



POLISH MISSION, SARUQ AL-HADID 2019 FINAL REPORT

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Polish Academy of Sciences (IKŚiO PAN)
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e-ISBN 978-83-963880-8-7

Polish Mission, Saruq al-Hadid 2019 Final Report

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WARSZAWA 2021

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Acknowledgements

The Polish Mission wishes to thank the CEO of Architecture Heritage and Antiquities Department, Mr. Ahmed Mahmoud, for the opportunity to work at the site of Saruq al-Hadid in the 2019 season. Many thanks are extended to Dr. Mansour Boraik and Mr. Yaaqoub Yousif Al Ali for the knowledge, advice, and assistance received before and during the field season. We also greatly appreciated DM surveyor and photographer Jamal Safi for his surveying assistance and for supplying object photographs in the absence of our project photographer. Senior DM archaeologist Hany Attia and DM archaeologist Mariam As-Suidi provided us with regular assistance in logistical, and formal documentation matters for which we are also very grateful.

I. Introduction

The inaugural field season of the Polish Mission at Saruq al-Hadid (SAH), contracted by Archeo-Consultant Inc., and under the auspices of the Dubai Municipality, was conducted between February 10 and May 10, 2019. During this period, a total of 14 staff members, including archaeologists and material specialists, analyzed, documented, and reported on the results of excavation in 12 squares within Area F of the site.

Workflow proceeded logically through the process of systematic excavation, spatial data acquisition, curation/registration, photography, and analysis/conservation, and finally reporting. Several specialists provided focused analyses on ceramics, geological characterization of the site and broader area, ornamental beads, and metallurgical finds (See individual specialist sections below). Field data and finds were documented in accordance with Dubai Municipality standards, and select objects were photographed, illustrated, and conserved for curation or future analysis. The collection of spatial data provided the means to visualize both artifact distribution and contextual changes, as well as track daily excavation progress.

This combination of excavation and data/object processing provided the basis for monthly reports during the season, and finally the overall report which follows here.

The format for this report proceeds from a summary of season logistics and fieldwork, through individual square reports (including excavation and artifact summaries), to more detailed contributions by material class, geospatial, and geological specialists.

II. FIELD LOGISTICS

FIELD STAFF

The Polish Mission at SAH in 2019 was comprised of a total of 14 team members during the entire field season. A core group of 3 field archaeologist supervisors led by a field director, and under guidance by the project director were present on-site for the duration of the project. Several field supervisors arrived/departed on rotation, however the bulk of the field season was overseen by 3 primary field supervisors and the field director. Also present for the duration of the field season was the registrar who provided continuity in artifact information and data gathering, as well as acting as intermediary between field and artifact processing activities. A lab/field photographer provided documentation of both finds and field context information, while the addition of an illustrator provided further detailed documentation of select special finds. The cartographer assisted in field measurements and created spatial documentation of all finds, features, and contexts. During the latter part of the field season, a ceramicist and geologist joined to provide an analysis of finds and observations relative to their respective disciplines.

Table 1. Polish Mission staff during 2019 season.

Team Member	Position
Karol Juchniewicz, Ph.D.	Director
Sidney Rempel, M.A., Ph.D.(ABD)	Field Director, Lithicist, GIS
Katarzyna Pawłowska M.A.	Registrar
Karol Ochnio, M.A.	Archaeologist
Marek Woźniak, M.A.	Archaeologist
Joanna Rądkowska, M.A.	Archaeologist
Marta Bajtler, M.A.	Archaeologist
Joanna Ciesielska, M.A.	Archaeologist
Otto Bagi, B.A.	CAD/GIS, Cartography
Katarzyna Molge, M.A.	Illustrator
Łukasz Zieliński, M.A.	Metal Conservator
Jan Kurzawa, B.A.	Photographer
Teodozja Rzeuska, Ph.D.	Ceramicist
Hubert Kiersnowski, Ph.D.	Geologist

WORKFLOW

The workflow during the season typically followed a 5 day work week (Sunday to Thursday) and 5.5 hours of field work per day. This does not include reporting and analysis time each day and during weekends. At the earlier part of the season, hours worked in the field began at 7:00 am but were moved gradually to 6:00 am to avoid increasing temperatures. All days worked were a full 5.5 hours, except for 18 days which were cut short by environmental factors (e.g. wind, rain).

Initially, the Polish Mission was granted 15 workers for excavation. At the end of March this number was increased to 19. With 3 supervisors, it was possible to keep at least 3, and later 4 squares under active excavation for the season. Workers with previous experience (DM) were assigned to excavation each square, while the remaining (blue) workers assisted with screening, filling bags, etc. Supervisors recorded all finds and documented all context changes, coordinated field photos, total station measurements, and communicated progress/issues to the field director.

The registrar was responsible for receiving daily finds from each square supervisor and entering data into the project database. She was also responsible for selecting objects for GR# assignment, for photographs, and illustration. From this point of contact, all objects were distributed to the appropriate specialist as required.

All points shot by total station each day (e.g. object locations, elevations, features) were provided to each square supervisor in the form of a daily map indicating precise locations of each entity within the current context. These maps formed part of the daily log of information retained by each square supervisor. Ultimately, all spatial data was compiled daily within a GIS for summary and final report submission, as well as submission to the DM as a spatial record of all measurements taken.

The photographer was available to take both field and lab photos as required. Field photos included objects found *in situ*, context surfaces, and overall Area F excavation views. Lab photos were the primary means of final object documentation for archival purposes and report presentation.

Two monthly reports were submitted (February and March) during the field season which summarize field activity and finds during that time. These included a written summary of activity in each square, tables of small finds, bulk finds, and select photos of representative or special finds.

METHODOLOGY

In its commitment to work in ten squares this season, the strategy for excavation in the Polish Mission section of Area F focused on maximizing horizontal exposure (when possible) to avoid the excessive need for sandbagging and baulk trimming. The remaining modern dune surface in this area is, however, quite high (~106.50 mASL) and required partial excavation in certain squares while turning attention to adjacent squares to bring them to a similar level. In this way, broader areas were brought to key horizons at nearly the same time (i.e. Iron Age II, Wadi Suq levels).

Beginning with 15 workers, it was possible to reasonably open 3 squares for excavation at a time, allowing for shovel excavation, screening, and transport of sand. Later in March, a further 4 workers were added, allowing excavation in 4 squares simultaneously with 3 supervisors.

For the duration of the season, excavation was typically by shovel shaving in thin, arbitrary levels where no features or ancient terrain was detected. Where surficial features/horizons were encountered, excavation adapted to a stratigraphic approach, following feature or surface contours. This stratigraphic approach was applied mainly to the two primary slag deposits and the upper Iron Age II surface where it was detected (See Figure 3 for context numbers of these horizons). When upper and lower slag deposits were encountered, excavation proceeded down, leaving slag in place for photos and topographic measurements. Upon removal, excavation proceeded in flat arbitrary levels until the next cultural horizon. The Iron Age II deposit was typically defined by the appearance of corresponding metal artifacts, however in the eastern portion of the area, artifacts were further accompanied by the presence of charcoal flecking, and in some areas, heavy charcoal deposits. Details of these deposits are found in individual square reports below.

Contexts were designated by changes in depositional characteristics, e.g. presence of slag deposit, in which case, each deposit received a new context number. All objects recovered from each context were so identified and retained in the database to allow segregation of objects/finds from each occupational phase. Context identification for Area F followed a unique range of numbers for each square. A range of 100 possible consecutive context numbers was thus possible for each square, e.g. Square V8 = Contexts 100-199 etc.

Context 99 was assigned to baulk-trimming, general cleaning within each square so as to segregate objects/finds from a possible mixture of cultural horizons, leading to cross-contamination of discrete contexts. Gypsum bedrock was assigned Context 88 across Area F since it is an homogenous, regular landform in the area. Structures (i.e. features) such as postholes and hearths were assigned unique numbers within C88, in each square.

In situ artifacts were measured by total station for 3-point location. In the case of a cluster of objects, each object was measured as well as several ground control points for orthophotogrammetry. In combination with orthophotos, surveyed data was used to accurately digitize each object for inclusion in the overall geospatial database (GIS). Objects found *in situ* which were assigned a general registry number (GR) are included in this database, and are delivered in the form of an ESRI shapefile with this report.

All small finds and bulk finds were assigned consecutive excavation numbers, and where appropriate, a GR number (e.g. complete objects, special finds). All field and object measurements were then recorded in corresponding databases, including the E3, R1, and R2 forms for the DM.

All GR objects, and representative samples of bulk finds were selected for photography; also delivered with this report. A subset of GR objects was further selected for conservation, illustration, or both.

Structures (or features) encountered were excavated fully, mapped by total station, rendered in orthophotogrammetric planviews, and documented in structure forms E4 as well as in the project GIS for report map production.

Completed squares were cleaned to bedrock (C88) including natural fracture channels in preparation for final photos at the completion of the square, and for final season-end aerial photos. Unfinished squares had sandbag walls reinforced as required, and were covered with plastic tarps for protection in between excavation seasons.

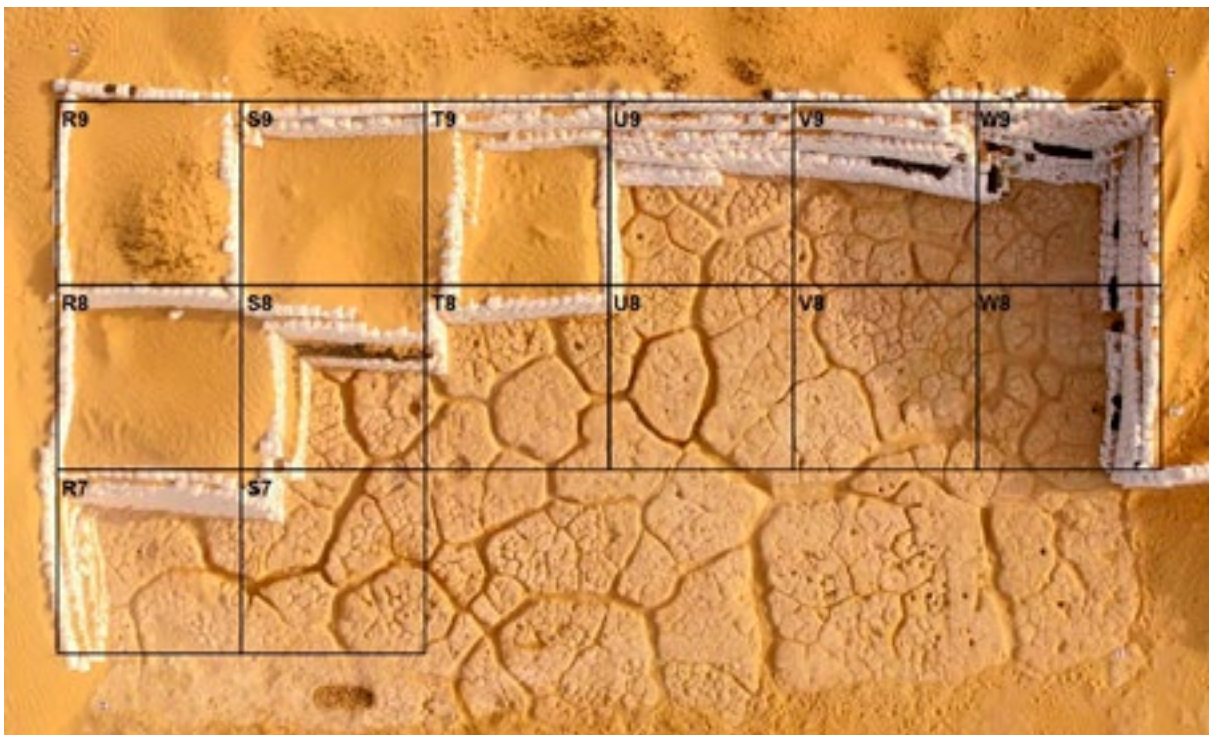


Figure 1. Aerial view of Polish Mission excavation grid in Area F. Taken April 23, 2019. (Note: Does not show completed square T9).

III. FIELDWORK OVERVIEW

The following summaries encapsulate the highlights of specialized investigations, approaches, and analyses that are discussed in detail separately under section VI. Specialist Reports.

EXCAVATION OVERVIEW

Excavation was conducted in Area F between February 10 and April 30 2019. A total of 14 squares were under some level of excavation (See Figures 1 and 2): 9 squares were excavated to completion (i.e. bedrock) and 3 squares with partial excavation. Of the 9 completed squares, S8, T8, V8, and W8 were left partially excavated by the previous mission. Squares S7 and U8 were completed by the previous mission, however during preliminary cleaning this season, objects were recovered and retained as part of cleaning contexts 99 within each square.

Approximately 300 square meters was under excavation this season, with elevation maximums of 106.2 mASL at the top of Square R9, and 100.9 mASL at bedrock in Square R7. Necessarily, with such overall sand dune thickness, each square often had to be buttressed with sandbags along margins to prevent collapse. This effectively reduced the overall dimensions of available excavation area, but retained the integrity of surrounding sand baulks.

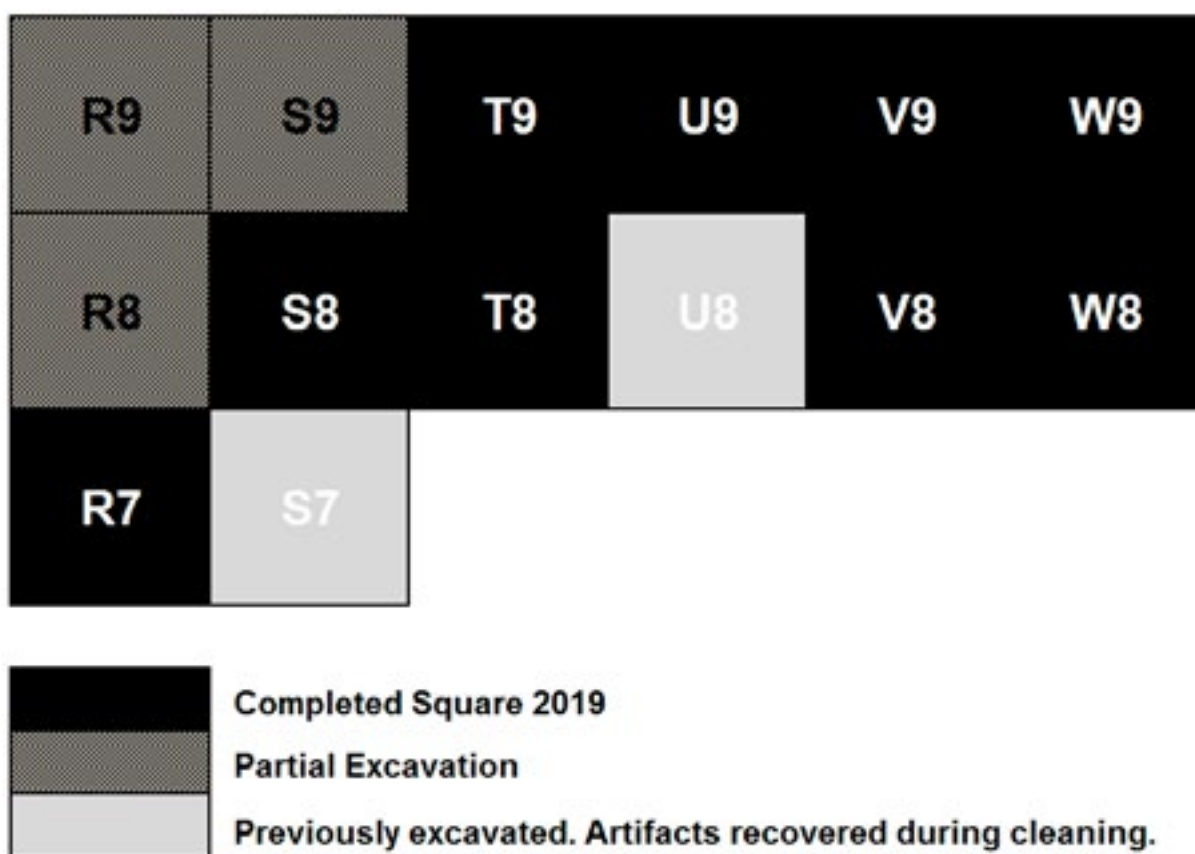


Figure 2. Excavation grid showing square status at end of 2019 season.

METAL CONSERVATION OVERVIEW

The total number of conserved objects in 2019 season is 77 (1 gold, 76 copper based). Among them, 74 were fully conserved and 3 underwent only mechanical cleaning. The collection is divided into 16 types among which there are: 27 arrowheads, 12 snakes, 4 daggers, 4 knives, 4 spearheads, 4 cups,

3 scrapers, 3 rings, 2 drills, 2 anklets, 1 bracelets, 1 axe, 1 clip, 1 bow, 1 bullhorn amulet and 7 scraps (2 plates, 2 rods, 1 disc, 1 band, 1 ring/ bent rod).

CERAMIC ANALYSIS OVERVIEW

This season, a small assemblage of 39 ceramic objects was excavated. All but one are preserved fragmentarily, mainly as body sherds. There are only eight diagnostic fragments (rim, bases and spouts) including one complete jar. Ten pottery objects originate from the Iron Age II and two from Wadi Suq stratum. The assemblage has been analyzed and is described below (see Appendix B spreadsheet). In addition, selected objects have been drawn and photographed.

BEAD ANALYSIS OVERVIEW

A total of 188 beads from the area of Polish excavations were analyzed in season 2019. 172 were found in stratified contexts and the remaining 18 came from mixed layers. Beads were found in both slag deposits and dispersed within sand matrix contexts. All excavated squares produced certain amount of beads apart from U8 and U9. A significant concentration was noted in squares S8: 125 beads, W9: 26 beads, and R7: 23 beads. Three concentrations of similar beads were recovered in squares W8, W9, and V9 suggesting they may have been part of the same adornment. All beads were analyzed and photographed, and a representative selection used for illustration.

Note: The full report on bead analysis by an independent researcher is provided as an external document accompanying this report.

LITHIC ANALYSIS OVERVIEW

A total of 398 flaked stone objects were recovered from seven squares in the 2019 season. Identified with Early Bronze (Wadi Suq) deposits, the collection is comprised of 1 retouched flake tool, 5 flint cores, 20 registered flakes, and 372 pieces of debitage. The collection underwent preliminary analysis, photographic and illustration documentation, and general registry selection.

GEOSPATIAL MANAGEMENT / CARTOGRAPHY OVERVIEW

All field measurements were recorded by total station for daily mapping and final map production. Geospatial and photogrammetric methods applied to field data collection resulted in the production of 10 plan orthophotos for completed squares, and 16 profile orthophotos where stratigraphical interpretation required it. Orthophotos and DEM's were further processed in AutoCAD and QGIS to produce all planviews and profile drawings in vector format. In addition, 3D models were created of several objects, to be delivered in PDF format.

GEOLOGICAL INVESTIGATION OVERVIEW

The geological / geomorphological report presents the results of on-site surveys conducted at the multi-period archaeological site of Saruq al-Hadid in the Dubai desert. The works comprised surveys of fenced area recognized as potentially an area of archaeological research. The main goal was to understand the relationship between paleogeomorphology of the area and paleo-environmental conditions. The second goal was to try to determine the age and origin of sediments in relation to dated human activity in this area.

IV. CHRONOLOGICAL PHASING AND ARTIFACT DISTRIBUTION

Due to the nature of sedimentary deposits at Saruq al-Hadid, being primarily aeolian sandy silt with episodes of alluvial redeposition, the stratigraphy encountered in Area F is at once complex, but overall predictable. In the broadest sense, the Polish Mission portion of Area F conforms stratigraphically to adjacent areas that were excavated by previous missions, with minor local variations.

Two squares excavated in 2019 demonstrate the full, local sequence of strata (V9 and W9) which reveal 3 major phases of cultural occupation. Each major phase is characterized by differences in cultural material residue, both qualitatively and quantitatively, thus providing tangible cultural disjuncts between phases where it is not always possible through sedimentary observation.

The three phases are represented in Wadi Suq (c. 2000-1880 B.C.), Iron Age II (c.1000-800 B.C.), and Post-Iron Age II, where dating is uncertain but possibly extends into early/mid Islamic periods. Each of these major phases is typically separated, both chronologically and sedimentarily, by cycles of aeolian dune accumulation, deflation, and occasional hydrologic redeposition. Although these intermediate phase lacunae are not represented well materially, they are not culturally sterile. To complicate matters, the movement of objects laterally and vertically within sand dunes and between stratigraphical layers is easily accomplished, and the intermediate strata should not be viewed as strict vertical boundaries between cultural horizons. This follows from the geologic difficulty in determining the chronological aspects of dune accumulation and deflation.

