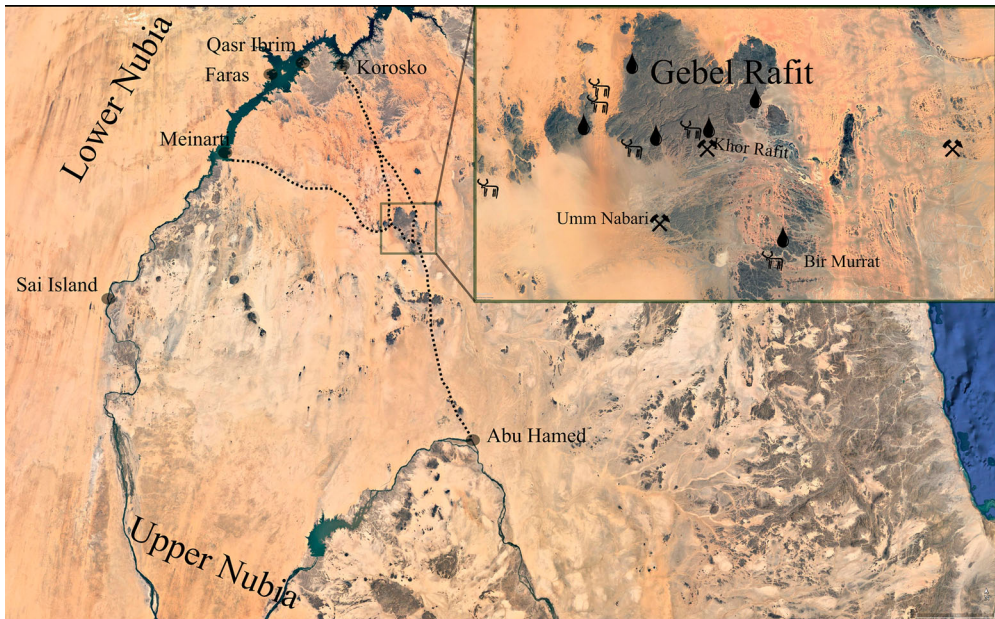


Figure 1. The location of Khor Rafit in the Atbai Desert of Sudan. © Google Earth.

cemetery ascribable to the local nomadic population. This correlation of resource exploitation and indigenous burials raises important questions and prospects regarding the role that nomads played in the gold industry and their relationship with an industry that is generally considered being controlled by foreign peoples on the Nile.

Khor Rafit is a complex multi-period site spread over a large area of braided wadis, gravel terraces and hillsides (Figure 2). The most visually prominent feature is a large cemetery of dry-stone circular tumuli (AS19.3). North of the cemetery, the main channel of Khor Rafit fans out in a series of braided channels, with evidence of multiple domestic occupations and isolated burials of various ages (AS19.4) on the raised terraces above the channels. On the north side of the wadi is a largely disturbed gold refining area characterised by millstones (AS19.5). Directly adjacent to this refining area is a small ridge of rock art (AS19.6). Further west of this area, the main wadi narrows into a ravine forming a small natural rain-fed reservoir or waterhole (AS19.7). North of the main wadi is a large mining excavation on the hillside, littered with quartz chippings, the focus of gold-working (AS19.12). North of these gold-workings, there is evidence of more settlement activity (AS19.9) as well as a large boulder containing a densely packed rock art tableau (AS19.11). South of the main wadi is yet another settlement site, positioned around a wadi depression possibly bearing water after rain (AS19.8), which was only cursorily visited by our team in our short season. A further settlement was not accessed by the expedition but is easily rendered on satellite imagery on the cliff-top 200 metres above the wadi (AS19.13). Based on our initial investigations, the majority of these occupations, especially the gold-working areas, date to Late Antiquity and the ensuing medieval period, although there is certainly evidence for earlier and later use of the site from the Palaeolithic until the present, especially in the form of a mid-Holocene ‘Neolithic’ phase associated with cattle pastoralists.

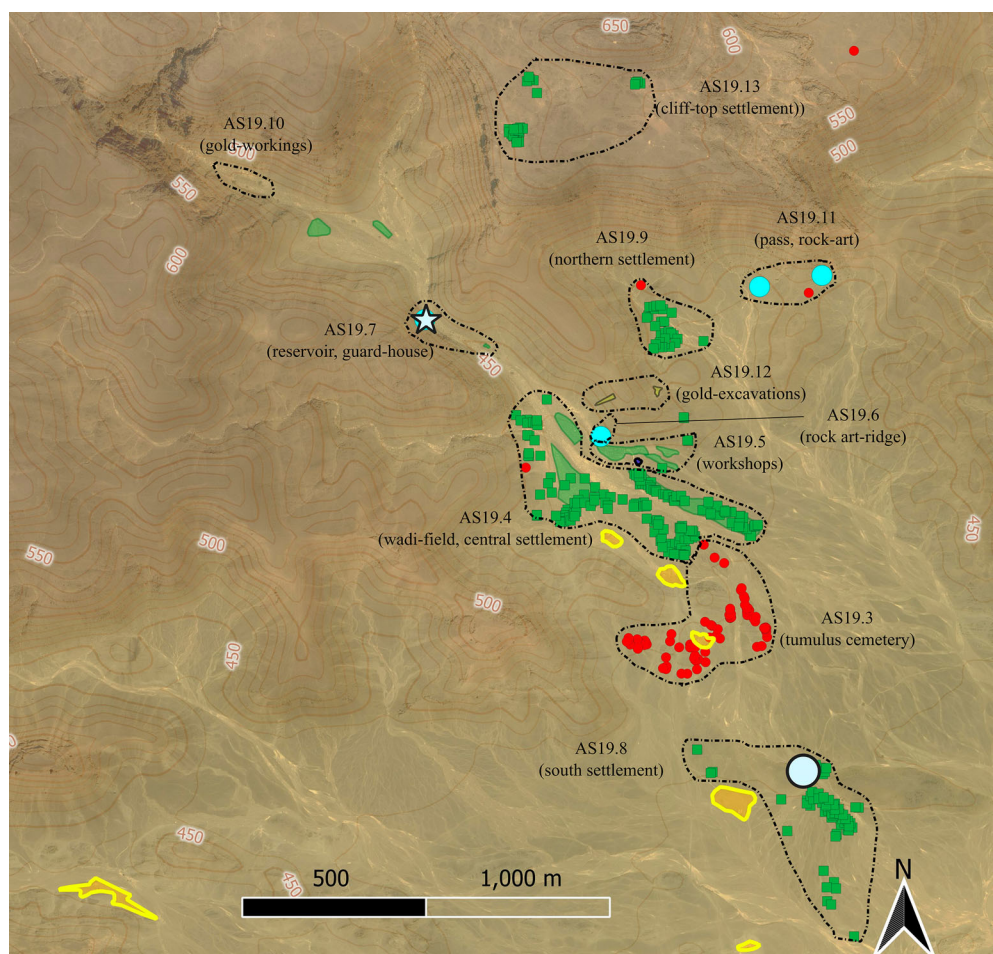


Figure 2. Map of the sites and structures at Khor Rafit. Green dots and polygons: domestic structures; red dots: tumuli; light blue dots: rock art loci; yellow areas: modern destruction and mining; white star: water source; white circle: probable water source. The map was assembled in QGIS using Google Earth © and Open Topography DEM (NASA Shuttle Radar Topography Mission 2013).

Previous research

As far as is known to the authors, no previous archaeological work has been conducted at the site except for a cursory investigation by Jean Vercoutter (1959: pl. 28, 34) that produced photographs of the cemetery (AS19.3) and the gold refining area (AS19.5). He hypothesised that the tumulus cemetery belonged to the C-Group archaeological horizon of Lower Nubia (c. 2500–1500 BC), an ultimately incorrect assessment based on the broadly reminiscent circular appearance of these burial structures. Ancient iron (limonite) workings on the slopes of Jebel Rafit are mentioned in Dunn (1911: 62), although his unclear description makes it uncertain if he is describing this site or another part of Jebel Rafit.

Some earlier travellers reported on the site, generally stopping here as part of their journey along the Korosko Road between Abu Hamed and Korosko. The traveller

Joseph Russegger (1841: 430) remarked that the ‘Medina’ reservoir was dry when he visited and that it had not rained for four years. Such was the importance of this water source that in the 1820s the American diplomat George English even described a village at Khor Rafit supplying travellers along the Korosko Road (English 1822: 219), although it is unclear to what part of the site his village corresponds. In all likelihood, it was in fact some kind of nomadic encampment of the Bishareen Beja who are known to roam the pastures of the Wadi Gabgaba basin to the east. The well-known geologist Linant de Bellefonds visited the site in 1831 and described the local tumuli, which he linked to Arabs of the Tulunid dynasty (AD 868–905) (Bellefonds 1868: 146–148). He also described a gold-working village full of millstones for crushing quartz. The report of the Prussian scientific expedition under Richard Lepsius recounts that they watered their caravan here when crossing the Nubian desert (Lepsius 1853: 138–142). Intelligence reports from the British colonial service noted that the ‘Medina’ reservoir was a reliable source of water for its military caravans, as well as for local nomads, especially when the wells at nearby Murrat were exhausted or too brackish for human consumption (Lyons 1895: 84). These nineteenth-century accounts demonstrate that the site was an important and notable water source in an exceptionally barren desert and track. The question of the utilisation of this route and site in earlier epochs, especially before the arrival of the camel, has not been equivocally demonstrated (Welsby 2020). It seems plausible that there was an earlier and ancient desert bypath functioning in a similar manner to the Korosko Road, but no historical text or local archaeological material unequivocally demonstrates the use of a long-distance route between Abu Hamed and Korosko.

While this region's connection to an early desert bypath is questionable, it is certain that the area was accessed for its gold wealth at an early date. Surveys conducted on the nearby western escarpment of Jebel Rafit reveal that the region was visited by Pharaonic Egyptian expeditions on their way to gold mines, mainly during the New Kingdom (c. 1550–1070 BC) (Castiglioni *et al.* 1998; Davies 2020). There are also nearby ancient workings in the surrounding hills at Mosei and Umm Nabari to the south and east (Bellefonds 1868; Klemm and Klemm 2013). The rock art record in the nearby desert points to forays of Nile Valley dwellers as far back as the fourth millennium BC, in times contemporary with the A-Group and Naqada Cultures along the Nile (Cooper and Vanhulle 2019, 2023). This work demonstrates the presence of both local populations and Nile dwellers in this region since the prehistoric period.

While no contemporary pastoralist herders were seen by the 2019 expedition, the observation of fresh dung near the water source suggests that camel and goat herders still frequent the site for watering and pasture; they are probably Bishareen Beja coming from their more fertile pastures further to the east in the Wadi Gabgaba. The reservoir was full of water in 2019.

Survey results

The gammam (AS19.7)

The continued occupation of the site, perhaps also even the viability of gold mining itself, seems to stem from the local availability of water in the wadi bed (Figure 3, top). This water source arises from the Khor Rafit ravine, and ultimately from rainfall on the



Figure 3. Khor Rafit: the *gammam* or natural reservoir (above) and the multi-room structure on the shelf overlooking the wadi (below).

