Sabaloka (West Bank) Research Project

Exploration of the site of Sphinx (SBK.W-60): findings of the 2014 and 2015 field seasons

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Background and aims

In the autumn of 2014 and 2015, the expedition of the Czech Institute of Egyptology (Faculty of Arts, Charles University) continued its interdisciplinary exploration of the late prehistoric occupation on the west bank of the Nile at Jebel Sabaloka and the Sixth Nile Cataract.[2] In both field seasons, attention was focused on further investigation of the promising site of Sphinx (SBK.W-60) located in the north-western foothill zone of the *jebel c.* 3.5km from the Nile (Plate 1). The site is situated *c.* 425m above sea level at the top of a granite outcrop. Its elevated position *c.* 15m above the surrounding terrain, the clear view it commands, and the 'rampart' of rocks that encircles and protects the site, make its location of some strategic importance. The roughly crescent-shaped settlement platform (approx. 940m^2) is divided naturally into southern, central and northern parts. Perpendicular to the central part are two tongue-shaped areas gently sloping from east to west: the northern and southern shelters (Plate 2).

Following its discovery by the Czech mission in the autumn of 2011, a brief surface survey was performed and two test pits (Trenches 1 and 2) were excavated in the central and southern parts of the settlement platform respectively, to ascertain the character and thickness of subsurface deposits and general potential of the site for exploration (Plate 3). During the 2012 season, Trench 2 in the southern part of the platform, where a human burial (B.1) had been detected in 2011, was extended to 20m^2 in order to explore the broader context of the grave. In addition to attesting to the presence of thick settlement deposits, 24 burials (B.1-B.24) were unearthed. Based on the burial rite, presence of a carbonaceous crust (or *kankar*) on the bones, and AMS ^{14}C dating of bivalves found in direct contact with three of the skeletons (B.1, B.4 and B.5), the burial activities at the site were tentatively dated to the Mesolithic. Furthermore, Trench 1 of 2011 (500 × 400mm) was extended by 500 × 500mm to obtain another sample of the subsurface concentration of molluscs uncovered in the previous season, and another two trenches, each measuring 1m square, were excavated in the central (Trench 3) and northern (Trench 4) parts of the site. The results of these excavations were briefly published in this *bulletin* (see Suková and Varadzin 2012a) and elsewhere (see Suková and Varadzin 2012b; 2013; Suková *et al.* 2014; Sůvová and Suková 2014).

The next phase of exploration of the site in 2014 and 2015 focused on a detailed study of post-depositional processes as the previous seasons made it clear that the stratigraphic picture of the deposits had been obscured by secondary homogenization. In connection with this we aimed at establishing a suitable set of methods for direct as well as indirect identification of stratigraphic units (SUs). We also concentrated on further excavation of the burial ground in the southern part of the site to ascertain its size, internal layout, and dating. At the same time, we wished to test a hypothesis, formulated on the basis of the previous sounding, that the central and northern parts of the site had not been used for burials. Parallel to these tasks, we planned to collect other evidence to further our understanding of the former human activity at the site.[3]

Methods and approaches

To address these issues, six trenches with a total area of 26.5m^2 were excavated in 2014 and 2015 in the southern and central parts of the site and in the northern shelter (Plate 3). The trenches were divided into squares 1 × 1m in size (or smaller) and the deposits were excavated in subtle horizontal sections (mechanical units, MUs) of no more than 50mm in thickness. Where stratigraphic units (SUs) – layers or any fixtures (features, structures) – could be detected, the stratigraphic excavation method was employed. Most of the excavated soil was dry-sieved using a 4mm mesh, with a 2mm mesh used for selected contexts in Trench 8. Concurrently, systematic collection of samples for archaeobotanical (pollen, macro-remains, phytoliths) and geoarchaeological (chemical, micromorphological) analyses was pursued. Detailed photo-

[1] Unless specified otherwise, all photographs and drawings are by Ladislav Varadzin.

[2] In 2014, the field season lasted from the 15th October until the 4th November. The research team consisted of Aleš Bajer (geologist), Murtada Bushara (NCAM inspector), Kristýna Kuncová (archaeobotanist), Lenka Lisá (geologist), Jon-Paul McCool (geologist), Jan Novák (archaeobotanist), Jan Pacina (surveyor), Adéla Pokorná (archaeobotanist), Petr Pokorný (palaeoecologist), Lenka Suková (research director), Ladislav Varadzin (excavation director), and four trainees – Safaa Ahmed Mohamed and Reemah Abdelrahim Kabbashi (NCAM) and Hanaa Mohamed Hamid and Huyam Mohamed Alamin (University of Bahri). In 2015, the season lasted from the 5th-29th November. The fieldwork was performed by Katarína Čuláková (lithics specialist), Marie Peterková Hlouchová (finds registrar), Petr Pokorný (palaeoecologist), Jaroslav Řídký (ground stones specialist), Sarah Abdulatif esh-Sheikh (NCAM inspector), Zdeňka Sůvová (archaeozoologist), Ladislav Varadzin (excavation director), Lenka Varadzinová Suková (research director), and four trainees – Abud Adam Hamid, Bella Hajj Mohamed and Tafa'u Rafi' Ahmed (NCAM) and Saba Suleiman Murkez (University of Bahri). During both campaigns, the logistics was arranged by Tumbus Tourism Co., Ltd., with Saleh Mohamed Saleh and Osman Abdalla as drivers and Mahmoud Almahi Altayeb and El Nour Abdalla Galab as cooks.

[3] In 2014, extensive (palaeo-)pedological and (archaeo-)botanical surveys were performed alongside the excavations at Sphinx. For overviews and results of these surveys, see Lisá *et al.* (2017) and Pokorná and Kuncová (2015), respectively.

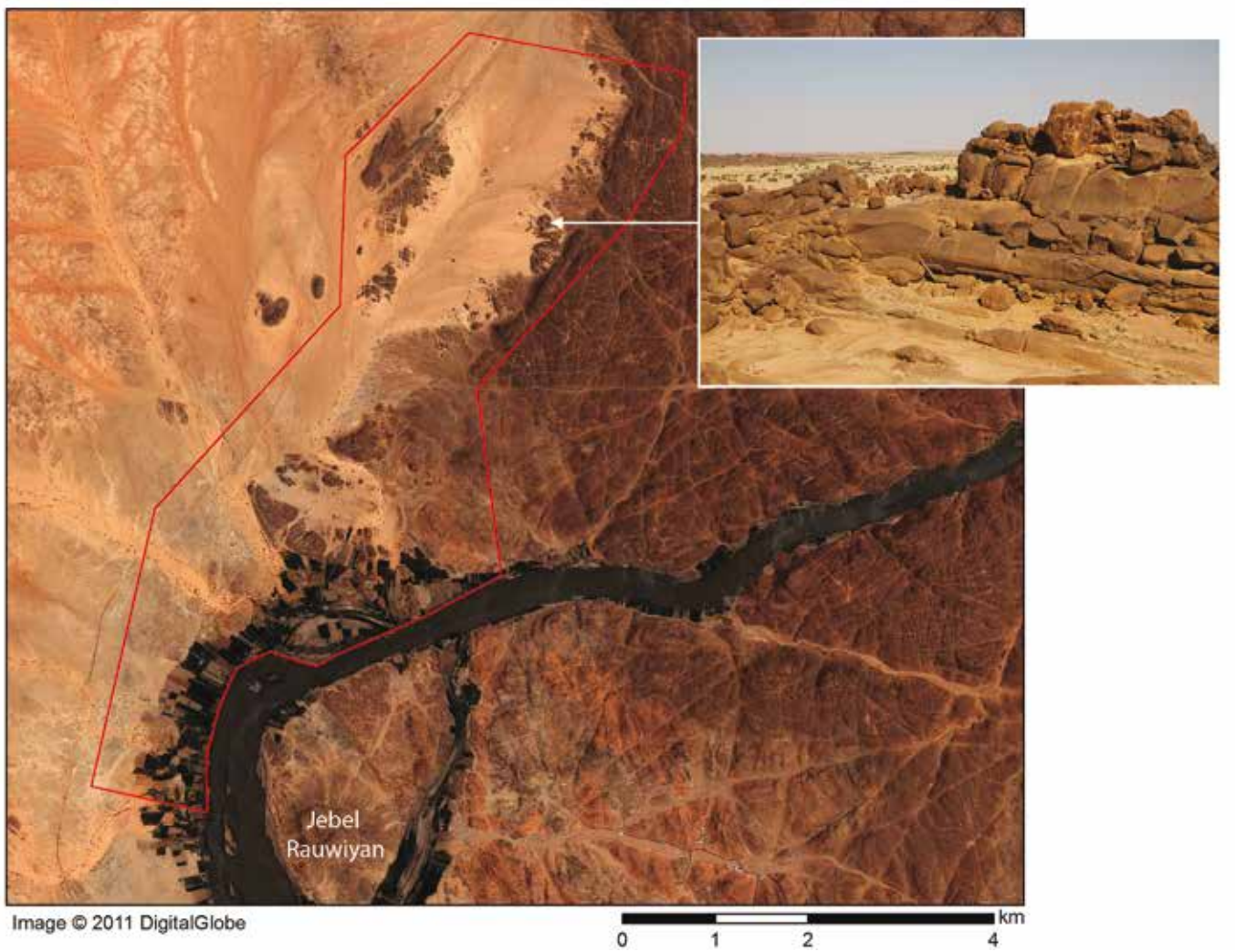


Plate 1. The site of Sphinx (SBK.W-60) in the north-western foothill zone of Jebel Sabaloka, with a close-up of the southern part of the platform. View from the south east (background Google Earth 2011).

graphic and drawn documentation was produced, with especial attention paid to the vertical or inclined position of stones and artefacts. Selected find situations were documented by means of stereophotography (Pacina 2015). All artefacts and ecofacts were recorded using a system reflecting the location in a particular SU, MU and sector of the trench. All six trenches were excavated down to the bedrock.

Main findings[4]

Trench 5 (7.5m^2, max. depth 0.9m) explored in 2014 was located at the north-eastern edge of the southern part of the settlement platform on the opposite side of the supposed burial ground from Trench 2. Beneath the surface layer (20-50mm) consisting of weathered granite fragments mixed with numerous artefacts and ecofacts (SU1), 17 deposits differing in colour, texture, and compactness (SU2-SU18) were recorded (Plate 4). Some of these were further subdivided into two (e.g. SU9: A, B) to five (e.g. SU11: A-E) subunits to account

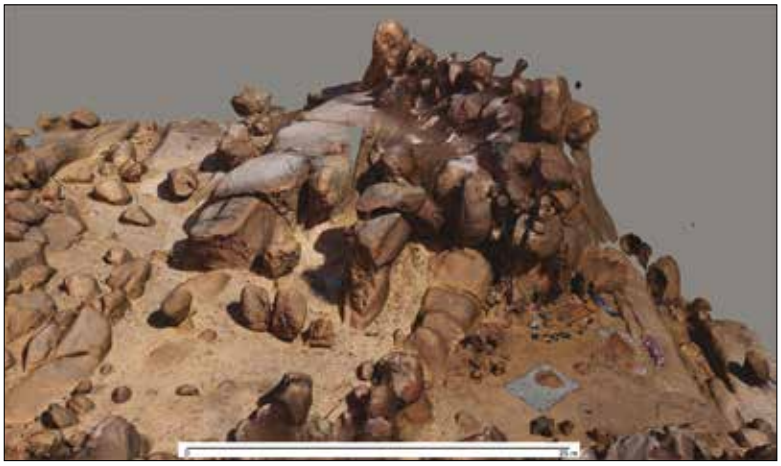


Plate 2. View from the west of the settlement platform at Sphinx, with its northern, central and southern parts and the northern and southern shelters (3D model based on KAP by J. Pacina, 2014).

[4] The main archaeological findings of the two seasons have been briefly overviewed in Varadzinová Suková and Varadzin 2015, Varadzinová Suková *et al.* 2015 and Varadzinová *et al.* 2016.

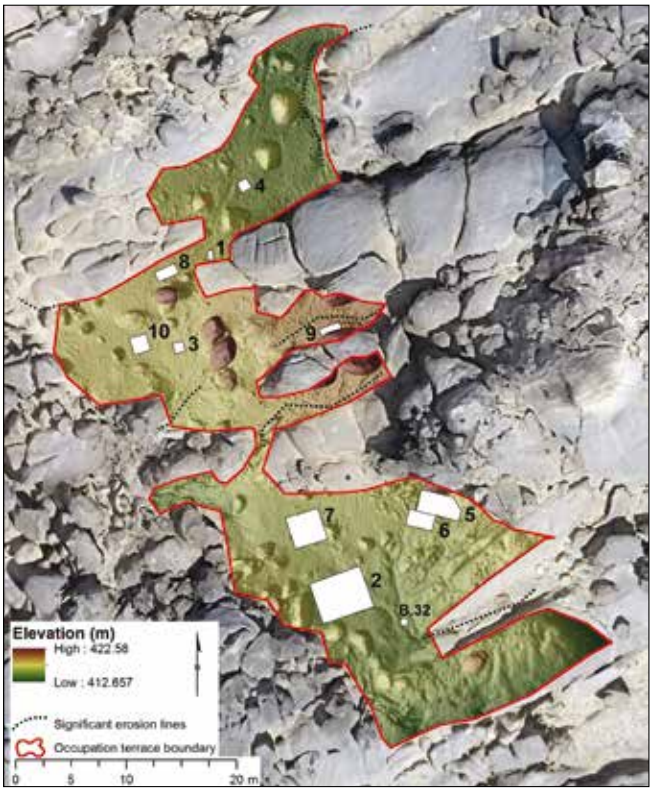


Plate 3. Plan of the settlement platform showing the locations of all trenches excavated since 2011 and the location of burial B.32 by the southern edge of the site (background by J. Pacina, 2014; updated by L. Varadzin, 2017).

for finer differences. However, already in the course of excavation it became evident that most of the units did not correspond to the original strata and were the result of post-depositional processes (see below).