The following is a brief summary of the stratigraphic components in the Polish portion of Area F, with a brief account of finds associated with each phase / intermediate phase.

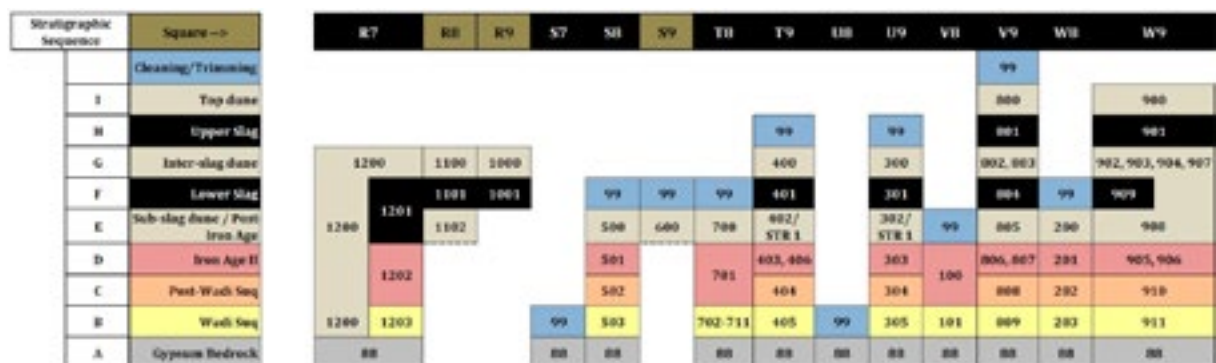


Figure 3. Context matrix and summary of all squares recorded in 2019 season. See Appendix A for larger size chart).

A. BEDROCK AND ASSOCIATED FEATURES / STRUCTURES

The lowest substrate encountered in Area F consists of a soft but compact anhydride gypsum precipitate formed following the final evaporation of a local lake that predates the Wadi Suq phase (i.e. pre-2nd Millennium B.C.). During the Wadi Suq phase, this deposit was utilized by carving postholes, hearths, and pits directly into the gypsum. Natural fissuring prior to cultural occupation created variable eroded channels which were subsequently filled with a grayish-tan silt. No artifacts were recovered strictly within these channels in 2019.

Bedrock (Context 88) was reached in 9 squares. Features (Structures) associated with the Wadi Suq phase that were dug into it include 4 hearths, 2 pits, and numerous postholes or potential postholes (See individual square sections below):

R7 Hearth STR.1
 S8 Hearth STR.1, Pit STR.2, Large Postholes STR.3, Small Postholes STR.4
 T8 Hearth F1, Postholes STR.2
 U9 Postholes STR.2
 V8 Postholes STR.1
 V9 Postholes STR.1
 W8 Hearth STR.1, Pit STR.2, Postholes STR.3
 W9 Postholes STR.1

B. WADI SUQ (c. 2000-1880 B.C.)

Wadi Suq phase was also reached in 9 squares:

Squares V8 (C101), W8 (C203), U9 (C305), T9 (C405), S8 (C503), T8 (C702-711), V9 (C809), W9 (C911), and R7 (C1203)

Sedimentation during this phase is typically sandy silt combined with small gravel (3-10mm) that shows evidence of water transport. Its depth ranges from approximately 3-7 cm and is strongly adhered to the underlying bedrock. Flint debitage in the form of primary, secondary, and tertiary reduction/retouch flakes, flint cores, and occasional tools are interspersed with alluvial gravels at this level, though few show evidence of alluvial wear from tumbling. This would indicate local centers of core reduction and flake deposition post-dating gravel deposition from sheetwash.

Though there is some ambiguity as to whether all postholes and hearths are cut into the bedrock through the debris or not, there is no evidence to suggest a large chronological gap between the two phenomena (See Weeks, et al. 2017:114-115).

Artifacts are primarily lithic debitage, however highly fragmented faunal bones are present but appear to decrease from south to north within this part of Area F.

Anachronistic objects such as unworked copper may be assumed to be intrusive from upper levels.

Table 2. Finds from Wadi Suq phase in all squares.

Wadi Suq Small/Bulk Finds	Count	Weight (g)
Beads	2	4
Ceramics	2	2.7
Debitage	292	545.33
Faunal Bones	785	362.3
Fish Bones	2	0
Flint Cores	4	127.9
Flint Flake	14	74.8
Flint Tool	1	9.1
Stone	72	115.1
Unworked Copper	2	5.7

C. POST WADI SUQ

The intermediate stratum after Wadi Suq was observed and excavated in 6 squares:

Squares W8 (C202), U9 (C304), T9 (C404), S8 (C502), V9 (C808), and W9 (C910).

This is an irregular surface comprised of dense grayish-tan sandy silt that is not present in squares R7, T8, and V8. In remaining squares where it is observed, it serves as a loose marker stratum between Iron Age II deposits and Wadi Suq phases. The presence of objects typical of both of these phases suggests a permeable boundary with artifact migration. This necessarily made its identification difficult in some squares.

Table 3. Finds from Post-Wadi Suq level in all squares.

Post-Wadi Suq Small/Bulk Finds	Count	Weight (g)
Beads	7	12.1
Debitage	24	47.3
Faunal Bones	97	44
Shell	1	0.6
Stone	55	417
Unworked Copper	12	24.3

D. IRON AGE II (C. 1000-800 B.C.)

The Iron Age II phase is predominant historic phase in Area F and provides both the majority of objects and bulk finds, as well as the main identifiable stratigraphic level in Area F where it was excavated in 9 squares:

Squares V8 (C100), W8 (C201), U9 (C303), T9 (C403), S8 (C501), T8 (C701), V9 (C806-807), W9 (C905-906), and R7 (C1202).

Objects and features found correspond to findings of previous missions (See Hermann et al. 2012:57 for radiometric assessment of charcoal samples). Sedimentarily, this horizon consists of a grayish-tan sandy silt that contains variable amounts of charcoal or charcoal flecking across the area. In two squares (W9 and V9), a high concentration of charcoal likely represents local activity associated with metallurgy. Charcoal from this and charcoal heaps found by the previous mission was apparently dispersed in the immediate area, providing a visual indication of horizontal exposure at the time. While the presence of this charcoal was a useful indicator of Iron Age deposits, the easy movement of sand made its secure identification with this level suspect at times.

There was a total of 198 objects associated with Iron Age II horizon in the 2019 season. See individual square sections and metallurgical section for detailed discussion.

Table 4. Finds from Iron Age II phase in all squares.

Iron Age II Level Objects	Count
Arrowheads	22
Axehead	1
Beads	76
Ceramics	3
Copper Blades	14
Copper Bow	1
Copper Cups	14
Copper Hooks	4
Copper Pins	4
Copper Sticks	2
Gold objects	3
Ingots	11
Ornamental copper objects	9
Scrapers	3
Silver	1
Snakes	23
Steatite objects	3
Worked Copper (Sp)	3
Worked Iron	1

E. POST IRON AGE II DUNE

Significant sand dune formation followed the major Iron Age II occupation, although it is difficult to determine what time frame this intermediate deposit represents. It is typically a relatively compact tan sandy silt with occasional root runs. It ranges in thickness from approximately 1-1.5 meters. Artifacts are significantly lower in number than the previous Iron Age II deposit, and could easily be subsumed under this phase except for the appearance of charcoal deposits mentioned above (See Table 5 below) This stratum was excavated in 9 squares:

Squares W8 (C200), U9 (C302), T9 (C402), S8 (C500), S9 (C600), T8 (C700), V9 (C805), W9 (C908), and R8 (C1102).

A unique sandstone slab structure associated with this stratum was uncovered in its entirety in squares U9 and T9 (Structure 1 - see discussions in U9 and T9 sections). The absence of objects or changes in sedimentation make a definitive chronological association difficult.

Table 5. Finds from Post-Iron Age II intermediate dune in all squares.

Post-Iron Age II Objects	Count
Arrowheads	7
Beads	18
Ceramics	2
Copper Cups	12
Copper Hook	1
Copper Sticks	7
Flint Flake	1
Gold	2
Ingot	1
Scrapers	2
Steatite objects	1
Worked Copper (Sp)	1

F. LOWER (EARLY) SLAG DEPOSIT

This stratum is comprised solely of metallurgical slag waste which was discarded along a northeast trending sand dune (Stratum E) and was present in 7 squares excavated this season:

Squares U9 (C301), T9 (C401), V9 (C804), W9 (C909), R7 (C1201), R8 (C1101), and R9 (C1001).

Although its physical deposition sequence is separated by significant sand accumulation, its chronological separation from Iron Age deposits is indeterminate. Objects found within this slag deposit are not high in counts, but are reminiscent of Iron Age objects. A significant number of narrow copper bands are found in most squares in this deposit, as well as a high number of worked and unworked iron fragments, suggesting a shift in metallurgical practice and disposal in the area.

Table 6. Finds from lower slag deposit in all squares.

Lower Slag Objects	Count	Weight (g)
Arrowheads	2	8.6
Beads	3	0
Ceramics	13	1993
Copper Bands	197	89.6
Copper Blades	2	5.2
Copper Cups	3	5.9
Copper Stick	2	4.7
Faunal Bones	1	1.7
Ingots	4	3059.1
Iron Blade Frags	283	358
Shell	1	2.1
Steatite Objects	1	194.5
Stone	5	137.9
Unworked Copper	73	762.3
Unworked Iron	66	252.2
Worked Copper	13	12.1
Worked Iron	14	63.7

G. INTER-SLAG DUNE DEPOSIT

The lower slag deposit was in turn covered by another sand dune representing an indeterminate period of time. This dune generally trends southwest to northeast, following the previous terrain that was stabilized by the early slag deposit. Sediment is generally tan sandy silt and bears occasional objects, notably pieces of metallurgical activity such as furnace fragments and metal ingot fragments (Table 7).

This intermediate stratum was excavated in 4 squares. Its identification in squares R7, R8, and R9 is indeterminate at the time of writing. In other squares excavated, this stratum was either absent or previously excavated:

U9 (C300), T9 (C400), V9 (C802-803), W9 (C902-904, C907)

Table 7. Finds from Inter-slag dune in all squares.

Inter-slag dune object	Count
Arrowhead	1
Copper Blade	1
Copper Cup	1
Furnace Fragments	2
Ingots	2
Worked Copper (Sp)	2

H. UPPER (LATE) SLAG DEPOSIT

Similar to the lower slag deposit, this stratum is comprised of black slag waste from metallurgical processing. It was present in only 2 squares (V9 (C801), W9 (C901)). The remaining squares of similar starting elevation were briefly excavated through this stratum in previous seasons. Whether this deposit was previously present in squares R7-R9 is currently indeterminate.

As with the lower slag deposit, artifacts relate primarily to metallurgical production, including several furnace fragments.

Stratigraphically, this deposit represents the final cultural horizon in Area F. The conventional separation of this and the lower slag deposit may, in future excavations, be found to be an artifice of archaeological interpretation locally, but conflation of these levels is currently contingent on forthcoming verifiable evidence.

Table 8. Finds from upper slag deposit in all squares.

Upper Slag Deposit Objects	Count	Weight (g)
Slag with furnace nozzle	1	16.7
Slag/furnace fragments	5	29.3
Steatite vessel fragment	1	5.8

I. MODERN DUNE DEPOSIT

The uppermost sand dune deposits are comprised of shifting aeolian sandy silt and, at various times, are covering local stable strata, or are being eroded by wind/rain action. The thickness of these dunes varies from mere centimeters to several meters above archaeological deposits and indeed can change over days, months, and years. Geologically, this material is not being newly formed, but is a persistently migrating erosional feature originating from regional geologic parent material (See section on Geology in this report for further discussion).

V. SQUARE EXCAVATION

APPROACH TO EXCAVATION

In order to achieve a balance between efficient, timely excavation and a better understanding of local horizontal deposits, the Polish Mission chose to excavate the squares in a sequence that maximized this potential. After eliminating previously, partially excavated squares, the objective focused on excavation of contiguous areas where possible. The 2019 season thus began with removal of partial squares V8 and T8, and moved to the far east end squares W8 and W9. As staffing was increased, this further allowed initiation of excavation in the row 9 squares T-V, creating an adequate assessment of synchronous deposits across multiple squares. This also allowed time for major modern dune removal in columns R and S in preparation for the last several weeks of excavation.

The following individual square report sections are presented in alphabetic order for consistency, rather than in chronological order of excavation. Reference to Figures 1-3 is recommended for clarification.



Figure 4. Area F conditions prior to excavation. View west of rows 8 and 9. February 13.



Figure 5. Area F, during early excavations in W8 and T8. February 19. View SE.

Square R7 KAROL OCHNIO

Excavation dates: March 31 to April 4, 2019

Contexts:

C1200 Loose windblown sand. Excavated: 2019-03-31 to 2019-04-08.

Top: 103.19 m ASL

Bottom: 101.15 m ASL

Thickness max.: 1.80m

C1201 Slag layer under the loose sand. Excavated: 2019-03-31 to 2019-04-07

Top: 101.83 m ASL

Bottom: 101.40 m ASL

Thickness max.: 0.1-0.3 m

C1202 Compact sand under the slag. Iron II cultural horizon.

Excavated: 2019-04-02 to 2019-04-07

Top: 102.60 m ASL

Bottom: 101.19 m ASL

Thickness max.: 1.34 m

C1203 Gravel, partially cemented grey sand (Wadi Suq layer) under the compact yellow sand.

Excavated: 2019-04-08

Top: 101.21 m ASL

Bottom: 101.14 m ASL

Thickness max.: 0.075m

C88 Gypsum bedrock. Layers: 020, 021. Excavated: 2019-04-08 to 2019-04-09

C99 Mixed contexts from the cleaning of northern section and from the ditch along north section that was dug to build a sand bag wall.

Excavation Metrics

Starting elevation: 103.20 mASL

Bottom elevation: 101.12 mASL

Maximum excavation depth 2.08 m (at northernmost side)

Area under excavation: 25m²

Estimated volume removed: ~25m³ (accounting for surface slope)

EXCAVATION SUMMARY

Context 1200 (Figures 1, 2) was covering almost whole surface of the square except north east corner where the slag layer (C1201) (Figures 2, 3) was visible. Contexts 1200 and 1201 were mechanically excavated starting from the north. The depth of the sand was increasing towards west and south and simultaneously the slag layer C1201 was going deeper in the same directions. In these contexts there were found some artifacts like: copper bands, unworked copper and iron pieces, some bone fragments and pottery shard. After two days of fieldwork on April 2nd the next context was distin-

guished- 1202 (Figures 4, 7). It was a compact sand with some charcoal. It was found under the slag layer near the northern section- 2m max from the square's edge. This context was rich in worked artifacts, especially its upper part from an elevation of 102.01 m ASL to 101.77 m ASL were most of worked objects were found. Those copper objects were: snake (Figure 4), bands (Figure 5), scraper (Figure 6) and balance dish (Figure 7). The rest of artifacts was found during the screening.

During the season there were two times when the context 99 was in use. Once when the north section was cleared and mixed material has fell down and the second time when the safety and documentation reasons forced the excavators to dig a ditch along the north section to document and then secure that section using sand bags. That narrow trench reached the layer below c1202 and bedrock. The mixed material from that trench was described as context 99 and was screened. The layer below C1202 was distinguished as context 1203 (Figures 2, 8)- Wadi Suq layer.

That context has been already excavated in mid and southern part of the square like c1202 except that spot where C1202 was found, along northern section. The context 1203 consists of compact gravel and partially cemented grey sand mixed with flint artifacts and bones. The layer below C1203 was bedrock (Figure 10). It a cracked into polygons gypsum bottom of a playa lake. That natural formation had one feature on its cracked surface. It was a heath marked as structure 1(Figures 9-11). That shallow feature was carved in gypsum bottom of playa lake. The max. extension of smoked surface was 0.87m, its depth was max.0.11 m. It has contained 24 burnt stones and some dark yellow sand. Their dimensions varied from 3.5 to 10 cm length and 3 to 7 cm width. They were found in two groups. Bedrock was shaped to create two smaller cooking pits.

During the fieldwork it turned out that square R7 was partially excavated before (2/3 mid and south part) and context 1200 – loose sand – was covering not only the surface but also was lying on bedrock. Collapsed walls of this previously dug trench could cause migration of some artifacts from C1202 to C1200.

ARTIFACT SUMMARY

Small finds that were found in this square were mainly jewelry: beads (examples: Figure 12-GR20474/SHP19_0574, Figure 13-GR20474/SHP19_0575, Figure 14- GR20474/SHP19_0576, Figure 15- GR20474/SHP19_0760, Figure 16- GR20474/SHP19_0514), bracelet (Figure 17- SHP19_0524) and pieces of gold wire prepared to jewelry production (Figure 18- GR20405/SHP19_0758). Other small finds were: partially preserved copper blades (example Figure 19- SHP19_0632), one fragment of copper arrowhead (cut in half) (Figure 20- SHP19_0509), a broken copper scraper (Figure 21- SHP19_0512), fragments of balance dishes (example Figure 22- SHP_0462), copper snakes (example Figure 23- GR20475/SHP19_0505), copper sticks (example Figure 24- SHP19_0577) and partially preserved copper model of a sword (Figure 25- SHP19_0499). Amount of bulk finds was 11 times higher than small finds and these objects were: copper bands (example Fig.26- SHP19_0583), pottery shards (example Figure 27- SHP19_0525), copper ingot, unidentified copper objects, unidentified iron objects, pieces of shells, flint flakes, bones, copper unworked and iron unworked. Only a few objects were found in situ (Figure 28), rest of them during the screening. All objects (Tables 9 and 10) and slag (Table 11) are summarized below.

Table 9. Summary of Small Finds for entire Square R7.

Small Find	Count	Weight (g)
Arrowhead	1	1.5
Beads	23	0.4
Ceramic	1	1.1
Copper Blades	2	5.2
Copper Cups	7	15.6
Copper Sticks	4	6.6
Gold	2	0
Ingot	1	48.6
Ornamental Copper	1	5.7
Scraper	1	17.8
Snakes	3	32.5
Steatite	1	0
Worked Copper (Sp)	2	5.4
Worked Iron	1	15.2
Total	50	155.6

Note: All artifact categories and counts refer to complete and fragmentary all objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 10. Summary of Bulk Finds for entire Square R7.

Bulk Find	Count	Weight (g)
Ceramic	8	98.4
Copper Bands	110	100
Faunal	334	139.9
Fish Bone	1	0.4
Lithic	38	88.1
Shell	2	0.5
Stone	1	187.1
Unworked Copper	99	368.3
Unworked Iron	49	231.5
Worked Copper	4	9.3
Worked Iron	9	33.3
Total	655	1256.8

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

Table 11. Slag and technical ceramic for entire square R7.

