

Sandro Salvatori, Donatella Usai and Andrea Zerboni

New Evidence from the Prehistoric Sites at Al Khiday and Al Jamrab, Central Sudan

Introduction

The relatively large Mesolithic mound named Al Khiday 3 (16-D-3; Fig. 1) has been often visited in the past years for surface survey, but only in the 2013 field season it was considered for a stratigraphic text excavation. This had the first aim of understanding its preservation condition, depth of deposit and archaeological potentialities. Apart for the upper part of the stratigraphy that resulted to be a colluvial deposit, as in other contemporaneous mounds along the White Nile and at Al Khiday 1 (16-D-5; Salvatori *et al.* 2011), an interesting anthropogenic stratification is here preserved.

A thick deposit of burned to fresh *Pila* sp. shells and intermixed ashy ground-mass, a proper shell midden, and some other features related to firing activities were identified. A first geoarchaeological study of the sequence including thin sections analysis has also been done to confirm preliminary archaeological interpretation of the good state of preservation of the stratigraphy and the functional interpretation of excavated layers.

Few dozen of meters to the south of Al Khiday 3, is a vast scatter of Neolithic material pertaining to a single phase. A systematic investigation was forwarded at this site in order to understand whether, even if eroded, features of the Neolithic



Fig. 1. Map of the area under concession of the Italian Archaeological Mission with location of sites mentioned in the text

period could be located in the area. The material recovered is noteworthy, however the interpretation of the evidence is not straightforward.

The Palaeolithic presence in the area of Central Sudan was attested until now only by surface evidence, traces of which were detected also at Al Khiday (Salvatori *et al.* 2014; Usai and Salvatori 2006). A different situation was recorded at Al Jamrab (Fig. 1), an area crossed by Wadi Al Hamra, just 8 km west of Al Khiday. A first preliminary exploration at the site revealed an in situ stratified Middle Palaeolithic site that produced hand axes associated to a single or opposed platform core exploitation technology. The geomorphological sequence revealed at the site has been studied in detail.

1. The excavation at Al Khiday 3 site (16-D-3)

A sounding of 4x4 m was made at Al Khiday 3 for checking the preservation condition of the archaeological deposit and its chronological setting.

Most of the Mesolithic sites along the Nile have been reused in Post-Meroitic times and this, together with natural and anthropic disturbances, produced mixing and pedoturbation of the original anthropogenic deposits and Al Khiday 3 had not escaped this fate. In fact, the upper part of the stratigraphy is composed of two different colluvial layers (Colluvial Layer 1 and 2; Fig. 2): one (20 to 30 cm thick) made of silt, sand and small gravel, sometimes packed, rising the doubt that it is partially resulting from collapse of very late mud-brick structures; the other (30 to 40cm thick) made of a mixture of ashes, aeolian powder and silt, very loose and un-structured. Both include archaeological material of various periods, dating from the Mesolithic to the Meroitic period.

These two units, however, were sealing a rather thick, in situ shell midden deposit (SU1; Fig. 2): a nearly 40cm accumulation of *Pila* sp. shells, with a lot of specimens of quite big dimensions, including also a minority of *Aspatharia* and *Ostrea*. The deposit is intercalated by thin (3 to 5 cm) levels of pure silts, attesting small period of interruption in shells accumulation. It also contained scarce faunal remains and human artefacts, especially well preserved Mesolithic pottery. Horizontal pottery deposition also confirms the in situ status of the deposit itself. This pottery seems to be, at least, partly contemporary to the Middle Mesolithic II phase identified at Al Khiday 2 (Salvatori 2012; Usai in press).

The shell midden deposit had been disturbed by more recent graves whose burial-pit may have been cutting through the colluvial sediments (Fig. 3). Four of