The deposits were found to contain 11 burials. Of these, B.25-B.31[5] rested on the solid granite bedrock in the south-eastern half of the trench at a depth of only 150-350mm (Plate 5). Two of them were in a contracted position on the left side, with the head to the east, facing south (B.25) or south east (B.26). Another two of the deceased (B.29, B.31) were laid on their right side, but the position of the bodies is uncertain due to advanced fragmentation; at this point, no information as to position can be given for the remaining disturbed and incomplete burials (B.27, B.28 and B.30). In the same area, we recorded five groups of loose human bones that may indicate the former presence of earlier, now entirely destroyed burials (loose bones 1/2014-5/2014). Further from the natural subsurface 'bench' formed by the granite bedrock, four human skulls (B.33-B.36) were uncovered in the south-western section of the trench at a depth of *c.* 500-750mm. They rested one on top of the other (with the calvarias of B.33 and B.35 touching) and were weighed down by several granite cobbles (Plate 6). They appeared to be part of a quadruple burial consisting of individuals interred at the

[5] The numbers assigned to the burials continued the sequence introduced in 2012.

Plate 4. Trench 5 during excavation, with feature F.1/14 of unknown function (view from the north west).

same time in one grave. No funerary offerings were found in association with any of the deceased. Three fragmentary bivalves were collected from the vicinity of the head of B.33 (see Plate 6) for the purposes of AMS ^{14}C dating (see below).[6]

In the western part of the trench, at a depth of *c.* 400mm below the surface and above the skulls of B.33 and B.35, medium-sized granite cobbles were found arranged in a semi-circle of *c.* 500mm in diameter (see Plate 4). This feature

Plate 5. Burials B.25-B.28 uncovered on the solid granite bedrock just below the surface in Trench 5; note the groups of loose bones from disturbed burials around B.25.

[6] Another burial (B.32) was recorded by the southern edge of the southern part of the site where it had been exposed in an erosion gully enlarged by heavy rains in 2013 and 2014. The bones were impregnated with calcium carbonate, with their state of preservation corresponding to that of the human remains uncovered in the trenches. After recording, the burial was covered with soil and left unexcavated.

F.1/14 was obviously of anthropic origin, but due to the absence of any accompanying finds (e.g. in the form of ash or burnt stones – see below) its function remains unknown.

In 2015, Trench 6 (2.5 x 1.5m, max. depth 800mm) was excavated immediately adjacent to Trench 5 with the objective of uncovering the post-cranial parts of the deceased tentatively designated as B.33-B.36 (Plate 7; see also Plate 3). In the trench, embedded into the uppermost part of the subsurface deposits, were two large granite blocks; it is not clear whether they had been placed there intentionally in the past (as a grave marker?), or whether they had fallen from the outcrops that enclose this part of the site (see Plate 7). Lower down, at a depth of *c.* 400mm, incomplete remains of at least three probably juvenile individuals (B.37-B.39), as well as B.30 and B.31 whose elements had been recorded and collected in 2014, were uncovered along the northern edge of the natural slightly inclined granite 'bench' that formed the bedrock in more than half of the area of the trench (Plate 8). All of these burials had been disturbed and fragmented probably as a consequence of rainwater draining down on the inclined granite 'bench'.

Plate 8. Trench 6 after removal of the remains of non-adult individuals B.37-B.39 and parts of B.30-B.31 (of 2014) from the edge of the solid granite 'bench' and after uncovering the remains of B.35 and B.36 (of 2014), B.40-B.45, and possibly other individuals redeposited in the burial pit of B.35. The black crosses mark long bones from a disturbed individual placed carefully around B.41. View from the south.

Plate 6. Skulls of B.33-B.35 projecting from the south-western section of Trench 5.

Plate 7. Trench 6 at the start of excavation in 2015. Three skulls of individuals B.33-B.35 were collected in 2014 from beneath the group of stones visible in the lower part of the newly uncovered south-western section of the former Trench 5. The skull of individual B.36, located further within (see the arrow), was left in its place in 2014. View from the north east.

Much more interesting was the situation uncovered further from the granite 'bench' in the north-western part of the trench (Plate 8). There, at a depth of *c.* 500-800mm, five burials *in situ* – B.35 and B.40-B.43 – were unearthed one next to the other, with the heads to the north. Their bones were coated generously with *kankar*. Burial B.35, whose cranial part had been previously uncovered in Trench 5 (see Plate 6), was lying on its left side in a contracted position, with the legs drawn tightly to the chest (Plate 8 – detail). The upper level of the bones had been slightly disturbed by a deposit containing the remains of several individuals (see below). To the west lay B.40 in a very tightly contracted position, impossible to attain without the use of bags or ropes to wrap or bind the corpse. The individual was placed on its left side with its hands on the face. Another 'bundle' burial – B.41 – was separated from the former one by two pieces of granite; it had been placed with the face and abdomen to the ground, with the legs below the chest and, just as in the former case, with the hands on the face. Four long bones and part of a pelvis from another, earlier burial were carefully placed on its perimeter. Further to the west, and probably contemporary with B.41, was B.42 in a contracted position on its right side, with the front side of the body running into the north-western section of the trench. To the north of B.41 was B.43 with most of the skeleton located beyond the limits of the trench. From the posture of the legs, a contracted position on the left side can be deduced. There were no artefacts found in direct association with any of the deceased with only one exception: a Middle Palaeolithic core of rhyolite found directly on the legs of B.40 (see Plate 8). Of interest are granite cobbles

Plate 9. Detail of the skull of B.40 weighed down by a granite cobble. View from the south.

placed on the skulls of B.40 and B.42 (Plate 9), as well as irregularly-shaped pieces of granite weighing down some of the human remains in the trench.

An unusual find is represented by the accumulation of human remains located just above the body of B.35 (Plate 8). They derive from no less than five incomplete individuals (B.33, B.34, B.36, B.44 and B.45) whose cadavers are very likely to have been redeposited from disturbed graves in which they had originally been placed. In view of the still articulated position of a number of the bones (e.g. B.45 on Plate 8), the redeposition must have occurred comparatively shortly after the original burial.

Trench 7 (3 x 3m, max. depth 1.2m) was located in the northern sector of the southern part of the site, *c.* 3m to the north of Trench 2 (see Plate 3). Below the surface layer (SU1), the exploration in 16 mechanical units uncovered a homogenised grey-coloured deposit, *c.* 1m in thickness, that concealed settlement remains mostly undisturbed by burials. Nevertheless, this sector of the site also contained graves, but they were noted only on the perimeter of the trench (Plate 10). In the north-eastern corner, there was a burial of an infant (tentatively determined in the field as neonatus or *infans* I) laid in a contracted position on the right side, with the head to the south east (B.48; Plate 10 – detail). The burial was accompanied by two fragments of a quern, one placed above the body, the other in front of the knees. In the south-eastern corner, bones of a foot with the ends of tibia and fibula in an articulated position projected from the side of the trench, apparently forming part of a burial of an adult (B.49). The southern section of the trench contained the knees (both patellas with the ends of tibias, fibulas and femurs) of an adult individual (B.50) placed probably in a contracted position on its right side. Further evidence of burial activities at this place consists of a group of calcified human bones from a disturbed burial which were found at a depth of *c.* 800mm in the north-western corner of Trench 7 (loose bones 2/2015).

In the central part of the site, two trenches were excavated (see Plate 3). Trench 8 (2 x 1m, depth 650mm; Plate 11) was located in the corridor leading to the northern part of the site in a surface concentration of broken and unbroken shells of *Pila* sp. The excavation revealed that the shells occurred in clusters from the surface down to the bedrock. No evidence of human burials was noted in this trench, except for a fragment of diaphysis of a bone (probably a distal part of femur) found in a secondary position. Only settlement debris

Plate 10. View (from the west) of the lower section of Trench 7 (right above the geological foundation), with a detail view of burials B.48-B.50 and loose bones 2/2015.

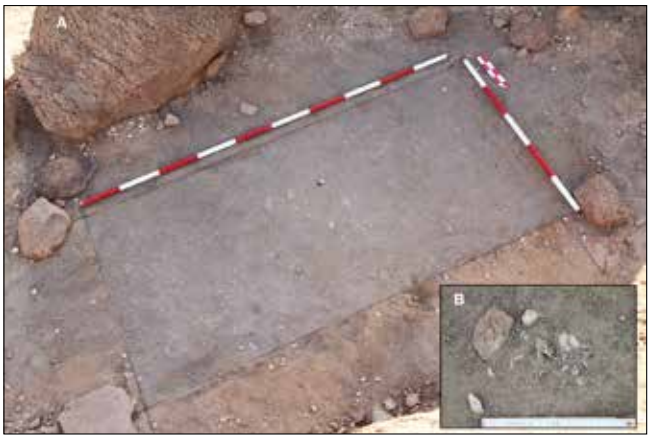


Plate 11. Trench 8: A – after removal of the surface layer (view from the north east); B – detail of one of the clusters of gastropod shells.

was obtained from Trench 10 (1.5 x 1.5m, depth *c.* 500mm) excavated roughly in the centre of this part of the site.

The last trench, Trench 9 (2 x 1m, max. depth *c.* 400mm) was excavated in the northern shelter where activities of looters between November 2014 and October 2015 appeared to have disturbed a human burial (see Plate 15).[7] The excavation uncovered remains of one displaced skeleton of which only the terminal parts of fibula and tibia were preserved *in situ* (B.47), and an intact burial of an individual (B.46) in a contracted position on its right side with the head to the south west, facing south east, with bones in a state of preservation similar to that of the burials in Trenches 2 and 5-7 (Plate 12).

Plate 12. Trench 9 in the northern shelter with an intact burial B.46. View from the south east.

In the course of excavation, all categories of finds typical of Mesolithic settlements in central Sudan were obtained by dry-sieving of the deposits or direct collection, with fragments of Mesolithic pottery, lithics, ground stone artefacts, animal bones and molluscs constituting the most abundantly represented types in all trenches (see the specialist reports below). Other categories of finds – bone and shell artefacts, including decorated fragments, ostrich eggshell fragments and beads in different stages of manufacture, pieces of red (mostly haematite) and yellow pigments, pieces of mica (some worked), and botanical finds – on the other hand, occurred mostly in the trenches excavated in the southern part of the site and were rather rare or entirely absent in those opened in the central part and in the northern shelter (Plate 13). Trenches 8 and 10 also contained lithics and pottery that, while still falling generally within the Mesolithic, differed from the point of view of types and raw materials or decoration and paste, respectively, from the remains uncovered in the trenches excavated in the southern part of the site.

After repeated surface surveys of the site, Mesolithic material still constitutes the majority of the finds. Only a fragment of an archer's loose of Meroitic or Post-Meroitic date (at the southern edge of the central part of the site)

[7] Altogether six pits of smaller dimensions dug by robbers in the central and northern parts of the site were recorded in 2015.

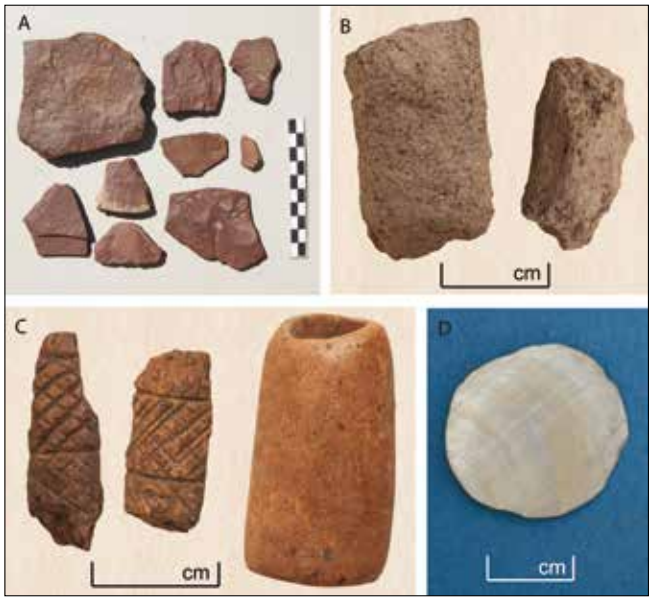


Plate 13. Examples of finds: A – Red pigment (haematite) with traces of flaking; B – cylindrical objects from baked clay of unknown function (fragments of statuettes?); C – decorative bone artefacts; D – disc-shaped plate of mother of pearl (photos: P. Pokorný – B, C; M. Peterková Hlouchouvá – D).

and several dozen non-prehistoric sherds (in the northern shelter), some of which we tentatively attribute to the Funj period, have been recorded.

Of significance for the understanding of the former human activity as well as the past transformation(s) of the site are also certain natural and anthropic features recorded during the two seasons on boulders or surrounding rocks. The former type includes bands of horizontal weathering lines running continuously at a height of between 300mm and 900mm above the present-day ground surface across the lower parts of the granite rocks and boulders that delimit, or outcrop within, the settlement platform (Plate 14). The latter group consists of numerous grinding hollows (or cup-marks) located on the upper surfaces of the exposed bedrock in particular at the southern edge of the settlement platform and, more interestingly, 33 narrow cylindrical holes drilled into

Plate 14. Weathering lines on the rocks delimiting the southern shelter.

Plate 15. Southern wall of the northern shelter: pieces of wood indicate the position of some of the drilled holes that probably constitute remains of light architecture. Below the wall, note the deposits disturbed by looters. View from the north west.

the vertical faces of rocks or immovable boulders delimiting the northern (16 holes), central (one hole), and southern (two holes) parts of the site and the northern shelter (two clusters of two and 12 holes) (Plate 15).

AMS ^{14}C dates

Since 2012, 29 samples on varied materials have been submitted to AMS ^{14}C analyses (Table 1). Of these, 14 were disqualified due to an absence or insufficient amount of collagen in the human bones (Sphinx 6-16) or teeth (Sphinx 17-19). The available AMS ^{14}C measurements thus derive from settlement residues, although some were collected from the fills of graves where they occurred as admixtures. As to the bivalves of *Unio elongatulus* closely associated with some of the burials (see Table 1, Sphinx 1, 4, 5, 28), it is difficult to determine whether they constitute grave offerings, or mere admixtures.