Slag (kg)	Technical Ceramic (kg)
50.00	5.25

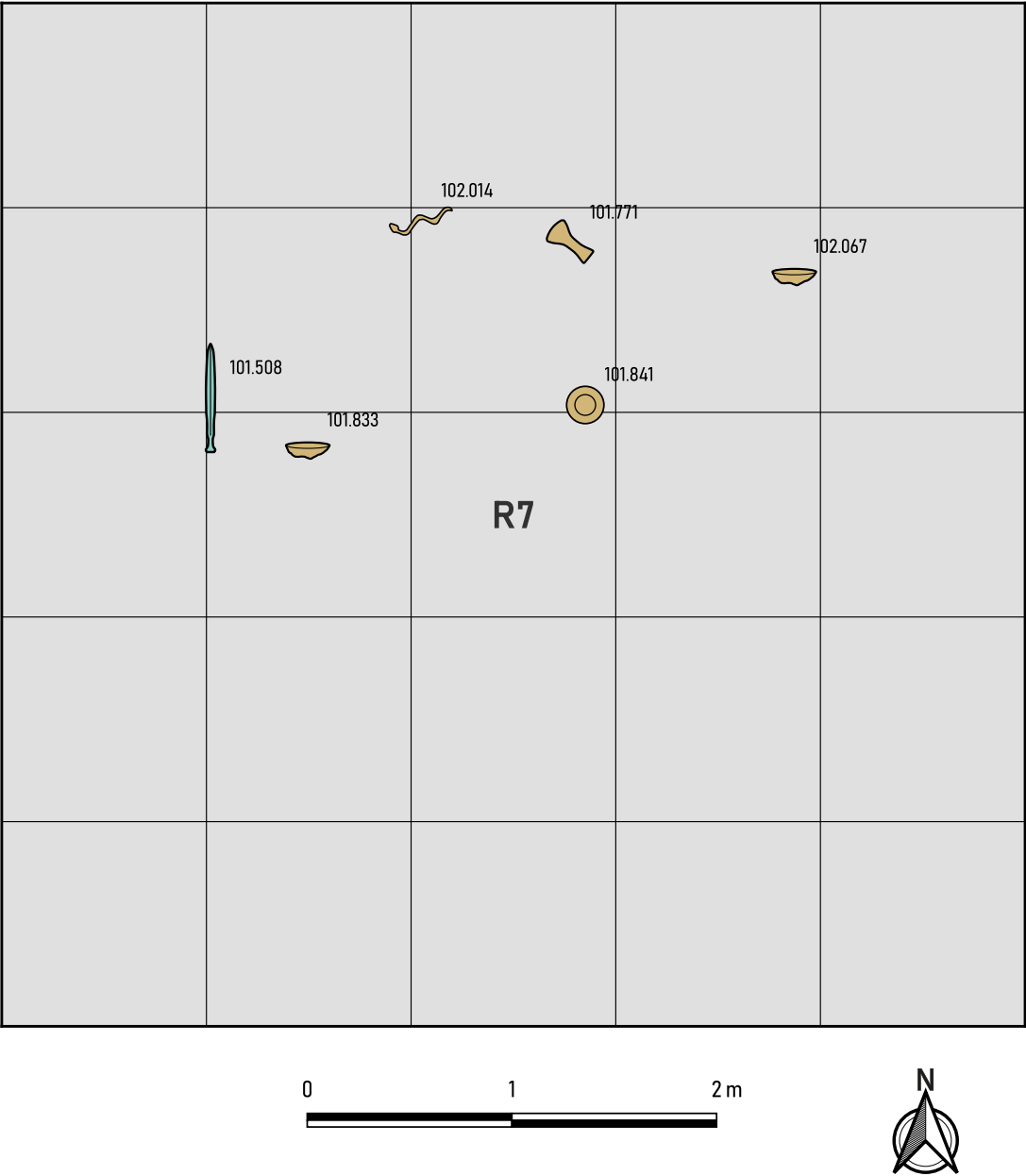
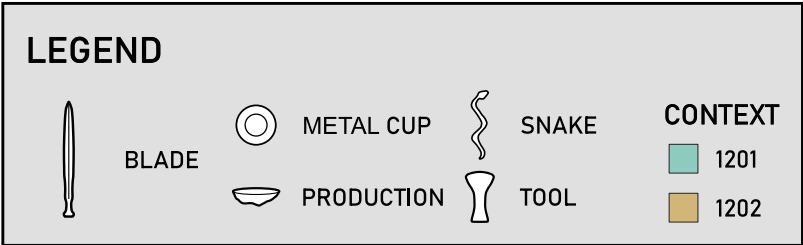


Figure 28. Object planigraphy (Context 1201 & 1202).



Figure 1. Square R7 before excavation, top of Context 1200.

<p>Saruq al-Hadid Polish Mission</p> <p>Scale 1:50</p> <p>0 1 m</p> <p>N</p>		SHP19	2019
		Area F/R7/S7	OP13
		1200/1201/1202/1203	
		Northern profile of R7 and part of S7. The western part of the square is heavily disturbed which is indicated by the unstable sand and the sharp direction change of banding.	
Otto Bagi	2019-04-04	UTM Zone 40N (EPSG::32640)	

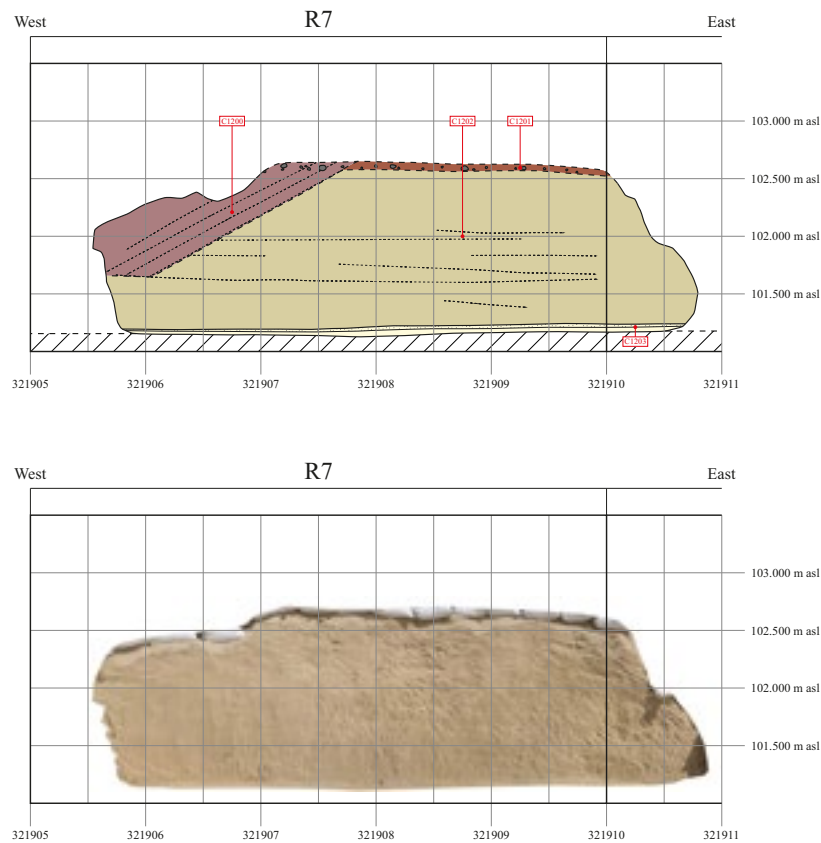


Figure 2. North section of the square.



Figure 3. Top of slag layer, Context 1201.



Figure 4. Copper snake in situ in Context 1202.



Figure 5. Copper bands in situ in Context 1202.



Figure 6. Copper scraper in situ in Context 1202.



Figure 7. Copper balance dish in situ in Context 1202.



Figure 8. Top of Context 1203- Wadi Suq layer.



Figure 9. Structure 1 in bedrock.

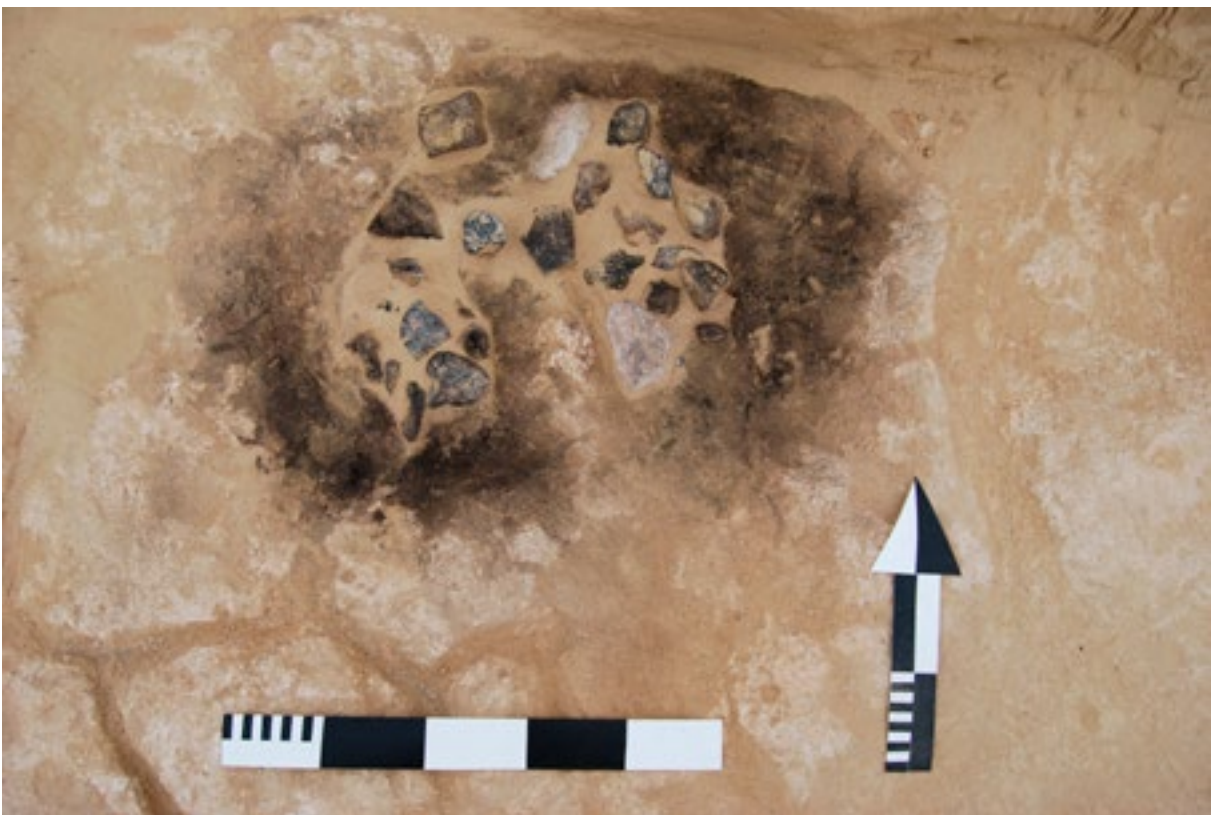
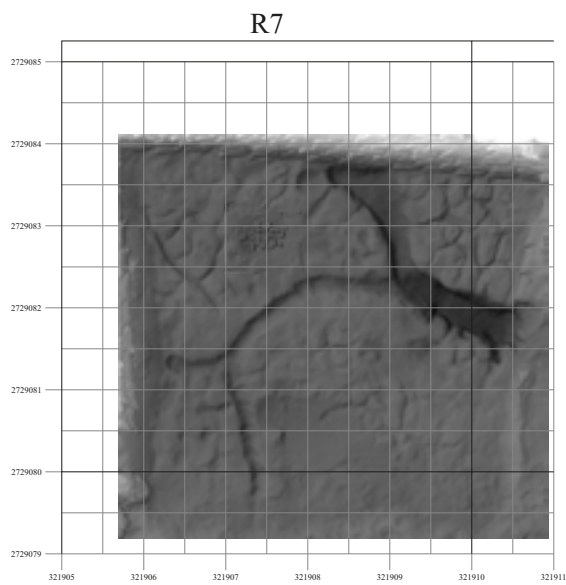





Figure 10. Bedrock- Context 88.



<div></div> <p style="text-align: center;">Saruq al-Hadid Polish Mission</p>		SHP19	<div></div>
		Area F/R6-7 S6-7	
		OP15-16	
		HEARTH R7-1	
		Scale 1:50	Exposed bedrock in R7 and parts of R6, S6 and S7 with a hearth (HEARTH R7-1) in the north-western part of square.
Structure Elevation Contour lines (0.5cm)			
Otto Bagi	2019-04-09	UTM Zone 40N (EPSG::32640)	

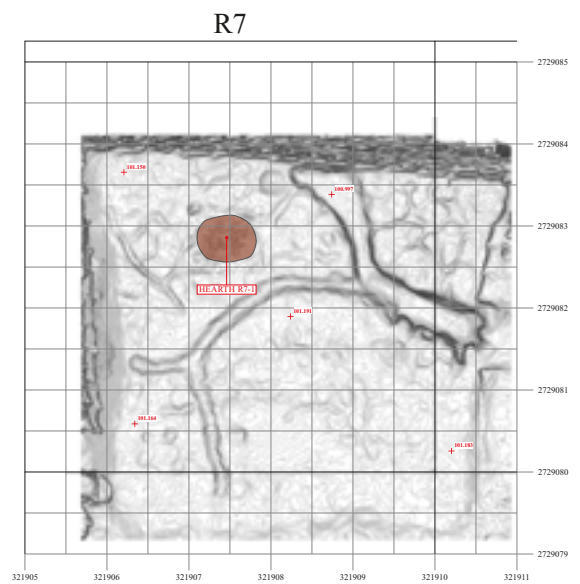
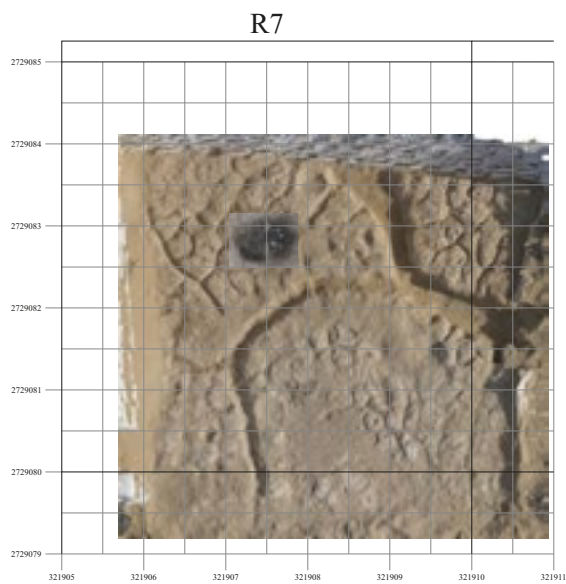


Figure 11. Bedrock plan.



Figure 12. Stone bead (GR20474, Context 1202).



Figure 13. Stone bead (GR20474, Context 1202).



Figure 14. Faience bead (GR20474, Context 1202).

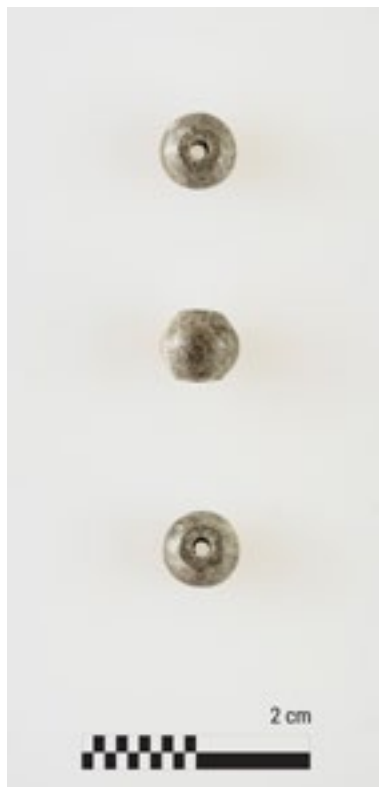


Figure 15. Stone bead (GR20474, Context 1200).

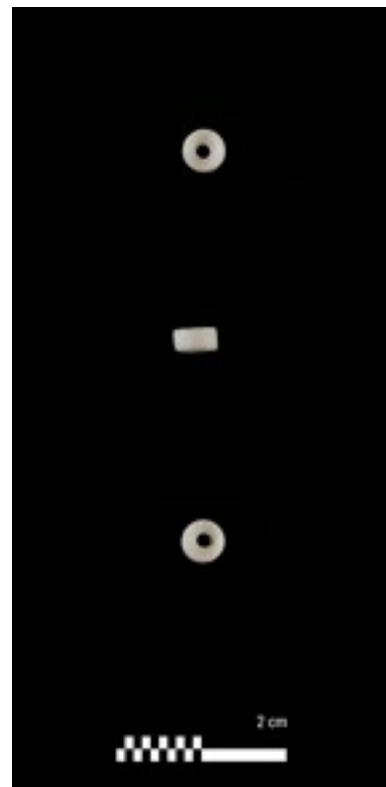


Figure 16. Stone bead (GR20474, Context 1202).



Figure 17. Copper bracelet (SHP19_0524, Context 1202).



Figure 18. Gold wire (GR20405, Context 1200).



Figure 19. Copper blade (SHP19_0632, Context 1201).



Figure 20. Copper arrowhead cut in half (SHP19_0509, Context 1202).



Figure 21. Copper scraper (SHP19_0512,



Figure 22. Copper balance dish (SHP_0462, Context 1200).



Figure 23. Copper snake (GR20475, Context 1202).



Figure 24. Copper sticks (SHP19-0577, Context 1202).



Figure 25. Copper sword model (SHP19-0499, Context 1201).



Figure 26. Copper bands (SHP19_0583, Context 1200).



Figure 27. Pottery shards (SHP19_0525, Context 1202).

Square R8 KAROL OCHNIO

Excavation dates: May 9 to May 16, 2019

Contexts:

C1100 Loose windblown sand.

Top: upper slope- 104.92 mASL. Bottom: upper slope - 104.79 mASL

Top: lower slope- 103.05 mASL. lower slope- 102.79 mASL

Thickness: 0.13- 0.57 m

C1101 Slag layer under the loose sand.

Top: upper slope- 104.83 mASL. Bottom: upper slope- 104.69 m ASL

Top: lower slope- 102.79 m ASL. Bottom lower slope- 102.76 m ASL

Thickness max.: 0.02- 0.26 m

C1102 Compact sand under the slag.

Top: upper slope- 104.69 mASL. Bottom: 103.08 mASL

Thickness max.: 1.5m (not fully excavated)

Excavation Metrics

Starting elevation: 104.92 mASL

Bottom elevation: 102.76 mASL

Maximum excavation depth 2.16m (primarily at northern half)

Area under excavation: ~25m²

Estimated volume removed: ~27m³ (accounting for surface slope)

EXCAVATION SUMMARY

During these eight days of fieldwork in square R8, north of R7, three contexts have been excavated, two of them fully, one partially. The square was not fully explored due to security reasons caused by significant height of north section. The fieldwork was moved to another square located just above R7.

The first context of the R8 square was loose yellow sand that was covering 2/3 of the surface counting from west, the rest of the surface was covered with slag. That loose sand was marked as C1100 (Figure 1). This layer was spread along the slope towards south and west and got thicker towards west. The layer has contained some artifacts: iron flakes copper unworked, copper bands, bones fragments and a pottery shard. All artifacts were found during the screening process. It took one day to fully explore C1100 and another context was completely visible on the surface. It was a slag layer: C1101 (Figure 2) mixed with semi compact sand, the same that was previously found in square R7 under the loose sand. The context contained significant amount of copper bands along with other objects. The only artifact that was found in situ was a copper arrowhead (Figure 3). The rest of objects was found during the screening. This context was completely explored the same day and another was distinguished: C1102 (Figure 4). It was a compact yellow sand with a lot more worked artifacts within except copper bands which were more common in context 1101. Some artifacts were found in situ (Figures 5, 6) like 2 cups and one arrowhead in western half of the square, rest of them during the screening. On the fourth day of exploration walls of sand bags was built along north and west sections to secure them and workers from the collapse. Foundations of these walls,

narrow trenches, were dug in C1102. The exploration was stopped at the level of the last row of sand bags when the wall has reached 1.5m height. Therefore C1102 was not completely excavated (Figure 7). The fieldwork was moved to the square above R8.

ARTIFACTS SUMMARY

All except one artifact from C1101 (Figure 3) and three from C1102 (Figure 6) were found during the screening. Small finds represents three groups of artifacts: arrowheads (example: Figure 8 GR20503/SHP19_0790), beads (example: Figure 9- SHP19_0801) and copper cups (example: Figure 10- SHP19_0792). There were found twenty times more bulk finds than small finds. The most numerous of bulk finds were copper bands (e.g. Figure 11 SHP19_0807). Summaries of small (Table X), bulk finds (Table X) and slag (Table X) are below.

Table 12. Summary of Small Finds for entire Square R8.

Small Find	Count	Weight (g)
Arrowheads	3	14.2
Beads	5	0
Copper Cups	7	16.8

Note: All artifact categories and counts refer to complete and fragmentary all objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 13. Summary of Bulk Finds for entire Square R8.

Bulk Find	Count	Weight (g)
Ceramics	9	106.6
Copper Bands	201	81.6
Faunal Bones	5	2.3
Unworked Copper	20	46
Unworked Iron	29	88.3
Worked Copper	11	15.8
Worked Iron	18	51.5

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

Table 14. Slag summary for entire Square R8.

Slag (kg)	Technical Ceramic (kg)
80.50	-



Figure 1. Top of context 1100.



Figure 2. Top of context 1101- slag layer.



Figure 3. Copper arrowhead in situ (context 1101).



Figure 4. Top of context 1102.