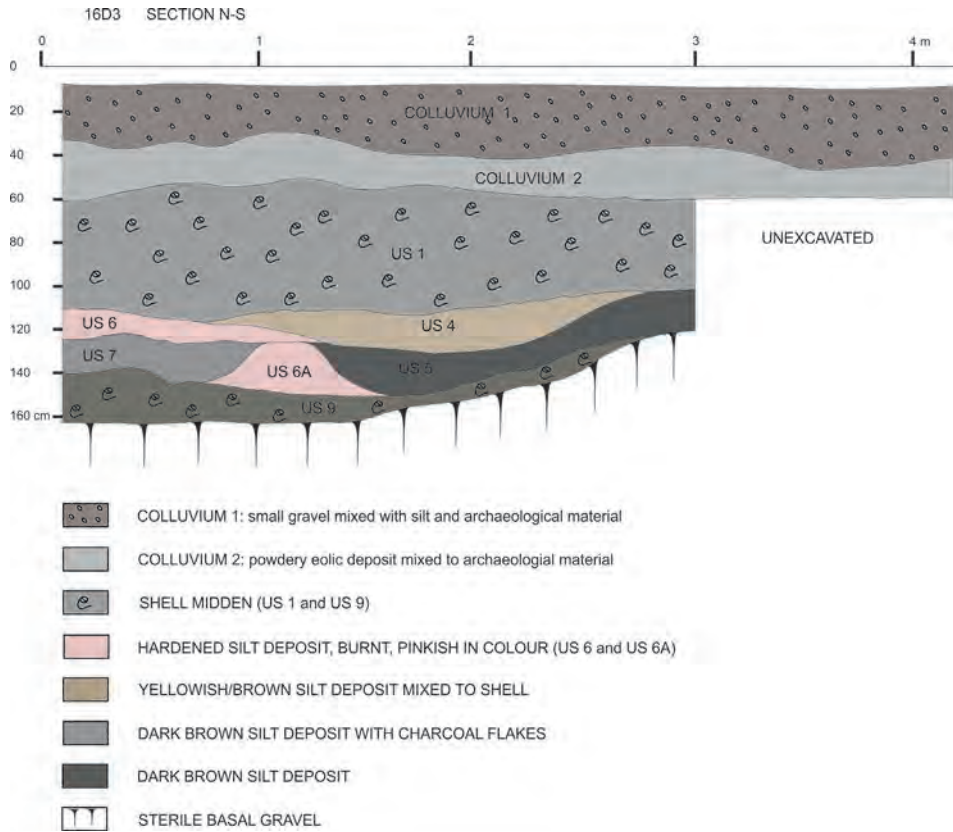


Fig. 2. North-south stratigraphic sequence at site 16-D-3

them were located but only two excavated, it is supposed they may be even Christian in age but this would need to be ascertained.

The shell midden deposit was overlapping a series of in situ deposits; among them a layer of silt mixed to small gravel that has certainly undergone heating (SU6; Fig. 2). Pinkish silt, often agglomerated and hardened, was found concentrated in the north-eastern corner of the trench. This included thin layers of burned silt and chunks of charcoal that have been sampled for ^{14}C dating. This soil concentration corresponds to a small depression whose interpretation is made arduous by the limits of the trench itself. However, few things were noticed that seem to suggest that the area could have been linked to some specific activities associated to pottery production: big nodules of yellow and red ochre, and a con-

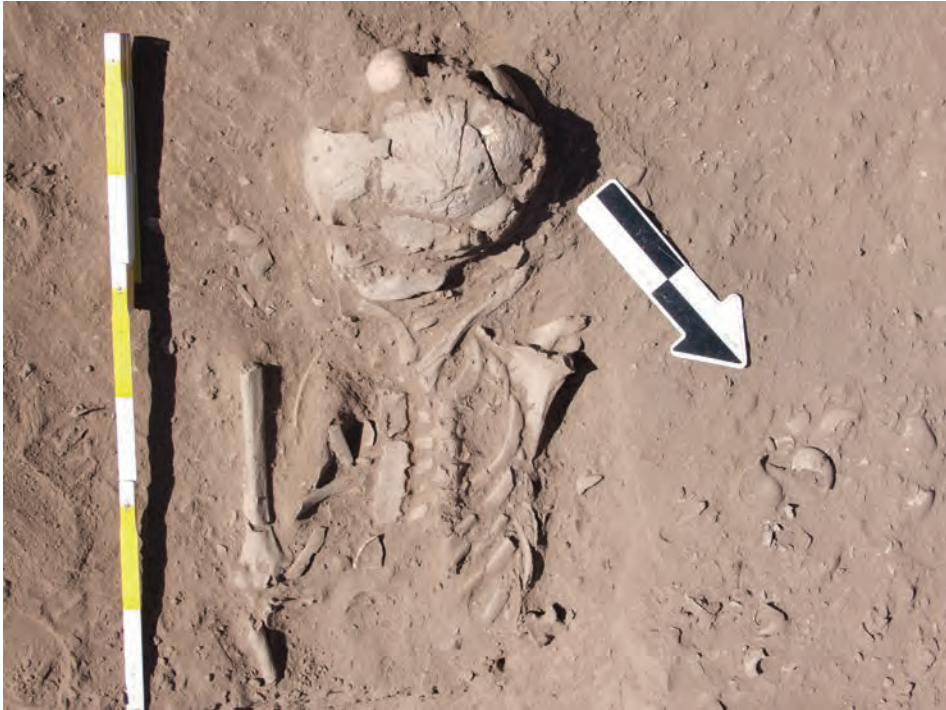


Fig. 3. A disturbed burial with partially preserved skull identified on top of SU1, the shell-midden deposit

centration of pottery fragments with rounded side that could have been used for polishing the pots during their making. The bottom deposit (SU9; Fig. 2) is another shell midden, which also includes pottery, lithic and other artefacts, and it is richer in faunal remains.

1.1. The geoarchaeological analysis

From the geoarchaeological point of view, the sequence shows many analogies with the one studied at 16-D-5 (Zerboni 2011); it consists of an upper macro-unit composed of two distinct mixed layers, overlaying a well-preserved stratigraphic unit dating to the Mesolithic period. The upper units can be defined as a complex of mixing due to anthropic bioturbation and colluvial processes, acting after the Mesolithic exploitation of the site. These layers have an abundant fine matrix with interspersed bones, lithics and vertically tilted Mesolithic to Meroitic sherds. Beneath, we can identify a thick in situ deposit, grey in colour, very rich in shells

and bone fragments; this layer is generally clast-supported, as the fine ashy matrix is generally poorly represented; it can be interpreted as a shell midden with fish bone fragments. The lowermost part of the sequence includes some layers displaying evidence for fire activity (calcitic ash and heated sediments) interlayered with lenses of clast-supported accumulation of *Pila* sp. shells.