Jebel Rafit massif. Judging from the local vegetation around the waterhole in the ravine (AS19.7), in the form of a palm (*Medemia argun*) and reeds, this particular rain-fed water source seems quite dependable.¹ This is not an artificial well but a natural depression or

reservoir in the side of a wadi where rainwater is trapped between the surface and the impermeable bedrock, a feature usually called a *gammam* in Sudanese Arabic, *qalt* in Egyptian Arabic or *magwal* in Beja. This is one of the few sources of surface water in the region; the water at nearby Bir Murrat is brackish and other wells are frequently dry or relatively modern constructions. Sometimes *gammam* appear periodically after rains in other rocky ravines in the nearby mountains (Gleichen 1905: 88; Castiglioni and Castiglioni 2020b: 24). Directly next to the water source is a small rock art panel depicting fauna which we discuss below.

A large dry-stone multi-roomed structure measuring approximately 15 × 8 m is situated on a level platform above the wadi bed and has a good vantage over the *gammam* and the ravine (Figure 3, bottom). It comprises at least three rooms, a central inner room to the northwest, with two rooms partially surrounding this to the southeast and southwest. The walls consisted of an outer and inner face of dry-stone packed with a fill of earth and finer rubble. The structure is exceptional at this site for its size, high-walls, multiple rows of masonry and layout, which have no counterpart at Jebel Rafit. This was the only structure at Khor Rafit where walls were preserved to a considerable original height. Looking over the water source, it seems plausible that this structure functioned as a guard-post or lookout post, perhaps even a station for gold-washers to use. Parallels for this structure in terms of layout and masonry technique occur at other gold mines in the region, for example at Jebel Nigeim, Avai and Wadi Abaraga, which is situated near Wadi Gabgaba, a site dated by its pottery to c. AD 800–950 (Klemm and Klemm 2013: 505; Castiglioni 2020a: 13, 18, 2020b: 30). These were sometimes interpreted as fortifications, although it is unclear if their express purpose was defence. There was clearly a pattern at the goldmines in the Arab period of having a large central structure that may have had some official or even defensive purpose, not one limited to gold-working. There was no diagnostic pottery on the surface that could assist with dating.

The gold-working and refining areas (AS19.5, AS19.6, AS19.12)

On the northern side of the wadi, where the terrace meets a hillside and approximately 500 metres from the cemetery, is a large gold refining area. Its outline and function are relatively clear from the dry-stone walls and numerous millstones on the ground. The refining and gold-working area's internal architecture is, however, highly disturbed and now resembles only haphazard vestiges of the original structures. Today, it consists of ruinous stone piles without a clear or discernible pattern in what must have originally been a series of connected rooms for crushing and refining gold ore. The whole complex is approximately 230 × 40 metres across. Hundreds of millstones (or querns) are found scattered throughout the working area; they are well-worn and bear signs of extensive use. The most common type is ovoid in shape and they millstones average about half a metre long, with a large convex smoothed depression for crushing quartz or other ores (Figure 4A–B). Millstones of this type are generally considered to represent a technology of earlier mining operations from the Egyptian New Kingdom (Klemm and Klemm 2013; Rabot *et al.* 2020: 357), but there are difficulties in general with dating macrolithic gold processing technology to single periods (Rega 2020). A similar lithic technology is present in later Roman operations in the Eastern Desert too (Meyer



Figure 4. Khor Raftit millstones: a) millstones from the gold-working area, the most common ovoid millstones; b) a close-up of wear-marks and striations of the same millstone; c) a different macrolithic type with circular ‘mortar’ indentations.

2011: pl. 95, 97), calling into question an exclusive New Kingdom date for this type. Another type of millstone present in the working-area exhibited small circular grinding depressions embedded in larger stones, so-called ‘mortars’ (Figure 4C) (Rega 2020: 105). Conspicuous in their absence are the so-called ‘rotary querns’, one of the most distinctive gold mining macrolithic artefacts present in Roman and especially early Arab period mines, although it cannot be discounted that these did exist under the piles of stone detritus. Based on the ceramics found in the gold-working area, which include Late Roman amphorae and early Arab-Islamic wares (see below), it is difficult to presume a New Kingdom date for this mining operation, although some sort of reuse and recycling cannot be completely discounted. Recent satellite imagery indicates that a large part (20 × 6 m) of the gold-refining area has been destroyed through modern mining operations.

On a small ridge directly above the gold working settlement, merely a few metres from the western part of the gold-refining areas, was an area of rock art with images of animals carved into six boulders (AS19.6). Based on the likely date of the gold-workings and also the style and content of the rock art (Kleinitz 2012; Polkowski 2021; Cooper and Vanhulle 2023), it seems that the rock art belonged to an older climatic period when different species roamed this desert, predating the main phase of gold-working by millennia (see below). While the rock art and gold-refining do not therefore seem to have been contemporaneous, the question of earlier gold operations should be partly left open, but there is no surface evidence documented so far to confirm gold exploitation before the first millennium AD. Earlier works may have

been on a smaller scale and focused on alluvial exploitation or they may have been destroyed by later workings.

On the northern side of the same hill as the gold-working area there is a large excavation in the side of the mountain (AS19.12, [Figure 5](#)), approximately 30 metres across, which is likely to have been the main focus of the gold mining effort. The proximity of this excavation to the gold-working area (~170 m) explains the placement of the gold-refining area and settlements. The refining area was situated between the gold excavations and the water source, with water being important both for hydration and as a vital ingredient in the refining process ('gold-washing'). This excavation is not the only sign of gold extraction at Khor Rafit. Tailings are visible on numerous hillsides in the nearby valleys and the surrounding hills, often characterised by small excavations and piles of overburden which have cascaded down steep hillsides. A small station of gold-working, for example, was identified following the ravine to its terminus a kilometre north in the jebel (AS19.10). It is likely, then, that the gold-refining area acted as a central refining node for multiple gold sources in the surrounding hills on the southern slopes of Jebel Rafit.

The cemetery (AS19.3)

The cemetery at Jebel Rafit is one of the largest in the exceptionally barren desert region west of Wadi Gabgaba, with 99 structures counted on the survey ([Figure 6](#)).² The tumuli are all dry-stone constructions, with the overwhelming majority following a similar pattern of being near perfect circles with near vertical sides.



Figure 5. Khor Rafit: the artificial gold excavation on the east side of the hill (AS19.12).

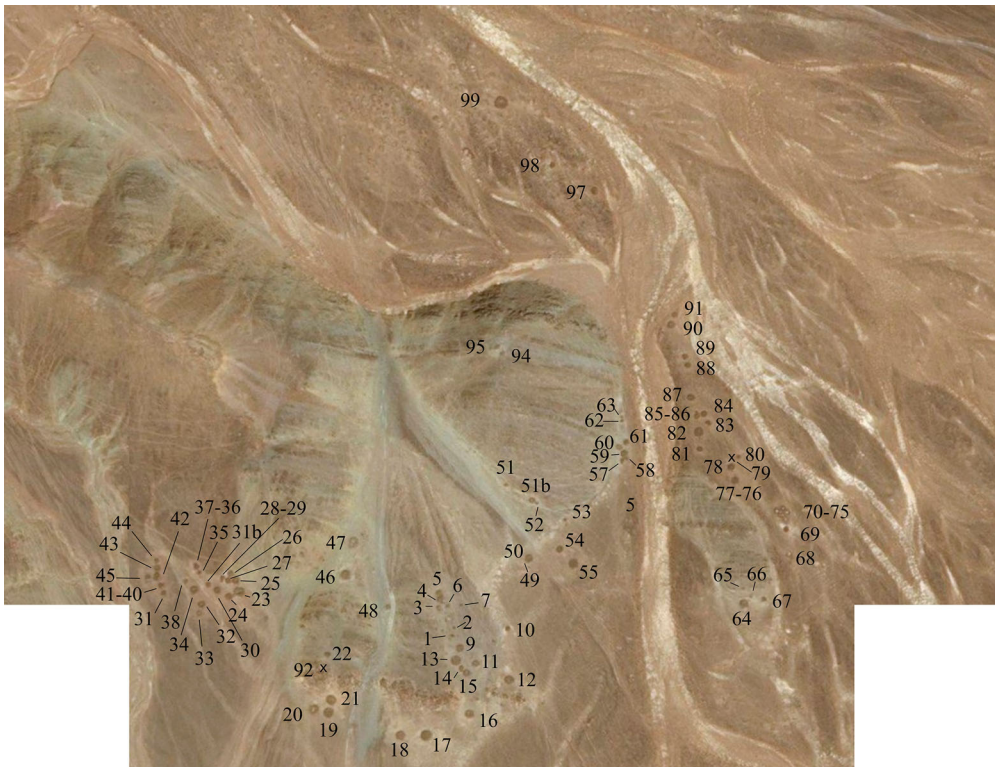


Figure 6. Khor Rafit: numbered structures in the tumulus cemetery (AS19.3). © Google Earth.

Archaeologists frequently call this type of burial ‘platform’ or ‘disc-shaped’ tumuli (Figures 7 and 8); they are known as *akerataheil* in the local Beja language.³ *Akerataheils* are found at numerous sites throughout the Eastern Desert, from the Sudan-



Figure 7. Khor Rafit: kite photograph of Tumuli 23–44 in the western part of the tumulus cemetery.

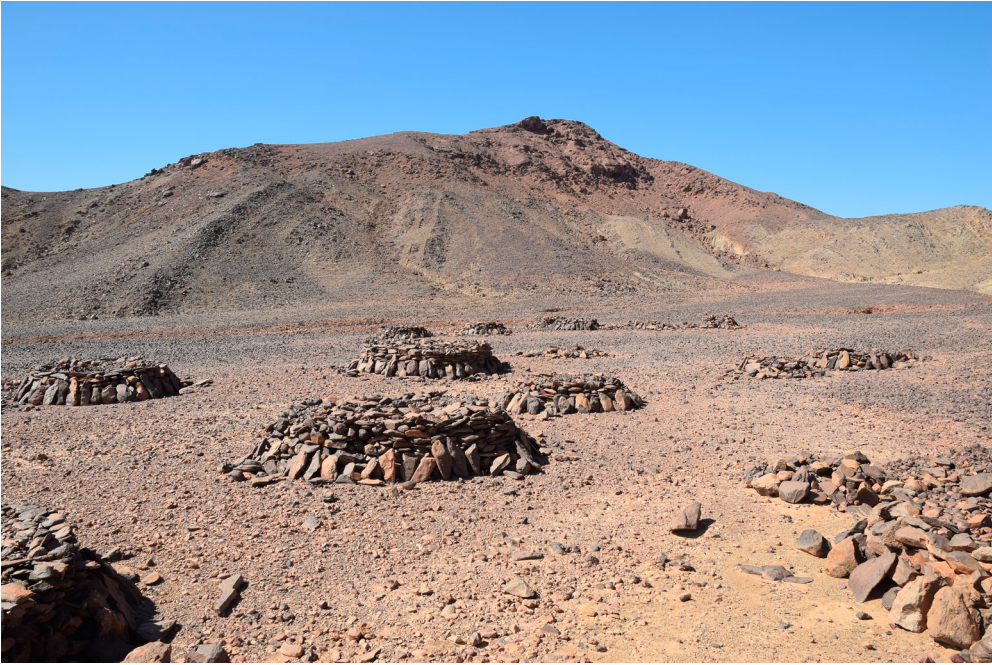


Figure 8. Khor Rafit: platform tumuli or *akerataheils* in the western part of the cemetery, the same cluster as in [Figure 7](#).