When ordered in sequence from the earliest to the latest (Figure 1), the available dates show that occupation of the site spans from the late ninth to the late sixth millennia cal. BC and the continuous character of occupation in particular during the Early Mesolithic. Furthermore, one may notice a discontinuity in the sequence during the late seventh and mid-sixth millennia cal. BC. At present, however, it cannot be discounted that these two hiatuses are caused by the limited number of samples dated from the central part of the site where later occupation could have had its focus.

Discussion and evaluation

The finds obtained in 2014 and 2015 during eight weeks by exploration of six trenches covering a total of 26.5m^2 (2.82% of the area of the site) significantly contribute to a better understanding of the former human activities at Sphinx. While analyses of the finds and data obtained are still in progress, we here offer an interim updated insight into the history and character of the studied site (cf. Suková and Varadzin 2012a; Suková *et al.* 2014; Varadzinová Suková *et al.* 2015).

Table 1. AMS ^{14}C dates obtained for the site of Sphinx so far, all calibrated using OxCal 4.2 (Bronk Ramsey 2009) and according to the IntCal13 calibration curve (Reimer et al. *2013).*

Sample no.	Lab. no.	^{14}C yr bp	cal. BC (95.4%)	Material	Context	Notes
Sphinx 1	Poz-48347	8220±40	7355-7079	molluscs (*Unio elongatulus*)	Trench 2, B.5	
Sphinx 2	Poz-58572	6180±40	5286-5002	molluscs (*Pila wernei*)	Trench 1 (2012), SU2	concentration of molluscs (*Pila wernei*)
Sphinx 3	Poz-58573	6220±40	5302-5057	molluscs (*Pila wernei*)	Trench 1 (2012), SU2	concentration of molluscs (*Pila wernei*)
Sphinx 4	Poz-60410	8160±40	7305-7061	molluscs (*Unio elongatulus*)	Trench 2, B.1	
Sphinx 5	Poz-60411	8620±40	7725-7580	molluscs (*Unio elongatulus*)	Trench 2, B.4	
Sphinx 6-16	-	-	-	human bone	Trench 2, B.1, B.2, B.3, B.5, B.8, B.9, B.11, B.12, B.22, B.23, B.24	disqualified due to absence of collagen
Sphinx 17-19	-	-	-	human tooth	Trench 2, B.1, B.12, B.24	disqualified due to insufficient content of collagen
Sphinx 20	Poz-63004	8920±50	8269-7941	ostrich eggshell bead	Trench 2, B.3	
Sphinx 21	Poz-63005	8950±50	8276-7965	ostrich eggshell bead	Trench 2, B.4	
Sphinx 22	Poz-63006	8480±50	7592-7482	ostrich eggshell bead	Trench 2, B.5	
Sphinx 23	Poz-63007	8690±50	7936-7591	ostrich eggshell bead	Trench 2, B.21	
Sphinx 24	Poz-63314	8340±40	7521-7312	ostrich eggshell bead	Trench 2, B.1	
Sphinx 25	Poz-72253	6960±40	5974-5741	molluscs (indeterminable)	Trench 5, B.33	
Sphinx 26	Poz-72254	7880±40	7024-6636	molluscs (indeterminable)	Trench 5, B.33	
Sphinx 27	Poz-72255	8510±40	7594-7521	molluscs (cf. *Mutela*)	Trench 5, B.33	
Sphinx 28	Poz-72256	8040±40	7081-6813	molluscs (*Unio elongatulus*)	Trench 2, B.1	
Sphinx 29	Poz-78011	6200±40	5295-5045	charcoal	Trench 6, above B.40	concentration of charcoal

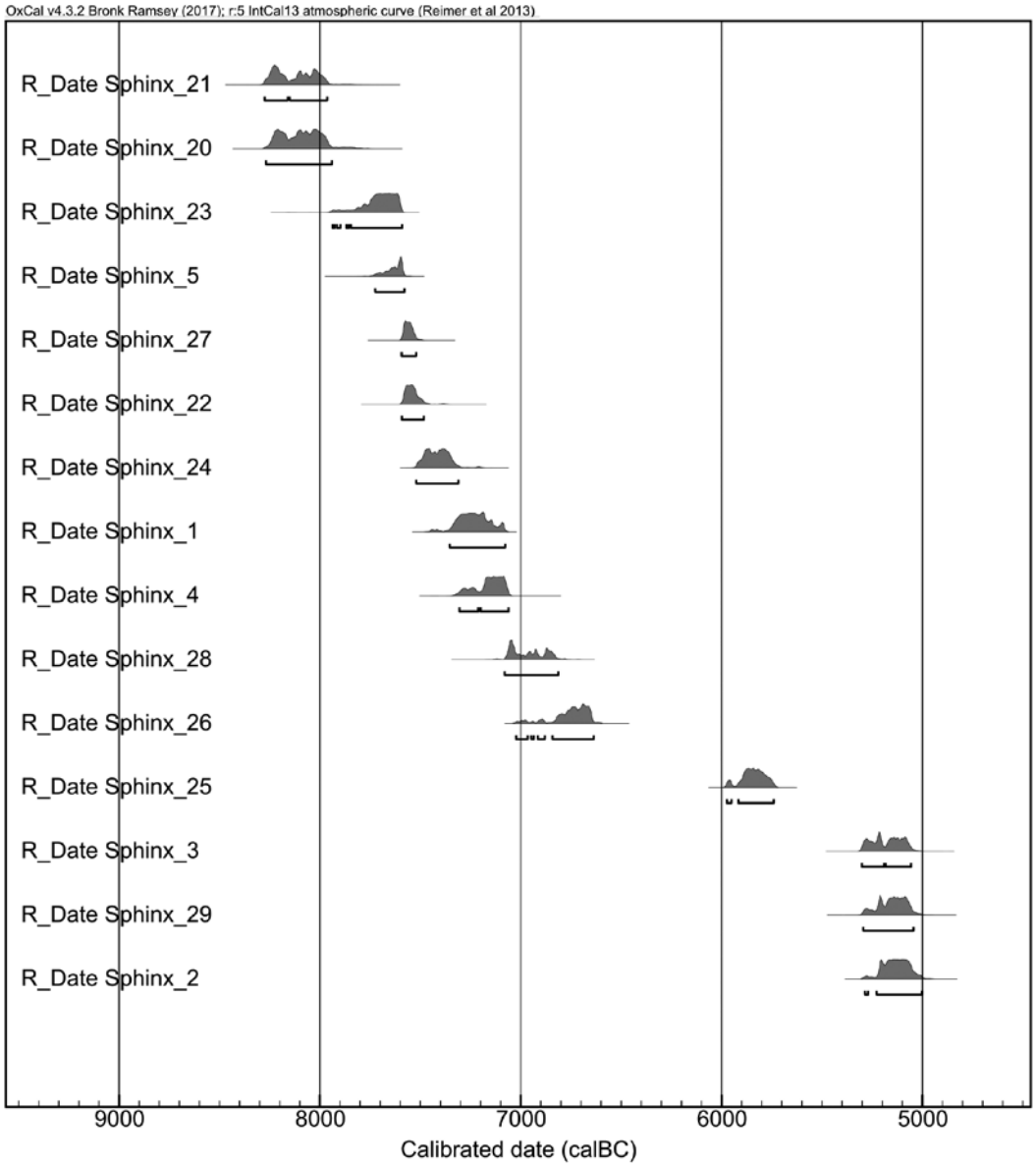


Figure 1. AMS ^{14}C dates available for the site of Sphinx so far, ordered in a sequence from the earliest to the latest.

Deposits and stratigraphy

The surface layer (SU1) at the site is formed by a nearly continuous, *c.* 20-50mm thick, mostly well consolidated sedimentary cover composed of weathered granite intermixed with numerous artefacts and ecofacts.[8] This layer constitutes the remains of anthropogenic deposits reduced during millennia by selective wind and water erosion. The approximate maximum height of the ground surface during climatically favourable periods of the Early and part of the Middle Holocene is indicated by the weathering lines on the rocks that enclose, or outcrop within, the settlement platform (see Plate 14). It is thus apparent that the former ground surface at the site was as much as 900mm above the modern one.

Between SU1 and the bedrock or eluvium, there is usually a grey homogenised complex of deposits with a total thickness of up to 1m (depending on the georelief of the bedrock) which contains only archaeological material of Mesolithic date. The basic natural component (40-90%) of all the deposits is made up of the local granite in different stages of disintegration (dust, clasts, stones). A targeted multi-disciplinary investigation of Trench 5 confirmed that the stratigraphy at the site had suffered from the operation of several-millennia-long intensive N-transformations. These have caused not only a nearly full-scale homogenisation of the layers or fills of sunken features, but have also brought about the disappearance of ash layers (due to secondary mobilisation of carbonates) and, in some cases, even the appearance of pseudo-layers and pseudo-features corresponding to secondary concentrations of manganese, various forms of carbonates and other chemical elements (Plate 16). These field observations and a detailed discussion of the impact of these processes on the archaeological record were

[8] The density of surface finds varies across the site; for instance, in the area of Trench 7 SU1 contained 1,012 pcs of lithics per m^2, while in Trench 10 the density of the same category of finds was as little as 80 pcs per m^2.

Plate 16. Western part of Trench 5, with pseudo-features created as a consequence of severe natural (geochemical) transformations.

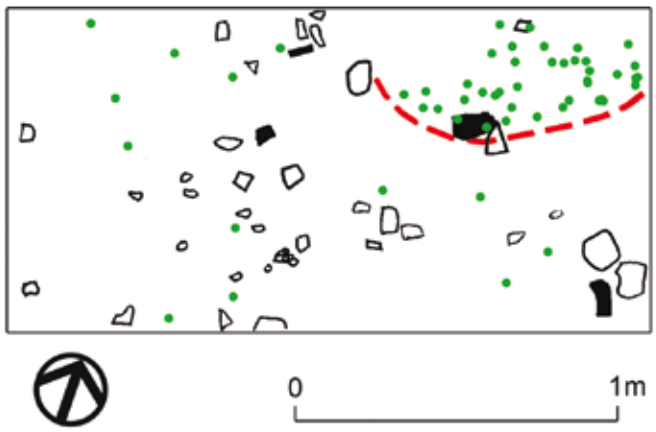


Figure 2. Outline of an oval-shaped feature identified on the basis of a concentration of unbroken shells of Pila *sp. (green dots) revealed after superimposition of 12 plans documenting individual mechanical units.*

published *in extenso* elsewhere (see Varadzinová Suková *et al.* 2015). However, the fact that the local deposits are clearly not colluvial and that they are more or less intact in their character is attested by the presence of graves and settlement features. In response to the stated transformations which make it impossible, with some exceptions, to differentiate stratigraphic units by the usual observation methods (by naked eye, touch, and pressure), we had to resort to methods of excavation and documentation that would allow at least in the post-excavation phase, following a comprehensive data analyses, an approximate identification of layers and sunken features and associated movable finds.

Settlement activities

In view of the above facts, the number of settlement features uncovered at the site so far is comparatively low. While for example feature F.1/14 (Trench 5) of unknown function could be identified during excavation thanks to the semi-circular arrangement of granite cobbles (see Plate 4), other settlement features could be revealed or confirmed only during the processing of field documentation. A good example is a sunken oval-shaped feature of unknown function in Trench 8 whose outline could be identified on the basis of a concentration of unbroken shells of *Pila* sp.[9] revealed only after all the documented mechanical units from the trench (altogether 12 plans) had been projected onto one level (Figure 2). In a similar way, but using larger finds (stones, bones, larger fragments of pottery) in a vertical or inclined position, we have been able to identify five or six more possible sunken features[10] in Trenches 5 and 7.

The spectrum of structural remains at the site was extended by groups of holes drilled into the rock walls or immovable boulders at a height of 1.3-3.2m above the present-day ground level (see Plate 15). A special study has been devoted to the hypothesis that these are remains of above-ground wooden pole-built structures probably associated with mobile or semi-mobile groups (Varadzin *et al.* 2017). Dating of these structures is, however, very difficult; besides the Mesolithic, they may also theoretically fall within later (pastoral) periods.

For the time being, therefore, the most robust sources of information on the character and dating of the Mesolithic settlement activities remain the artefacts (pottery, lithics, ground stone artefacts, bone and shell artefacts, beads from ostrich eggshell, worked mica, pigment, daub, etc.) and ecofacts (mainly animal bones and molluscs). First and foremost, their considerable quantity and occurrence throughout deposits of up to 1m in thickness (and originally even more as indicated by the weathering lines on the rocks) attest to an intensive occupation of the site during the Mesolithic. One should not ignore the scale at which the settlement activities are likely to have taken place: the size of the settlement platform (*c.* 940m^2) hardly allows for more than 15-20 inhabitants to have been living at the site at any one time. Of significance is also the testimony of the animal bones consisting of species available and hunted in different seasons of the year, which in their sum suggest an all-year-round occupation of the site.

Interestingly, while, in the light of distribution of artefacts and ecofacts, some activities do not to seem to have been zoned at the site (e.g. pottery and meat consumption, lithic production and consumption, grinding, working of pigments), with other activities we may assume a spatial differentiation. For instance, there is a conspicuous concentration of numerous remains of production and discard of beads from ostrich eggshell (dated by five AMS ^{14}C measurements on beads in different stages of production to 8276-7312 cal. BC; see Table 1, Sphinx 20-24, and Sůvová *et al.* forth.) in the southern part of the site where decorated bone artefacts are also markedly abundant (when counted per m^3). This may suggest not only production but also some ritual activities (?) as the same area (specifically Trench 2 of 2012) also yielded an object reminiscent of later ancient Egyptian *kohl*-sticks, as well as a fragment of a singular decorated 'non-utilitarian' (as it is too fragile) cylindrical object made of petrified bone (see Suková and Varadzin 2012a, pl. 12). By contrast, the boundary

[9] The tentative identification in the field is to be confirmed and specified.
[10] The term 'sunken feature' is used as it implies a greater diversity of the features as compared to the term 'pit'.

between the central and the northern part of the site is the only place where we encounter marked concentrations of shells of edible snails (dated by two AMS ^{14}C measurements on two opercula of *Pila wernei* from Trench 1 to the late sixth millennium cal. BC; see Table 1, Sphinx 2 and 3), which attest either to storage of this type of food or disposal of its waste.