Some samples for micromorphological analysis have been collected from the well-preserved Mesolithic layers; in particular, very interesting is the observation under the microscope of the shell midden (SU1). The deposit of SU1 consists of a huge concentration of shell fragments and few large and small bone fragments (mostly fish), included in a poor fine matrix. The latter consists of two different materials (Fig. 4): a less represented, very loose, clay+amorphous organics matrix and a dominant micritic (micro-calcite) matrix. The first corresponds to

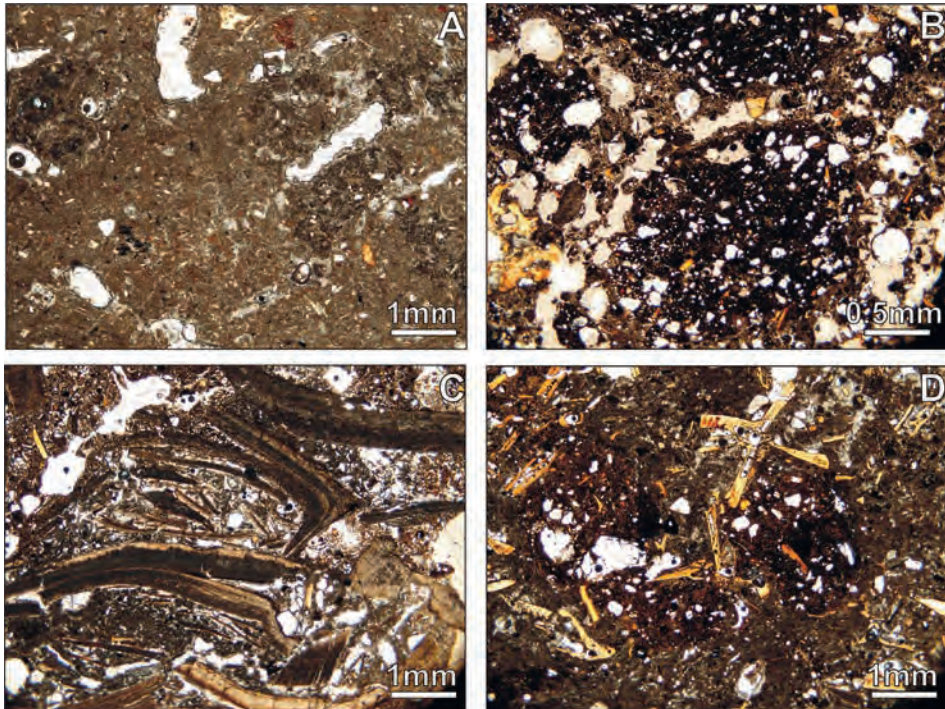


Fig. 4. Photomicrographs of the shell midden of SU1: A – wood ash-rich matrix; B – clayey micromass with abundant amorphous organic matter; C – detail of a shells accumulation (shells occasionally show in situ breakage); D – concentration of bone fragments

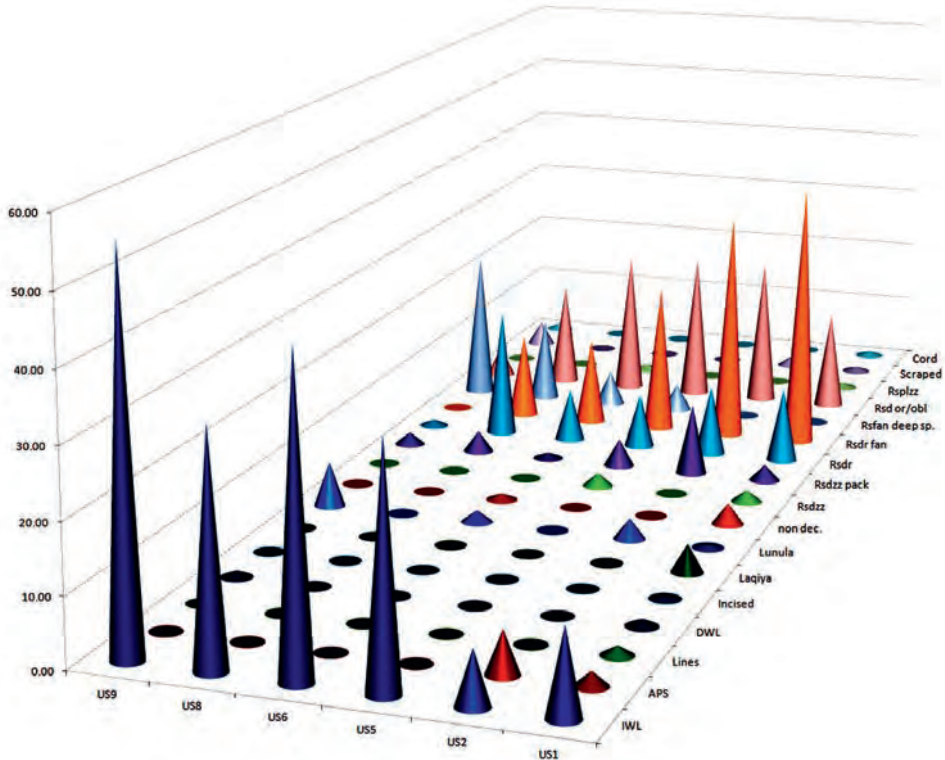


Fig. 5. Graphic showing distribution of pottery decoration types along the stratigraphic sequence of Al Khiday 3 (16-D-3)

the reworked sediments of the area (Fig. 4A), while the latter originated after the re-crystallization of wood ash. Moreover, the ashy matrix (Fig. 4B) is very rich in microcharcoals and phytoliths (single, in bundles or in chains), which displays in many cases evidence for heating (bubble phytoliths). The coarse fraction of US1 consists of few quartz grains and heated pedorelicts and very common to abundant bone and shell fragments; these in many cases display evidence for heating and are effected by calcium carbonate-bearing pedofeatures (Fig. 4C-D).