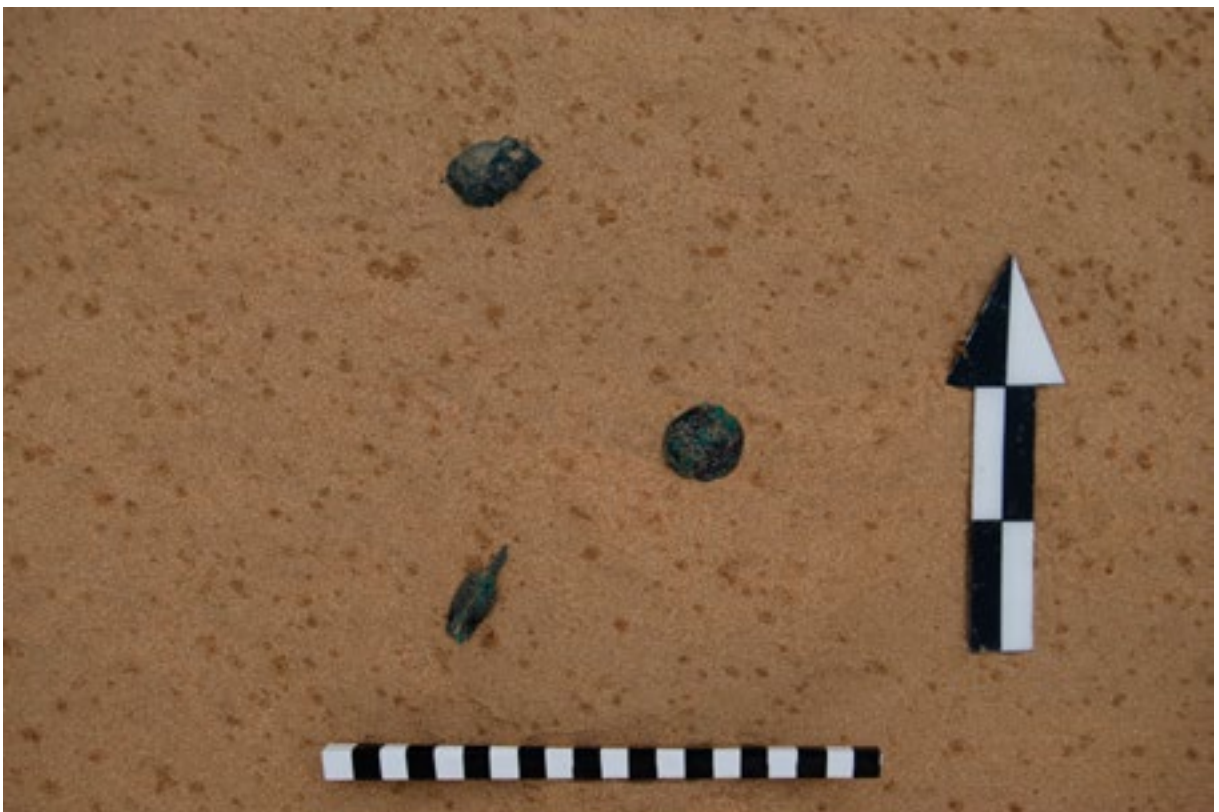


Figure 5. Group of objects found in situ (context 1102).

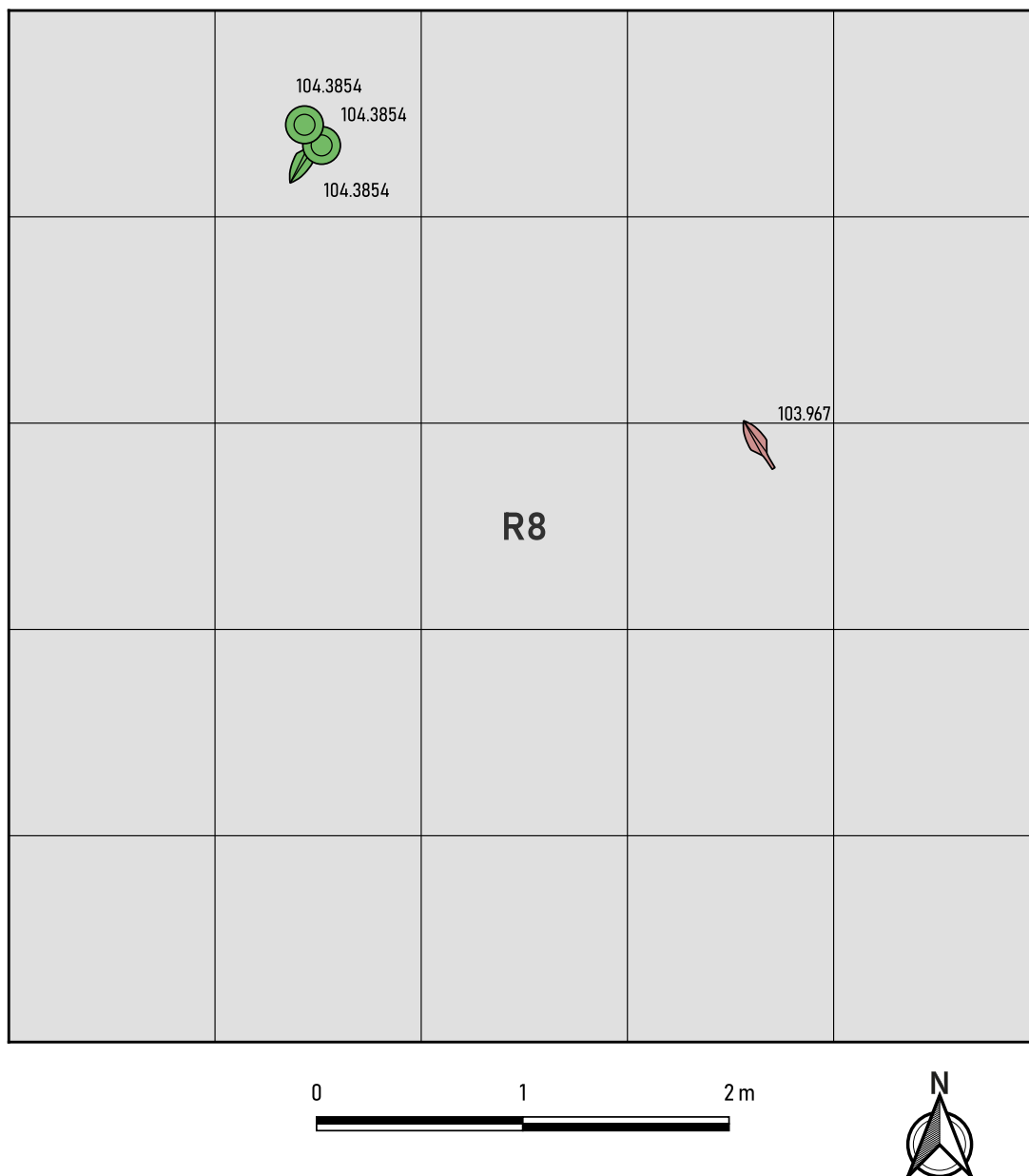
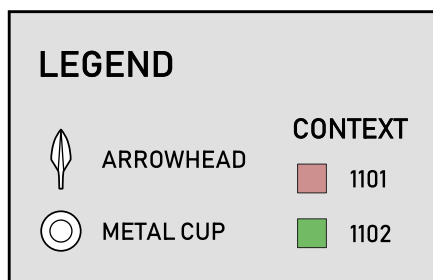


Figure 6. Objects planigraphy (context 1101 & 1102).



Figure 7. Context 1102.



Figure 8. Copper arrowhead (GR20503, context 1102).

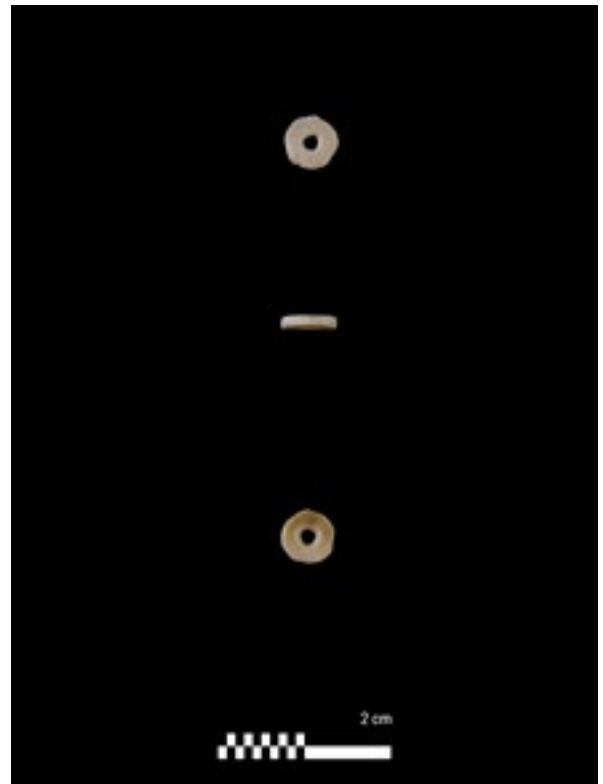


Figure 9. Bone? bead (SHP19_0801, context 1101).

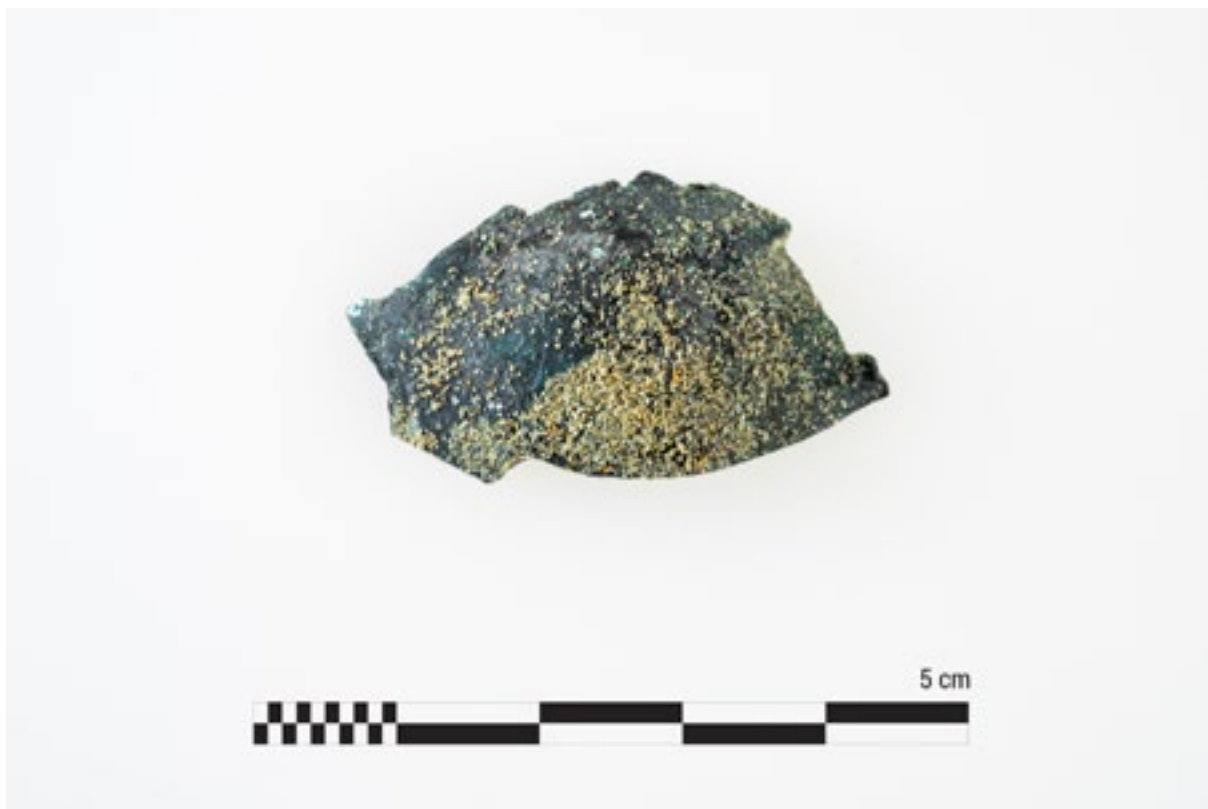


Figure 10. Copper cup (SHP19_0792, context 1102).



Figure 11. Copper bands (SHP19_0807, context 1101).

Square R9 KAROL OCHNIO

Excavation dates: April 17 to 21, 2019

Contexts:

C1000 Loose windblown sand.

Top: 106.19 mASL. Bottom: 104.81 mASL

Thickness max.: 0.61 m

C1001 A layer of slag within compact sand under the loose sand (C1000)

(Not excavated in 2019).

Top: 105.54 m ASL

Excavation metrics:

Starting elevation: 106.19 m ASL

End elevation: 104.81 m ASL

Maximum excavation depth: 0.61 m

Area under excavation: excluding north and west baulk sand bags and slag layer= 2.5x4.5m (11.25 m²)

Estimated total volume removed: 3.9 m³

EXCAVATION SUMMARY

The loose sand, context 1000 (Figure 1) was excavated three days and was completely explored. It was covering north and west part of the square. The thickness of this layer was increasing towards west. The same layer composition was observed before in square R7 and R8. The bottom of C1000 was marked by compact layer of sand and slag, but not everywhere. The compact substrate was traceable just around the visible heap of slag in central part of the square, father west the compact layer with slag was disappearing. The sand was loose, mixed with some slag. It might indicate that original layers on the top of dune were destroyed by some activity. On the second day of fieldwork the wall of sand bags was built along north and wet sections. The last day of excavation the main activity was screening the heap of C1000 sand. Another context: 1001 (Figure 2) was uncovered. When context 1000 was photographed and measured. The fieldwork stopped after three days.

ARTIFACT SUMMARY

Two beads from C1000 were recovered during screening. See Figures 3 and 4.

Table 15. Summary of Small Finds for entire Square R9.

Small Find	Count	Weight (g)
Beads	2	<0.1

Table 16. Summary of Bulk Finds for entire Square R9.

Bulk Find	Count	Weight (g)
Copper Bands	37	4.2
Faunal Bones	4	3.3
Unworked Copper	4	2.5
Unworked Iron	9	24.5
Worked Iron	3	2.4

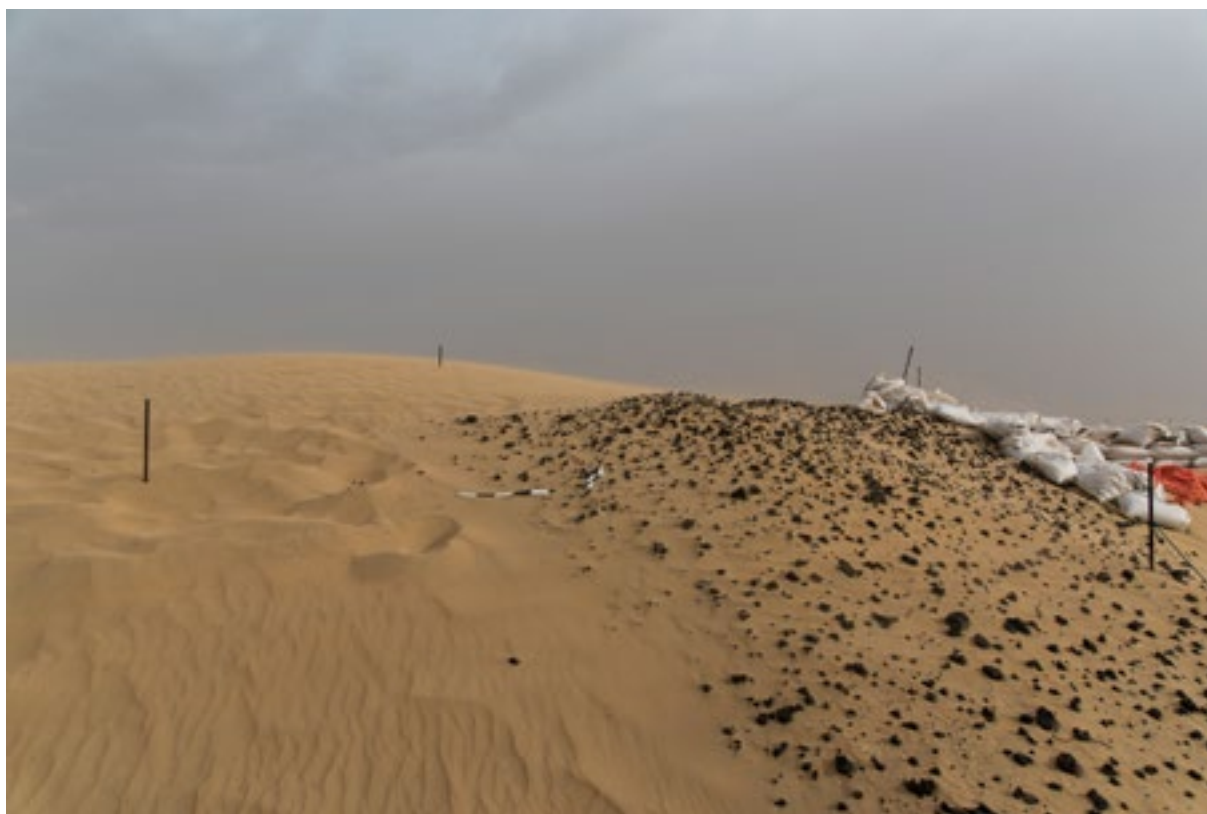


Figure 1. Pre-excavation photo of contexts 1000 (Loose surface sand) and context 1001 (uppermost slag deposit)



Figure 2. Mid-excavation of C1000, exposure of slag deposit (C1001).

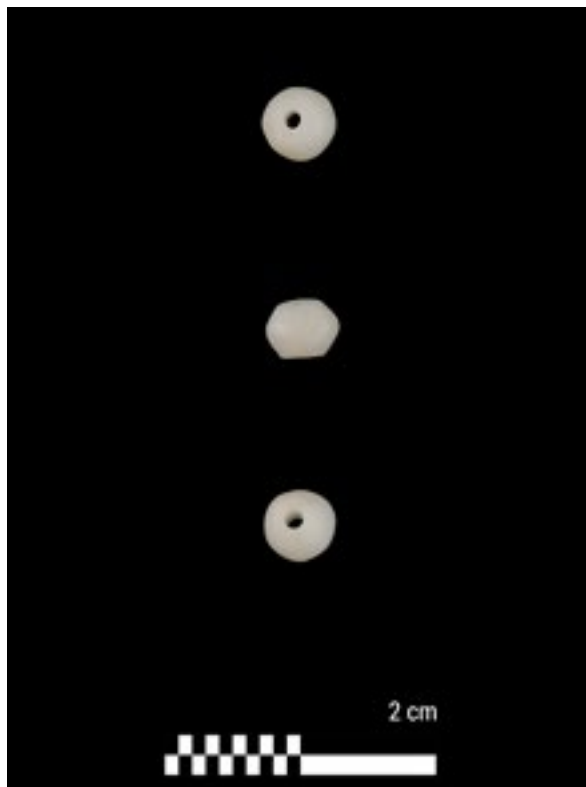


Figure 3. Bead (SHP19_0890) (Context 1000)



Figure 4. Bead (SHP19_0895) (Context 1000)

Square S7

MAREK WOZNIAK, SIDNEY REMPEL

Excavation Dates: February 26, 2019

Contexts:

C99 Clearing and screening of windblown sand, and sand slumped in from Squares S8 and R7. Mixed sediment with objects from Iron Age II, and Wadi Suq phases.

Excavation Metrics:

Starting elevation: 100.89 mASL

Bottom elevation: 100.56 mASL

Maximum excavation depth: 0.33 m

Area under excavation: 25.0 m²

Estimated volume removed: 4.12 m³

EXCAVATION AND ARTIFACT SUMMARY:

Square S7 was excavated to completion in 2018 by the previous mission. Activity in S7 by the Polish Mission in 2019 was limited to clearing off the dune sand that had accumulated over the last year. The purpose of cleaning S7 to bedrock was to facilitate easier access to excavating Square S8 which was begun on April 2.



Figure 1. Pre-excavation photo of Squares S8 and S7 looking south. February 13, 2019.

Despite the limitation of excavation to cleaning, a number of objects belonging to the Iron Age phase were recovered during screening or had fallen into the square during excavation. Five objects including one copper cup, three copper snakes, and one arrowhead were recovered (GR20418, GR20419, GR20420, GR20466, and GR20467) (See Table 17). Bulk finds included a sampling of finds typical in adjacent squares in all three major time periods (i.e. Wadi Suq, Iron Age II, Post-Iron Age) (For example, Figure 7, Copper Bands)(See Table 18)

No further work was done in S7 apart from final bedrock sweeping for final aerial photographs on April 23.