Funerary activities

In 2014 and 2015, important new data were brought to light with respect to the funerary component of the site: 24 burials uncovered in 2012 were supplemented by at least 26 new individuals. Most of these concentrate in the southern part of the platform. The minimal total number of deceased so far known from this part of the site (48), together with the location of the graves by its western (24 in Trench 2), northern (three in Trench 7), north-eastern (20 in Trenches 5 and 6), and southern (one burial revealed by erosion) sectors, corroborate our earlier hypothesis that at one time this area had been used for quite intensive burial activities. Furthermore, the density of 1.17 burials per m^2 [11] makes it possible to estimate the size of the burial ground to equate to at least 400 deceased[12] and to regard Sphinx as one of the largest hunter-gatherer (or pre-Neolithic) burial grounds in North-east Africa.

Moreover, two burials unearthed in the northern shelter and a single human bone found in a secondary position in Trench 8 do not exclude the possibility that funerary activities had taken place also in other parts of the site; however, in view of the location of Trenches 1, 3, 4, 8 and 10 with no primary burials, this appears to have been a less usual practice.

There are several features that characterise the local burial customs. It is a multi-generational, probably community burial ground incorporating various age groups including very young children (B.13 and B.48 in Trenches 2 and 7). The graves show an uneven distribution and form clusters that could reflect chronology or, in some cases – in particular in the eastern parts of Trenches 5 and 6 with a concentration of young individuals – age categories. The grave pits were usually excavated to the bedrock. Except for some rare cases, the outlines of the grave pits could not be distinguished due to homogenisation of the deposits. This makes it difficult to assess the possible contemporaneity of some burials. Where ascertainable, the deceased were placed in a more or less contracted position, with three individuals (B.10 in Trench 2, and B.40 and B.41 in Trench 6) contracted so tightly as to suggest the use of ropes or some kind of wrapping to bind the corpses prior to burial. One of these 'bundle' burials (B.41) was placed in a rather unusual position with the face and abdomen to the ground (cf. Crèvecœur *et al.* 2012, fig. 12). Of interest is the evidence for use of stones to surround (B.2 and B.3 in Trench 2) or separate (B.40 and B.41 in Trench 6) some burials, or to cover the bodies or skulls of the deceased (e.g. B.10 in Trench 2, B.40 and B.42 in Trench 6), which may be an expression of some elements of the spiritual world of the group(s) burying their dead at the site.

Burial interferences do not constitute a rarity, as evidenced by graves cutting each other and as suggested by frequent finds of loose human bones or their fragments in the deposits. Attention should also be devoted to the intentional treatment of parts of older cadavers in some cases. With the bundle burial B.41, for instance, we find long bones from another displaced individual carefully arranged on its perimeter (see Plate 8). Of a markedly different character – and rather surprising – is the redeposition of parts of only partially decomposed individuals immediately over B.35 or in the fill of this grave.

Some differences in placement of the bodies may suggest a degree of diversity within the burial ground. For instance, while in Trench 2 an east-west or west-east orientation was the most common, a north(east)-south(west) orientation clearly predominates in Trenches 5 and 6. This, together with clustering of burials, numerous instances of multiple superimposition and cutting of graves in Trenches 2 and 5-7, and with the evidence of a redeposition of parts of cadavers in Trench 6, indicates an intensive, diversified and long-term use of the site for burial.

Direct dating of these activities at Sphinx has been hampered by the absence of collagen in bones and teeth and by the impregnation of the remains with carbonates (which makes dating structural carbonates or bone apatite impossible), as well as by the lack of unequivocal and datable grave goods. Although at el-Barga bivalves have been proved to constitute grave offerings already in Mesolithic burials (Honegger 2004, 29, tab. 1), in the case of our site one cannot discount that the four (nearly) complete bivalves of *Unio elongatulus* found in some of the burials in Trench 2 constitute accidental admixtures from earlier settlement debris. For this reason, it is not clear whether the AMS ^{14}C dating of these bivalves into the eighth and early seventh millennia cal. BC (see Table 1, Sphinx 1, 4, 5 and 28) provides a *terminus ad quem*, or *terminus post quem* for the respective burials. More convincing arguments are offered by the AMS ^{14}C measurements of one of the three fragmentary bivalves found near the head of B.33 (5974-5741 cal. BC; see Table 1, Sphinx 25) and of charcoal from a concentration found above the stone covering B.40 (5295-5045 cal. BC; see Table 1, Sphinx 29). As the former provides a *terminus post quem* for the placement of B.33 (and perhaps other human remains deposited in the grave pit of B.35) and the latter a *terminus ad* or *ante quem* for B.40, it is clear that at least some of the burial activities in Trench 6 date back to the sixth millennium cal. BC.

[11] I.e. 47 burials in Trenches 2 and 5-7 (40.25m^2); B.32 is not included in the count as it was located outside the excavated trenches.

[12] It is important to note that both the ascertained density and the supposed size of the burial ground constitute minimum estimates as there was a frequent occurrence of loose fossilised bones in secondary positions that could derive from an unknown number of other burials now destroyed by later graves or settlement features. Moreover, other graves could have vanished in consequence of surface erosion. This is the case in particular on the southern and eastern edges of the site where the originally subsurface granite bedrock has been exposed.

As for the remaining burials, their general Mesolithic dating is supported by the considerable coating of the bones with laminas of precipitated calcium carbonates, which can be hardly later than the Middle Holocene (in this sense already Arkell 1949, 11-12; see also Zerboni 2011; Dal Sasso *et al.* 2014), and by the large number of graves in which no Neolithic or later artefacts have been found.

Due to the secondary homogenisation of the deposits by severe N-transformations, unfortunately, it is difficult to determine the stratigraphic relations between the graves and the settlement layers or features. The occurrence of plentiful Mesolithic occupation debris in the fills of all the graves and the position of feature F.1/14 above the skulls of B.33 and B.35, however, suggest that the funerary activities were contemporaneous with the Mesolithic settlement, or fell in between two unspecified settlement phases. Nevertheless, further work will be necessary to elaborate the chronology of the burial ground and to extend the understanding of the former human occupation of the site.

Acknowledgements

The authors would like to thank the National Corporation for Antiquities and Museums of Sudan for the long-term support granted to the Sabaloka (West Bank) Research Project. The fieldwork of 2014 and 2015 was carried out thanks to the financial support from the Charles University Scientific development programme No. 14: *Archaeology of non-European areas, Subproject: Ancient Egyptian civilisation research: cultural and political adaptations of the North African civilisations in Antiquity (5000 BC – AD 1000)*, and from *Papaver – Centre for human and plant studies in Europe and Northern Africa in the post-glacial period*, a project co-financed from European Social Funds and the national budget of the Czech Republic (no. CZ.1.07/2.3.00/20.0289, 2013–2015). The present report forms part of the *Communities and resources in late prehistory of Jebel Sabaloka, central Sudan: from analysis to synthesis*, a research project (no. 17-03207S) supported by the Czech Science Foundation (GA ČR).

The pottery from Sphinx

Elena A. A. Garcea

Analysis and classification of the pottery assemblages from the excavations in the western part of Jebel Sabaloka have been conducted with the aim of observing ceramic manufactures from a broad perspective correlating social identity to artefactual productions and associating cultural change to technological and chronological variability (e.g. Gosselain 2000; Roux 2008; D'Ercole *et al.* 2017).

The relational database that was specifically created for the study of Sudanese and Saharan prehistoric ceramic collections (Garcea and Caputo 2004) and was employed for the classification of other assemblages (e.g. Garcea 2001; 2006; 2008; 2013; Garcea and Hildebrand 2009) has been also used for the study of the productions from Jebel Sabaloka. This approach incorporated and complemented the well-developed system of classification of pottery decorations designed by Caneva (1988; Caneva and Marks 1990). It was developed in order to outline the main stages of the manufacturing processes, or *chaînes opératoires*, which regard preparation, production, finishing, use and discard. As Sudanese prehistoric pottery is typically decorated with incised and impressed patterns, particular attention was also given to decorative tools, decoration techniques and motifs. In addition to the macroscopic examinations, microscopic analyses are currently in progress, namely, mineralogical, petrographic (XRD and SEM observations) and chemical analyses (trace elements by ICP-MS and XRF), as well as gas chromatography analyses on organic residues for information on possible uses of the pots.

This paper briefly reports on the ceramic assemblage from the site of Sphinx (SBK.W-60) located *c.* 3.5km from the Nile on the western margin of Jebel Sabaloka. The pottery that was first analysed comes from two trenches excavated in the southern part of the site and includes a small portion of finds from Trench 2 of 2012 (139 fragments)[1] and the entire ceramic assemblage from Trench 5 of 2014 (681 fragments) (see Varadzinová and Varadzin above). A few other fragments collected from the surface layer in the southern (four fragments) and central (one fragment) parts of the site were also studied.

Sphinx has been dated to the Mesolithic period (except for several dozen sherds from post-Mesolithic times collected from the ground surface in the northern shelter) and the subsurface ceramic assemblage has not been contaminated by later artefactual material (Varadzinová and Varadzin above). With only ephemeral human presence at the site during later times, the area has preserved an undisturbed anthropic deposit dated to the Mesolithic. On the other hand, strong post-depositional processes have obscured the original stratigraphic sequence of the site (see the details in Varadzinová

[1] These sherds were obtained during uncovering of human remains and/or from beneath (or the bases of) burials B.1, B.4-B.6, B.9-B.12, B.14, B.19 and B.21-B.24.

Suková *et al.* 2015). Furthermore, as numerous burials were repetitively dug into the habitation settlement in the southern part of the site, no clear information is as yet available on the progression of the uses of the site, except that the Mesolithic settlement was either earlier or contemporary with the burials.

Some of the anthropic and post-depositional events are clearly reflected in the ceramic assemblage: it uniquely includes Mesolithic pottery with no intrusive elements and occasionally the sherds show manganese and calcium carbonate stains and/or a silty-clayey patina, attesting to the post-depositional events recorded during the excavation (Varadzinová Suková *et al.* 2015). Except for the natural events that affected the visibility of stratification within the deposit, several sherds join together and indicate that they were not moved from their primary position and no trampling or other severe mechanical disturbances occurred on the spot. The observation of the pottery also suggests that it was deposited at different times as the sherds exhibit different preservation conditions, confirming a long chronology for the site, which has been dated from the end of the ninth to the end of the sixth millennium cal. BC (Varadzinová and Varadzin above, Table 1), and suggesting either a long occupation of the site or repetitive occupations of the same spot.

Although some of this pottery was collected during excavation of the burials (155 fragments, 18.8% of the total), all of it was related to the settlement remains into which the burials had been dug. In fact, it came from the filling or from the bottom of the burials and no grave goods, except possibly for very few shells of Nile bivalves, occasional lithics and rare ground stones, were found associated with the burials (Varadzinová Suková *et al.* 2015; Varadzinová and Varadzin above).

Two sherds were also recovered during excavation of feature F.1/14 of granite cobbles arranged in a small (semi) circle of *c.* 500mm in diameter, but it seems more likely that they were lying on the ground before the feature was constructed. In fact, this feature was located within the anthropic deposit, *c.* 400mm below the present-day surface and above the skulls of B.33 and B.35 (see Varadzinová and Varadzin above, Plate 4).

In general, the pastes of this pottery are friable and include considerable quantities of sand, possibly suggesting that Mesolithic potters either had difficult access to quality clay sources or did not specifically search for them, using instead clayey sediments available in the vicinity of the site. Tempering materials are almost exclusively mineral, with only exceptional flat vegetal fibres (four samples in total); the textures of the pastes are usually medium-fine.

In some cases, the sherds had been re-employed to make tools for other functions, as was the case of a pottery comb that was likely used for pottery decorations (Plate 1) or an oval-shaped token with smoothened edges (Plate 2). All the pottery that exhibited preserved surfaces and could be, therefore, classified was decorated with either impressed or incised motifs and no plain, undecorated sherds were recorded in

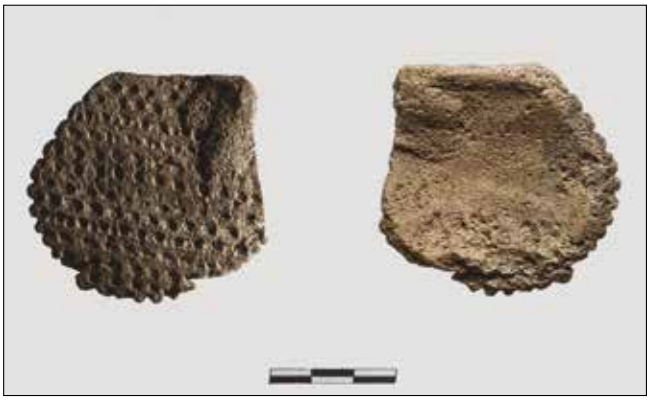


Plate 1. Ceramic comb from Sphinx (SBK.W-60), Trench 5 (photo: R. Ceccacci).

Plate 2. Oval-shaped ceramic token from Sphinx (SBK.W-60), Trench 5 (photo: R. Ceccacci).

these assemblages. Most impressed decorations were made according to the rocker technique (235 samples, 88% of the decorated pottery) to make dotted zigzags with a combed tool (Plates 1, 2, 3.1) and plain zigzags with a plain-edged tool (Plate 3.2). This technique was also used to make dotted wavy line motifs, which could appear in alternated bands of dotted zigzags and dotted wavy lines (Plate 3.3). The second most common impression technique was the so-called 'simple' technique (17 samples, 6.4% of the decorated pottery) as it implied that a tool, in this case a comb, was applied to the surface of the still soft paste of the pot and entirely lifted before re-applying it next to the previous impression (Plate 3.4). The alternately pivoting stamp technique is another impression method and uses a double pronged tool (Plate 3.5), but was quite rare at Sphinx (five samples, 1.9% of the decorated pottery). Ultimately, incisions, which are also made with a combed tool, are another common technique (10 samples, 3.7% of the decorated pottery). The majority of the sherds decorated with this technique show wavy line motifs (Plate 3.6), which are typical of the Mesolithic period of central Sudan, locally called Early Khartoum (Arkell 1949). Only one sherd exhibited parallel lines, instead of wavy lines, but was made with the same incision technique.