On the basis of these data, it seems reliable to interpret the SU1 as a midden, originated since the accumulation of shells, bones and ash after the cleaning of domestic fireplaces. Moreover, the micromorphological study confirms that this layer was found in situ; in fact, in many cases elongated features (shells, bone fragments, charcoal lenses) are oriented according to planar layers and display in situ breakage, which are characteristic of occupational trampling (Fig. 4C). A further



Fig. 6. Fragments of pottery from SU9, pertaining to the Early Mesolithic phase; it includes Lunula (A-B) and Incised Wavy Line fragments (C-D)



Fig. 7. Fragments of Laqiya pottery from Al Khiday 3

shell midden-like deposit is located at the bottom of the sequence (SU9) and displays almost the same properties, but it includes a larger quantity of fish bones.

1.2. The analysis of the pottery

Regardless the limited size of the test trench and some anthropic disturbances the sequence of 16-D-3 site is consistent with that recovered from 16-D-5 and 16-D-4 sites (Fig. 5; Salvatori 2012: Figure 15). Stratigraphic Unit 9 pottery is characterized by Lunula (Fig. 6A-B) and Incised Wavy Line decoration types (Fig. 6C-D) well at home in the oldest layers at 16-D-5. The C^{14} determination from SU9 (Beta-376245: ^{14}C dated 7980 ± 50 uncal. BP) confirms the chronological position of those distinctive decoration types. Pottery from SUs 8, 6, and 5 shows a progressive transition from the Early to Middle Mesolithic as known at 16-D-5 (Salvatori 2012). SUs 4 and 2 pottery is comparable to the Middle Mesolithic phases at 16-D-4 and finally SU1 (Beta-376244: ^{14}C dated 7300 ± 30 uncal. BP) covers the end of the VII millennium cal. BC and is characterized by an increasing presence of Laqiya decoration type (Fig. 7) that makes its first appearance in SU4. This decoration pattern continued to be in use also later as suggested by its abundant presence in the un-stratified colluvial layer 2.

The pottery distribution along the 16-D-3 sequence follows the same trend we documented at 16-D-5 with an abrupt disappearance of the Lunula decoration, a progressive decreasing of the IWL and Rocker stamp deep and spaced fan and the increasing of Rocker stamp dotted zigzag packed, Rocker stamp drops and the appearance at the end of the sequence of Alternately Pivoted Stamp decoration motives (Fig. 5).

The use of ochre coating is here attested all along the sequence while some sherds from SU1 show ochre painting applied with a brush (Fig. 8). Most of pottery is from micaceous clay and tempered with feldspar and crashed quartz (IWL, Rocker stamp dotted zigzag packed, APS) and with different amounts of sand together with calcite and ochre particles often with addition of vegetal materials (all other types). Temper recipes are highly variable in the quantity of added materials and in the size of sand granules suggesting a household production.

In addition to pottery, it is noteworthy the presence in SU9 of a number of sandstone grinders often bearing traces of ochre (Fig. 9), hammers, fragmentary rings, side scrapers, yellow and red ochre pebbles and several sherds reused as polishers (Fig. 10) supporting the suggestion of an activity area.



Fig. 8. A – fragments of pottery decorated with a rocker stamp pattern showing in the internal surface a sort of painting, or red colour applied with brush strokes (see contrasted Photo B)



Fig. 9. Sandstone grinding stone bearing traces of red ochre



Fig. 10. Potter's polisher made from fragments of pottery

2. Systematic and extensive excavation at the Al Khiday Neolithic site 16-D-6.

The site was discovered in 2009 and it is located ca. 50m SW of Al Khiday 2 cemetery (16-D-4). It appears as an immense scatter of pottery, lithics, grinding stones and faunal remains and has a single-phase occupation. It has been widely disturbed by animal trampling because a group of herders occupies this area as seasonal encampment. Two trenches were opened: Area 1 and Area 2 (Fig. 11).

A first rectangular area of 5x15m, Area 1, was located where the denser concentration of Neolithic material was observed on the surface and disturbance was assumed to be limited. A grid of 1x1m was established and archaeological material visible on the surface was gathered to keep under control the distribution of the material in relation with possible eroded features. This material was connected to a thin layer of yellowish-ochre sand covering all site surfaces. Under this crust a light-brown silt deposit was brought to light where numerous concentrations of pottery, lithics, grinding stones and faunal remains were observed (Fig. 12). Possible post-holes were identified some showing a sort of alignment (Fig. 13). This silty deposit was identified almost everywhere, but it tended to be rather thin in the southern part of the area. To keep the distribution of the material constantly under control the excavation of this deposit, SU1, proceeded by square meters. This stratigraphic unit never exceeded 20cm in thickness being, as already mentioned, extremely thin in the southern part of the area. No other feature was