Eritrean borderlands to the hinterlands of Upper Egypt. They are also found at select sites on the Nile Valley itself, with a large cluster well known in the northern area of Lower Nubia at Kalabsha South-Wadi Qitna, in particular, as well as Mo‘alla on the Upper Egyptian Nile (Ricke 1961; Strouhal 1984a; Magid *et al.* 1995; Sadr *et al.* 1995, 1998; Reinold and Ahmed 2003–2008; Lassányi 2010, 2012; Krzywinski 2012; Bashir 2017). Some cemeteries of this type have also been identified in the Fourth Cataract region (Paner and Borcowski 2007: 7–8) and as far south as Kassala (Manzo *et al.* 2010). Radiocarbon dating of such burials has generally returned dates from the first millennium AD. Platform tumuli cemeteries range from isolated single tumuli to huge clusters with hundreds or even thousands of tumuli at sites like Bir Ajjami and Khor Nubt (Reinold and Ahmed 2003–2008; Krzywinski *et al.* 2020). Due to their distribution throughout the entirety of the Sudanese Eastern Desert, as well as their dates, which are largely based on ceramic typologies and a few radiocarbon samples, they can be connected to the only known historical groups who occupied this desert, namely the ‘Blemmyes’ and ‘Beja’ of Late Antiquity and the ensuing medieval period (c. AD 200–1000) (Lassányi 2012; Cooper 2020). This broad geographic pattern and established tumulus typology are good indicators that the tumuli at Khor Rafit belong to indigenous nomadic populations rather than to foreign miners from the Nile Valley.

In the context of the exceedingly dry environs of the Wadi Gabgaba basin and the great ‘S-bend’ of the Nile, the Khor Rafit cemetery is quite large — most other cemeteries in the region number only a handful of tumuli or sometimes even an isolated tumulus. Larger cemeteries are generally a feature of the more fertile ecologies further east in the

main range of the Red Sea Hills, where plentiful grazing and watering opportunities allowed for a greater density of human activity (cf. Hjort and Dahl 1991; Hinkel 1992). The occurrence of this denser cemetery in the Khor Rafit might be attributed then to both the location of a (semi-)dependable water source and also the presence of local gold-bearing ores. Although it is impossible to ascertain in a single season of fieldwork, there is a distinct possibility that this cemetery, situated approximately 500 metres to the south of the gold-working area, represents the burials of local nomads involved in the gold-working industry. This presents an unprecedented opportunity to place a proverbial magnifying glass onto the social dynamics of gold mining in the Eastern Desert, a unique case study as most gold mines do not contain such large 'nomad' cemeteries.

The majority of the tumuli generally present a uniform architecture. The outer casing of stones usually consists of vertical upright revetment stones (or orthostats), which rest against the side of the tumuli and sit on the desert surface, with the next 'ring' internal layer of stones being made from carefully laid horizontal slabs. The inner fill of the tumulus consists of smaller stones and rubble. The burial interment could be situated in two different settings, either a small, corbelled recess above the surface level and within the dry-stone tumulus, or in other cases a grave cut was excavated into the desert surface on top of which were horizontal capping slabs and the tumulus superstructure. Sometimes the tumuli cluster in groups of three to ten and on occasion they even directly adjoin one another. This proximity might be indicative of familial or kinship connections, with Strouhal (1984a, 1984b, 1986) proposing family unions in 'clustering' Blemmyean burials.

The tumuli at Khor Rafit almost universally bear signs of disturbance or robbing, with a central hole tunnelled into the middle of the superstructure, or sometimes the undermining of a whole side of the structure to expose the burial. Judging from the fresh tracks and modern plastic rubbish, some of the tumuli at the site were bulldozed in relatively recent times as a result of robbing or modern gold mining prospections. All the tumuli are constructed on a gravel terrace (*hamada*) above small drainages, a deliberate choice that avoided damage from violent flash flooding. Their location seems to have been further guided by local geological conditions and ease of making burial interments. The builders took advantage of natural recesses in schist-veins or rock spurs to create burial compartments within niches between the rocks. Identical strategies are found in other 'platform' cemeteries, for example at Wadi Qitna and Kalabsha South, where the inhabitants constructed tumuli on the edges of clefts or around boulders to assist with the making of natural burial compartments (Strouhal 1986: 85).

While most of the tumuli at the site accord to this classical 'platform tumulus' type, some other burials are not concordant with this shape. This includes some smaller tumuli that are basically mounds with sloped or tapered rather than vertical sides. This type is attested at other Eastern Desert sites, including those which also possess 'platform tumuli' (Borcowski and Welsby 2012; Lassányi 2012). So-called 'crevice burials' (Vasáros and Lassányi 2010; Borcowski and Welsby 2012) were also found at the site, a burial type frequently found in the Eastern Desert and Sudanese Nile Valley in rocky areas. A single example of a corbel-vaulted 'dome grave' was also identified (Figure 9), consisting of an ovoid shape with a hollow vaulted chamber. This



Figure 9. Khor Rafit: a dome type burial.

burial type has chronological implications for the occupation of Khor Rafit. On the Sudanese Nile it has been dated to the first millennium BC (the Napatan Kushite period) through radiocarbon dating and ceramic typologies and thus predates the *akerataheils* (Strouhal 1984a: 80–81; Paner and Borcowski 2012). Another unique burial at the site consisted of an extremely dilapidated and reused 17-m diameter circular structure in the wadi field (AS19.4). While its form is difficult to make out due to reuse, the closest parallels are to the monumental cattle burials of the Wadi Khashab type, which are approximately dated to the fourth millennium BC (Osypiński *et al.* 2021).

The genesis of a cemetery space at Khor Rafit can be pushed back even further. In the eastern part of the Late Antique cemetery, there was a small group of six interlocking burials with a wholly different superstructure to the platform tumuli (Numbers 70–75) (Figure 10). These features were characterised by a low ring of large stones and boulders with a central burial pit in the middle of a stone ring. Unexpectedly given the predominant first-millennium AD material culture across the site, subsequent excavations revealed these burials to be of Neolithic date based on the pottery excavated in the pit. This could signify that Neolithic pastoralists had been attracted to the site due to the favourable hydrology and the *gammam* rather than the presence of the gold-workings. It must be stressed that in the African Humid Period, which was coeval with these burials, the wadi environment would have been much greener and watering opportunities more plentiful (Jesse *et al.* 2004; Bobrowski *et al.* 2013). Nevertheless, the favourable topography of the site, allowing for the concentration of water in the ravine, may even in this period of greater rainfall have created a unique ecological niche in an otherwise semi-arid environment of low hills and sand dunes.

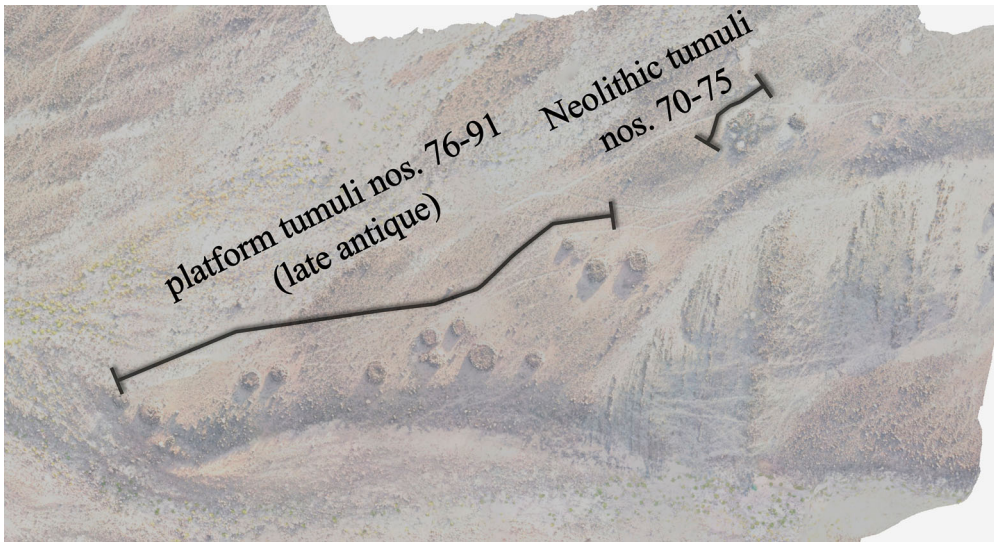


Figure 10. Khor Rafit: a wadi terrace in the eastern part of the cemetery (AS19.3) with both platform tumuli and Neolithic tumuli.

All 99 structures in this space are recognisable as tumuli, but two (numbers 94 and 95) do not appear to have functioned as burial places. Both are situated at the summit of a small hill. One of them (No. 94) exhibits two parallel walls in a north-south alignment and its function is wholly unclear. It seems ill-suited for the purposes of a dwelling, so it might conceivably have had some other function as a lookout post or indeed a small shrine.

Excavations in the cemetery

The team had a little under three weeks to survey and plan the site, as well as to excavate a sample of the burials, a task that was considered important due to encroachment of modern gold-works and evidence of recent destruction. At least four tumuli have been bulldozed and almost all bear signs of robbing, although it is uncertain if all of this is modern in date. Because of the remoteness of the site, the small team and the preliminary nature of the excavations, only a sample of the tumuli were selected for excavation. The aim was to choose several burials that appeared to have different characteristics in their construction. This approach attempted to understand these variations and the possible different phases of the site's use. In the short time available five burials were investigated, including two burials of the 'platform' or Late Antique type (Figure 11) and two of the low ring tumulus type which were discovered to be Neolithic constructions. One partially collapsed structure (No. 78) was also studied. The tumuli are described in detail below. No grave goods were excavated in the Late Antique tumuli, but surface ceramics across the cemetery space and sometimes on top of the tumuli themselves indicate a mid-first-millennium AD date. The pottery on the tumuli is possibly a result of robbing spoils, although it cannot be discounted that some sherds around the tumulus structure represented deliberate votive deposits. A similar pattern was observed on *akerataheils* at