Figure 2. Copper cup (GR20418, C99)



Figure 3. Copper snake (GR20419, C99)



Figure 4. Copper snake (GR20420, C99)



Figure 5. Copper snake (GR20466, C99)



Figure 6. Arrowhead (GR20467, C99)



Figure 7. Copper Bands (SHP19_0108, C99)

Table 17. Summary of Small Finds from Square S7, Context 99.

Small Find Summary	Count	Weight (g)
Arrowhead	1	7
Copper Cup	1	15.2
Snakes	3	13.9

Table 18. Summary of Bulk Finds from Square S7, Context 99.

Bulk Finds Summary	Count	Weight (g)
Ceramic	1	3.1
Copper Bands	11	2.6
Faunal Bone	6	3.2
Lithics	4	23.3
Stone	2	20.9
Unworked Copper	12	36.5
Unworked Iron	16	49.5
Worked Iron	1	1.7

Square S8 MAREK WOŹNIAK

Excavation dates: March 2 to March 11, 2019

Contexts:

C99 Cleaning of plan of trench (eg. after sandstorm) (14.02 2019, 02.04.2019) and cleaning of small area in the SE corner disturbed in time of rebuilding of sandbag wall (08.04.2019). (**Figure 1**)

C500 Compacted, yellowish-brown, fine, sand with particles $< 0,1\text{mm}$. Very occasional small (1-2cm \varnothing) stones- mostly pale grayish-brown sandstone, and small (2cm \varnothing) pieces of black slag. Belongs to post iron-age cultural horizon. (Begun in autumn 2017). In recent season excavated from 2019.04.02 to 2019.04.07. Top: 103,68 m ASL – 101,71 m ASL (in SE corner remains of eroded slope falling to SE). Bottom: 102,06 m ASL – 101,86 m ASL (originally seems falling very gentle to NE). (**Figure 2**)

C501 Compacted, yellowish-brown, fine sand with occasional admixture (1% $<$) of small (0,5cm-1cm \varnothing) of soft charcoal. Belongs to iron-age cultural horizon. (Begun in April 2019). In recent season excavated from 2019.04.07 to 2019.04.08. Top: 102,06 m ASL-101,86 m ASL (seems falling minimal to the NE). Bottom: 101,91 m ASL- 101,70. m ASL. (**Figure 3**)

C502 Compacted, hard soil of yellowish-brown, fine sand, with thin a little more brownish subsoils. With no visible admixture (except bottom 1-2cm with inclusions of small stones (less than 1cm \varnothing) and very small fragments of bones – probably area of transition between C 502 and C 503 (Wadi Suq level). Belongs to post-Wadi Suq cultural horizon. (Begun in April 2019). In recent season excavated from ASL- 101,18 m ASL (**Figure 4**)

C503 Hard, compacted, Pale yellowish-brown sand, with about 15% of gravel (ca 1-2cm \varnothing , rounded stones of different kinds). Occasional inclusion of bigger stones from 3cm – 8cm \varnothing . Less than 1% of small fragments of bones. Belongs to the Wadi Suq cultural horizon. (Begun in April 2019). In recent season excavated from 2019.04.09 to 2019.04.11. Top: 101,27 m ASL – 101, 18 m ASL. Bottom: 101,27 m. ASL – 101,10 m ASL. (**Figure 5**)

C88 Surface part of bedrock (uncovered in 11.04.2019), with network of natural cracks of different width and rock cut structures filled with sand (Structure 001 - hearth/roasting pit, Structure 002 – round storage pit. Structure 003 – a row of bigger postholes, Structure 004 – a series of small postholes). (**Figure 6**)

Excavation metrics:

Starting elevation (2019): 102,69 m ASL. (avg.)

End elevation: 101,18 m ASL (avg.)

Maximum excavation depth: 2,5 m, Minimum excavation depth: 0,60m – (avg. 1,5m)

Area under excavation (excluding north baulk sand bags) = 4,0 x 4,0m (16,00m²)

Estimated total volume removed (accounting for slope) = 24 m³

EXCAVATION SUMMARY

Excavation works in Square S8 were carried out between 02.04.2019 and 11.04.2019 (with on surface finds collecting on the beginning of season 14.02.2019). Contexts were excavated plastically, but inside it works were carried out with flat mechanical levels ca. 2-5cm thick. Contexts of square S8 appeared to be very rich in finds but mostly in the same, a few groups of artifacts in each of them. Stratigraphy was undisturbed and excavated contexts of S8 were very simple to compare with related contexts of neighboring squares. Thickest soil was context 500, under-slag sand. There was not troubles to indicate C 500 as exactly similar and related to contexts 402 in square T9 and 302 in square U9. Main difference between square S8 and the rest of neighboring squares were visible on the levels of two lower contexts of square S8- charcoal soil- C 501 and “post Wadi Suq” dune C502.

Except square T9, where situation on this level is unknown yet, contexts of sand with charcoal related to C501 in S8 in U9, V9 and W9 were much thicker than C 501 in square S8. Amount of charcoal flakes in context 501 was much smaller than in related soils of three mentioned squares. For addition charcoal fragments were concentrated in W and NW part of square and it seems that are related not to charcoal spots in squares U9, U8, V9, V8 and W9, W8 but to completely different spot (maybe related with another furnace area) somewhere to the NW from square S8. (in eastern part of S8 there was not charcoal at all and possible this clear area is even bigger).

If Context 501 in S8 was thinner and less visible, next, underlay context 502 was much thicker and massive than related contexts in square U9, V9 and W9. Slope of both contexts (501 and 502) in square S8 was almost impossible to indicate (soils seem to be almost flat), but on the base of difference of thicknesses of related contexts in squared to the E and NE from S8 we can assume that there was falling to the NW. It was very significant that C 502 was almost completely sterile too. In the hard, very compacted sand of this soil there was not completely any finds. Such a structure of C502 seems to be marker and effect a significant dry period dividing more humid and fertile period (related with Wadi Suq culture activity in Saruq) from dryer (but very active in the way of metal production) period of iron age.

Except the metal finds of contexts 500 and 501 the most interesting feature in Square S8 were structures cut in the bedrock surface. It seems that here better than in the rest of squares excavated in this season we can observe a shape and installations inside of interior of huts of Wadi Suq period.

EXCAVATION DETAILS

Context 500

Stratigraphically context 500 (identical with 402 in square T9 and 302 in U9) was a soil of fine, windblown sand probably accumulated in the core of ancient dune or mound. Shape of top of context 500 (**Figure 2**) in the beginning of works was effect of erosion of flat level left after excavations carried here in the autumn 2017. Almost flat area in N-W half of square (levels: 102,71 m. ASL– 102,51 m ASL) was still more or less preserved part of this excavated level, but slope in the S-E corner (levels: 102,36 m ASL - 101,70 m ASL) was caused by activity of wind and water in time of hiatus in the works between seasons. Original slope of top of C 500 was not identified in square S8 neither in time of excavations in 2017 season nor in time of recent works. Its fragment, with steep slope to the N, was uncovered in 2017 in N part of square S9 and of course (as a top of context 402 and 302) in march of recent year in square T9 and U9.

Exploration of C 500 from the beginning of works was carried out by horizontal, mechanical levels about 3cm thick, from highest, flat area in N-W corner, gradually covering of all square.

Context 501

Was a context related with “charcoal” layers of square U9 (C303), V9 (C806), and W9 (C905) but amount of charcoal admixture in comparison with different squares was minimal. The same, thickness of C 501 in comparison with U9, V9 and W9 was visible smaller. C 501 was accumulated almost

without any slope (visible in square S8) but careful observation and measurement show that it's falling gently to the NW. Top of C 501 (**Figure 3**) was difficult to identify because of extremely low amount of charcoal in admixture and sand identical with sand in C 500 and it's possible that last, lowest ca. 5-8 cm thick mechanical level of context 500 belongs in fact to C 501 (amount of finds much higher even than the rest of cont. 500 can prove this supposition).

Context 502

Context 502 (Figure 4) was much different than two previously described contexts. Compaction of its sand was even stronger and in thickness a series of thin, more brownish subsoils was visible. Finally C 502 was almost absolutely without any finds. Only in bottom part (last few centimeters) very little of small fragments of bones, round stones and a few lithicks (more just pieces of flint) had been found. All subsoils lay almost flat (with only minimal slope to the N-E). It seems that "post Wadi Suq dune" which in U9, W9, and V9 squares had only a few centimeters of thickness in square S8 was much thicker (0,73cm) and whole context 502 is exactly a fragment of the core of this dune. Justified on the base of absolute lack of any metallurgical remains it seems that all copper smelting and copper production activity was started after dune of context 502 was accumulated. Character of soil itself can indicate that moment of accumulation of C 502 was the first dry period noted in stratigraphy of Saruq with stronger desertification and deflation processes visible in soils structure.

Context 503

Very thin soil of fine sand, pale yellowish-brown in color with significant admixture of gravel which consists small, round pieces of different stones (from local bedrock and sandstone fragments to darker and harder stones transported for sure from outside the site) (Figure 5). Gradation of material suggest not only wind but a water origin of this soil too (probably washing of material, especially bones, from some higher area to the south, to the square S8). In C 503 there was not any traces of metallurgical activity and it seems to be that it was a first soil accumulated in completely different part of history of researched area. Interesting aspect of context 503 in square S8 is fact that it is covered completely the structures as thought related to the Wadi Suq period. All of structures excavated in square S8 (hearth- 001, storage pit with working area- 002, postholes- 003, 004) were filled with smooth yellowish brown sand only, without gravel and fragments of bones characteristic for C 503. It is possible that some climatic event caused accumulation of C 503 happened in the very end of Wadi Suq period on Saruq site or even after it.

Context 088

Bedrock of researched square S8 (Figure 6) was built by gypsiferous or calcareous rock with genesis in evaporation of some prehistoric lake with its surface cut by network of natural cracks different width and depths. These cracks were filled with pale yellowish brown, hard, slightly loamy sand without any remains of human activity. In such a formed bedrock a few different kinds of human-made structures were cut.

Structure 1

was the hearth or roasting pit. It was prepared in shallow (9cm in depth) but wide (82cm long- NNE-SSW and 64cm wide- WNW-ESE), rock cut pit (Figure 9). In cross-section it was perfectly visible that deepest layer was built by smooth, black ash with very small fragments of soft charcoal. On the ash layer a level of tightly packed pieces of sandstone was laid (Figure 8). Everything (probably after use and abandon of structure) was covered by thin layer of fine, almost loose sand yellowish-brown color (Figure 7) and finally with C503 with its characteristic gravel admixture. Structure 001 seems to be classic and still used by Beduins roasting pit. In this kind of "installation" in some hollow (mostly dug in the ground) on the layer of red hot charcoal the level of hard stone fragments is heated, covered with animal's fat and then used for roasting pieces of meat.

Structure 2

was cut in bedrock to the north from structure 001. It consists two elements- storage pit almost perfectly round in shape (42cm in diameter), quite deep (24cm in depth), very well carved in the rock and filled with smooth, fine sand (Figure 10). To the north of pit were slightly lowered area “working area” (98cm long and 46cm wide, divided by low ridge for two oval-shape parts each of them ca. 50cm long) with visible traces of “rubbing” possible by bottom of some tool or implement eg. millstone (Figure 11). This area touch a round pit and exactly in the place where in its “rim” a cut wide for 5cm and deep for 4cm was cut. Probably this cut was used for sweeping up something (flour?) from working area to the pit. Similar cut was visible on opposite side of pit’s rim. Surface of rock around the edge of pit for about 5cm was painted with white color. Traces of white painting in the shape of big “L” were visible to the south of pit too.

Structure 3

Was completely different kind of structure in comparison to previously described objects. It consist of 10 (or even 11) postholes (8-12cm in diameter, 8-10cm in depth) circular or slightly oval-shape (Figure 12). Two (or three) of them were strictly outside the square S8 (to the south of hearth/roasting pit (structure 001) in square S7) but visibly belongs to the same structure (posthole system). 7 of postholes of structure 003 were cut in the bedrock in well visible, semicircular row around (on northern, western and southern side of) structures 001 and 002. It’s probably a shape of oval shape hut with construction supported on wooden posts (with the lower ends placed in the postholes in the bedrock) and two first structures (001 and 002) inside. Western part of hut was possibly divided with some internal wall start between of structures 001 and 002 and runs to the west even outside the western part of semicircular wall of hut.

Structure 4

Was similar to structure 003 system of 11 postholes, but much smaller than in structure 003 (4cm in diameter, 2cm deep) and evidently concentrated in one place, in western part of square S8 (Figure 13). In the localization of smaller postholes there is more difficult to find some order similar to the order of bigger postholes of structure 003, but it seems that two lines of it one runs N-S, second E-W Joint together in the corner with its southern and eastern ends with angle between of lines about 90°. If both systems of postholes (structures 003 and 004) are the same date structure 004 was placed outside the hut with the wall supported on the posts inside postholes of structure 003, and to the west of it. Structure 004 can be remains of some simple construction for impossible to determine purpose.

All surface of bedrock (context o88) was documented in a few different way- by traditional photography (Figure 13) orto photo and 3D models (Figure 39).

FINDS SUMMARY

Two contexts richest in finds were C 500 and 501.

In compacted sand of C 500 amount of finds (much higher than in related contexts (under-slag sand) of squares T9 and U9) grew gradually from the highest to lowest layer. In general context was rich in different kinds of finds but beads (made of glass, stone, shell, carnelian and bone) (38 pcs- GR20472) (Figure 38), and “copper cups” (4pcs complete- GR20486, 20487, 20496, 20497) and its fragments (7pcs.) were two mostly represented groups. Two of beads were found in situ (Figure 14 - 15), similar to most of complete cups (eg. Figure 16 - 17). In lower part of context 500 more complete copper cups (Figure 24 - 26) were found, in upper part higher amount of its cut fragments and fragments of cut copper sheets was noted. Third group of significant finds (7pcs) were fragments of extremely thin, flat gold wire (or strictly gold bands) (GR20405) (eg. Figure 18 - 21). Finally, between

more significant finds from context 500 the large, broken shell plaque (GR20483) (Figure 22) and gold ringlet with granulated decoration (GR20508) (Figure 23) should be mentioned. Set of bulks was extremely typical for almost all squares- most interesting group were copper bands, the rest were drops of “copper not worked”, iron not worked”, flakes of “iron worked” etC. Characteristic feature of finds in C 500 was that most of it had been found in N-W half of square. It seems to be related with situation in next context (context 501)

Amount of finds in C 501 was similar to C 500 . Main group were beads (24pcs- GR20472) different size and made of different materials (stone, glass shell), second group were “copper cups” (2pcs complete- GR20500, 20502) (Figure 27-28) and 3 fragments. Third group of finds consisted (similar to C 500) a gold wire fragments (2pcs- GR20405) eg. (Figure 29). Between interesting finds the arrowhead (GR20498) (Figure 30) and small model of copper sword (GR20499) (Figure 31) should be mentioned too. In localization of finds in context 501 the same characteristic feature as in C 500 was recognizable- all of them had been found in N-W half of trench, exactly in the area with fragments of charcoal. Area free of charcoal was free of finds, what can suggest some relation between finds and area of metal production (some furnace ?) which probably exist somewhere to the N-W from square S8. More, it seems that it was a kind of specialization in production between of metallurgical areas (related probably to charcoal areas). In group of finds from charcoal areas of squares U, V and W there is visible much more of arrowheads, models of weapon, copper blades, daggers etC, and only a little of cosmetic utensils or copper cups. In square S8 situation is totally different. Between of metal finds most of it are copper cups (5pcs complete) and its fragments (11pcs), copper sheets different size and shape (7pcs) and 1 copper stick, completely there was not spearheads, knife or dagger blades and only a single arrowhead (GR20498). In square S8 most of gold wires from this season had been found (10pcs) too. This situation is even more underlined by old finds of DM-s mission which found (probably in S6 square) a dozens of copper cups.

For distributions of main finds in contexts 500 and 501 see (Figure 40).

Completely different groups of finds were characteristic for context 503 (Wadi Suq). This context definitely was not related with metallurgical production, much more with hunting activity probably and main groups of finds were lithics (82pcs, between of them one with GR20461) and fragments of bones (398pcs- 209,5g in weigh). Finds of both groups were spread around, more or less even on whole square (and on neighboring squares too). Due to this whole context seems to be a secondary deposit, with material washed down from different, higher area of site and excavated finds are probably only lightest “fraction” of whole material deposited somewhere further.

A few very interesting finds which were impossible to connect with any context excavated in square S8 (because had been found in time of cleaning square surface after storms, sandstorms and in area disturbed in moment of rebuilding of wall of bags on the SW corner of square) were registered in context 099. It were 4 beads (carnelian, stone and glass made) (GR20472), 2 copper models of swords (one complete – Figure 32 and handle half of second one (Figure 33), copper stick, (Figure 34), fragment of gold wire (GR20405) (Figure 35) and 3 cut fragments of copper cups.

Table 19. Summary of Small Finds for entire Square S8.

Small Find Summary	Count	Weight (g)
Arrowhead	1	6,5
Beads	63	6,4
Ceramic	1	20,8
Copper Blades	3	9,1
Copper Cups	19	80,4
Copper Stick	1	1,5
Flint Flake	1	3,2
Gold	12	0
Shell	1	85
Unworked Copper	25	16,4
Worked Copper (Sp)	7	16,1

Note: All artifact categories and counts refer to complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 20. Summary of Bulk Finds for entire Square S8.