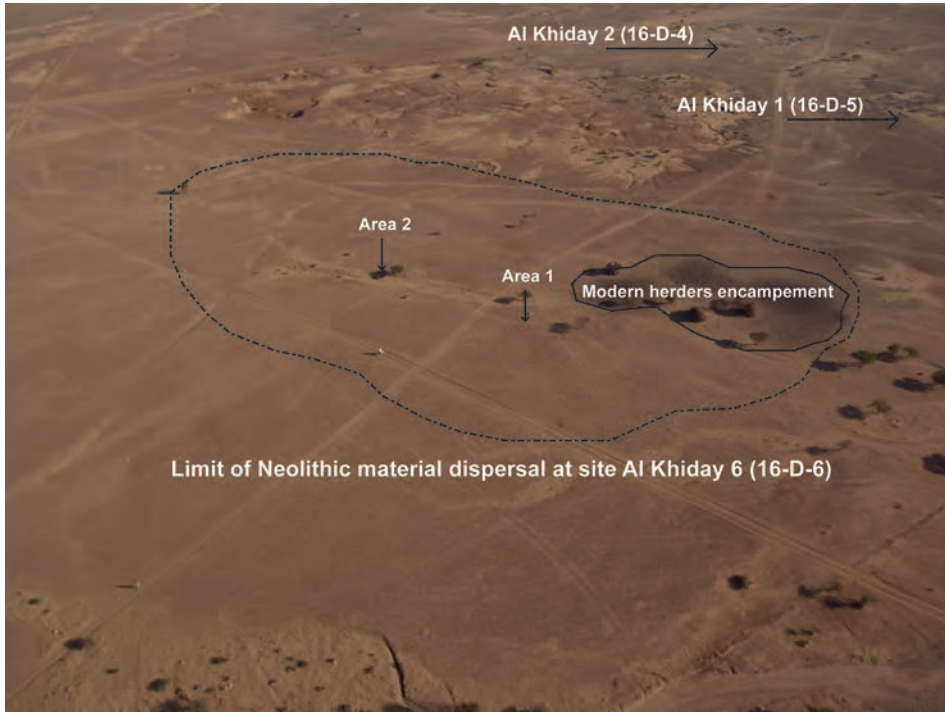


Fig. 11. Kite photo of the area of Al Khiday Neolithic 16-D-6 site (Al Khiday 6)

clearly visible in this SU, but several concentration of pottery quite often refitting in quite big pot portions (Fig. 12). In the first squares, in the northern part of the excavated area, once removed the silty deposit a circumscribed burnt area was located, SU3. All over the area under SU1 a sandy-clay reddish-brown deposit was brought to light, some of the post-holes identified at US1 level were cutting through it.

Afterwards another trench, 5x10m, was opened few meters to the N-E of Area 1 and labelled Area 2. A dense scatter of archaeological material was noticed also in this area, part of it eroding on a slightly sloping edge because of a small *khorr* incising the surface. Some post-holes were identified also in Area 2 and a small fireplace containing ashes and a fragment of a grinding stone. Collection of archaeological material was done, also in this area, according to an established grid of 1x1m.

Other operations were forwarded at the site to test the reliability of identifying any other possible feature connected to the Neolithic occupation: regular square areas, nearly 5x5m, were scraped haphazardly within the site extension. The sys-

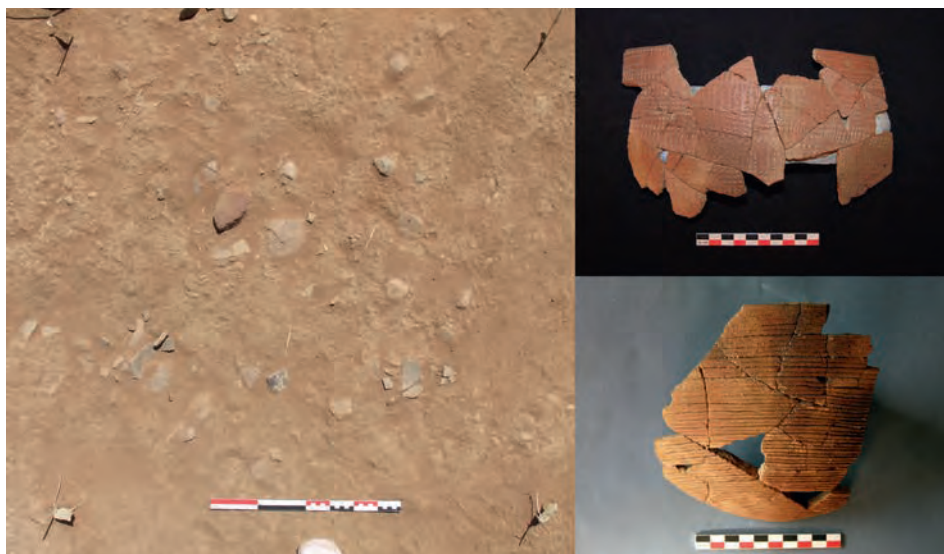


Fig. 12. One of the concentrations of pottery located in Area 1 and two of the reconstructed incomplete pots here recovered