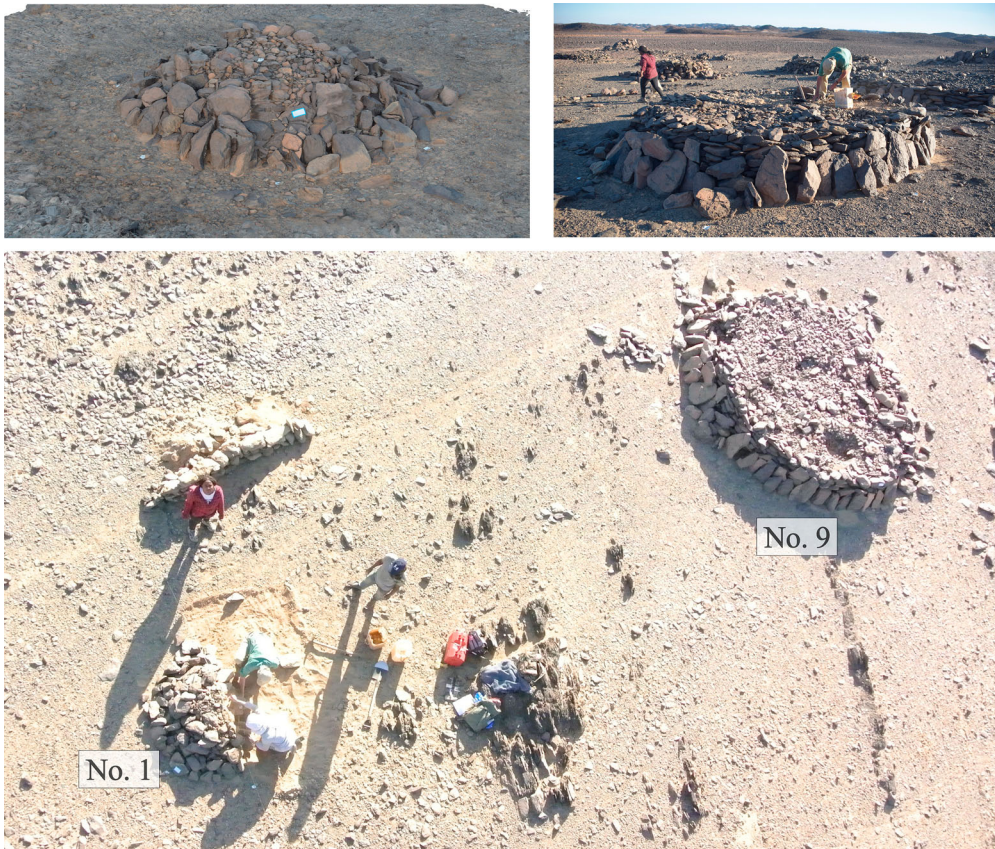


Figure 11. Excavation work at the Khor Rafit cemetery (AS19.3): top left) photogrammetric model of Tumulus 1; top right) excavation of Tumulus 9; bottom) kite photograph of the excavation of platform Tumuli 1 and 9.

Onib (Sadr *et al.* 1995: 220), Wadi Qitna (Strouhal 1986: 101) and Bir Minayh (Vasáros and Lassányi 2010: 265–266), where sherd scatters were found on top or directly adjacent to the tumuli structures. This speaks to a pan-Blemmyean funerary practice occurring across the entire Atbai. The pottery here includes finds of Eastern Desert Ware, which can be connected with the local desert-dwelling Blemmyean nomads (see below), and Post-Meroitic wares from the Nubian Nile.

A preliminary analysis of the human remains was undertaken using standards set out in Buikstra and Ubelaker (1994). An estimation of biological sex was made using features of the skull and pelvis after Phenice (1969), Acsádi *et al.* (1970), Buikstra and Ubelaker (1994) and Rogers and Saunders (1994). Age estimation was made from the appearance of the pubic symphysis after Brooks and Suchey (1990) and the auricular surface after Lovejoy *et al.* (1985). Both the pubic symphysis and auricular surface are located on the pelvis and are very fragile elements of the skeleton, meaning that age estimation was not possible in all individuals. Age estimation for non-adult remains was made using skeletal development, epiphyseal fusion (Scheuer and Black 2000) and dental development (AlQahtani *et al.* 2010).

Tumulus 1 — Grave 6 Skeleton 5

Initially, a small, low tumulus was chosen for excavation. The superstructure consisted of a mound of stones roughly 1.3 m in diameter and 480 mm high; larger stones were arranged in a hemispherical-like tumulus with smaller pebbles in a depression on top (Figure 12). Under this was a substructure, consisting of an oval ring surrounded by stones and several capping stones over a grave cut (480 × 460 mm in size and 450 mm deep). The cut and fill were partially overlapped by the large enclosing stones, suggesting that the grave was dug and filled before laying these. The cut was divided by a natural vein of schist-like bedrock that ran east-west through the grave around a third of the way from the southern end. The burial had been laid within this southerly third of the grave cut. The back of the body rested against this line of bedrock. As evident from its size, this was the burial of a child less than one year old. The remains were fully articulated and had a west-east orientation, laid on the right side with the head to the west, face south, in a tightly flexed position. The arms were flexed with both hands under the head. The grave cut was raised under the head as if a ‘pillow-like’ mound had been left. The right twelfth rib showed some enlargement of the shaft particularly in comparison with the left, indicating a possible healed fracture, according to Waldron (2021). Directly around the remains was a dark powdery deposit, suggesting that they may have been wrapped in an organic material, perhaps leather. There were no funerary goods nor small finds in this burial.

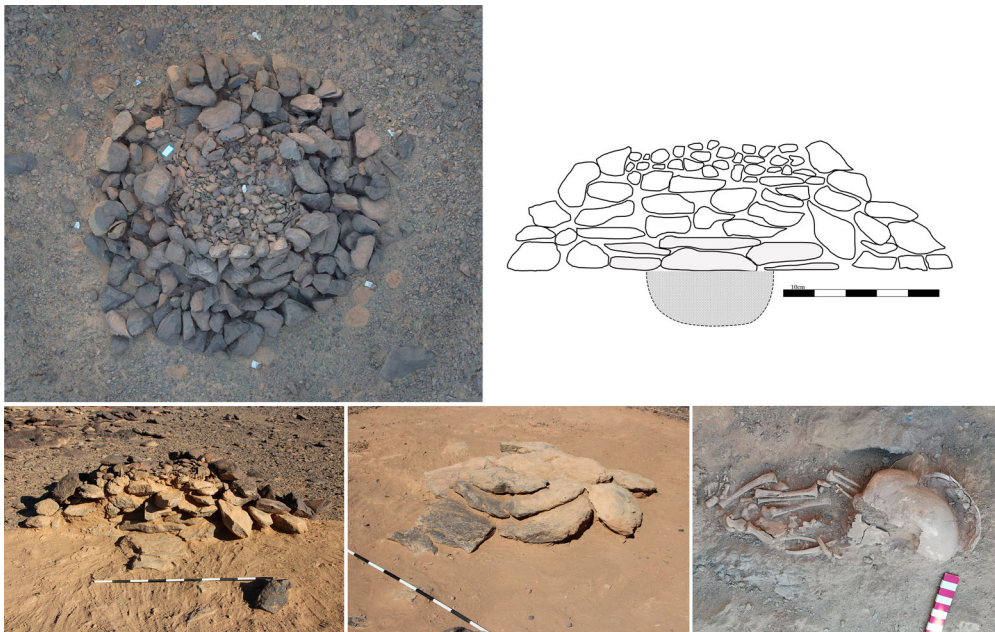


Figure 12. Khor Rafit Tumulus 1: top left) orthomosaic of the tumulus; top right) cross-section sketch. The shaded stones overlaying the grave cut (dashed and shaded area) represent the larger surround and capping stones; bottom left) half-section; bottom centre) capping stones; bottom right) remains of Skeleton 5, a non-adult found in Grave 6 under Tumulus 1. The head is to the west end of the grave, the hands are tucked under the head, and the legs flexed.

Only one sample suitable for radiocarbon dating was obtained in the course of excavations, a piece of charcoal from the burial interment of Tumulus 1. This was subjected to AMS dating and returned a date of the seventh century AD (1395 ± 20 BP, cal. AD 605–665, 95.4% probability).⁴ While this date is indicative of the date of interment in the tumulus and is largely consistent with the Late Antique pottery found throughout the site (see below), one date should not be used as a linchpin for dating the whole cemetery.

Tumulus 9 — Grave 9 Skeleton 10

The second tumulus chosen for excavation was Tumulus 9. The superstructure was large, around 2.7 m in diameter and 610 mm high (Figure 13). This superstructure was half-sectioned to better understand its construction, revealing that the outer parts consisted of vertically placed orthostats leaning against a revetment. The revetment and the lower portion inside it were horizontally placed slabs stacked with spaces between that had filled with fine, wind-blown silty dust over the centuries.



Figure 13. Khor Rafit Tumulus 9: top left) half sectioned excavation; top right) cross-section sketch. The shaded stones overlaying the grave cut (dashed and shaded area) represent the surround and capping stones; bottom left) capping stones covering the grave cut under Tumulus 9, photographed along the long-axis of the grave-cut; bottom right) remains of a probable adult male, aged between 35 and 49 years (Skeleton 10) buried under the tumulus.

The revetment rose a little higher than the lower inner portion to contain the upper inner portion, which consisted of small black stones to a depth of around 100 mm. There were two depressions in the upper, inner layer and some human bone was found. These depressions were initially thought to be robber's pits communicating with the burial beneath. However, they did not appear to penetrate through the lower layer, and the bone did not come from the individual interred there. The half section also revealed a substructure similar to that of Tumulus 1, where capping stones had been laid across the grave cut itself on top of several surround stones that constituted the bottom layer of the lower inner portion of the tumulus. These surround and capping stones covered the grave cut and burial chamber. On the south side of the grave, lying on the original ground surface, was a deposit that was around 110 mm thick. The lower stones of the tumulus lay on top of this, as did the surround stones. The deposit consisted of a fine soil with some small stone inclusions and was likely the up-cast from the digging of the grave. The strong prevailing wind in modern times blows from the north, which, if the same in ancient times, would explain the choice of the south side of the grave for this up-cast, avoiding the wind blowing the soil back into the grave cut.

The grave cut was a narrow slot measuring 2.1×0.69 m and 400 mm deep. As in Tumulus 1, a natural vein of schist-like bedrock ran through the grave directly along the north edge, running west/east and the back of the interred individual was placed against this. The individual was extended, laid on the right side with the head to the west and face to the south. Textile impressions could be seen around the back of the individual, again indicating that he may have been partially or fully wrapped for burial. Several rodent tunnels had disturbed the burial which was otherwise fully articulated. The individual was squeezed tightly into the grave cut with the left arm placed behind the back and the right to the front. The feet were bent to fit within the grave limits and the head raised up the western sloped side of the grave cut. This was the burial of a probable male between 35 and 49 years of age. Several pathological changes were present, including osteoarthritis on the distal articular surfaces of both radii, the right first metatarsal and the left first phalanx of the foot. Healed fractures were present on the distal right radius shaft, while the styloid process of the right ulna had fractured in two forming a pseudo-joint. Intervertebral disc disease was present in the lumbar vertebrae from L2–5. A calcified, spherical mass (20 mm in diameter) was found posterior to the sternum, possibly indicating a liver or gall stone. Small, bony rings were also found inferior to the skull and may have been the calcified cartilaginous rings of the oesophagus.

Tumulus 78 — Skeleton 3

Several tumuli had clearly been constructed with the burial chamber built into the superstructure, above the desert floor. Tumulus 78 was one of these and was only partially 'excavated' due to disturbance by robbers, revealing the burial chamber and leaving some human bones visible and exposed to the elements. Full deconstruction of the tumulus did not take place. Because of this, the full method of construction could not be assessed. However, it was clear that the tumulus sat directly on the original ground surface and that the burial chamber had been constructed of large rounded and flat

stones to around 580 mm off the ground with roofing slabs placed on top. Several of these slabs had been moved to allow access for the robbers. The burial chamber was aligned east-west and around 1.94 m long and 540 mm wide. The burial chamber had partially filled with wind-blown sand and the skeletal remains had been disturbed. Partial articulation suggested that the individual was laid extended in an east/west orientation with the head towards the west. The right arm was present and appeared to be laid by the right side of the body. The individual was between 35 and 49 years old, but its biological sex could not be determined. Some marginal osteophyte was visible on the eleventh and twelfth thoracic vertebrae, while pitting and new bone formation on the insertions of the left rotator cuff tendons (infraspinatus and subscapularis) suggested rotator cuff disease in this shoulder. There were no discernible artefacts present in the partial excavation of this tumulus.