The continuation of the study of the ceramics from this and other sites, the additional archaeometric analysis, and

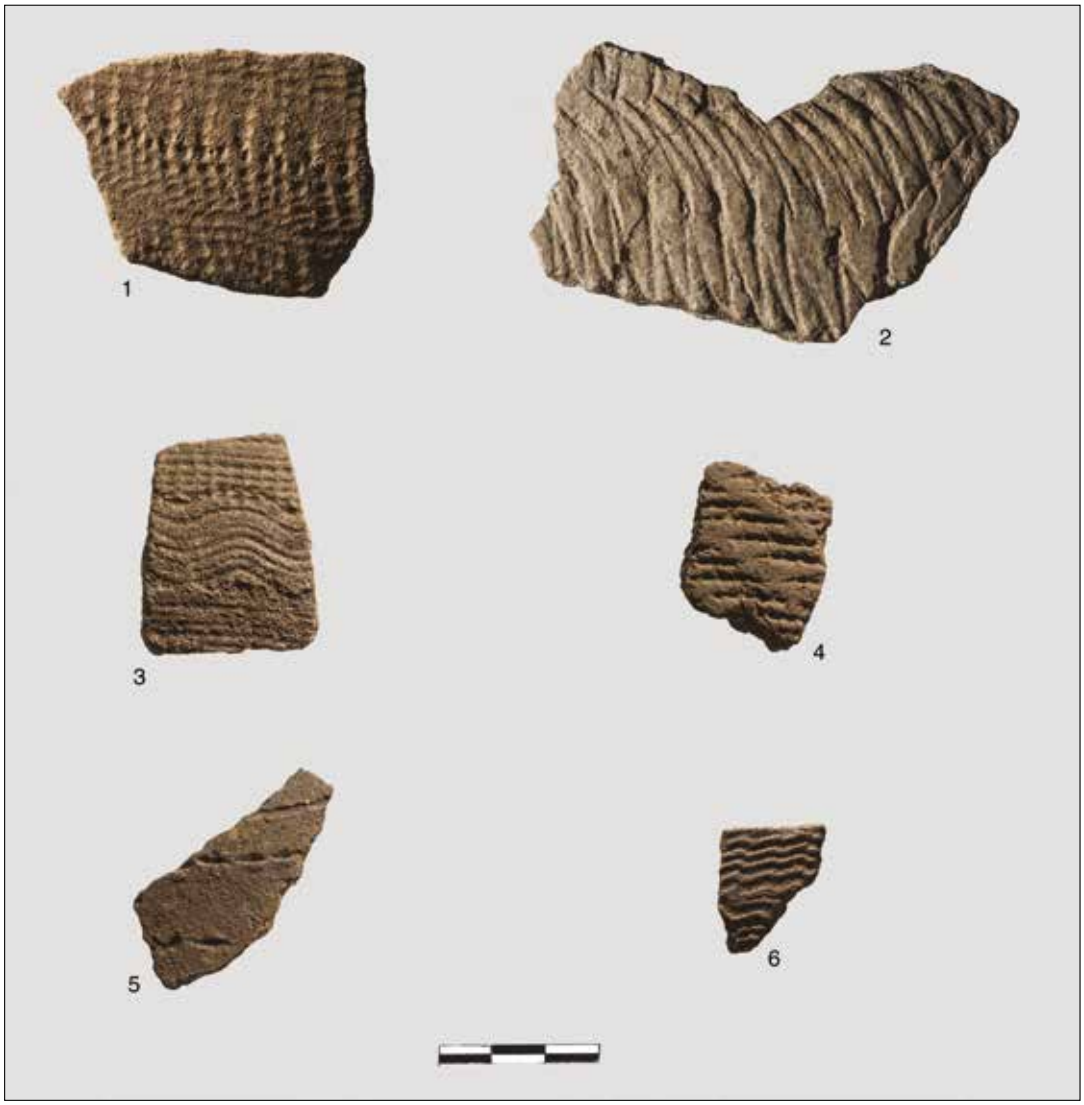


Plate 3. Decorated pottery: 1 – Dotted zigzags made with the rocker technique; 2 – Plain zigzags made with the rocker technique; 3 – Alternated bands of zigzags and dotted wavy lines made with the rocker technique; 4 – Dotted lines made with the simple impression technique; 5 – Paired lines of dashes made with the alternately pivoting stamp technique; 6 – Wavy lines made with the incision technique (photo: R. Ceccacci*).*

further radiometric dating of the site will allow us to obtain more in-depth data on the ceramic production and its social role over the long period of Mesolithic occupation at Jebel Sabaloka and in central Sudan.

Acknowledgements

This report forms part of the *Communities and resources in late prehistory of Jebel Sabaloka, central Sudan: from analysis to synthesis*, a research project (no. 17-03207S) supported by the Czech Science Foundation (GA ČR).

The lithics from Sphinx

Katarína Kapustka

With its large quantities of lithics the site of Sphinx fits well amongst Mesolithic sites in central Sudan (Plate 1). For this reason, only a representative sample of finds was selected in the first stage of analysis conducted in the field during the 2015 campaign. The sample included all lithic material from two 1 x 1m squares in Trench 7 (A and C in the north-western and north-eastern corner of the trench, respectively) in the southern part of the settlement platform which, after removal of the uppermost surface layer (SU1, 20-50mm), was explored in 16 mechanical units down to the bedrock (*c.* 1m below the modern surface). In addition, all finds from

Plate 1. Lithics from the surface layer in Trench 7 prior to analysis (photo: K. Kapustka).

one 1 x 1m square in Trench 8 (A in the western half of the trench, depth *c.* 650mm) and from the entire Trench 10 (1.5 x 1.5m, depth *c.* 500mm) in the central part of the site, were included in the analysis. The results presented below omit finds from the lowermost mechanical units from the trenches, the analysis of which has not yet been completed.

As the most effective analytical approach to the robust sets of finds, we have chosen technological study that basically attempts at understanding the way the artefacts were created and how the site was used in the past. The set of methods adopted by us reflects the tradition of the French school aimed at identification of individual steps of production (*chaîne opératoire*; Leroi-Gourhan 1971; cf. Mevel 2013) as well as the Anglo-Saxon ethnoarchaeological and experimental research (Magne 1985; Seetah 2011). In terminology we give precedence to the work of J. Tixier (Tixier *et al.* 1995).

In this preliminary report we present only basic information on technological characteristics of the assemblages. Together with a tradition, the natural characteristics of the used raw materials constituted the main limiting factor in the lithic production. A total of 12 raw materials have been identified in the find assemblage. All of them are of local origin with their sources located at a distance of not more than 5km from the site. Most of the raw materials were exploited from primary deposits that occur on the ground surface at some locations (e.g. vein quartz, red rhyolite) as well as in the form of pebbles that occur both in the *wadis* near the site and in the gravels in the vicinity of the Nile. The pebble form predominates markedly especially in the case of quartz as far as it was possible to distinguish the pebble form from the vein one.

The proportional representation of raw materials varies in production categories, but only slightly across the site (Table 1). The proportion of raw materials is as follows:

Table 1. Numerical representation of raw materials per production category and in the whole sample studied in 2015.

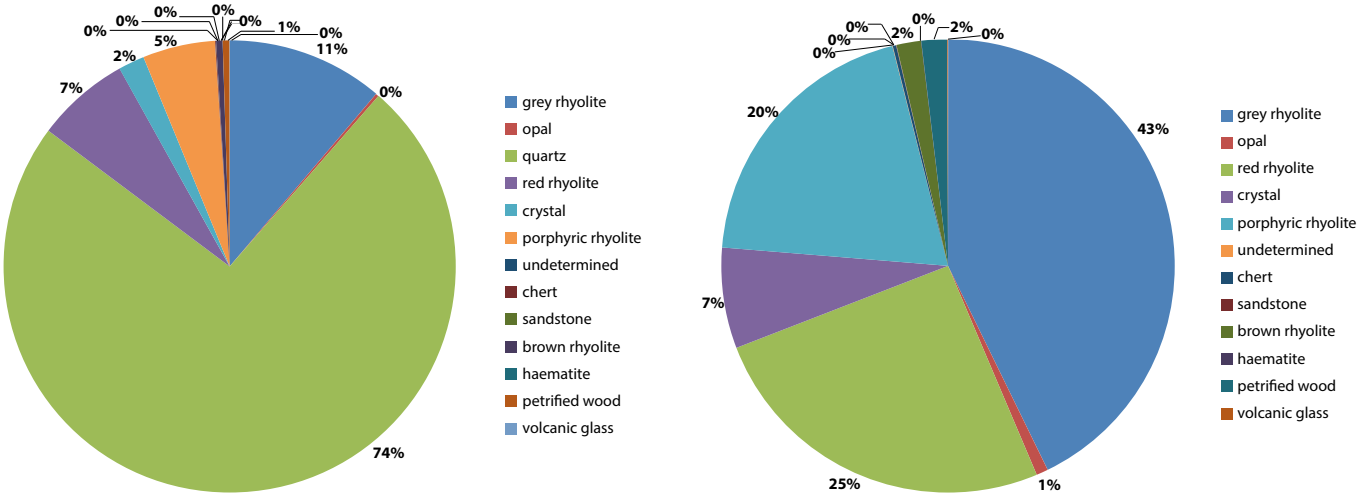
Raw materials	Tools	Cores	Debitage	Total
quartz	319	278	10,179	10,776
grey rhyolite	23	13	1,600	1,636
red rhyolite	13	11	952	976
porphyric rhyolite	11	7	738	756
crystal	28	12	234	274
petrified wood	0	0	70	70
brown rhyolite	0	2	65	67
opal	5	1	26	32
chert	2	0	7	9
volcanic glass	0	0	2	2
haematite	0	1	0	1
sandstone	1	0	0	1
indeterminate	1	0	0	1
Total	403	325	13,873	14,601

74% quartz, 11% grey rhyolite, 7% red rhyolite, 5% porphyric rhyolite, 2% crystal and 1% for the sum of opal, chert, petrified wood, volcanic glass, haematite[1] and indeterminate raw material (Graph 1). In the category of debitage, the raw material composition equals that of the total sample. In the category of tools, on the other hand, quartz predominates even more significantly (80%), and also crystal is represented more markedly (8%), but other raw materials are fewer – grey rhyolite 5%, red rhyolite 3%, and porphyric rhyolite 3%. The remaining raw materials have a minimal representation (opal, chert, and indeterminate raw material). In the category of cores, quartz is the most numerous (86%; Figure 1); crystal, and grey and red rhyolites amount to 4% each, while porphyric rhyolite equates to 2%; other raw materials are present in very small quantities. The differences in frequencies between the trenches are not particularly significant.

In production categories, production waste is the most abundant (94.5%); tools and cores equate to a mere 2.5% and 2% respectively.[2] Among tools, (Graph 2) those of universal character predominate, in particular the characteristic cres-

[1] Haematite is rather problematic because it is not possible to distinguish if the production waste is connected to lithic production or to preparation of colouring material.

[2] Percentage of the total number of finds.



Graph 1. Representation of raw materials in the sample studied in 2015; left – with quartz, right – without quartz.

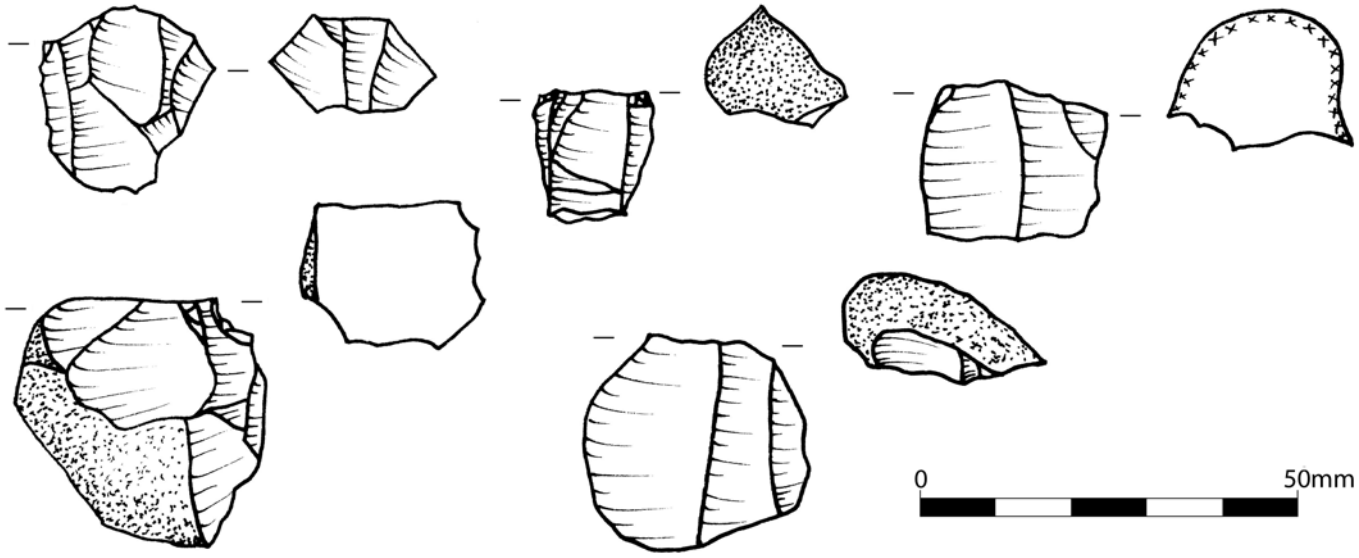
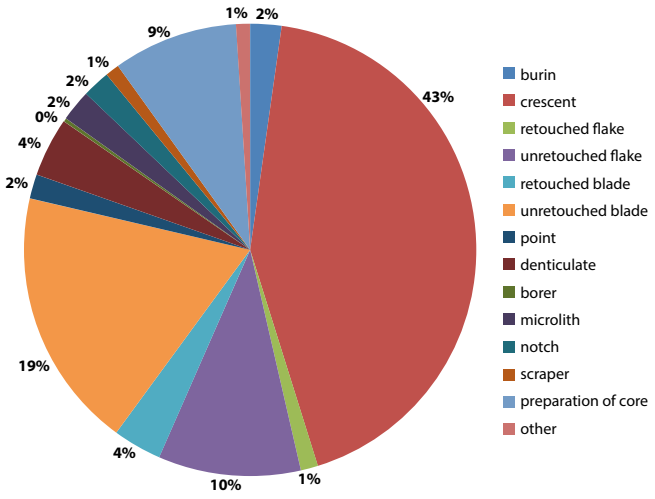


Figure 1. Examples of cores of quartz pebbles from Trench 5 of 2014, scale 1:1 (drawing: K. Kapustka).