Bulk Find Summary	Count	Weight (g)
Ceramic	1	4,9
Copper Bands	149	95,3
Debitage	82	177,8
Faunal Bones	398	209,5
Stone	156	642,3
Unworked Copper	80	165,1
Unworked Iron	152	282,4
Worked Copper	4	8,6
Worked Iron	19	25,9

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

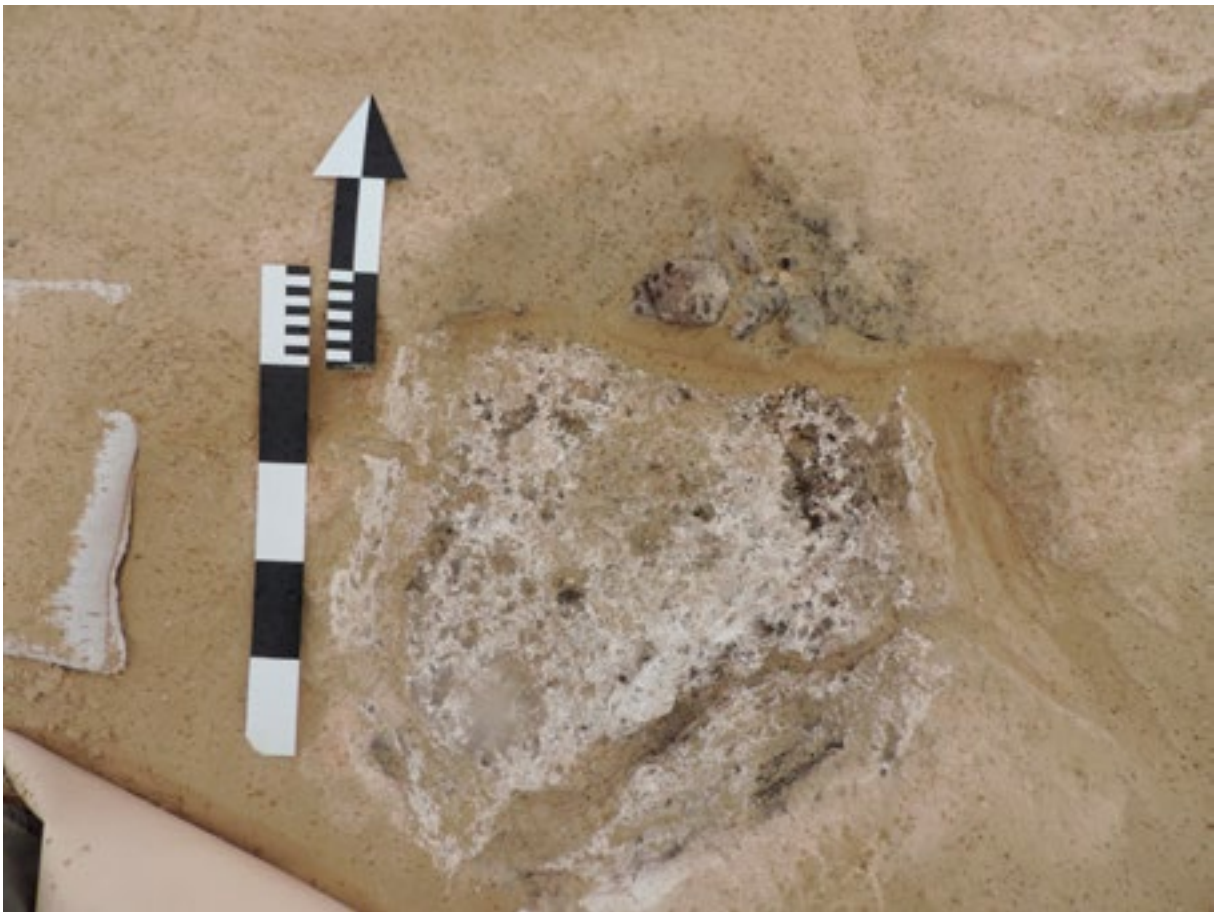
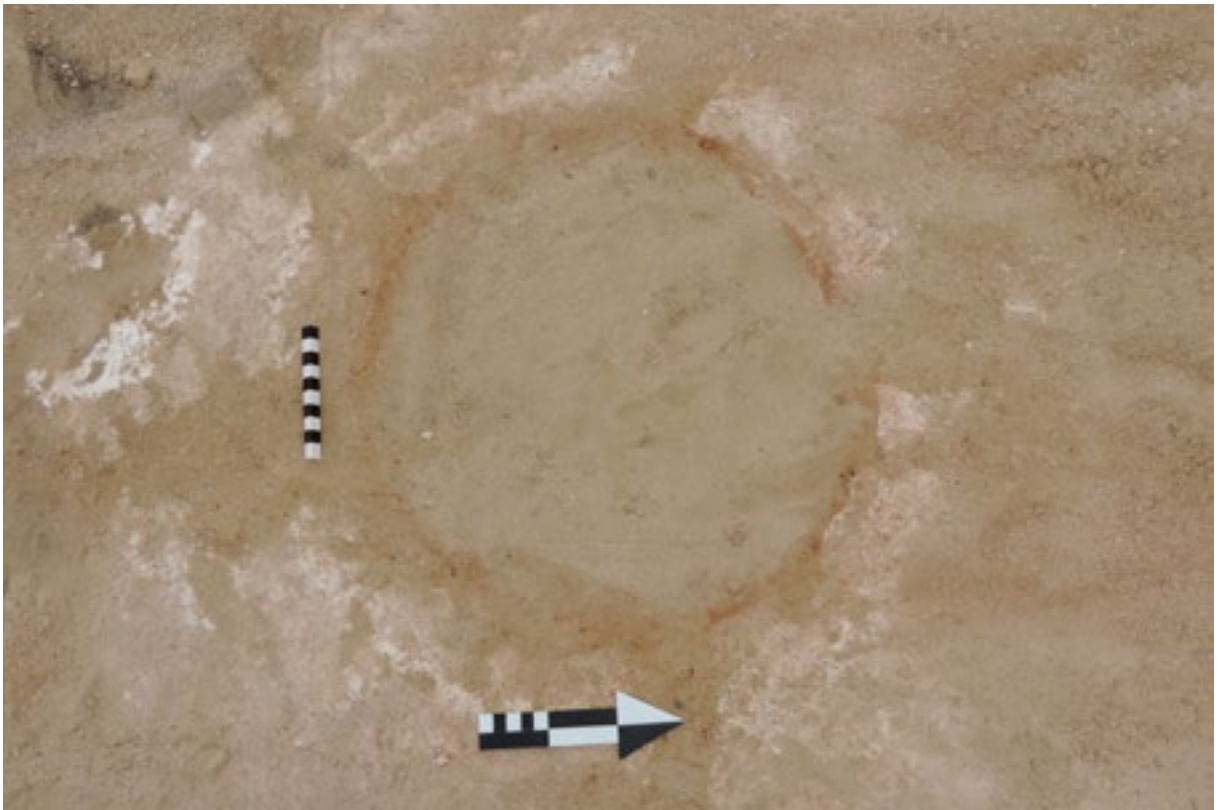
Table 21. Slag content in contexts of entire square S8

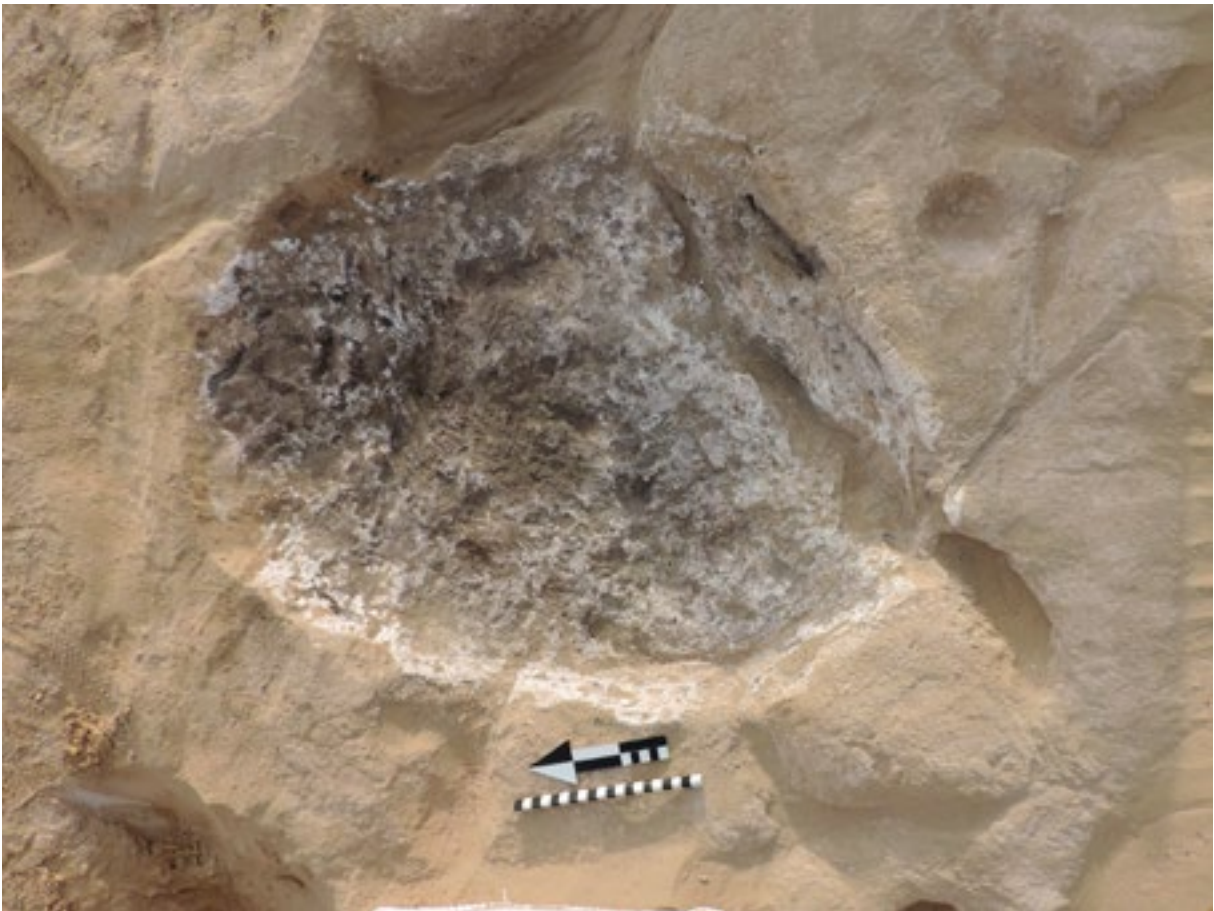
Square	Slag (kg)	Technical Ceramic (kg)
S8	33.25	

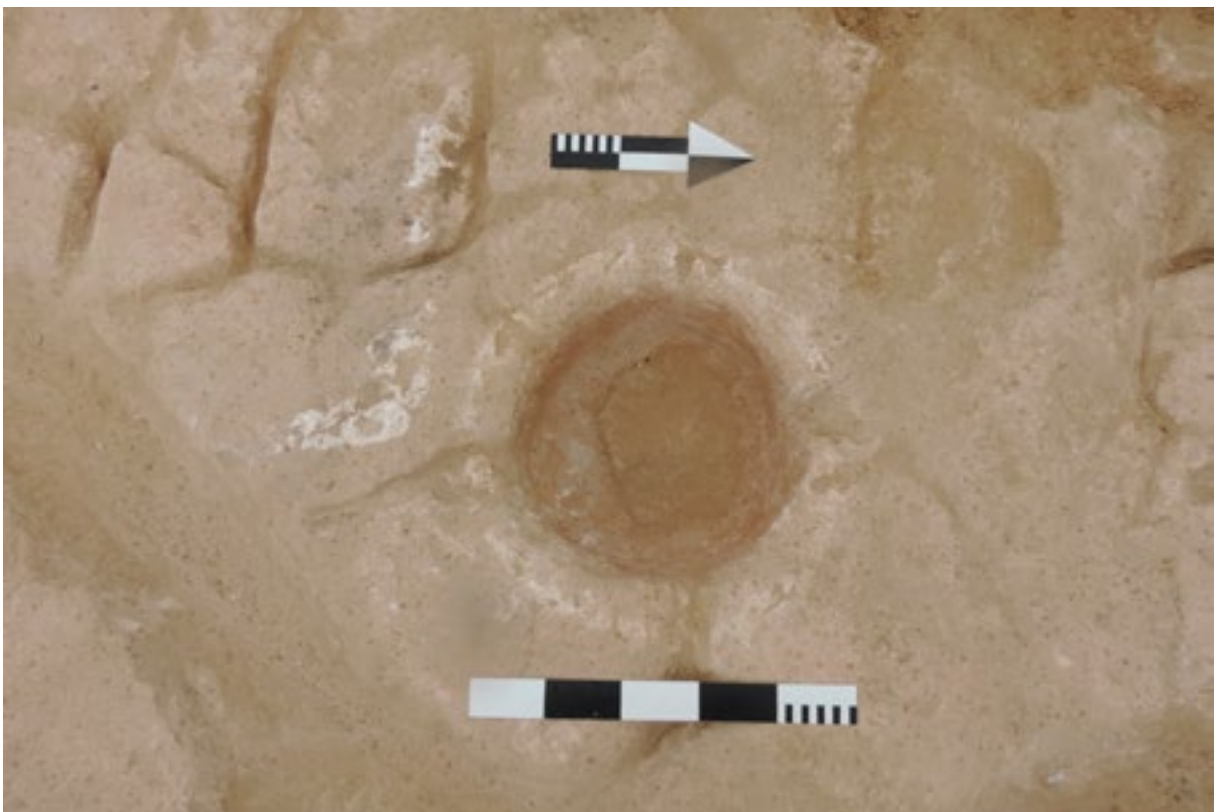
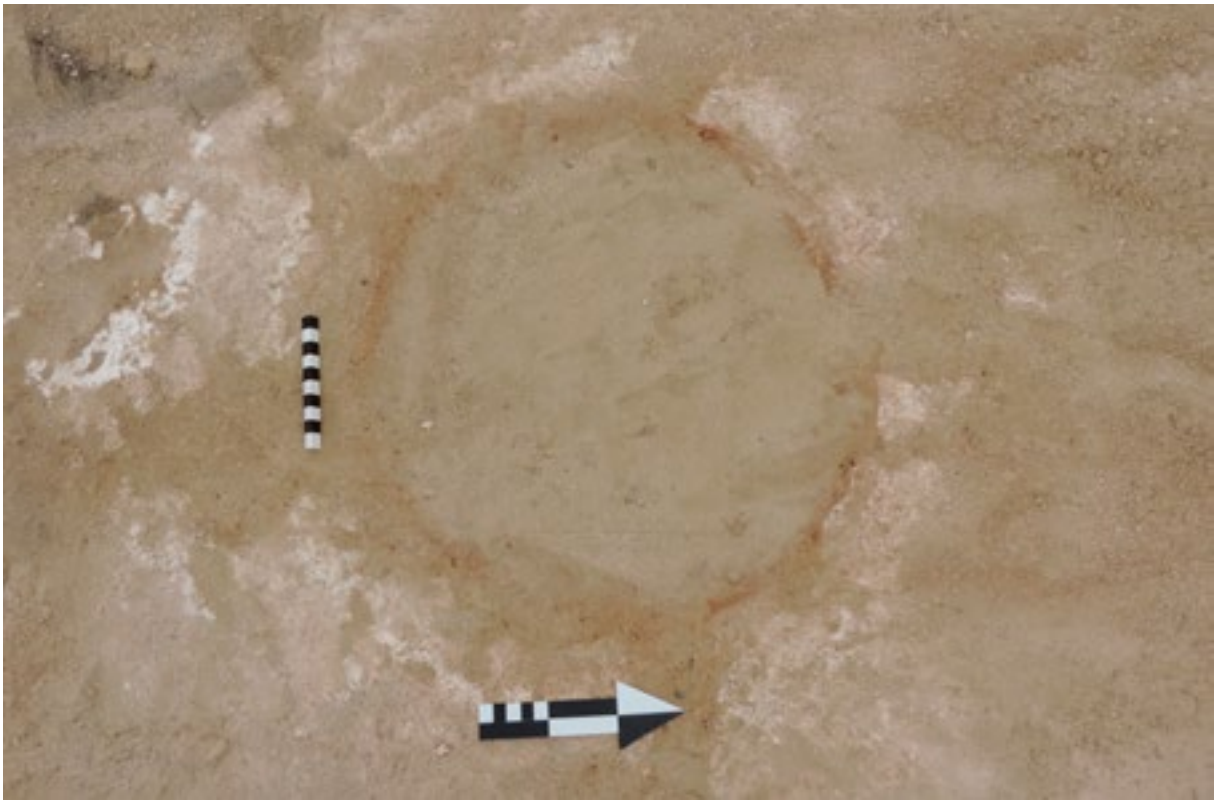








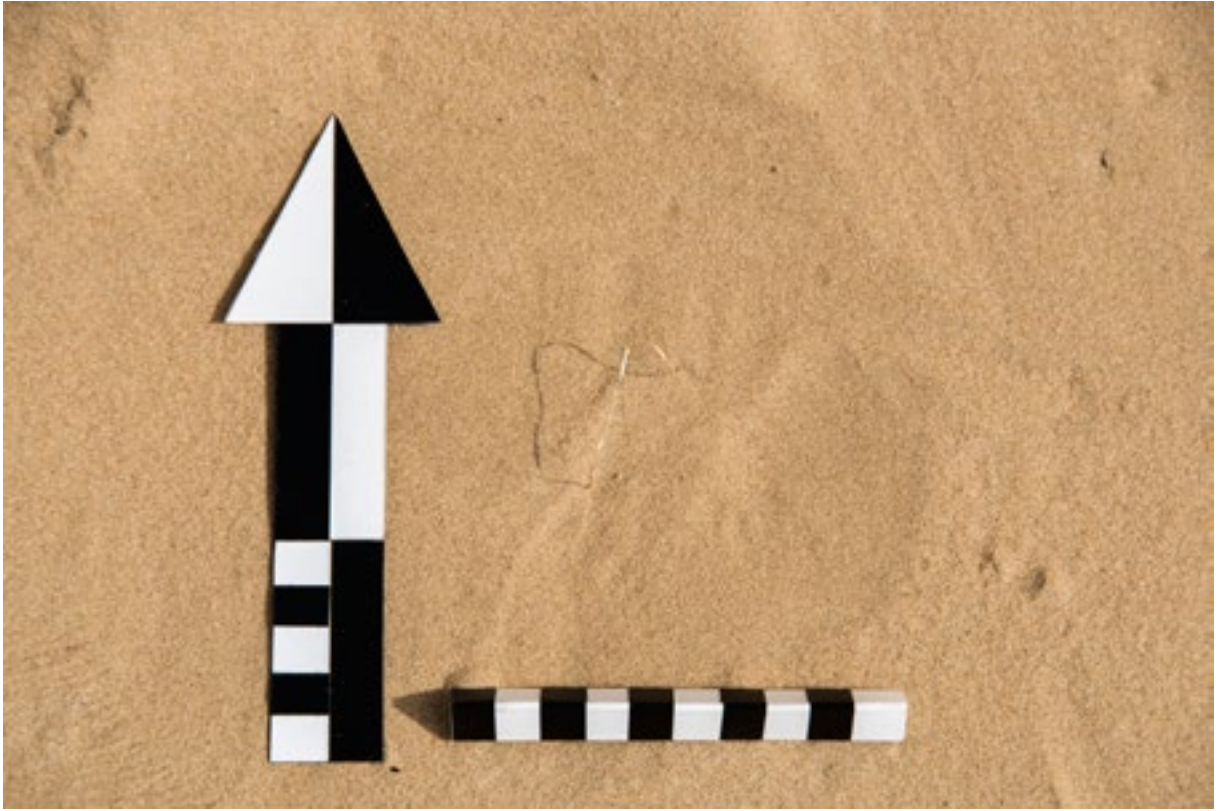


















2 cm







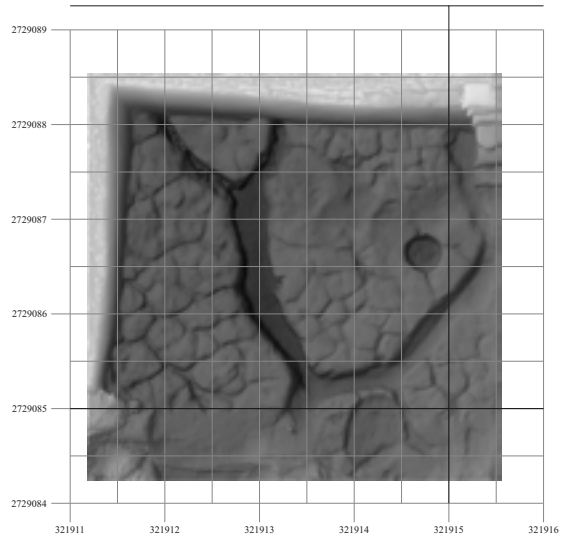













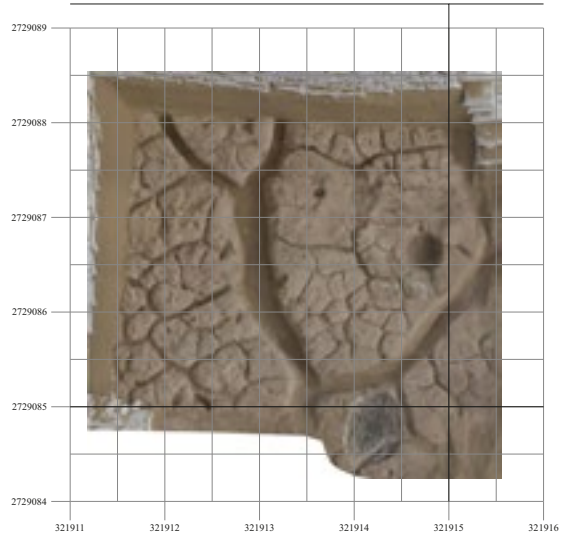
S8



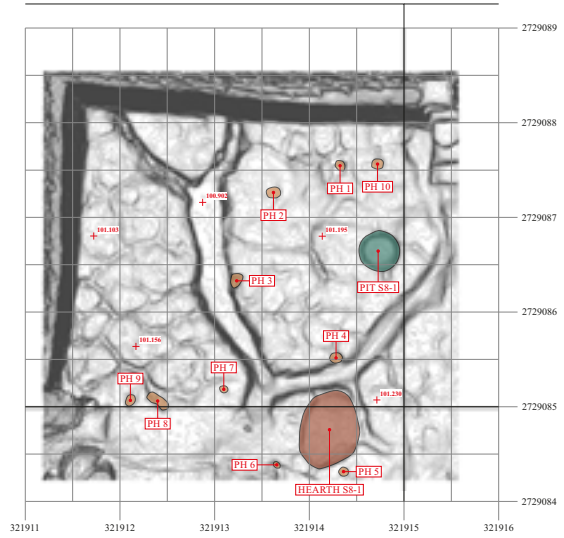
 	SHP19	
	Area F/S7-8 T7-8	
	OP22	
	HEARTH S8-1/PIT S8-1/PH 1-10	
Saruq al-Hadid Polish Mission	Scale 1:50	
	Exposed bedrock in S8 and parts of S7, T8 and T7 with a hearth (HEARTH S8-1), a pit (PIT S8-1) and several postholes (PH 1-10).	
Structure		
Elevation		
Contour lines (0.5cm)		
Otto Bagi	2019-04-11	UTM Zone 40N (EPSG::32640)




S8




S8




LEGEND



BEAD




METAL CUP




PRODUCTION

CONTEXT



500



501

The figure is a site plan of an archaeological area, divided into a 5x5 grid. Various artifacts are plotted on the grid, each with a unique label. The artifacts are categorized by shape and color according to the legend. The labels include 101.976, 102.004, 102.037, 102.014, 101.931, 102.291, 101.952, 102.074, 101.879, 102.063, 102.052, 102.074, 102.054, 102.096, 101.983, and a central label 'S8'.