The Neolithic tumuli: Tumulus 72 (Grave 14 Skeleton 9) and Tumulus 73 (Grave 15)

Tumuli 72 and 73 were positioned east of Tumuli 1 and 9 and were part of a cluster of six burials, consisting of adjacent low rings of stones (see [Figure 10](#) above). They were chosen for excavation due to their differing architecture when compared to the rest of the platform tumuli of the cemetery. Both had very similar superstructures of low rings of rounded stones with depressions in the centre ([Figure 14](#)). Tumulus 72 was larger than 73 but ill-defined, while Tumulus 73 measured approximately 1.2 m across and raised to between 300 and 400 mm from the ground's surface. No kerb structure was seen inside or outside of either grave, as was observed in the smaller stones in the platform tumuli. These tumuli most closely resemble burial type FT04b as described in the Merowe Dam salvage project (Borcowski and Welsby 2012). They were both half-sectioned and excavation revealed that the depressions were likely to be the remains of robbers' pits. In both burials, these pits extended to the level of the burial and both original grave cuts were around 2.1 m in depth, although neither could be fully defined due to the large stones present in the surrounding bedrock. No human remains were found in Grave 15 (Tumulus 73), with only unidentifiable bone fragments found in the fill of the robber's pit. However, several pottery vessels consistent with Neolithic wares known from Nubian cemeteries were recovered (discussed below). These included two intact vessels.

In Grave 14 (Tumulus 72), the remains of an adult (20+ years) probable female were found, partially articulated with some fragments found in the robber's pit fill, which could be refitted with those from the original burial context. All the skeletal elements were stained black and were extremely friable, making lifting difficult. In some cases the bones appeared only as a powdery black colouration of the soil. The individual had been laid in a tightly flexed position on the left side with the head to the west and face to the north. Under the head was a soft dark powdery deposit which had the appearance of folds, suggesting an organic material, possibly animal skin folded under the head as a pillow-like rest. Several teeth and part of the jaws were present, showing carious lesions on the distal upper left first molar and lower left canine. Signs of periodontal disease, recognised as described by Kerr's (1988) scores 3–5, were present between the upper left second incisor and canine, as well as between the lower left first and second

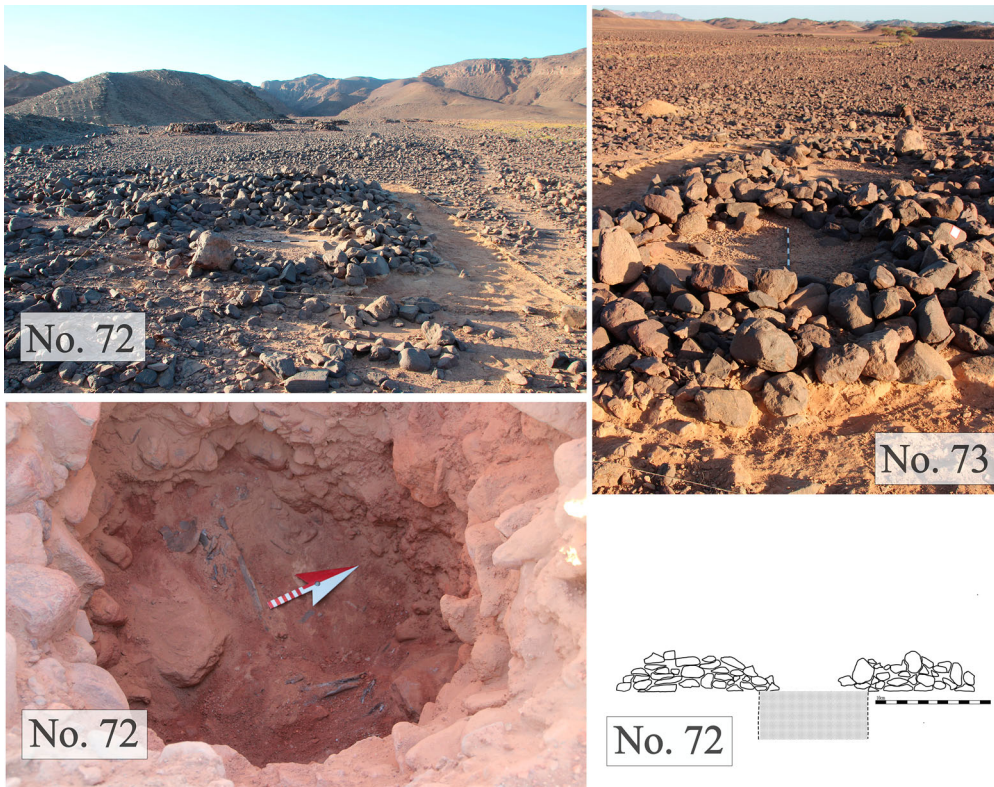


Figure 14. Khor Rafit Neolithic burials: top left) Tumulus 72; top right) Tumulus 73; bottom left) burial in Tumulus 72; bottom right) cross-section of the superstructure and burial cavity of Tumulus 72.

molars. Little else could be determined due to the poor state of preservation. A fragmented pottery vessel and a stone bead, although disturbed from their original position, were recovered from the fill of this burial.

In terms of parallels, the architecture and purpose of these structures resemble the Neolithic structure excavated by Sadr (1997; Sadr *et al.* 1995) at Wadi Elei further east in the Atbai, a ring tumulus surrounding two internal pits. As with Tumulus 73 at Khor Rafit, one of the Wadi Elei pits (D5.1) seems to have been an ‘offering pit’ of burial goods comprising pottery, charcoal and stone beads but no human remains, while another shallow human internment was constructed directly adjacent to the offering pit. Charcoal at D5.1 was radiocarbon-dated to the fifth millennium BC, making its date consistent with the pottery found within the Khor Rafit pits, especially the diagnostic tulip beaker found in Tumulus 73 (see below). Similar Neolithic structures have also been reported from the Wadi Allaqi area (Paris *et al.* 2006), making these Neolithic burial structures a consistent tradition of the Atbai.

With Neolithic and mid-first-millennium AD burials in the one cemetery space, it would be tempting to suggest that the southwest part of Khor Rafit site was, since the Neolithic, demarcated and dedicated as cemetery site, reoccupied by Late Antique pastoralists millennia later. However, given the great time depth between these

occupations, interrupted only by a single dome burial of the first millennium BC, it would be speculative to posit a continual occupation or one based on espoused ancestry. Rather, it seems likely that the Late Antique cemetery was deliberately positioned on the nearest available flat gravel terraces that avoided the gold-working space and domestic areas to the north, while being proximal to the settlements in the main wadi field. Not mutually exclusively, another possible explanation is that the Late Antique inhabitants of the area were attracted to the site by its pre-existing funerary structures. The fact that there are few signs of earlier tumuli or later Arab-Islamic burials suggests that the emergence of a new Late Antique cemetery was connected to the contemporary gold-mining operations, with an additional possibility that a Blemmyean nomadic community occupied the Jebel Rafit area in order to control strategic gold and trade routes along with the water source.

Settlements and domestic architecture

Settlement remains were found in four areas of the site: in the middle wadi field south of the gold-working area (19.4); in a basin to the north of the gold mine (AS19.9); in the southern site around another possible water source (AS19.8); and at the cliff-top settlement (AS19.13), which was not visited on the survey. The most pervasive domestic architecture at Khor Rafit consists of simple dry-stone architecture in the form of single room huts. This usually consists of a small ring of stones horizontally laid and a few courses high, or even just one course in some cases (Figure 15), with a rough average size of 3.5×2.5 metres across. Frequently, these are simple semi-



Figure 15. Khor Rafit: domestic architecture in the northern settlement.

circles or ‘windbreaks’ and are open to the south, a common feature in vernacular architecture in Sudan that protects against the prevailing northerly winds (Murray 1935: 81; Borcowski and Welsby 2012). Three or four stone huts on the western side of the wadi field (AS19.4) preserve complete circular huts with higher walls, but these are in a minority.

Conceivably, much of this architecture may have had matting or reeds added to it in the manner of contemporary Beja or other northeast African nomadic architecture. There are examples both in ancient and contemporary Beja nomadic architecture exhibiting a small course of stones on top of which is placed a tent structure (Luft 2010; Darnell *et al.* 2020). In the absence of excavations and identification of post-holes, such questions must be left for future research. The wadi field settlement contains at least 98 discernible structures (AS19.4), the southern site 55 (AS19.8), the northern settlement 29 (AS19.9) and the cliff-top settlement 26 (AS19.13). Extensive flash flooding and reuse of materials seems to have erased many more. The structures never interlock or touch each other and in general are arranged to create a loose organisation with plenty of space to pass in between them (~3–8 m). The natural gravel surface is highly disturbed in all the settlement sectors, with artificially flattened areas free of rocks, leading to the impression that settlement may also have included now invisible tent structures or intense livestock corralling.

Ceramics in and around the domestic architecture attests to Late Antique and early medieval occupations. Limited time in the field prevented closer or systematic surveying of artefacts and densities. cursory observations showed that various wares present in the cemetery space and gold-refining area, such as Eastern Desert Ware and Late Roman amphorae, were also present in the settlement spaces. It should be noted that the main tracks leading to the reservoir also pass through the settlement spaces, which broadens the scope for later reoccupation of these structures for miners, travellers on the Korosko Road and itinerant nomads seeking out water.

While the simplicity of this architecture might be well-suited for seasonal and transhumant living arrangements concordant with gold-mining settlements, this type of dwelling does not find direct parallels with most known contemporary Roman and Arab gold-mining settlements in eastern Sudan (Klemm and Klemm 2013). These usually contain interconnected (‘agglutinating’) rectilinear structures built with many courses and wythes of stone and they are much more densely arranged and nucleated. There is some resemblance to the mid-first-millennium Blemmyean camps found in the Upper Egyptian and Sudanese deserts (Sidebotham *et al.* 2002; Darnell *et al.* 2020; Cooper 2021). However, even here the structures at Rafit seem to be structurally simpler and of a more ephemeral or seasonal nature. The best parallel seems to be a Blemmyean emerald mining settlement at Gebel Zabara, which, like Khor Rafit, almost exclusively contains similar single-room huts with walls low to the ground, often open at one end (Oller Guzmán 2022). The southern, central and northern settlements at Khor Rafit therefore seem to have much more in common with transhumant camps than established gold-mining settlements, but there is no reason to think that the gold refining area (AS19.5) could not have had a dual function as both domestic quarters and a gold-refining industrial area. The ruinous state of the area hampers our interpretation of this space. One possible explanation of this entire settlement arrangement, then, is that it was a series of Blemmyean ephemeral camps surrounding a

Roman and later Arab gold-refining area, although this typological distinction is probably too simplistic for what was clearly a dynamic, internationalised and multi-ethnic operation.