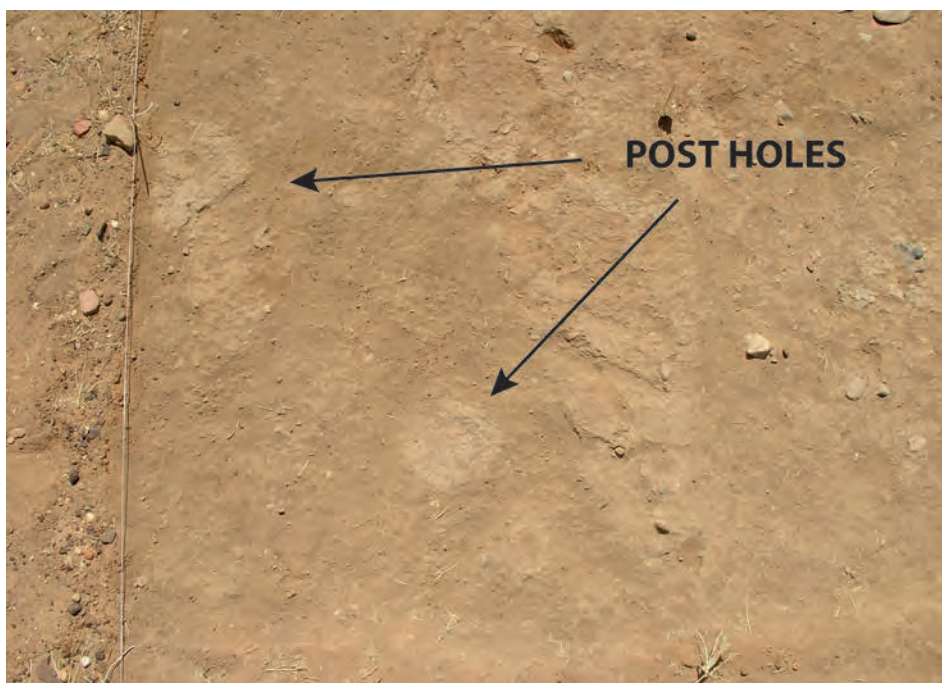


Fig. 13. Two of the several post-holes identified at Area 1



Fig. 14. The grave recovered in the north-eastern corner of Area 1 at Neolithic site Al Khiday 6 (16-D-6)

tematic excavation and these scraped surfaces proved that the site has suffered from quite a strong erosion and apart from post-holes and the concentrations of archaeological material nothing more has been preserved.

However, more operations at the site are planned in the future to better understanding the origin of the immense scatter of Neolithic archaeological material. In fact, a complete grave was found in the NW corner of Area 1 (Fig. 14) and other possible remains of human skeletal material in Area 2. If the area had also been used as a cemetery, this would better explain the circumscribed concentrations of pottery fragments, often refitting, localised in both areas. Apart from the identified post-holes and a small fireplace containing a fragment of a grinding stone, nothing much related to a living surface was located in the area, not even at a very eroded stage of preservation.

3. Geoarchaeological investigation at Palaeolithic site 16-B-3, Al Jamrab

3.1. *The stratigraphic context*

Some in situ Palaeolithic artefacts were identified during the geoarchaeological survey carried out in 2012 in the area west of the Al Khiday sites. This very surprising evidence, at moment unique for central Sudan, was discovered along the Wadi Al Hamra (Fig. 15). Therein, the wadi cut exposes a very interesting stratigraphic section of the pediment east of the Jebel Maddaha in the vicinity of the Hillat Al Jamrab (Fig. 16A-B). The abundance of lithic artefacts dotting the exposed surface suggested planning a more detailed investigation, including the opening of a test trench to check the archaeological potential of the deposit.

During the 2014 field season, a long part of the Wadi Al Hamra was surveyed in detail and the bed of the river and the banks were both checked by foot to locate the main concentrations of Palaeolithic artefacts. The most indicative have been photographed and in some cases collected for drawing and studying. The geologi-



Fig. 15. View of the area of Wadi Al Hamra; dashed line indicates dispersal of lithic material

cal formations outcropping along the wadi have also been observed, in order to identify the layers or strata displaying the highest concentration of archaeological remains.

The stratigraphic sequence appears discontinuous as along the wadi recent fluvial activity have removed part of the sedimentary sequence. A second feature, which made difficult the interpretation of the geological context hosting Palaeolithic artefacts, is represented by the many discontinuities in the stratigraphy and the recent cover of fluvial sand. The latter made impossible to follow the stratigraphic record along the wadi, while the occurrence of stratigraphic discontinuities put in contact sedimentary units, which are not in continuity. The stratigraphic sequence, reconstructed on the basis of many field observations, consists at the top of a layer of laminated aeolian sand. Below, we notice a thick and well-cemented layer (up to 1 m) of red fluvial/alluvial sand, showing a high degree of weathering at its top, which is richer in clay and manganese nodules. An erosional surface represents the boundary to the subsequent layer of grey fluvial silt and sand; this sediment is moderately to weakly cemented and displays evidence for a long standing of the water table. A layer of greenish, hydromorphic silt and clay follows; it is deeply cemented by the occurrence of calcium carbonate nodules, locally greater than 1 cm. This kind of sediment was formed in a low-energy environment, possibly by decantation in a marsh or lake; it has many analogies with the Upper Pleistocene lacustrine formation described in the region by Williams *et al.* (2015). The lower boundary of this layer is wavy, possibly due to an erosive event affecting the following deposit, which includes at its top the Palaeolithic artefacts. This unit consists of fluvial sediments displaying an upward fining trend; in the lower part a gravel-bearing (clast to matrix supported) deposit is present, becoming sandy to clay toward the top. This unit has to be considered as originating by the same fluvial process, with progressive decreasing energy. Moreover, the upper part of the layer, where artefacts are entombed, is represented by a concentration of calcium carbonate and Fe/Mn-rich concretions, cemented by calcium carbonate (Fig. 16C-D-E). The upper part of this layer consists of a paleosol, developed under environmental conditions wetter than today and it can be interpreted as the topographic/occupational surface at the time of the Palaeolithic occupation of the region. The lower boundary of this unit is also wavy, due to the occurrence of an erosive surface at the top of the following deposit, which is represented by deeply weathered sandstones. This unit possibly corresponds to an Early Quaternary (or earlier?) paleosols developed on the sandstone outcropping in the region due to pedogenesis under pluvial environmental conditions.