Graph 2. Representation of individual types of tools in the sample studied in 2015.

cents that can be used for diverse activities (43%;[3] Figure 2). Unretouched blades and fragments thereof (19%), as well as unretouched flakes (10%), are also comparatively frequent. Tools used for specific activities, such as scrapers, burins, notches, borers, points, microliths and retouched blades (in total 19%) occur in smaller quantities and in a comparatively balanced distribution. As for cores, flake cores predominate markedly, while bladelet cores equate to less than 10% of all cores. From the typological point of view, cores with changed orientation are the most abundant in consequence of the natural characteristics of the local raw materials as well as of the effort to exploit the cores to the maximum; they are followed by single- and double-platform cores, with the latter being the least numerous (Graph 3).

The technological analyses of the assemblage shows that production of flakes predominated. Blades were in demand, but with quartz as the dominant raw material blades were

[3] Percentage within the category of tools.

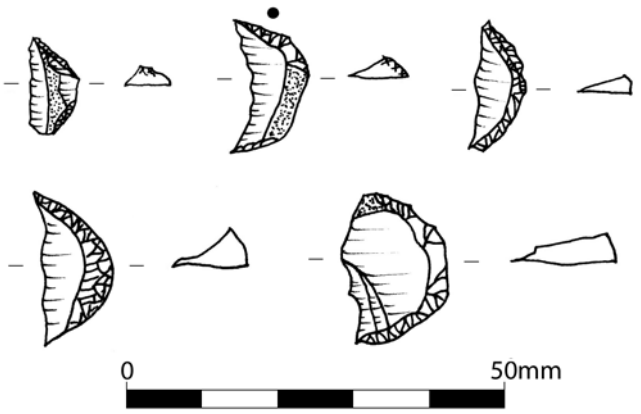
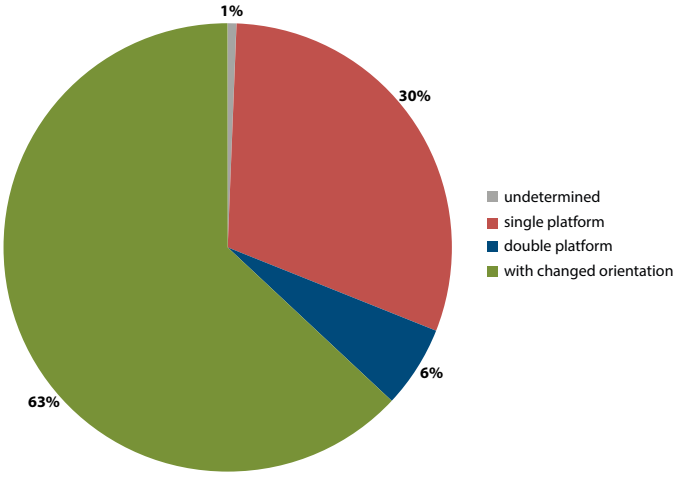


Figure 2. Examples of crescents from Trench 5 of 2014, scale 1:1 (drawing: K. Kapustka).



Graph 3. Representation of individual types of cores in the sample studied in 2015.

difficult to obtain due to its natural characteristics. Thus, the final percentage of the blades/bladelets in the collection is influenced by two main aspects: the tradition of lithic production and the natural (especially the physical) characteristics of the used rock. Blade cores were noted in significant quantities (11%) in Trenches 7A and 8A, while they were not recorded at all in the other two trenches (Trenches 7C and 10). The form of blanks could be determined in 96% of the cases. Flakes prevailed (68%) and blades equated to 28%. In the remaining cases it was not possible to determine the blanks unequivocally. In individual trenches, the representation of blades as blanks for tools varied between 17-34%.

It is obvious that further analysis will bring much additional information. As the results obtained so far seem to suggest that there is no correlation between the type of raw material and the method of its working, a more detailed statistical analysis may demonstrate a relationship between used raw materials and tool categories. While the producers no doubt had to respect the geological properties of the raw materials, we still find tiny bladelets made even from quartz pebbles which are not suitable for this technological procedure (Kobusiewicz 1996; Tixier *et al.* 1995). Particularly in view of the exclusively local origin of the processed raw materials it seems that the producers were members of a comparatively settled community (Caneva *et al.* 1993).

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The ground stones from Sphinx

Jaroslav Řídký

The category of ground stones (hereinafter referred to as 'GS') traditionally includes artefacts formed, at least in a certain phase of production, by grinding, as well as production waste in the form of flakes of the raw material and, finally, tools used in their production (Adams 2002). In the Mesolithic and the Neolithic in central Sudan, these are in particular various forms of lower stationary querns and palettes, upper active grinders, and, furthermore, hammer stones, rubbers/abraders and biconically drilled discs, so-called 'stone rings' (Arkell 1949, 51-73; 1953, 41-45; Jórdeczka 2011).

In 2015 the exploration of the site of Sphinx included a study of the typological (Plate 1), metrical and basic raw-material composition of ground stones collected from the surface of the whole site (approx. 940m^2) divided into six parts – Areas 1-6 (Figure 1). The analysis covered also all ground stones obtained through excavation of Trenches 6 and 7 (after removal of the uppermost surface layer of *c.* 50mm in thickness). The main intention was to gather fundamental information on the composition of the assemblage from the surface layers and the assemblages deposited in the lower settlement layers in order to facilitate in the future a suitable formulation of the questions and issues of a more focused analysis from stratified contexts.

Plate 1. Collection of surface finds from Area 6 located in the vicinity of cup-marks (photo: J. Řídký).

With surface finds one has to take into account the fact that they reflect the sum of activities of several millennia of occupation of the site during the Mesolithic, and as such they constitute rather a basic comparative collection. The typological composition of artefacts from the surface may, in an ideal case, reflect particular activities adapted to the geomorphology of the site (such as at the places of occurrence of grinding hollows on the surfaces of flat granite formations in the southern part of the site). Basically, however, we have to allow for the long-term effect of various N-transformations

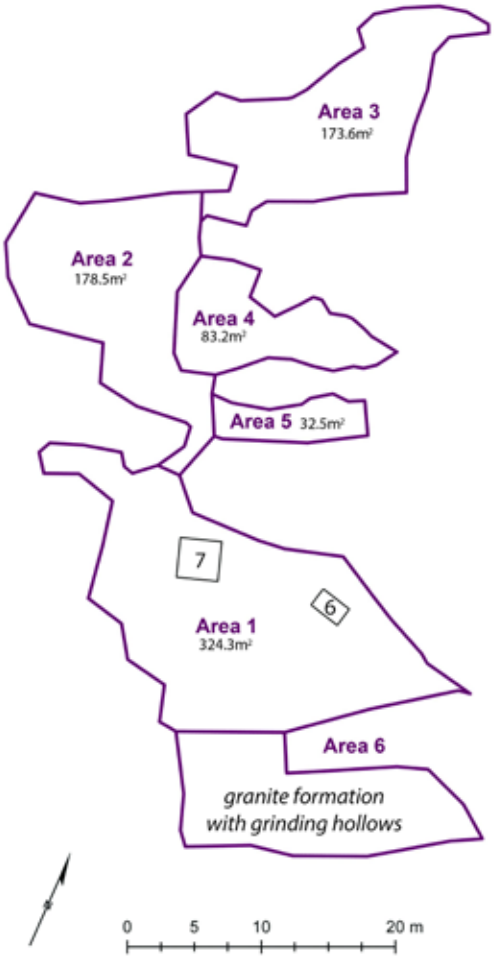

Figure 1. Sphinx. Division of the site into areas for the purposes of analysis of surface finds of ground stones: 1 – southern part, 2 – central part, 3 – northern part, 4 – northern shelter, 5 – southern shelter, 6 – gully between two boulders with cup-marks (outside the settlement platform) (plan: J. Pacina).

of which erosion processes constitute the most accentuated ones. Even with the artefacts retrieved from both trenches it is not possible to determine unequivocally for reasons given by L. Varadzinová and L. Varadzin above (redeposition in consequence of excavation of settlement features and graves) what kind of waste in the particular stratigraphic units the ground stones actually represent (but see burial B.48 on Plate 10 in Varadzinová and Varadzin above).

Besides technological categories (final tools, blanks, flakes), the ground stone artefacts were divided into several functional groups (e.g. querns and grinders), and, furthermore, according to metrics and on the basis of raw materials. Last but not least, the preservation of tools, modification of original shapes, and traces of secondary use were noted.

The raw-material composition of the ground-stone industry is formed predominantly by rocks of sedimentary origin, in the vicinity of Sabaloka represented by sandstones, silicified sandstones and quartzites; other rock types, such as rhyolites, local granites and, with hammer stones, also pebble or vein forms of quartz, were utilised less frequently.

The raw materials come either from the immediate environs of the site (rhyolites, various forms of quartz), or from the Jebel Rauwiyan formation *c.* 8km to the south (sandstones, quartzites; see Varadzinová and Varadzin above, Plate 1).

In total 619 pieces of ground stones were obtained through surface survey of the entire site (Table 1), among which we distinguish grinding tools (including final tools, blanks and flakes; N=609; 98%; Figure 2.1-4), rubbers/abraders (N=3; 0.5%; Figure 2.5), biconically drilled rings (N=2; 0.3%; Figure 2.6-7) and hammer stones (N=2; 0.3%). Three small fragments could not be identified with more precision. Table 1 shows that the stone rings (their fragments) and rubbers come only from some areas (both types from Areas 1 and 5) and, by contrast, none were collected from the two trenches. In all three assemblages of artefacts – surface survey, Trench 6 and Trench 7 – grinding tools predominate. Let us, therefore, inspect this functional group in more detail.

In the individual areas as well as in both trenches, final tools were accompanied by sandstone flakes, and in Areas 5 and 6 even by sandstone blanks (Plate 2), i.e. by technological categories attesting to the final production and modification of shapes of grinding tools directly at the site (Table 2). In the most numerous group of grinding tools, the surface collection mostly consisted of generally used querns (N=330; 54%) outnumbering used grinders (N=269; 44%). Only in Area 3 were their numbers balanced, while in Area 6 grinders dominated the assemblage. Nevertheless, Area 6 is not a terrace that could have accommodated production activities; instead it is a gully between boulders with grinding

Table 1. Functional groups of the ground stones from the surface survey (Areas 1-6) and in Trenches 6 and 7.

Sets	Σ	Grinding tools (querns, grinders, blanks, flakes)	Rubbers	Rings	Unidentifiable ground stones	Hammer stones
surface survey	619	609	3	2	3	2
Area 1	176	174	1	1	0	0
Area 2	86	85	1	0	0	0
Area 3	61	58	0	0	3	0
Area 4	78	78	0	0	0	0
Area 5	94	92	1	1	0	0
Area 6	124	122	0	0	0	2
Trench 6	28	26	0	0	0	2
Trench 7	122	116	0	0	1	5

Plate 2. Blanks of querns from Areas 5 and 6 (photo: J. Řídký).

Plate 3. Basin-like quern from Area 2 (photo: J. Řídký).

Table 2. Comparison of the technological categories and functional groups of grinding tools from the surface survey (Areas 1-6) and from Trenches 6 and 7. In the rows of the table one can compare the percentage of the individual categories and groups in Areas 1-6 and in the trenches.