Rock art

The 2019 season identified three distinct loci of rock art throughout Khor Rafit. A small locus was on the rock-wall directly above the *gammam* and obscured by reeds, with another cluster on a small ridge above the gold-working settlement and the largest tableau on an extremely large boulder at the northeast part of the site. Set within the wadi ravine, the ‘*gammam* site’ (AS19.7) rock art depicts two uncertain quadrupeds, perhaps donkeys (Figure 16), with a strong resemblance to similar productions on the Lower Nubian Nile (Hellström and Langballe 1970: G11–35). The location of this panel is important as it likely points to the utilisation of this water source in the past.

The rock art adjacent to the gold-refining area consists of depictions on six panels on a small boulder-laden ridge, depicting various fauna such as cattle, goats, antelope and ostrich (Figure 17) but no human representations. Due to the occurrence of these specific species, especially the cattle, it is almost certain that these depictions belong to an earlier climatic phase of the African Humid Period, with a possible *terminus ante quem* in the third or early second millennia BC (cf. Cooper and Vanhulle 2023; Cooper 2024). The primary reason for this dating is the presence of the water-thirsty cattle in the rock art, a proxy for a wetter climate. Cattle are quite unlikely at a desert site under the present climatic regime and today only exist much further south near Kassala. Cattle are, however, known at desert sites from similar latitudes in much



Figure 16. Khor Rafit: the rock art tableau above the *gammam*.



Figure 17. Khor Rafit: rock art at AS19.6 on the ‘rock art ridge’ next to the gold-refining area. This panel depicts two long-horned cattle above and other indistinct quadrupeds, perhaps goats, below.

earlier epochs when rainfall was favourable for cattle pastoralism (Jesse *et al.* 2004; Bobrowski *et al.* 2013; Osypiński *et al.* 2021). Stylistic typologies of this pastoralist style also point to earlier dates (Huyge 2003). Some scant references to Eastern Desert cattle in Egyptian Middle and New Kingdom records also suggest that these ruminants were to be found in the desert perhaps as late as the second millennium BC (Cooper 2022: 13). Despite this, it cannot be discounted that cattle were found in the Eastern Desert in smaller numbers in later periods, perhaps sustained through Nile trade, foddering or herding in localised and favourable ecological conditions with plenty of grass and water. There was no local material culture present that would assist in dating this rock art context.

The rock art locus at the northeast part of the site (AS19.11) is situated approximately 230 metres northeast of the north settlement and is remarkable for its density and variation in the context of the wider rock art record of eastern Sudan (cf. Cooper 2024). It consists of a conspicuous boulder with numerous depictions on the east face and a smaller number of depictions on the west face and the ‘summit’ of the boulder (Figures 18A and F). The large tableau on the east face contains numerous depictions of fauna and human figures, with every suitable and reachable surface on the east face used by the ancient artists. Unfortunately, a number of surfaces on the rock have suffered from what appears to be deliberate vandalism in recent times. The boulder is positioned alongside a major caravan track discernible on the desert surface, likely one of the main (but not only) paths of the famous Korosko Road. The depictions on the east face are easily discernible as one descends the pass, which was clearly the intention of the ancient artists.

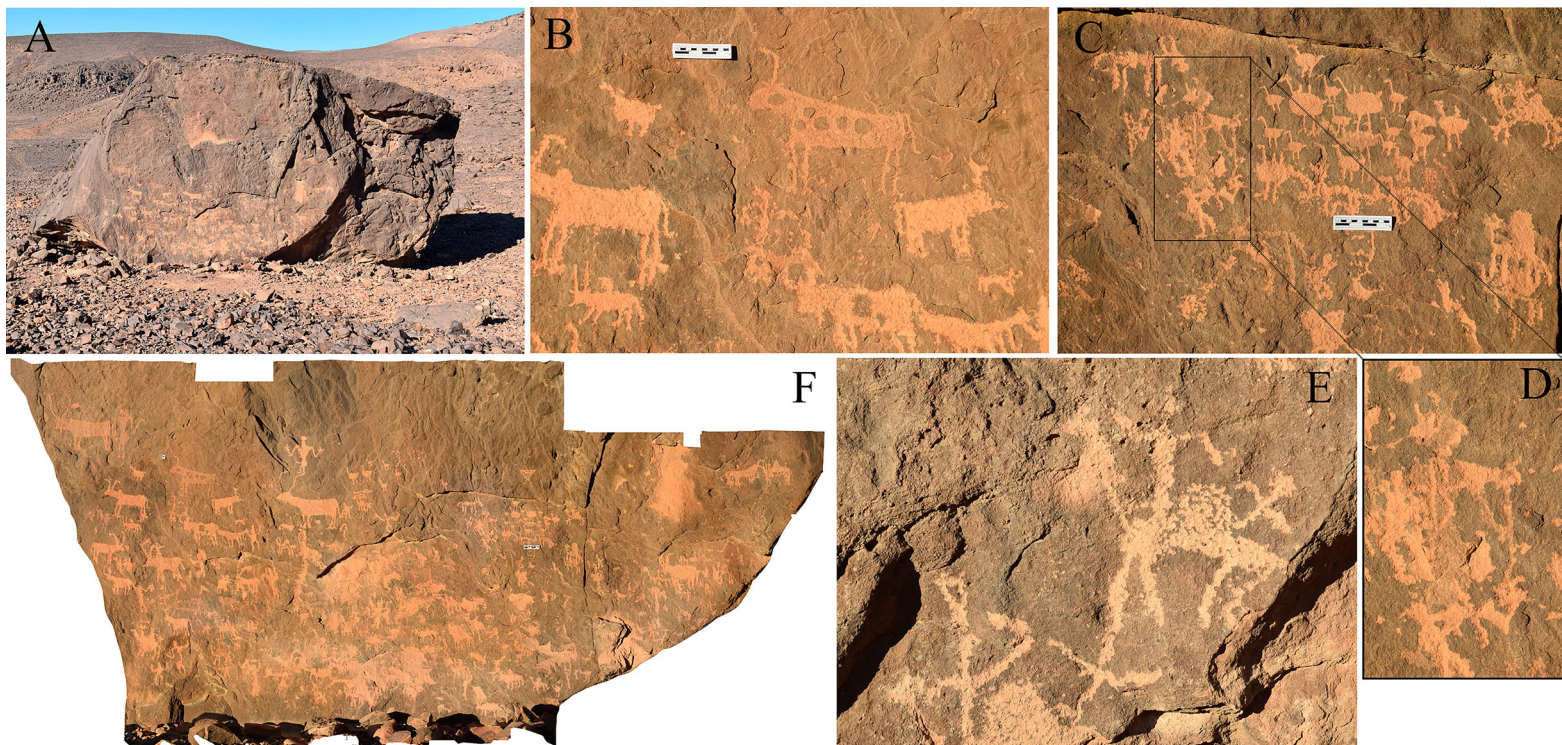


Figure 18. Khor Rafit: rock art at AS19:11: a) the rock art boulder; b) the differences in patina in the cattle depictions; c and d) rock art superimpositions, with older and younger patinas in a scene with bowmen, ostriches and an older figure partly obscured by a later bowman; e) humans on camel-back; f) an orthomosaic of the main east face.

Two broad chronological horizons are perceptible in the rock art on this boulder, which can be broadly demonstrated due to a combination of patina and subject matter. These horizons are sometimes simplistically called the earlier ‘cow period’ and the later ‘camel period’ although the possibility of overlap could be entertained roughly in the late first millennium BC and early first millennium AD (cf. Huyge 2003: 69; Bobrowski *et al.* 2013; Paner 2021). The ‘cow period’ is generally described as terminating in the third and possibly second millennia BC with the drying conditions becoming the norm since 4.5 kya, while the ‘camel period’ is contemporary with the gold mining operations and cemetery in the first millennium AD, with camels being a regular feature of Late Antique and medieval Nubian rock art (Kleinitz and Olsson 2005: 34–35).

Some of the images of cattle in the older horizon we detect are accompanied by a figure holding a whip (Figures 18A and C). Also present in the ‘earlier’ horizon is a large, feathered human figure holding a staff in one hand and possibly a throw stick in the other (Figure 18D) that has largely been obscured by later productions of human figures (bowmen) placed directly on top. Similarly styled depictions of this feathered human figure are relatively common in the rock art of the Nubian Nile and Eastern Desert of Upper Egypt (Rohl 2000: 9, 64, 127; Luft *et al.* 2010: Q 004; Polkowski 2021: 83). Dates in the Kerma period (c. 2500–1500 BC) have been suggested for similarly shaped anthropomorphs (Polkowski 2021: 84–85).

The later patina is more ubiquitous and includes depictions of human figures, bowmen, camels, donkeys, ostriches, and other indiscernible fauna (Figures 18C–F). It is possible that some of the ‘later patina’ productions are recarved or ‘retouched’ from the older horizon, as many of the ‘older’ animals like cattle seem to be produced in a fresher or newer patina (see Eisenberg-Degen *et al.* 2016: 164). Camel riders are common and some seem to hold javelins or swords (Figure 18E). One section of the tableau seems to show a camel rider hunting a feline (cf. Červíček 1974: abb. 27). On the west face of the boulder, a number of camels and *wusum* (camel-brand markings) were also inscribed onto the rock. *Wusum* are a frequent feature at Eastern Desert rock art sites (Winkler 1938; Červíček 1974; Cooper 2020) and are usually connected to the repertoire of shapes still used in contemporary camel-branding, with individual *wusum* designating affiliation to a specific tribal lineage. As both Blemmyes and Arabs are known to have utilised *wusum* (Cooper 2020), it seems likely that the *wusum* at the site belong to one of these two groups.

Rock art interpretation is notoriously difficult, and it is not yet possible to ascribe any of the other rock art productions to specific groups or cultures with confidence (desert-dwellers, Blemmyes, Nubians, Egyptians etc.), but the ‘camel period’ is certainly contemporaneous with the gold-mining operations at the site. The position of the boulder on a major track might also point to its utilisation by travellers on the Korosko Road, watering at the gammad as part of their journey. Dedicated studies relating to the content and chronology of this rock art panel are currently in preparation.

Ceramics and other artefacts

The pottery assemblage from the 2019 season represents a small sampling of surface sherds from the cemetery, wadi field and gold refining area, as well as the ceramics excavated from the Neolithic burials. Surface sherds were generally extremely exfoliated to

the point where slips and even glaze had disappeared, which made identifications with known wares difficult. Follow up fabric analyses on these ceramics, stored in the Sudan National Museum (Khartoum), have been hampered by the current political situation in Sudan.

The ceramic corpus at the site is not culturally homogenous. The pottery presents various vessels from different cultural periods, representing wares connected with local nomads of the Eastern Desert and imported wares from the Nile Valley and beyond (Figure 19).