A horizontal scale bar with markings at 0, 1, and 2 meters.

A north arrow pointing upwards, with the letter 'N' above it.

76

Square S9

MAREK WOŹNIAK

Excavation dates: April 15 to April 21, 2019

Contexts:

C099 Cleaning of plan of trench from windblown sand and material fallen from broken bags and outside the square- on the beginning of season (14.02.2019) and on the beginning of works (15.04.2019). Between of it collecting of finds washed and blown out by wind in time of storms and sandstorms (24-25.03.2019) corner disturbed in time of rebuilding of sandbag wall (08.04.2019).

C600 Slightly sompacted, yellowish-brown, fine, sand with particles < 0,1mm. Occasional small (2-4cm ϕ) pieces of black slag. Belongs to post iron-age cultural horizon. (Begun in autumn 2017). In recent season excavated from 2019.04.16 to 2019.04.21. Top: 104,92 m ASL – 103,06 m ASL (in SE corner remains of eroded slope falling to SE) (**Figure 1**). Bottom: not excavated in season 2019.

Excavation metrics:

Starting elevation (2019): 103,99 m ASL. (avg.)

End elevation: 103,45 m ASL (avg.)

Maximum excavation depth: 0,99 m, Minimum excavation depth: 0,11m – (avg. 0,55m)

Area under excavation (excluding north baulk sand bags) = 4,5 x 4,0m (18,00m²)

Estimated total volume removed (accounting for slope) = 9,9 m³

EXCAVATION SUMMARY

Excavation works in Sq. S9 were carried out between 16.04.2019 and 21.04.2019 (with on surface finds collecting on the beginning of season 14.02.2019, and 24-25.03.2019).

Square S9 appeared to be quite poor in finds. However only one context was excavated in season 2019 and the rest of soils seem to be much more rich (as it was in neighboring square S8). Works in sq. S9 was directed not on exploration of context only, but on lowering of western baulk of sq. T9 too. It will protect both squares from collapse of to high sandbag walls between of seasons.

EXCAVATION DETAILS

Context 600

Excavated context 600 (sub-slag sand) was absolutely comparable with another part of the same soil explored in sq. T9 (directly to the east) as a context 402. Consist compacted, fine sand color yellowish-brown homogeneous in structure. Top of C 600 was uncovered in time of works in autumn 2017 and was falling to the N in that time. Then after excavations of season 2017 was left flat on the level ca 104.92 and survived in this state until of beginning of recent works in 16.04.2019 (**Figure 1**). In SE corner however, huge hollow (almost all SE half of trench with lower point in 103,06 m ASL), with steep slope to the SE was effect of wind activity in hiatus between seasons 2017-2018 and recent. Thickness of context 600 caused that in square S9 it was excavated with flat, horizontal mechanical layers, and its bottom was not reached in season 2019. Natural slope of context was probably the same as slope of top, that's mean fell steep to the N. In thickness of cont. 600 natural lamination was not visible well.

FINDS SUMMARY

Context 600 was quite poor in finds, especially the small finds were quite rare. Most important and luxury object uncovered in C 600 was small, complete, steatite cup (GR20505) which was documented in situ in very beginning of works (Figures 2-5). It lay on its side with rim to the east. On its sides was ornamented with zig-zacs and squares drawn with shallow, engraved lines.

Second interesting object was badly preserved copper arrowhead (SHP19_0884) (Figure 6-7) from relative rare kind with almond shape leaf and thick, spine along it (square or rhomboid in cross section). Its blades were badly corroded, but shape was still possible to recognize.

In the same level another copper object was found. It was the blade part of broken scraper (SHP19_0881) (Figure 8-9). Third of finds was fragment of gold wire GR20405 (Figure 10-11). Based on the color it was possible to identify that amount of gold in wire was lower than in gold wires from sq. S8.

Last of copper small finds was small copper hook (SHP19_0882) (Figure 12) made of wire round in cross section.

The biggest group of finds were (the same as in sq. S8) beads (glass, stone and shell) (6pcs-SHP19_0859, SHP19_0860, SHP19_0886, SHP19_0888) (Figure 13-16). It was not so many of it as it was in sq. S8 and were smaller but still it represent a few groups of material and shape.

The rest of finds was quite typical and concern a drops of “copper not worked” and “iron not worked”, flakes of “worked iron”, etC In general the finds of sq. S9 in context 600 seems to be a little of trash character. From the state of preservation of iron flakes it is possible that part of finds origin from much earlier context secondary excavated after long period of deposition when iron swords and daggers were rusted and were crushed for fragments on moment of uncovering by later diggers.

For distribution of main finds in context 600 in sq. S9 see Figure 21.

Context 099 Objects collected on surface of trench on the beginning of season (14.02.2019) and on surface disturbed by winds and rains in time of storms and sandstorms (24-25.03.2019 and 15.04.2019) were classified as a context 099. It concern then: a round, flat copper object (GR20463) (Figure 17), 2 copper sticks (SHP19_0018, SHP19_0413) (Figure 18-19), one copper ring (SHP19_0852) (Figure 20) 5 cut fragments of copper cups, and a few typical copper bands.

Table 22. Summary of Small Finds for entire Square S9.

Small Finds Summary	Count	Weight (g)
Arrowhead	1	4,2
Beads	6	1,6
Ceramic	1	73,8
Copper Cups	5	16
Copper Hook	1	0,7
Copper Sticks	2	7
Gold	2	0
Ornamental Copper	1	0,4
Scraper	1	13,3
Steatite	1	232,7
Worked Copper (Sp)	1	1,8

Note: All artifact categories and counts refer to complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

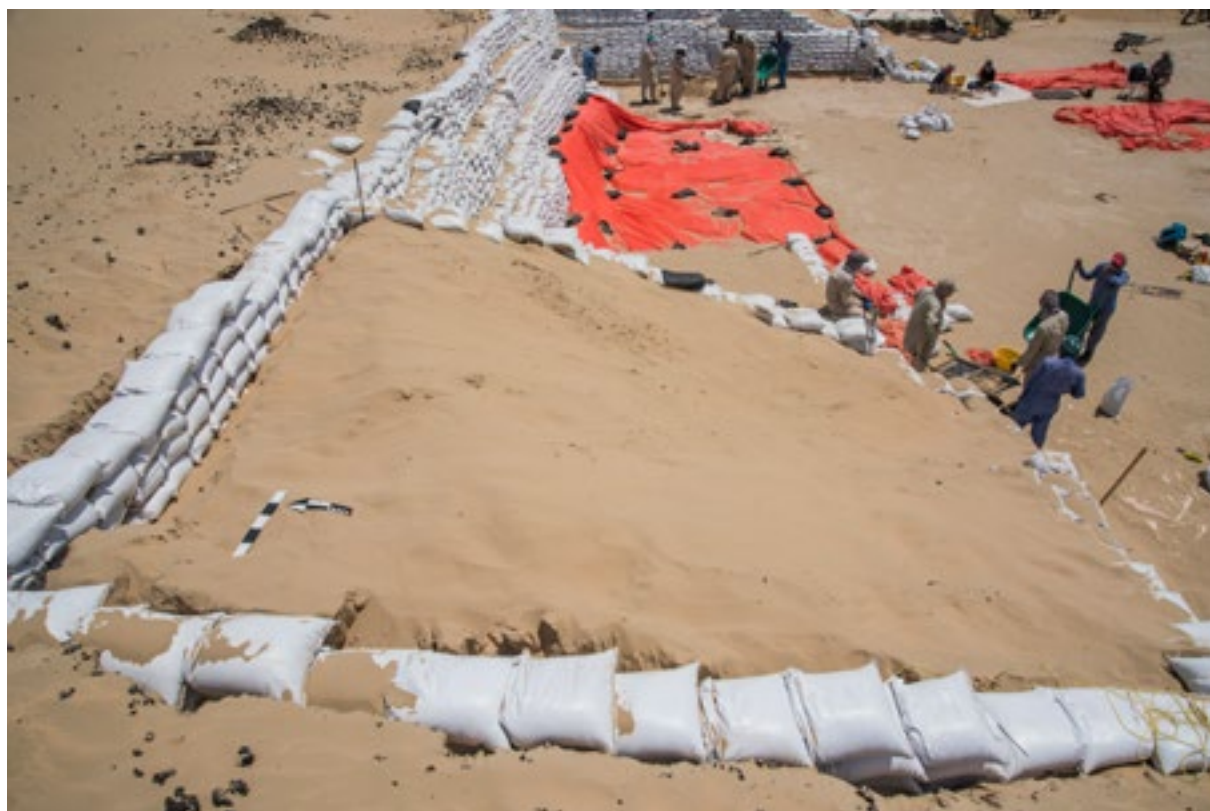
Table 23. Summary of Bulk Finds for entire Square S9.

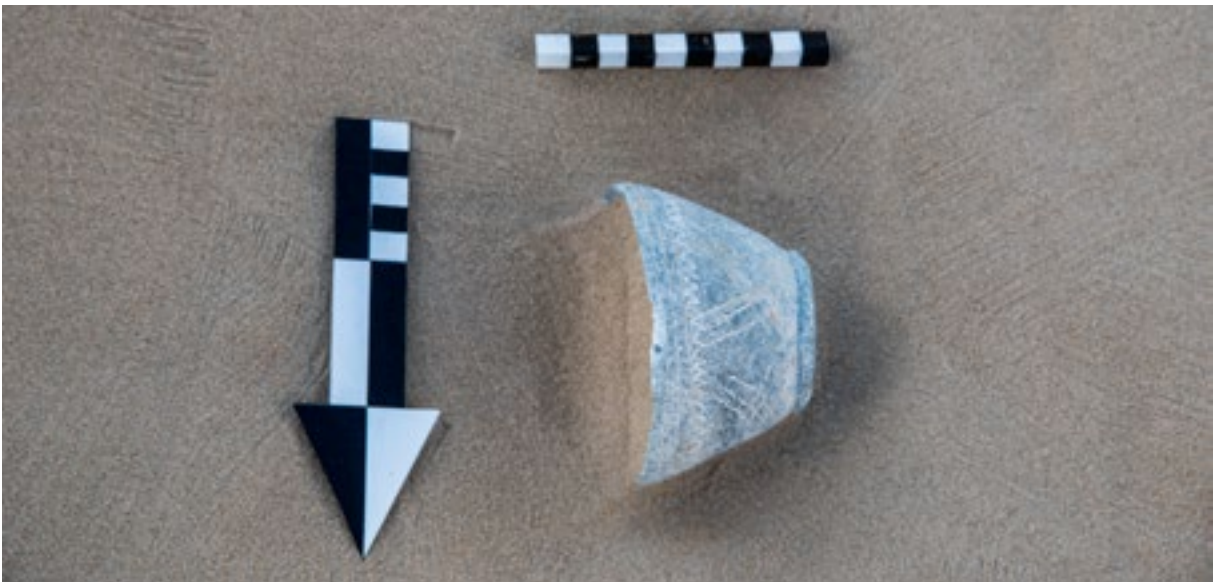
Bulk Find Summary	Count	Weight (g)
Copper Bands	360	147,1
Unworked Copper	49	101,6
Unworked Iron	183	297
Worked Iron	53	20,2

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

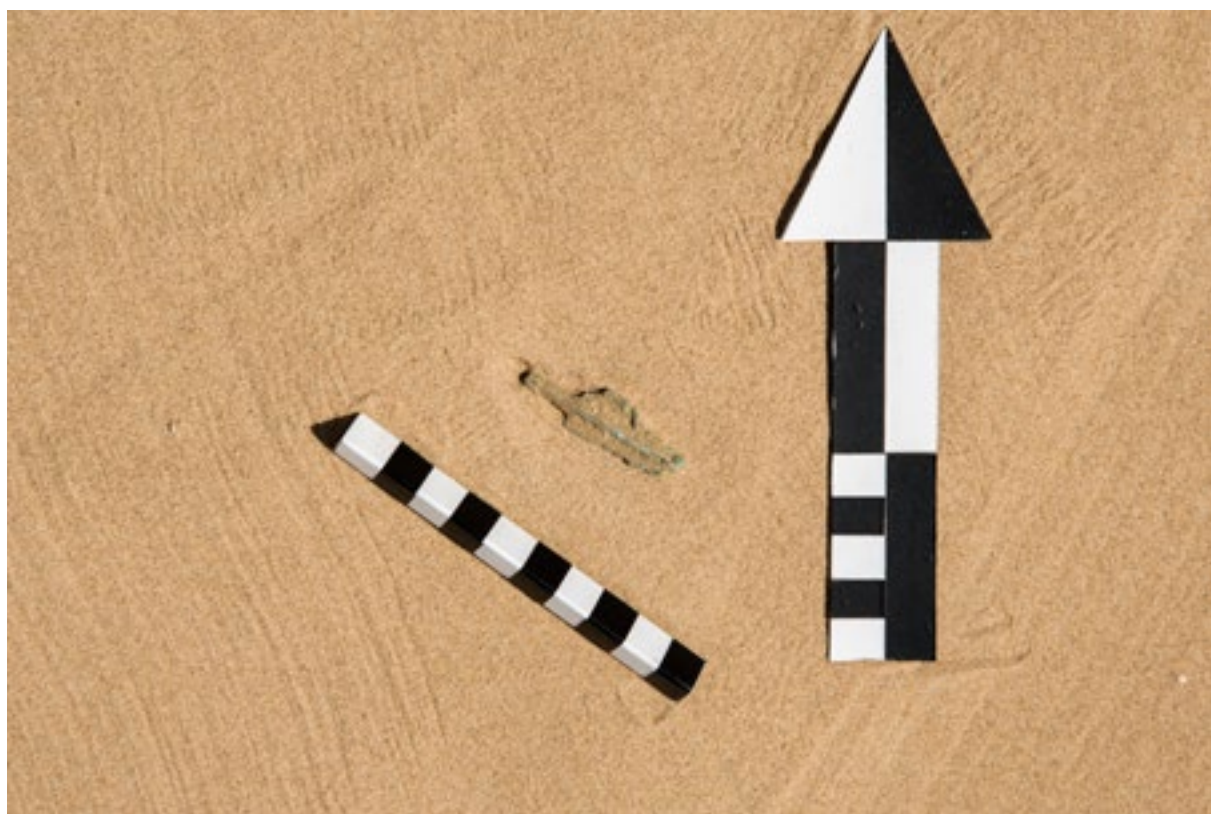
Table 24. Content of slag in contexts of entire Square S9

Square	Slag (kg)	Technical Ceramic (kg)
S9	46,85	0,50





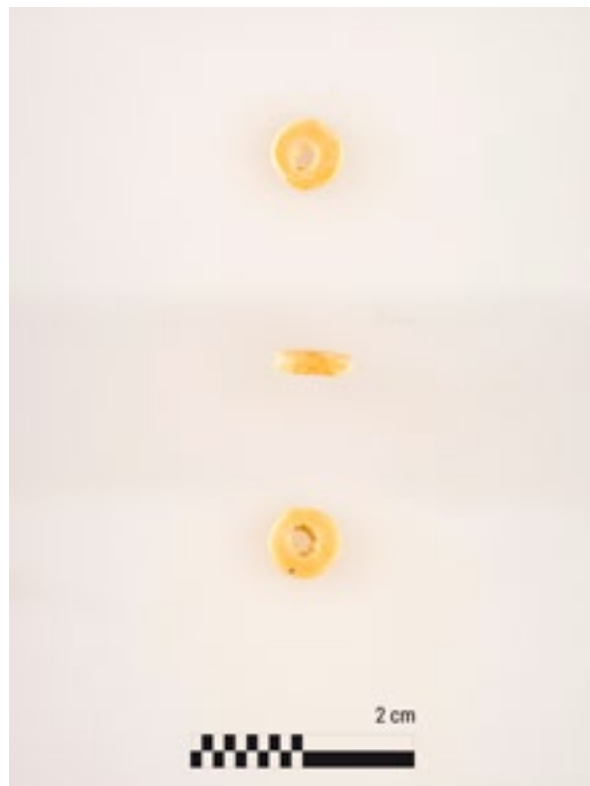




















LEGEND


VESSEL/SHERD

ARROWHEAD

TOOL

CONTEXT

600

PRODUCTION

The figure is a 6x5 grid representing an archaeological site plan. The grid cells are light gray with black borders. The following items are plotted on the grid:

- Artifact 104.553:** A green-filled vessel/sherd icon located in the second column from the left, third row from the bottom.
- Artifact 103.951:** A green-filled arrowhead icon located in the second column from the left, fourth row from the bottom.
- Artifact 103.8914:** A green-filled tool icon located in the second column from the left, fifth row from the bottom.
- Artifact 103.6012:** A green-filled production icon located in the third column from the left, fifth row from the bottom.
- Feature S9:** The label "S9" is centered in the third column from the left, second row from the bottom.
- Feature S8:** The label "S8" is centered in the third column from the left, fifth row from the bottom, positioned just above the 103.6012 artifact.

A horizontal scale bar with a black outline. It is divided into two equal segments by a vertical line. The number "0" is at the left end, "1" is at the division line, and "2 m" is at the right end.

A north arrow symbol consisting of a circle with a vertical line through the center. The top of the vertical line is labeled with the letter "N". The circle has a stylized arrowhead pointing upwards.

89

Square T8

KAROL OCHNIO, SIDNEY REMPEL

Excavation Dates: February 13 - 24, 2019

Contexts:

C99 Pre-excavation cleaning of sand dune build-up and slumping during 10 month hiatus from previous project.

C700 Sand dune deposit underlying lower (older) slag deposit. Post-Iron Age.

C701 Main Iron Age II artifact-bearing horizon. Sandy silt with some charcoal.

C702 Wadi Suq deposit. Small gravel/sand. Some lithic debitage. Hearth and postholes associated with this phase (C703-C711)

C703 Hearth (Structure 1). Wadi Suq phase. Cut into C88 bedrock.

C704- C711

Possible postholes (8) cut into C88 bedrock (Structure 2). Wadi Suq phase.

C88 Gypsum bedrock.

Excavation metrics:

Starting elevation: 101.93 mASL. (avg.)

End elevation: 101.24 mASL (avg.)

Maximum excavation depth: 0.69 m

Area under excavation 12.5 m²

Estimated total volume removed = 8.63 m³

EXCAVATION AND ARTIFACT SUMMARY

Formal excavation began in Square T8 on February 18 following cleaning and replacement of sand-bag support walls. The previous mission in Area F had excavated the south half of the square in 2018, but not to bedrock level, leaving the main Iron Age II level to be uncovered in the north half. This also left the Wadi Suq horizon to be excavated to bedrock level throughout the entire square.

Context 99

This cleaning context in the south half of T8 produced two stone beads and a copper clip (Figure 1), a copper blade fragment (Figure 2), among other bulk finds such as worked and unworked copper and iron, copper bands, faunal bones, lithics, and several pottery fragments. This admixture of objects is likely the result of post-excavation baulk slumping following the 2018 excavations in this square.

Context 700

This context represents major sand deposition between the prevalent “lower/early” slag layer encountered by the previous mission, and the Iron II horizon encountered below, at the ~101.80m ASL level. Despite this depositional horizon being typically absent of artifacts in Area F, three stone beads (Figure 3), worked and unworked copper fragments, and a copper band were recovered from this context.

Context 701

This context represents the primary local Iron Age II horizon, and is characterized by the appearance of charcoal flecking across the north half of T8. This flecking appears at the ~101.67m ASL level. While excavating a new sandbag trench on the north face of Square T8, a whole pot was uncovered and recorded at a depth of 101.30m ASL. (See discussion of whole pot in ceramics section of this report, as well as Figures 8a and 8b).