Sets	Σ	Querns	Querns %	Grinders	Grinders %	Blanks	Blanks %	Flakes	Flakes %
surface survey	609	330	54.19	269	44.17	6	0.99	4	0.66
Area 1	174	99	56.90	74	42.53	0	0	1	0.57
Area 2	85	63	74.12	22	25.88	0	0	0	0
Area 3	58	28	48.28	28	48.28	0	0	2	3.45
Area 4	78	51	65.38	26	33.33	0	0	1	1.28
Area 5	92	48	52.17	39	42.39	5	5.43	0	0
Area 6	122	41	33.61	80	65.57	1	0.82	0	0
Trench 6	26	12	46.15	12	46.15	0	0	2	7.69
Trench 7	116	48	41.38	55	47.41	0	0	13	11.21

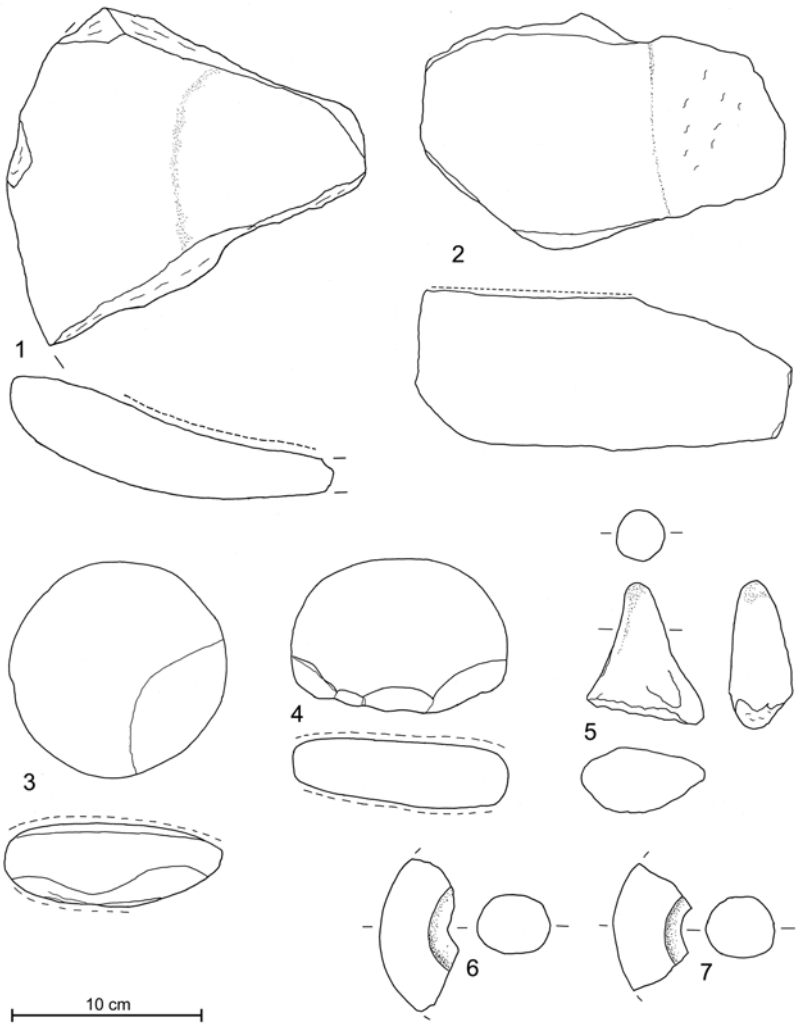

Figure 2. Representatives of the functional groups of tools and other artefacts from Sphinx: 1 – fragment of basin-like quern; 2 – complete flat quern; 3 – round grinder; 4 – oval grinder; 5 – rubber; 6 and 7 – fragments of stone rings (drawing: J. Řídký).

hollows (cup-marks) in which a greater quantity of grinders had accumulated over time. Of interest is the equal ratio of querns and grinders in Trench 6 and predominating representation of grinders in Trench 7.

Some querns as well as grinders could be divided into several types. On the one hand, there are querns with a basin-like working surface and body finished by careful and fine pecking or grinding (Figure 2.1; Plate 3), and, on the other, flat querns with variously inclined, more or less levelled working surface whose bodies are usually only roughly hammered into the desired shape (Figure 2.2). Querns that we regard as complete attained a maximum length of 140-260mm and width of 140-230mm. Based on the dimensions of some fragments, however, we can postulate much larger pieces.

The surface collection as well as the trenches contained grinders of round or oval, more or less regular shape, with one or several working surfaces (Figure 2.3-4). In cross section, the grinders may be oval, semi-circular or rectangular. Complete pieces were no more than 60-120mm in length, with a width of 60-110mm.

Altogether 17 querns (4%) can be regarded as complete (sometimes after modification of the original shape) or nearly complete; of these only two are of the basin-like type. They occur in the surface collection as well as in Trench 7. In the course of their study in the field, a degree of preservation (in percent) was estimated for each tool (Table 3). This is, as a matter of course, a subjective tool, which, however, makes it possible to consider the information potential of the material from the surface collection and the artefacts from the trenches. It is, for instance, evident that not many usable tools (with a degree of preservation at least 51% and more) have been left on the surface of the site. All over the place there were many small fragments, some of them not more than a few centimetres in size (Plate 4). Some of the fragments are likely remains of tools broken unintentionally in consequence of use (due to the pressure concentrated on the central part) or refreshing (rejuvenation) of the working surfaces. With a considerable portion of the querns (mostly of basin-like type), however, we cannot discount the possibility of intentional destruction. The latter interpretation is indicated by the marked fragmentation of the high-quality hard and compact raw materials of the querns as well as by the traces of impact noted on some fragments. An intentional destruction has been proposed, for instance, in the Neolithic collections of grinding tools in Western Europe, where breaking of querns has been interpreted as a possible expression of ritual activities (e.g. Ramminger 2007; van Gijn and Verbaas 2009). Nevertheless, without comparative experiments with raw materials from Jebel Sabaloka the circumstances of the discard of these tools remain an open question.

A quite different situation was seen with grinders (Table 4). A total of 198 pieces (59%) can be considered complete or nearly complete. In this functional group we recorded the lowest number of small fragments with an estimated degree

Table 3. Preservation of querns from the surface survey (Areas 1-6) and in Trenches 6 and 7 (division into groups made subjectively). With some pieces it was impossible to determine whether a complete piece or a mere fragment was concerned.

Sets	Σ	up to 10%	11-50%	51-75%	76-100%
surface survey	329	266	46	2	15
Area 1	99	77	20	0	2
Area 2	63	51	7	1	4
Area 3	28	24	3	1	0
Area 4	50	40	5	0	5
Area 5	48	40	8	0	0
Area 6	41	34	3	0	4
Trench 6	12	7	5	0	0
Trench 7	48	38	8	0	2

Plate 4. Rim fragments of basin-like querns from various areas within the site (photo: J. Řídký).

Table 4. Preservation of grinders from the surface survey (Areas 1-6) and in Trenches 6 and 7 (division into groups made subjectively). Some grinders could be used for their original purpose even when broken.

Sets	Σ	up to 10%	11-50%	51-75%	76-100%
surface survey	269	36	62	4	166
Area 1	74	13	19	1	40
Area 2	22	3	2	1	16
Area 3	28	2	12	0	14
Area 4	26	1	3	1	21
Area 5	39	10	11	1	17
Area 6	80	7	15	0	58
Trench 6	12	1	3	0	8
Trench 7	55	21	9	1	24

of preservation below 10%. This could be caused also by the fact that the production of grinders was far less demanding than with basin-like querns, for instance. Pieces made from the local rhyolites could be easily procured in the immediate vicinity of the site.

The objective of this first report was to provide an overview of the distribution of the ground stones and representation of their types at the site. In the future, it will be necessary to carry out similar comparative analyses also with other artefacts, such as pottery or lithics. Only then will it be possible to determine whether, for example, the much higher density of finds of ground stones in Areas 4 and 5 (see Table 5) is a consequence of human actions (for instance ritual), or natural agents. Further functional differentiation of the grinding tools will be possible following the analyses of micro-residues from the working surfaces of selected tools (e.g. Varadzinová Suková *et al.* 2015).

Acknowledgements

This report forms part of the *Communities and resources in late prehistory of Jebel Sabaloka, central Sudan: from analysis to synthesis*, a research project (no. 17-03207S) supported by the Czech Science Foundation (GA ČR).

Table 5. Quantity and weight of ground stones from the surface survey (Areas 1-6) and from Trenches 6 and 7. The table also states the sizes of the areas and trenches. The density of finds per square metre and per cubic metre (only with trenches) was calculated by dividing the amount of finds or their weight by the sizes of surfaces and volumes. The values for Area 6 are not included due to its location outside settlement platform.

Sets			Size of area/trench		Density of finds		Density of finds (g)	
	Σ	Σ (g)	m^2	m^3	m^2	m^3	m^2	m^3
surface survey	619	310,314	939.3	-	0.659	-	330.367	-
Area 1	176	77,694	324.3	-	0.543	-	239.574	-
Area 2	86	45,015	178.5	-	0.482	-	252.185	-
Area 3	61	26,814	173.6	-	0.351	-	154.459	-
Area 4	78	67,277	83.2	-	0.938	-	808.618	-
Area 5	94	34,002	32.5	-	2.892	-	1046.215	-
Area 6	124	59,512	-	-	-	-	-	-
Trench 6	28	10,110	3.75	2.17	-	12.903	-	4658.986
Trench 7	122	33,197	9	8.26	-	14.770	-	4019.007

The archaeozoological osteological finds from Sphinx

Zdeňka Sůvová

During the 2015 field campaign, thousands of fragments of bones were retrieved from Trenches 6-10. Already in the field, the zoological material was sorted, a preliminary determination was carried out, and a selection was made of finds for further detailed analysis in the Czech Republic (in progress). The data considered below represent preliminary results that are to be extended and refined on completion of the more detailed study.

The studied assemblage of animal bones and other archaeozoological material is comparatively numerous, but the bones are very fragmented. Most of the assemblage comprises small to very small fragments; this results in a low percentage of determined finds. The high level of fragmentation may affect not only the species composition: the finds of megafauna can be underestimated, while the remains of smaller animals can be overestimated. According to the preliminary results, catfish (Siluriformes), Nile monitor (*Varanus niloticus*), Nile perch (*Lates niloticus*), catfish (*Synodontis* sp.) and small-sized antelopes (some of the finds were determined as oribi, *Ourebia ourebi*) seem to be the most abundant taxa in the assemblage. The remains of tilapia (Tilapiini), Nile crocodile (*Crocodylus niloticus*) and rock python (*Python sebae*) are also common finds. Other taxa occur regularly: large-sized antelopes, bovines (Bovidae), catfish (*Clarias* sp.), cane rat (*Thryonomys* sp.) and hippopotamus (*Hippopotamus amphibius*). Other finds are less frequent or sporadic: medium-sized antelopes, pigs (Suidae), hare (*Lepus* sp.), rock hyrax (*Procavia capensis*), aardvark (*Orycteropus afer*), carnivores (Carnivora), giraffe (*Giraffa camelopardalis*), rhinoceros (Rhinocerotidae), small lizards and a variety of fish (*Gymnarchus, Mormyrus, Heterotis, Polypterus, Alestes, Schilbe*). Fragments of bird bones were found, but due to their erosion the determination will be quite difficult. Other bird remains were excavated: ostrich eggshell fragments, both worked (as beads especially) and unworked. Moreover, finds of presumably intrusive fauna were recorded: rodents (Muridae and Gerbilinae), frogs (Anura) and bats (Chiroptera). Nevertheless, the species spectrum will be probably enriched during further analysis.

The presence of some taxa shows that the former environment was more favourable compared to present conditions. The occurrence of the marshland element – the cane rat (*Thryonomys* sp.) – is the most significant one in this respect, since this large rodent was present in central Sudan only during the humid phase of the Early and Middle Holocene and it is a typical taxon of Mesolithic assemblages. It disappeared from the Sudan with the climate aridization during the Neolithic (Peters 1989, 130-132). So far, no finds of domestic species were recorded, which corresponds to the Mesolithic dating of the studied assemblage.

In the Nile Valley or its close vicinity (which is the case of Sphinx located *c.* 3.5km from the Nile), one may expect that fish constituted the major source of animal protein. However, the remains of reptiles, mammals and birds are quite abundant suggesting that fishing was only one of the subsistence strategies of the inhabitants of the site. A variety of fish species was found: fish of well-oxygenated waters, fish of shallow waters, as well as marshland species. In other words, fishing appears to have occurred all year-round both in the main river channel during low levels of the Nile and on flood plains, with wetlands constituting a supplementary source of fish. Based on the preliminary results, the elements of well-oxygenated waters (*Lates*, *Synodontis*) are more abundant in our assemblage than the species of flood plains (Tilapiini, *Clarias*).

The hunting adaptability of the inhabitants of Sphinx was rather high. Successful fishing in the main channel of the Nile required advanced equipment, especially stable boats (Van Neer 2004, 257). For the hunting of pythons or monitors we can expect the use of traps, while crocodiles can be best caught with nets, hippopotamus by harpoons and antelopes by lassos (cf. Hendrickx 2011).

Concerning taphonomical characteristics, the preservation of bones was rather poor and the fragmentation level of the assemblage very high. This means that finds with butchery marks or traces of gnawing are likely to be extremely underestimated. As we have expected, no gnawed bones were recorded. Butchery marks were found only rarely, and several finds can be interpreted as resulting from the bones being used as tools. On the other hand, burning of bones was quite frequent and included hundreds of fragments (Plate 1). As far as we can tell, traces of burning related to cooking above open fire were more abundant than those resulting from waste removal using fire or another more intensive exposure to fire.

*Plate 1. Vertebra of the Nile crocodile (*Crocodylus niloticus*) with traces of burning from preparation of the animal for consumption (photo: Z. Sůvová).*

Summary
A variety of species was determined in the assemblage of the vertebrate remains: fish (open water, shallow water and wetland species), reptiles (monitors, crocodiles, pythons), birds and mammals (antelopes and many others). The species composition supports the Mesolithic dating of the assemblage and indicates that the hunting adaptability of the Mesolithic inhabitants of the site was rather high.

Acknowledgements
This report forms part of the *Communities and resources in late prehistory of Jebel Sabaloka, central Sudan: from analysis to synthesis*, a research project (no. 17-03207S) supported by the Czech Science Foundation (GA ČR).

The molluscs from Sphinx

Lucie Juřičková

Molluscs – bivalves and gastropods – usually have a specific occurrence depending on environment and climate. Moreover, a number of species were – and in some cases still are – used in human societies as food, tools, or raw material for production of objects. Thus, an analysis of molluscs from archaeological contexts may bring invaluable information on the past environment as well as on some aspects of human consumption or production practices.

In this preliminary report, we present the first information on the representation of species as found in Trench 5 at the site of Sphinx (SBK.W-60), and discuss their information value for the understanding of the past environment as well as their possible use by the hunter-gatherers who occupied the site between the late ninth and the late sixth millennium cal. BC.

The material was obtained through dry-sieving of the soil excavated in the trench (4.03m^3) on a 4mm mesh according to sectors, stratigraphic units and mechanical units. It consists of several hundred broken and unbroken mollusc shells with a total weight of 1.51kg. The finds were catalogued under 89 assemblage numbers.

The separation of the non-identifiable remains and determination of the identifiable ones was performed in the Czech Republic using the available publications on African and Arabian freshwater and terrestrial molluscs (in particular Brown 1980; Van Damme 1984; Neubert 1998). The information at hand on the terrestrial gastropods is, however, particularly scanty, which in many cases makes the determination of species and their habitats and ecology impossible.

Of the 89 assemblages, 16 contained only unidentifiable fragments. The remaining 73 contained finds determinable down to species, or merely to the level of genus or family. The possibilities of determination were particularly low with freshwater bivalves due to their increased fragmentation in consequence of reworking of the original settlement deposits by excavation of graves.