Neolithic pottery was found in the excavations of Tumuli 72 and 73, with intact vessels found in Tumulus 73. An intact bowl (Figure 19.10) exhibiting rim decoration of oblique lines and a scraped surface was also found in the latter. This kind of rim decoration has parallels from sites along the Sudanese Nile, including the ‘Pre-Kerma’ traditions and general ‘Neolithic’ traditions of the Fourth Cataract and Dongola Reach (Salvatori and Usai 2001: 15–17; Honegger 2004: 42; Lange 2006: 612–613). This interment also yielded a unique example of an intact spouted vessel (Figure 19.11).



Figure 19. Khor Raftit: examples of pottery from different parts of the site.

A small sherd exhibiting combed decoration between raised lines was identified as part of a caliciform (tulip) beaker (Figure 19.12) found in the excavated context of Tumulus 73. Such vessels with almost identical decorative patterns are characteristic features of the Sudanese Neolithic and have also been found in the Western Desert, generally dating to the fifth millennium BC (Welsby Sjöström 2001: I, 320 CA2.2, CA3.2; Longa 2011; Chłodnicki 2021). A similar example of a probable caliciform beaker was found among the surface collection on the Neolithic site R12 in the Dongola Reach (Salvatori and Usai 2001: 19–20, pl. 1). These vessels have not yet been identified at any sites or burials in the Eastern Desert of Sudan and the presence of this fragment argues for the extension of this Neolithic tradition into the Atbai (for their distribution, see Dittrich 2011: 282). No certain examples of Middle Nubian sherds dating to the third/second millennia BC, such as the C-Group or Pan-Grave horizons, were identified across the site in our preliminary investigations.

The ‘indigenous’ pottery assemblage at the site can be easily identified with the ‘Eastern Desert Ware’ corpus, consisting of handmade ware, usually cups and bowls, with distinct incised patterning and a red-brown slip. Eastern Desert Wares, dated probably to the third to seventh centuries AD (Figure 19.13–14) were identified in the cemetery (AS19.3), the wadi field near the gold mine (AS19.4) and the Northern Settlement (AS19.9). Such pottery is documented at many other sites in the Eastern Desert, the Red Sea coast (Berenike) and the Nile Valley (Barnard *et al.* 2005: 51–52; Barnard and Rose 2007: 188; Barnard 2008: 22–23, 149), with the largest concentrations in the central parts of the Atbai (Barnard 2008; Manzo 2014, 2020; Cooper 2021). The presence of Eastern Desert Ware at the site, especially in settlement areas, raises important questions as to the role of the local nomads in the gold mining industry. Although the occurrence of Eastern Desert Ware cannot be used unproblematically as direct evidence for the presence of Blemmyean nomads, it does suggest that the networks of exchange and mining practices at the site involved both foreign and Blemmyean communities. In conjunction with the Blemmyean tumuli, these ceramics therefore point to a Blemmyean occupation at the site between the third and seventh centuries and coeval with some of the Roman and Post-Meroitic ceramics found at the site. It is much less certain whether this ceramic tradition continued into the Arab period (Barnard 2008), which makes nomadic presence difficult to discern in this later phase of gold-mining.

Wares from the Egyptian Nile are also attested at Khor Rafit. This pottery is represented in Egyptian Red Slip Ware Type A (Figure 19.2, 9) from the pink clay of the Aswan region, which were dated to the fourth/fifth centuries AD (Sidebotham *et al.* 2002; Barnard 2008: 27). For many years, excavations and surveys in the Eastern Desert and Red Sea regions of Egypt have resulted in the recovery of literally tonnes of Egyptian pottery, making this pottery consistent with the integration of these sites into Roman economic networks.

The location of desert goldmines, in areas unsuitable for large-scale agriculture, necessitated the importation of food in amphorae. At other Eastern Desert sites, amphorae were also reused along the desert roads and between the quarry sites for water transportation and storage. Within the Eastern Desert as a whole, ceramic assemblages dating from the mid-third century BC through to the sixth and possibly early seventh centuries AD are represented (Tomber 2007: 525–26). At Khor Rafit, fragments of Late Roman amphorae were discovered in the region of gold-working area. They

include examples of LRA 7 (Figure 19.5), dated to the seventh to eleventh centuries (Dixneuf 2011: 154–73), and LRA 5/6 (Figure 19.4), dated to the fifth to tenth centuries (Dixneuf 2011: 142–53). LRA 5/6 amphorae seem to have originated in Palestine during the fifth century and were prevalent in Egypt during the seventh/eighth centuries, with continued use as late as the tenth. Such vessels are known from the Western Desert close to Abu Gerara and probably served as transportation vessels for long-distance desert trade (Eichhorn *et al.* 2005). This dataset adds to the corpus of amphorae identified at Eastern Sudan gold mines by Massa (2020), where multiple types of LRA were attested, with a particular popularity in the fifth to seventh centuries.

Sherds of glazed ceramics likely date to the Arab period (Figure 19.6–8), conforming with other results in the Atbai that have shown a resurgence in mining activity in this period, particularly the ninth and tenth centuries (Sadr *et al.* 1995: 222–223; Krol *et al.* 2022). These were chiefly found in the gold-refining area (AS19.5), comprising surface collections between disturbed architecture in the western edge of this zone. Both Late Roman amphorae and glazed wares were identified in the same surface collection at the western edge of the gold refining area, suggesting that this site was active in both the Late Roman and early Arab periods.

The connection with Egypt is not the only international link observable in this pottery assemblage. Wares from the Middle Nile Valley and Post-Meroitic and medieval Christian traditions were identified from surface collections in the cemetery and gold-refining areas. Post-Meroitic pottery, well-known from cemeteries, especially in the Dongola Reach and the region of the Fourth Cataract dated to the fourth to seventh centuries AD (Czyżewska-Zalewska 2020: 2:46–47), was recorded in cemetery AS19.3 (Figure 19.1,15). Christian traditions are represented here by bowls (Figure 19.3,16) dated to the sixth to eighth centuries (Rodziewicz 1988: 77, pl. 8:88; Żurawski and El-Tayeb 1994: 301, 305, 317, fig. 9e). An original example of a bowl with decorated circle appendages on its rim (Figure 19.18) has no known direct parallels. Taking the glazed surface into account, it is probably connected with medieval traditions. The closest parallel was discovered in Debeira West and dated to the seventh century (Shinnie and Shinnie 1978: 3, 69, fig. 60:4). A fragment of a cooking vessel with additional clay added to the bottom was also identified (Figure 19.17). It is datable to the period between the sixth and thirteenth centuries. Such pots have been found in Dongola (Danys-Lasek 2012: 315, 323–24), with further examples identified at Qustul (Williams 1991: 9:63 fig. 19b, 220, 382) and Hambukol (Grzymiski 1990: 158–60 figs 21–23). A uniquely decorated fragment of a carinated bowl was recorded in the cemetery (Figure 19.19). Similar examples were discovered in the cemeteries at Gabati (Edwards and Rose 1998: I, 178–79, 188) and were quite common in the Alwa kingdom. Red or black burnished they are known there from Soba and are dated to the sixth to eleventh centuries (Welsby and Daniels 1991: 193–94, 206; Drzewiecki *et al.* 2021: 612–19).

Given the geographic proximity of the Nubian Nile to the site, the presence of Nubian ceramics of the Post-Meroitic and medieval Christian Nubian periods does not seem surprising, but the involvement of Post-Meroitic and Christian Nubian kingdoms in the gold industry is a topic that has not yet been broached in the literature. Post-Meroitic and Christian pottery is, however, known from other mine sites in the Atbai (Klemm and Klemm 2013: 423, 433, 455, 475), suggesting a pattern of established interest in gold operations and exchange. Gold objects are known from Christian Nubian contexts (cf. Czaja

2018) so it seems probable that the kingdoms of Nobatia, Makuria and Alwa were involved in gold importation, if not production itself. The fact that this pottery was commonly found in the cemetery area might suggest that the users of these vessels were local Blemmyean pastoralists who had integrated into Nubian trade circuits, perhaps even practising seasonal transhumance between the desert and the Nubian Nile. Together, these diverse ceramics do not exactly answer the ‘who’ of the mining practice at Khor Rafit, but they do suggest an internationalised operation that included the presence of local Blemmyean nomads.

Other finds

In the midst of the Late Antique cemetery zone on the *hamada* terrace (AS19.3), a single large Acheulean handaxe (Figure 20) was identified. A small number of similar sites exist in the Eastern Desert of Sudan, including at Khashm el-Bab (Usai 2020) and Jebel Karaiweb (Kobusiewicz *et al.* 2018). Further afield, dedicated Palaeolithic surveys near the Atbara River (Nassr 2018) and Red Sea coast (Beyin *et al.* 2020) paint a picture of a rich Palaeolithic presence east of the Nile. The presence of a Palaeolithic artefact on the gravel terrace at Khor Rafit attests to the high degree of deflation of the wadi area throughout the Pleistocene and Holocene.

Very few other artefact classes were documented across the site. Ostrich eggshell artefacts were found in the wadi field, as was a horseshoe and some basketry from an uncertain period. Soil samples containing likely eroded textiles were also documented from the excavations of both the Neolithic and Late Antique tumuli.



Figure 20. Khor Rafit: a Palaeolithic handaxe found on the surface on the cemetery terrace (AS19.3).

Ancient paths and tracks

One of the unique traces of the human past at Khor Rafit, easily discernible in the gravel terraces of the landscape, are the many tracks of compacted earth and disturbed rock linking different parts of the site. These tracks are clearly identifiable on a walking survey (Figure 21) and even more prominent in aerial photography and satellite photos (cf. Bourgeois *et al.* 2024). While many of these tracks might date to the recent past and the activity of (pre-)modern nomads, many are likely to be ‘ancient’ tracks by virtue of the fact that they directly link nodes of ancient activity and also because they exhibit ancient ceramics along their length. For example, a nexus of tracks connecting the gold excavation with the gold-refining area is likely to be the path used by miners in the first millennium AD.

Many smaller paths converge at the gold-working settlement and the *gammam*, an unsurprising pattern given the economic importance of these locations. A rather prominent and well-trodden track, sometimes comprising six or seven parallel paths, cuts across the site from southwest to northeast, where it then ascends to a small pass, thereafter leading north along the eastern escarpment of Jebel Rafit. This precise track is probably not a local bypath, but one of the major arteries of the ‘Korosko road’ (Figure 1), heading due north to the Nile at Korosko and then to Egypt (Welsby 2020).

A series of small tracks bifurcating west from the pass demonstrates the goals of travellers. One path leads directly to the *gammam* from the pass and it is along this path that the boulder with rock art is situated (AS19.11). The boulder’s position and high visibility on this track might explain the presence and ubiquity of rock art on its eastern face,



Figure 21. Khor Rafit: tracks leading up to the pass above AS19.11. This particular track is well-trodden compared to most paths, demonstrating that it was a major route through the site.