Samples for OSL dating have been recovered from the stratigraphy; they are under measurements, but results are not yet available, however some preliminary chronological suggestions can be advanced based on the stratigraphic observations made in the area. The same stratigraphic sequence observed at Al Jamrab is exposed (with different thickness and in many cases discontinuously preserved) at Al Khiday. Therein, the grey-greenish fine sediments have been recently interpreted as the result of lake sedimentation occurred in the Pleistocene (Williams *et al.* 2015). Many lakes were active in the central Sudan in the middle and upper Pleistocene; the one (or ones) active between Al Khiday and Al Jamrab after the Palaeolithic exploitation of the region can be dated, according to the results of some OSL analysis, at least between 70 and 40 Kyr BP (Williams *et al.* 2015). We may consider the oldest of the OSL dating (69 Kyr BP) as a limit ante quem for the exposure of the topographic surface of the paleosol and therefore for its occupation during the Palaeolithic. This deposit may correlate to the green olive clays that Williams *et al.* (2003) identified at Esh Shawal, which were left by the big White Nile lake that extended over the basin in the late Middle and Late Pleistocene period (Usai in press); for that reason, the Palaeolithic occupation of the region may be ante-dating this formation.

3.2. The excavation at Al Jamrab

After a preliminary inspection of the wadi a first test trench c. 2x2m was opened, starting from the left bank of the wadi and in a point where the red fluvial/alluvial sand (sterile deposit), that can be as thick as 1m, had been naturally eroded and didn't exceed 20cm. A surface deposit of laminated aeolian sand and residual stones was covering the 20cm thick layer of red to grey alluvium. Once this last one had been removed, the erosive surface of the paleosol was brought to light. A deeply cemented layer of carbonatic concretions represents the paleosol and it lies upon the deeply weathered sandstone of the bedrock. A second test trench was excavated on the left bank of the wadi, where erosion had almost completely brought to light the paleosol and a concentration of artefacts was visible on the sloping front.

The interpretation of the Palaeolithic occupation of central Sudan offered by archaeological evidence from Al Khiday and Al Jamrab may shed new light on one of the most intriguing issue of the Palaeolithic of northern Africa: the dispersal of the modern humans in the Middle-Late Pleistocene.

The lithic assemblage recovered, considering surface and in situ collection, includes several hand-axes, cores, and 83 pieces of débitage (Table 1). Débitage

Table 1. Al Jamrab. Data on flakes and blades

	Flakes	Blades
Unidentifiable	11	
From spc	42	
From opc	3	
From 90°c	7	
From mpc	16	1
Total	79	1
Unidentified platform	5	
Flat platform	51	1
Dihedral platform	4	
Pointed platform	1	
Faceted platform	4	
Total	65	1
Sandstone	64	
Mudstone	13	1
Chert	1	
Quartzite	1	
Total	79	1

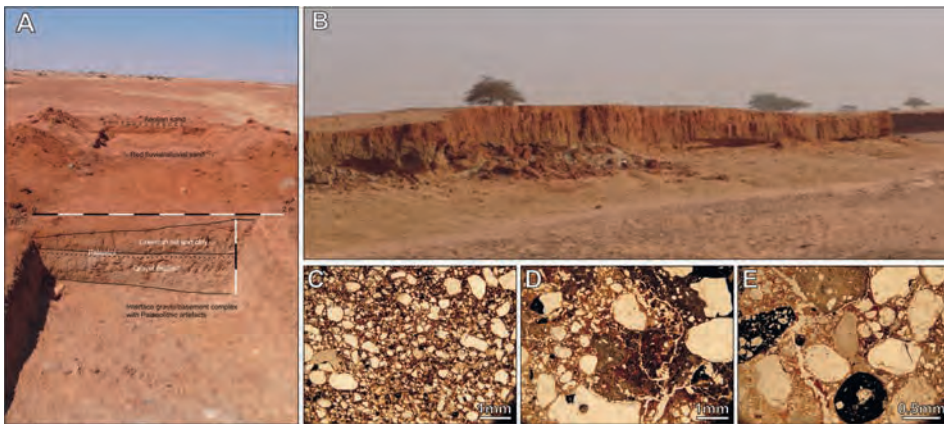


Fig. 16. A – the stratigraphic section excavated at Al Jamrab and (B) a view of the geological section exposed along wadi Al Hamra. Photomicrographs represent: C – the rubified clay and interspersed quartz sand of the paleosol; D – detail of a strong Fe-bearing impregnation; E – quartz grains and iron nodules cemented by calcium carbonate