Species represented

Table 1 summarises the species, genera and families encountered in Trench 5, together with the minimum number of specimens identified, the number of assemblages in which they were recorded, and the state of preservation of the finds. The molluscan corpus contains freshwater bivalves and gastropods and terrestrial gastropods (Plate 1). Of these, between one (20 cases) to nine (one case) were recorded in individual assemblages with determinable material. This uneven distribution throughout the trench corresponds to the former presence of layers and features that are usually no longer identifiable during excavation (see Varadzinová and Varadzin above).

Table 1. Sphinx, Jebel Sabaloka: mollusc species identified in Trench 5, with a specification of the number of specimens, frequency in assemblages, and state of preservation of the material.

Species	Specimens	Assemblages	Preservation
Pila wernei	197	60	unbroken and broken shells and *opercula*
Pila sp.	10	10	fragments
cf. *Pila* sp.	2	1	fragments
Bellamya unicolor	16	8	relatively well-preserved shells
cf. *Bellamya*	1	1	fragments
Lanistes carinatus	4	4	relatively well-preserved shells
Lanistes sp.	2	2	fragments
Unionidae – indet. fragments	54	41	fragments
Caelatura aegyptiaca	1	1	one valve with preserved teeth
cf. *Mutela*	1	1	fragments
cf. *Anodonta* sp.	1	1	fragments
Zootecus insularis	124	35	mostly well-preserved shells
Subulinidae – unidentified species 1	53	23	well-preserved shells
Subulinidae – unidentified species 2	1	1	well-preserved shell
Subulinidae – indet. fragments	1	1	fragments
Limicolaria sp.	13	9	complete adult specimens and fragments of shells
Gulella sp.	1	1	relatively well-preserved shells
indeterminable fragments		16	fragments

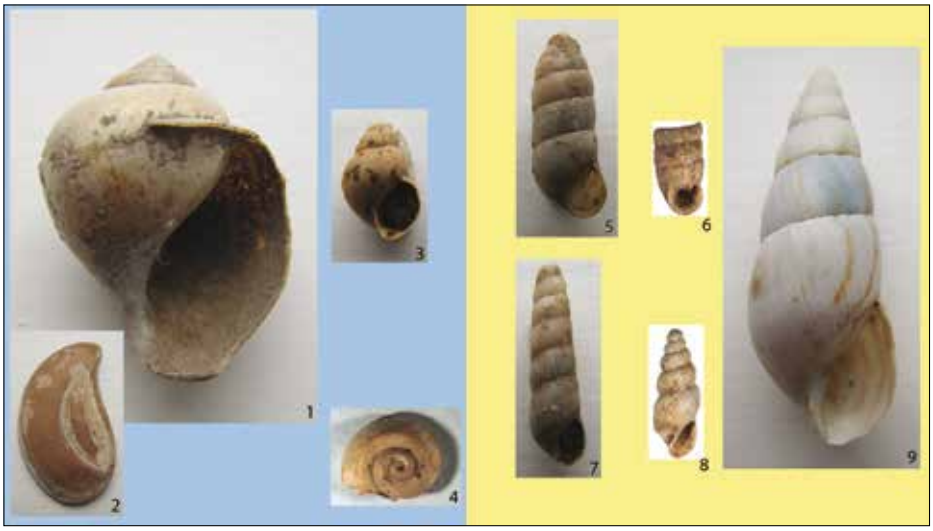

Plate 1. Sphinx, Jebel Sabaloka: main gastropod species recorded in Trench 5, with the average size of a whole specimen indicated in brackets. Freshwater snails (blue background): 1 – Pila wernei *(70mm); 2* – operculum *of* Pila wernei*; 3* – Bellamya unicolor *(25mm); 4* – Lanistes carinatus *(30mm). Land snails (yellow background): 5* – Zootecus insularis *(15mm); 6* – Gulella *sp. (8mm); 7 and 8 – Subulinidae unidentified species (7mm and 20mm); 9* – Limicolaria *cf.* cailliaudi *(55mm) (photo: L. Juřičková).*

Freshwater bivalves

Fifty-seven specimens of large freshwater bivalves were represented in the collection. Of these, only one specimen could be determined specifically as *Caelatura aegyptiaca* (Bivalvia: Unionidae). It is a common bivalve that occurs in big African rivers including the Nile and in lakes, but never in small water bodies (Van Damme 1984). It is found only sporadically at late prehistoric sites in central Sudan (e.g. Arkell 1949; 1953; cf. Peters 1986, tab. 1; 1991). The rest of the material consists of undiagnostic fragments of large bivalves originating from large water bodies or running waters (Unionida, cf. *Mutela*, cf. *Anodonta* sp.).

Generally, large freshwater bivalves are known to have been used for varied purposes – for food, tools or decoration (e.g. Arkell 1953; Gautier 1983).

Freshwater gastropods

Altogether 232 specimens of freshwater gastropods were recorded in the corpus. Most of these could be identified specifically as *Pila wernei* (Gastropoda: Caenogastropoda: Ampulariidae), in particular thanks to the common occurrence of *opercula* which enabled species-level determination (Van Damme 1984). This large water snail is distributed today in southern Somalia, southern Sudan, westward to the Niger in Mali, in northern Kenya, and in the Malagarasi Swamp in Tanzania (Peters 1991). It inhabits seasonal pools rich in underwater vegetation and papyrus swamps. It estivates, burrowed in the mud, if the environment dries out (Van Damme 1984; Peters 1991). It was widespread in Africa in prehistory (e.g. Tothill 1946; Van Damme 1984) and is found

in large quantities at late prehistoric sites in central Sudan (e.g. Arkell 1949; 1953; cf. Peters 1986, tab. 1; Gautier 1983; Peters 1991; Gautier and Van Neer 2011). Use of this species by man for food, as tools (spoons, cups), as bait for fishing, or as decoration has been suggested based on ethnographic parallels (e.g. Arkell 1949, 32; Gautier 1983, 93-94) or finds of worked specimens (e.g. perforated *opercula* used as pendants at Jebel Moya – Addison 1949, 137, pl. XL).

Lanistes carinatus (Gastropoda: Caenogastropoda: Ampullariidae), represented by four specimens, is a smaller-sized freshwater snail that often accompanies *Pila wernei* at prehistoric sites in central Sudan, but never in great quantities (e.g. Arkell 1949; 1953; Gautier 1983; Gautier and Van Neer 2011). Today this smaller freshwater species occurs in the Egyptian Delta and along the Nile southwards from Khartoum, in Ethiopia, Somalia, Kenya and Uganda. It is found in ditches and pools fed by rain but linked with the Nile and overgrown with aquatic vegetation (Brown 1980; Van Damme 1984). Use by man for food has been suggested (Gautier 1983, 93).

Bellamya unicolor (Gastropoda: Caenogastropoda: Viviparidae), represented by 16 specimens in eight contexts, is a small-sized gastropod recently distributed in Africa from Lower Egypt to Sudan and further southwards to Kenya and Tanzania and westwards to Senegambia. It commonly inhabits stagnant and slowly running waters that never dry out. It lives on aquatic vegetation (Brown 1980). Its late Pleistocene–Holocene distribution includes southern Libya, Chad and Niger (Van Damme 1984). In central Sudan, it has been reported from several late prehistoric sites (e.g. Arkell 1949; 1953; cf. Peters 1986, tab. 1; Gautier 1983). Its comparatively small size makes an intentional collection by man unlikely; however, finds of perforated specimens (whether artificially or naturally) made Arkell (1953, 23) suggest their use for personal wear and decoration. At Saggai 1 and Geili, they were regarded as geological intrusives (Gautier 1983, 96).

Terrestrial gastropods

In the corpus 193 specimens of terrestrial gastropods were recorded. Among them, *Zootecus insularis* (Gastropoda: Pulmonata: Subulinidae) clearly predominates both as to the number of assemblages (35) and number of identified specimens (124). In recent times this tiny land snail is a Saharan-Sindian species (India, Arabia, Eritrea, Egypt, Sudan, Senegal and Cape Verde Islands), but its wide distribution may have been caused by man (Verdcourt 1960). It seems restricted to semi-arid habitats, there are no records of it from humid mountain areas, but its ecology is poorly known (Neubert 1998). It is an intrusive species able to survive dry condition in deep narrow crevices under the surface. In addition to central Sudan (e.g. Arkell 1949; 1953; Gautier 1983; Peters 1991; Gautier and Van Neer 2011), its Quaternary African records are known from Nubia, the Western Desert, and the Acacus Massif (Peters 1991, 209). Use by man is not known and is highly unlikely due to its small size and the fact that it is a burrowing species.

Limicolaria spp. (Gastropoda: Pulmonata: Achatinidae) are big pulmonate snails endemic in Africa. However, as a revision of the genus exists (Crowley and Pain 1970), the taxonomic value of subfossil shells is hard to confirm. *Limicolaria cailliaudi* is the medium-sized member of the Achatinidae family with which most of the species found in Quaternary deposits in the Sudan have been identified (e.g. Arkell 1949; 1953; cf. Peters 1986, tab. 1; Gautier 1983; Peters 1991; Gautier and Van Neer 2011). Its recent distribution extends from eastern Sudan

Plate 2. Limicolaria *sp. in the area of its current distribution in south-eastern Sudan near the border with Ethiopia (photo: P. Pokorný).*

(Plate 2) to Ethiopia and Tanzania (Crowley and Pain 1970). It seems to be particularly tolerant to fluctuation of annual precipitation. It occurs in well-drained areas with tall grasses, acacia tall grass plains and clay-pans with annual precipitations of 400-800mm. In recent years, however, specimens shortly after death were collected along the Nile in Shendi where the microclimatic conditions were dramatically different from those further to the south (Peters 1991; Gautier and Van Neer 2011). This comparatively large snail can survive dry conditions in leaf litter rich soils under vegetation; if active, it climbs on trees. *Limicolaria cailliaudi* is a typical land snail found in prehistoric faunas in central Sudan (Crowley and Pain 1970). It is mostly regarded as pene-contemporaneous intrusive (e.g. Arkell 1949, 28; 1953, 10; Gautier 1983, 95), although possible use as food (Crowley and Pain 1970) and as decoration (e.g. Arkell 1953, 65) have been suggested.

Three other land snails were recorded in the collection from Trench 5, but their precise identification was not possible. Two of them belong to the tropical family Subulinidae with various ecological requirements, while one species appertains to the genus *Gulella* which probably indicates more humid climate. Moreover, the latter species occurs together with *L. cailliaudi.*

Evaluation

Environmental and cultural indications of the presence of molluscs can be assessed only in the case of species with known habitat or human use. Unfortunately, reliable information in this respect is not as abundant in natural-scientific, ethnographic and historical literature on Africa as one would wish. Of significance are, of course, traces of use preserved on concrete specimens as well as specific circumstances of occurrence of molluscs in archaeological situations.

The collection of molluscs from Trench 5 at the site of Sphinx described above comes from a comparatively small part of the site, but contains data rich enough to permit a preliminary evaluation of both environmental conditions and human behaviour in the past. A testimony with respect to the former is provided by *Limicolaria* sp., which is today known to live in grass plains and clay pans with 400-800mm annual precipitation and which thus constitutes, together with the single representative of the genus *Gulella*, a clear indication of more humid climate in the region of Jebel Sabaloka in the past. Climatic conditions different from those prevalent in the region at present are also suggested by the presence of freshwater gastropods *Pila wernei* and *Lanistes carinatus* that have not been recorded in the Middle Nile region in the recent past. These two species also indicate an occurrence of small water bodies in the vicinity of the site from which they could have been collected and brought to the settlement. *Zootecus insularis*, the second most numerous species in Trench 5, on the other hand, signals semi-arid habitats, but its ecology is poorly known. Its information value for our understanding of the climatic and environmental conditions during the Mesolithic period is limited as it is an intrusive species which may have colonised the site in later (more arid) times.

Human use of all of the freshwater bivalves recorded in Trench 5 is unquestionable as all of them had to be transported to the site. Very probable, although difficult to demonstrate directly, is their use as food. Utilisation of their shell as raw material for production of decorative objects is evidenced at the site, among other things, by the finds of mother of pearl worked into the shape of a disc (see Varadzinová and Varadzin above, Plate 13D) or perforated drop-shaped pendants. Also one can neither exclude nor confirm the utilisation of their valves as tools for shaping and smoothing or for decorating pottery (curved or serrated impressions) (cf. Arkell 1949, 92; Caneva 1983, 164).

Freshwater gastropods, all of which must have been brought to the site by man, provide a more diversified testimony as to their possible use by the inhabitants of the settlement. Food consumption is the most probable with *Pila wernei*, which is the only species found in large concentrations (in the area around Trenches 1 and 8), representing apparently the remains of food storage or refuse (see Varadzinová and Varadzin above). On the contrary, use for food may be discounted with *Bellamya unicolor* and *Lanistes carinatus* on account of the small size of the former and the small number of specimens of the latter. They are likely to have been brought to the site accidentally with aquatic vegetation on which they are known to live and which may have been collected by the inhabitants to be used in building or for basketry. The presence of these species in deposits could thus indirectly indicate the working at the site of this type of organic materials that rarely survive in the archaeological deposits. Last, but not least, the use of *Bellamya unicolor* – whether brought to the site purposefully or accidentally – or *opercula* of *Pila wernei* as beads or pendants (see Arkell 1953, 23; Addison 1949, 137, pl. XL) is not confirmed at Sphinx based on the available evidence due to the absence of perforation of the shells or traces of other use and wear.

It is more complicated to assess human use with land snails whose occurrence at the site could be (and in most cases probably is) autochthonous. Hypothetically speaking, however, one cannot discount a possible artificial introduction to the site of the aesthetically pleasing shells of *Limicolaria* sp., which is not excluded by the site's elevated position as well as by the results of the analysis which noted only mature individuals in the studied assemblage.

Acknowledgements

This report forms part of the *Communities and resources in late prehistory of Jebel Sabaloka, central Sudan: from analysis to synthesis*, a research project (no. 17-03207S) supported by the Czech Science Foundation (GA ČR).

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