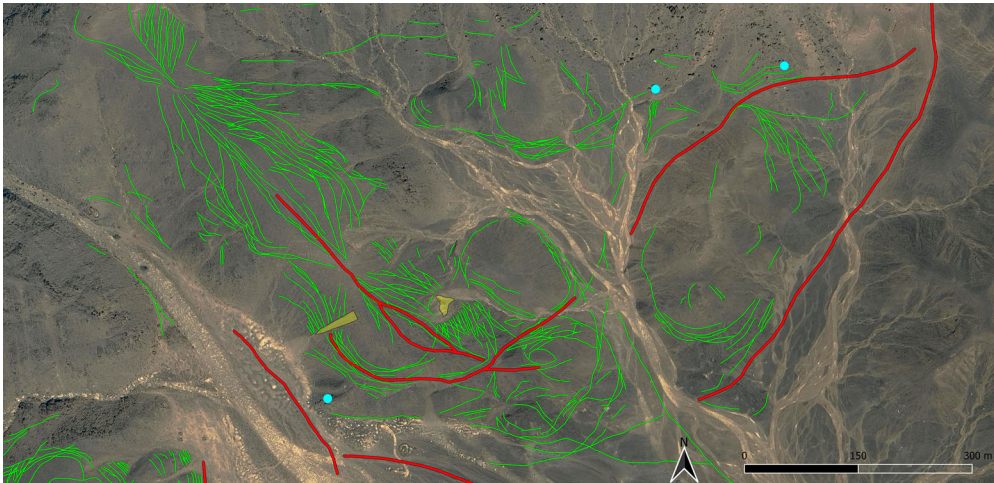


Figure 22. Khor Raftit: remote sensing image of the tracks across the northern part of the site showing narrow tracks (green), wide tracks (red), rock art sites (light blue) and ancient gold-workings (yellow). The boulder rock art site (AS19.11) is located at the top middle of the image. © Google Earth.

which is easily visible from the path as one descends the pass towards the gold mine and water source. The other path heads southwest with branches leading towards the next water sources at Bir Murrat and Umm Gerifat. Continued research as part of the Atbai Survey Project's remote sensing and satellite imagery mapping work aims to illustrate the uses of these path networks across the landscape (Figure 22).

Discussion and conclusions

Preliminary surveys and excavations at Jebel Raftit reveal the site to have been an important gold mine and watering station that attracted successive occupations over the millennia, with marked crescendos of human activity in the Neolithic and the first millennium AD. Before mining operations took place in Late Antiquity, the water source had attracted peoples over the millennia since the African Human Period, when ostriches, cattle, felines and other ruminants roamed the wadi environment. During the African Humid Period similar latitudes and wadi settings were highly conducive to cattle pasturing and in general exhibited semi-arid acacia deserts like today's Butana (Jesse *et al.* 2004; Bobrowski *et al.* 2013). The allure of water thus made it a central node in this western part of the Atbai Desert for travellers and nomads alike (cf. Crépy and Redon 2022). A single handaxe points to much earlier human visitation, although without a corpus of Palaeolithic material these remarks must remain preliminary.

Based on stylistic comparisons, some of the rock art productions, both on the boulder site (AS19.11) and the ridge site (AS19.6), likely belong to the interim period otherwise unrepresented in the archaeology at the site, between the Neolithic up to the second millennium BC. From present work, there is no certain evidence of gold-working before the first millennium AD, although the presence of smaller scale operations should not be discounted here as Pharaonic era gold mines are attested nearby at Umm Nabari and Umm

Fitfit (Klemm and Klemm 2013). A single Kushite style dome burial marks a rare example of first-millennium BC occupation. Together, these data suggest a long but discontinuous chronology of habitation of the wadi environment, all of which may be attributed to its favourable hydrological setting and also possibly to its strategic location on the desert bypath of the Korosko Road.

Cultural affiliations

The most pronounced phase at the site, represented in the tumuli, the rock art record and the gold-mining operations, is that of the mid-first millennium AD. A large enterprise for working gold was established at the site at this time, broadly coeval with late Roman times and continuing into the Post-Meroitic or Arab period, especially its Abbasid phase. Based on the information from the ceramic assemblages, a number of different groups were involved in the gold industry and occupation of the site, including indigenous Blemmyes/Beja, Egyptians from successive Roman and Arab administrations and Nubians from both Post-Meroitic and Christian contexts.

Among these groups, only the Blemmyes are known to have certainly occupied the site, judging from the remains of the cemetery, with our only radiocarbon date indicating that they lived there roughly on the eve of the Arab invasion of Egypt in 639–642. The mere presence of a Blemmyean cemetery in this exceptionally barren area is important as it points to a deliberate expansion of Blemmyean habitation at this site at a period coeval with gold-mining. The demographic core of Blemmyean occupation was in the deserts further to the east, where cemeteries and habitation sites are much more frequent and also larger with respect to the number of tumuli present (Cooper 2020; Krzywinski *et al.* 2020). This makes it likely that the Blemmyes were drawn to Khor Rafit to engage in mining and related support industries. It is perhaps not a coincidence that they did this at the time of their greatest power in the mid-first millennium AD when they controlled some mining operations like the famous emerald-mines of Smaragdus and even exerted territorial control on parts of the Nile itself in Lower Nubia and Upper Egypt (Cooper 2020).

The materials from other cultures in the gold-working areas might be attributable to foreign miners and support or administrative staff from Egypt and Nubia and/or to the extension of their trade networks into the goldfields. Further excavations and surveys are needed to clarify the social roles of various groups in the mining practice, as well as the chronology of the site. These foreign ceramic assemblages of Aswan Wares and Roman amphorae are insufficient to posit that this was a Roman controlled gold-mine, but there are pragmatic reasons for interpreting the operations as having an internationalised dimension, being *both* indigenous Blemmyean and foreign.

Gold-mining in the Sudanese Atbai

Historical sources provide some context for Roman and Arab mining operations in the Atbai. With the retreat of the Romans from northern Lower Nubia (the Dodekaschoinos) under Diocletian in 298, it would seem that Eastern Desert sites such as Khor Rafit would have been beyond the easy and direct reach of any Roman mining expedition. Afterwards, the Nobades and Blemmyes dominated the Lower Nubian Nile. The difficulty

of access to the distant Atbai Desert is corroborated by the Roman historian Olympidorus, who reported in the fifth century that a ‘royal order’ was needed from the king of the Blemmyes for him to visit the emerald mines in the interior desert east of Aswan (Cooper 2020: 9). While these historical texts paint one picture, the view from the archaeological record shows that Roman ceramics were still reaching the remote interior of the Sudanese Eastern Desert after the Roman administrative withdrawal from the nearby Nile Valley.

A number of gold mines in the Sudanese Eastern Desert exhibit Late Roman amphorae dating from the fifth to seventh centuries AD along with Eastern Desert Ware, just like at Khor Rafit (cf. Massa 2020). This tends to support the notion that mining in the interior desert did not directly depend on the Roman administration for its operation but nevertheless acted in concert with Roman economic networks. Even if gold was not directly procured by the Romans, by virtue of the fact that the Roman Empire was the largest market for gold in the region (cf. Sánchez 2015) it is likely that the gold was traded to the north in Roman Egypt, possibly through exchange and for profit. Perhaps local mining operations entailed co-operative practices between Romano-Egyptians and nomads, even if there is plentiful evidence for ongoing raiding and conflict between the Blemmyes and the Romans throughout Late Antiquity. The picture revealed here tends to support a much more internationalised practice at the goldfields of the Atbai, perhaps making their exploitation an industry that may have operated semi-independently of any state actors.

The guard-post structure has definite parallels to other known Arab gold-mining operations in the Atbai. It is tempting to view ‘Early Islamic’ period mining simply as a continuation of Roman mining in the Sudanese desert. The Arab historian Maqrizi even mentions that Roman ‘managers’ were still controlling some mines at the time of the Arab conquests (Vantini 1975: 623). However, the geopolitics of mining practices in the deserts changed considerably in the Arab period. The incursions of Arab tribes into the Atbai were much more pronounced than those of any previous Pharaonic or Graeco-Roman expeditions and by the ninth century Arabs had secured some mines for themselves under the leadership of a charismatic frontier filibuster Al-Omari (Power 2012). He brought with him the support of Arab merchants from Aswan and thus began the process of slowly Arabising the indigenous Beja, some of whom converted to Islam and would eventually form Arab-Beja confederations like the Hadareb. As in the Roman period, gold mining stirred up both conflict and co-operation in local nomadic groups. According to Yaqubi, the large gold mining hub of Allaqi was home to both Beja and Arabs, as well as to an undisclosed group of slaves who were forced to engage in mining (Vantini 1975: 77). Al Tabari mentions that the Beja and Arabs shared in the profits of the gold mines, later describing that in the time of the caliph Mutawakkil (AD 847–861) the Beja refused to co-operate with Arab gold miners, murdering a party of Arabs and ejecting them from the desert (Vantini 1975: 99).⁵ These historical sources demonstrate some of the complex dynamics that could take place at individual mines like Khor Rafit. It remains to be seen whether the archaeological record is paradigmatic of these patterns and dynamics, but even a preliminary study of Khor Rafit shows that this mine, in particular, was at least partially reliant on the support of the local nomads and of a multipolar world involving Roman and Arab Egypt as well as Post-Meroitic Nubia.

An Internationalised mining site?

Khor Rafit was both a strategic water stopping point and a gold-working area, giving it a unique profile in the Atbai Desert and more generally in Saharan archaeology. Taking into account the dates of the Blemmyean cemetery and Eastern Desert Ware ceramics at Khor Rafit, one putative model here would be that the earlier phase of mining in the mid-first millennium AD, coeval with the Blemmyean kingdom and the height of its power, was partly directed or run by this nomadic group yet nevertheless also integrated into Roman and Post-Meroitic exchange networks. This would later result in a new dynamic in the Arab period, particularly in Abbasid times, with much greater input from foreign Arab groups in the Atbai's goldfields. This must remain a model subject to further testing but corresponds broadly with the evidence at the site. Beyond mining, the site was a strategic outpost for the control of trade between Egypt and Nubia through the Korosko Road, and certainly travellers on this route stopped here on their north-south journeys. This pattern likely explains the repetitive use of the rock art 'boulder' on the pass. Prior to the first-millennium AD phase, seasonal habitations of the site should be construed around the favourable hydrological and pasturing conditions present in the Khor Rafit ravine, with successive phases of Neolithic and later pastoralists from the third to the first millennia BC utilising this vital water source and concomitant vegetation profiles. Viewed over the millennia, the site thus had ebbs and flows of nomadic occupation and foreign interest but was squarely situated in a nomadic zone of the Atbai Desert.

Notes

1. The word *khore* means 'dry water course' in Sudanese Arabic. The Topographic Map labels the site (NF 36-10 Murrat 1:250,000) as 'El Medina', Arabic for 'the city'. Hill (1956: 138) remarks that the site is labelled as such due to it being enclosed by mountains and thus resembling the famous Medina of the Arabian Peninsula. Cailliaud's (1827: II, 54) map calls the rainwater reservoir 'Medynet'.
2. From the remote sensing data thus far assembled by the Atbai Survey Project at Macquarie University (January 2025), this is by far the largest cemetery west of Wadi Gabgaba.
3. The word *akerataheil* is considered to mean 'hard-place' in the Beja language (Magid *et al.* 1997) but note should be taken that the word *akera* can also mean 'afterlife' in the Beja dictionary of Reinisch (1895: 12–13).
4. Australian Nuclear Science and Technology Organisation, code OZZ725, calibrated with OxCal v4.4.3.
5. Complicating this view, however, the historian Al Aswani states the opposite, namely that the Beja 'do not share in the extraction of these minerals' (Kheir 1989: 58).

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