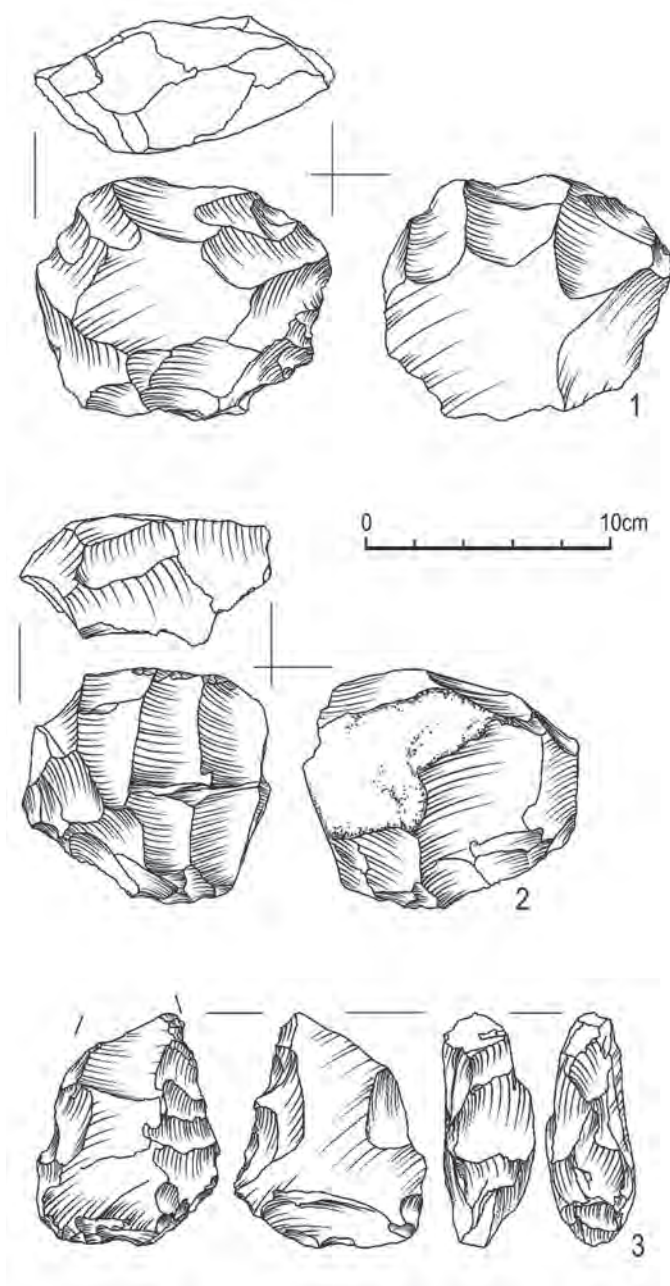


Fig. 17. Single and opposed platform cores from Al Jamrab



Fig. 18. Hand-axe from Al Jamrab

Table 2. Al Jamrab. Metrical data of flakes

Flakes	Length mm	Width mm	Thickness mm
Minimum	12.00	17.06	4.36
Maximum	68.64	80.42	30.87
Average	37.25	35.94	10.73
N° of pieces	40	71	71

accounts for a total of 80 pieces of which only one is a blade. Flakes (Table 2) are mainly from single platform core (N°=42), multiple platform flakes and ninety-degree core follow (respectively N°=16 and N°=7); most flakes display a flat platform (N°=51), dihedral and faceted platforms are poorly represented. Only one of the flakes can be possibly related to the Levallois technology, but in general flakes with centripetal scars are scarce. The single blade recovered is from multiple platform core, has a flat platform and is made of mudstone. Cores are of different types, discoidal, single and opposed platforms (Fig. 17). Important findings at Al Jamrab are handaxes (Fig. 18) and a cleaver. Denticulates, retouched pieces and heavy-duty tools were also recovered.

Material sometime has a white carbonatic film crust (due to post-sedimentary pedogenetic processes), but lithics generally when this is absent look not-abraded with fresh edges.

At moment, stratigraphic correlations with OSL-dated sequences and available elements are considered un-sufficient to define properly the Al Jamrab lithic assemblage; except that an Early Middle Palaeolithic/Middle Stone Age attribu-

tion seems the most probable if observations on stratigraphic relationships are considered together with the presence of hand-axes and apparent absence of strict Levallois technology. Relevant well preserved Palaeolithic contexts were recently recovered in the north of Sudan at Sai site 8-B-11 (Rots and Van Peer 2006; Van Peer 2004; Van Peer *et al.* 2003) and in the Atbara, in the Kashm El Girba Synthem (Abbate *et al.* 2010), with late Acheulean to Middle Stone Age artefacts in clear chronological sequence.

4. Concluding remarks

The work at Al Khiday is providing continuous updates on the Mesolithic period of Central Sudan. Among the important results, widely illustrated in previous papers, some are: the discover of a Mesolithic structured village, with “houses” and other features, i.e. pits of different functional destination (Salvatori *et al.* 2011, 2014; Usai in press); the recovery of data regarding plant gathering, one of the activity frequently associated with these populations, but until now attested only by the presence of grinding equipment or at best by seeds’pottery impressions (Buckley *et al.* 2014); an internal evolution stigmatised by the pottery production (Salvatori 2012).

Characteristic elements in the earliest pottery production of this location in Central Sudan is the Lunula type pottery and associated types which are basically unknown in other sites explored until now¹.

The excavation at the Mesolithic Al Khiday 3 mound has incremented our knowledge of the general sequence with a phase, dating to the end of the VII millennium BC, characterised by the Laqiya type pottery, firstly recognised in the Wadi Howar region (Jesse 2000, 2003). The work at this site has also implemented our knowledge of the subsistence economy. In fact the identification of the shell midden deposit enlarged our perception of the importance of molluscs as an element of the diet of Mesolithic people. Phytoliths present in the shell midden deposit hopefully will provide a wider insight on the vegetation and eventually on the plant consumed in that period.

The meagre results of the investigation at the Neolithic site 16-D-6 need careful interpretation and we do not think it is yet time to afford any conclusive statement. At moment we can just affirm that it provided an interesting set of archaeological material to be studied. The faunal remains, in particular, will serve to

¹ Some examples of Lunula type pottery were found by Arkell at Khartoum Hospital (Arkell 1949: Pl. 77.2)

complete the sequence of animal exploitation from the Mesolithic to the Neolithic that can be reconstructed thanks to the exceptional well preserved sequence revealed at Al Khiday sites.

Among the positive recent results of the work in the region we can certainly include the discovery of Al Jamrab (16-B-3) Palaeolithic site. Cultural and chronological interpretation of the site are left pending until OSL dates will be available as well as other materials from continuation of the archaeological activity. In fact, our impression now is different from that gathered from preliminary observations based only on surface collections. The overall material is not enough for associating the lithic assemblage to any of the specific cultural facies of the late Early Palaeolithic or Early Middle Palaeolithic; moreover, the exploration at the site has been too limited for fully understanding the formation processes and chronology of the paleosol preserved at Al Jamrab.

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