Two days later, a series of small finds were uncovered in the northeast corner of the square at the 101.50m ASL level. These included a copper cup (Figure 5), arrowhead (Figure 7), small and large rings (Figure 6), a bead and a copper disc. This concentration of objects corresponds to the concentration of objects found at roughly the same level by the previous mission in 2018 in the south half of T8, and is associated with the larger Iron Age II horizon (See Figure 15 for generalized artifact distribution). No further objects were found in this context (See Figure 8 for north profile showing location of whole pot).

Context 702

At approximately 101.27m ASL, the Wadi Suq phase produced a number of secondary and tertiary flint flakes that are characteristic of this phase in Area F. One flint tool (GR 20485, SHP19_0259) (See lithic section for photo, and illustration below) was also recovered from this context; a secondary flake with partial cortex that is retouched marginally on the left side (when viewed dorsally) to form an *ad hoc* scraper.

Context 703

A hearth (T8-Structure 1) in the southwest corner of the square, cut into C88 bedrock and bearing 60 burned/firecracked rocks in a matrix of ashy sandy silt.

Dimensions: 101.26m ASL at upper rim, 101.14 mASL in center, bottom. Total depth: 12 cm. (See Figures 11 and 12). Length and width of the hearth is 76.2 x 74.3 cm. In addition, 8 potential postholes (Structure 2) were identified. The average diameter of all postholes is approximately 15 cm. Figure 13 shows completed Square T8 to bedrock level. See Figure 14 for orthophoto, contours, and feature drawings.

Context 704-711

Structure 2, postholes (n=8) dug into C88 bedrock. No finds associated with these features.

Table 25. Summary of Small Finds for entire Square T8.

Small Find Summary	Count	Weight (g)
Arrowhead	1	7.65
Beads	5	<0.1
Ceramic	1	-
Copper Blade	1	1.85
Copper Clip	1	2.65
Copper Cup	1	5.7
Flint Core	1	44.2
Flint Flakes	8	28.5
Flint Tool	1	9.1
Ornamental Copper	3	9.95

Note: All artifact categories and counts refer to both complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 26. Summary of Bulk Finds for entire Square T8.

Bulk Find Summary	Count	Weight (g)
Ceramics	5	17.1
Copper Bands	34	8
Debitage	64	259.9
Faunal Bones	178	104.7
Fish Bone	1	0
Unworked Copper	103	498.4
Unworked Iron	63	225.4

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

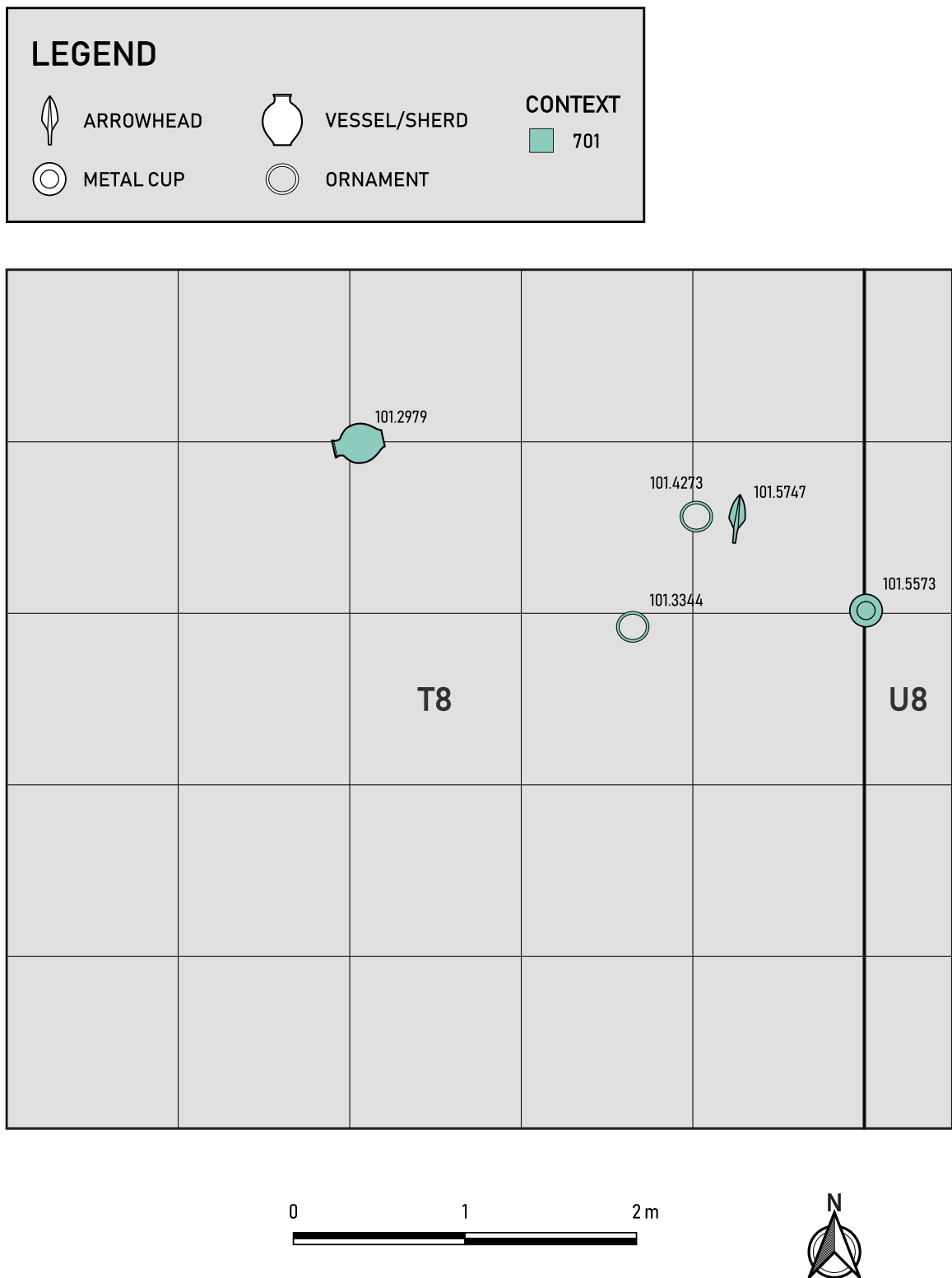


Figure 15. SD24 Generalized find distribution map of Context 701.



Figure 1. Copper clip found in Square T8, C99 during cleaning.



Figure 2. Copper blade fragment from square T8 during cleaning (C99) (SHP19-0068).



Figure 3. Stone beads, Context 700.



Figure 4. Excavation of whole pot (G.R. 20411) in Square T8, C701. (Feb. 19 2019)



Figure 5. Copper dish from T8, C701 (G.R. 20414)









Figure 6. Large copper ring from T8, C701 (G.R. 20417)



Figure 7. Arrowhead from T8, C701 (G.R. 20415)



Figure 8a-b. Complete pot from T8, C701 (G.R. 20411)

 Saruq al-Hadid Polish Mission		SHP19	OP2
		Area F/S8-T8-U8	700/701/702
Northern profile of T8 and part of S8, U8 showing the continuation of the charcoal layer (C701) sloping towards the west. The drawing includes the position of a complete jar (GR20411) found 0.4 m from the profile cut.			
Context		Suggested context div.	 Natural sand deposit 
Gravel		Wind-blown charcoal	
Otto Bagi	2019-02-18	UTM Zone 40N (EPSG::32640)	Scale 1:25

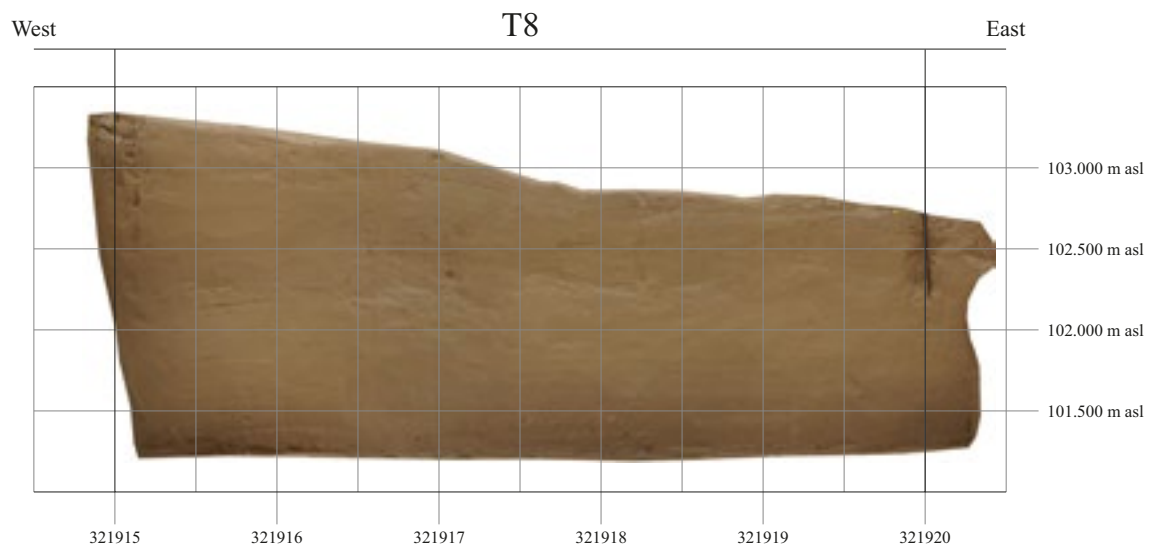
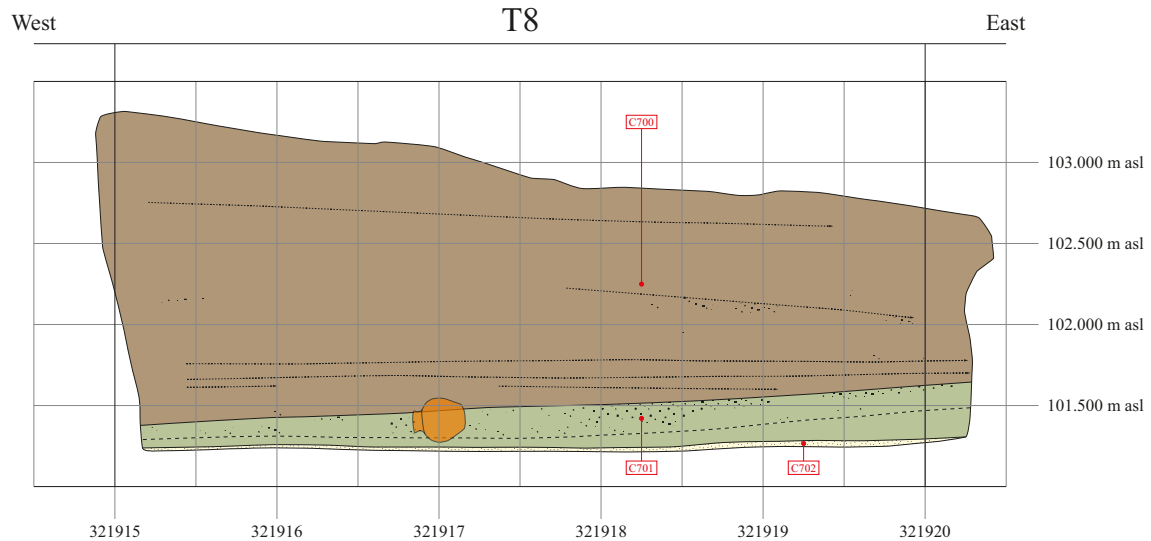


Figure 9. SD18 Northern profile of T8 and part of S8, U8 showing the continuation of the charcoal layer (C701) sloping towards the west. The drawing includes the position of a complete jar (GR20411) found 0.4 m from the profile cut.



Figure 10. Flaked stone (flint) from Square T8, C702 (Wadi Suq) (SHP19-0099).



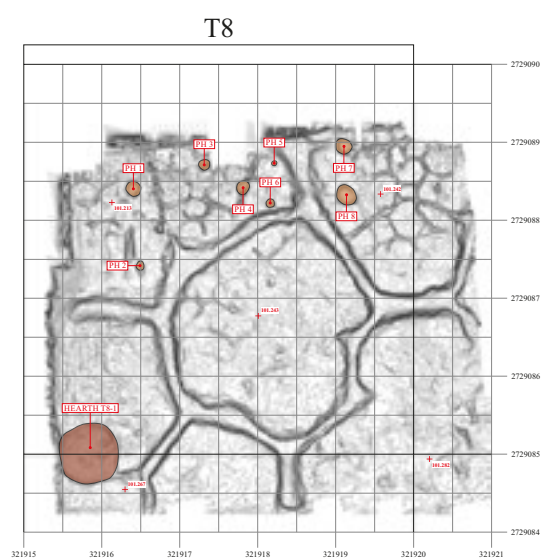
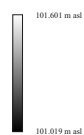
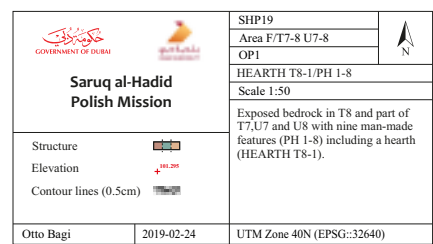
Figure 11. Hearth (T8-Structure 1) during excavation. Context 703.



Figure 12. Oblique view of Context 703 Hearth post-excavation.



Figure 13. Final photo of Square T8, Context 88 gypsum bedrock. Feb. 24, 2019.



101

Square T9 **MAREK WOŹNIAK**

Excavation Dates: February 27 to April 29, 2019

Contexts:

C99 Trench cleaning (e.g. after sandstorm) and trimming of baulks after collapse of sandbag walls (**Figure 1**).

C400 Slightly compacted (loose when dry), yellowish-brown sand with minimal admixture of fragments of black slag. In some places with thin, more yellow and a little bit more coarse subsoils. Belongs to post iron-age cultural horizon. (Begun in Spring 2017 by previous mission)

Top: 103.86 m ASL- 103.84 m ASL.

Bottom: 103.85 m ASL - 103.37 m ASL (sloping down to N-E)

Thickness: 0.15-0.45m

C401 Slightly compacted (loose when dry), yellowish-brown, fine sand with frequent admixture (about 10%) of black slag fragments from 2-3cm to 10-12cm in diameter. Belongs to post iron-age cultural horizon. (Begun in Spring 2017 by previous mission)

Top: 103.85 m ASL- 103.37 m ASL.

Bottom: 103.62 m ASL- 103.29 m ASL (sloping down to NE)

Thickness: 0.18-0.22m

C402 Compacted, yellowish-brown, fine sand homogeneous in color and structure. With very occasional admixture of chunks of black slag (mostly in upper 0.2m of thickness). Belongs to post iron-age cultural horizon. Structure 1 affiliated with this context.

Top: 103.64 m ASL- 103.54 m ASL (explored previously in 2017).

Bottom: 102.06 m ASL- 102.01 m ASL (almost flat, sloping down slightly to NE)

Thickness: 1.56m

C403 Compacted, yellowish-brown, fine sand. With occasional to moderate admixture of small (0.5cm – 1cm in diameter) fragments of soft, dry charcoal. Belongs to iron-age cultural horizon. "Upper level of charcoal".

Top: 102.06 m ASL- 102.01 m ASL.

Bottom: 101.72 m ASL- 101.64 m ASL (sloping down to NE)

Thickness: 0.36m

C404 Compacted to very compacted, yellowish-brown, fine sand, very homogeneous in color and structure. With a few fragments of pale sandstone (ca 4cm- cm in diameter). Post level of dune between charcoal levels.

Top: 101.72 m ASL - 101.64 m ASL (sloping down to NE)

Bottom: 101.47 m ASL – 101.40 m ASL.

Thickness: 0.25m

C406 Compacted, fine yellowish-brown sand. With occasional admixture of small (0.5cm – 1cm in diameter) fragments of soft, dry charcoal. Belongs to iron-age cultural horizon. Lower level of “charcoal soil”.

Top: 101.47 m ASL – 101.40 m ASL.

Bottom: 101.27 m ASL – 101.22 m ASL.

Thickness: 0.2m

C405 Hard, compacted, Pale yellowish-brown sand, with about 15% of gravel (ca 1-2cm rounded stones of different kinds). Occasional inclusion of bigger stones from 3cm – 8cm. Less than 1% of small fragments of bones. Belongs to the Wadi Suq cultural horizon.

Top: 101.27 m ASL – 101.22 m ASL.

Bottom: 101.22 m ASL– 101.15 m ASL

Thickness: 0.06m

C88 Gypsum bedrock. With Structure 2 postholes (3).

Top: 101.15 mASL (avg.)

Excavation metrics:

Starting elevation (2019): 103.85 m ASL. (avg.)

End elevation: 101.18 m ASL (avg.)

Maximum excavation depth: 2.71 m, Minimum excavation depth: 2.62 m – (avg. 2.67m)

Area under excavation (excluding north baulk sand bags (avg.) = 4.0 x 4.0m (16 m²)

Estimated total volume removed (accounting for slope): 42.7 m³

EXCAVATION SUMMARY

Excavation in square T9 has provided further information on the stratigraphy and activity in Area F. It has, in part, allowed a reconstruction of stratigraphic levels below the upper slag cover with at least three main contexts/soils- inter-slag sand (Context 400) (**Figure 2**), lower slag level (Context 401) (**Figure 3**) below it, and sandy soil of a larger mound with small dunes or sub-slopes on its surface (Context 402) (**Figure 4**).

Especially interesting is a correlation between the shape of terrain at the time of accumulation of Context 401 sediment, and the upper part of Context 402 with the western part of Structure 1 (**Figure 5**) (See U9 summary section for Structure 1 details). Context 401 was accumulated on one, long slope falling steep to the N-E and was uncovered in squares T9 and U9. About 0.2 to 0.7m below the bottom of context 401 (in square T9, in square U9 even less) Structure 1 was built on a smaller (in diameter), and lower bow-shaped slope, trending downward to the N, not the NE (**Figure 6**) as seen in later local dunes. This example shows that the area was very “active” from geomorphological point of view. The excavated area was comprised of a long slope which wind and rain/sheetwash shaped relatively rapidly. Superseding this dune were slag covers (or slag deposits mixed with sand which then was deflated by aeolian erosion) were deposited as evidence of metal production still active in the vicinity of Area F.

Lower part of square stratigraphy was more homogeneous and even with each next soil. Top of thickest context of this part of sq. T9 – c.402 (sub-slag sand) had been steeply sloping down to NE (**Figure 4**) but its bottom was almost flat, with gentle slope to NE only. The rest of contexts underlay the c.402 were accumulated much more evenly than upper contexts of sq. T9 (above c.402). Method

of plastic exploration of each context let to assume that in the period of metallurgical activity (in iron-age) terrain of researched area was almost flat, with very small mounds of sand mixed gradually with charcoal thrown out from furnaces cleaned after each use (visible eg. in top of context 403- **Figure 11**). From the area somewhere to the SW from researched area a tall dune “came” finally and covered of part of production area (in squares numbers 8, 9 and probably 10) (contexts 500 in sq. S8, 402 in sq. T9, 302 in sq. U9 etc.). Metallurgical activity was still carried on further to the NE, in slope of dune in this time a clusters of metal items were deposited.

EXCAVATION DETAILS

Context 400

Context 400 is a soil of sand accumulated on the slope (probably of ancient dune or mound) between upper and lower slag levels. Upper slag was in Square T9 explored almost completely in previous seasons, the same as most of sand of cont. 400. In the beginning of recent works context 400 was noted only in small, N-E fragment of square (ca 2m- along northern baulk by 2m- along eastern baulk by 2.5m across the N-E corner of square), in area flattened by previous (pre 2019) exploration. Top of cont. 400 (**Figure 2**) was, due to this, almost flat, slightly falling to the “N”, but original slope of soil (visible as a slope of bottom of context 400 and top of next context- 401) was much more steep and falling to the N-E.

Exploration of context 400 in square T9 has been carried out by one layer (with a 4 internal mechanical levels) in 27.02.2019. Soil was quite homogeneous in its structure and content, with a few small stones, a few fragments of copper bands SHP19-0121 and different smelting waste (occasional inclusions of black slag pieces - SHP19-0123 and fragments of so called “iron not worked” (pieces of iron and different iron-oxides SHP19-0122). Steep bottom of context 400 (falling to N-E) laid directly on top of only one, next soil - context 401.

Context 401

Only small fragment of context 401 left in N-E corner of square T9 not explored in previous seasons (**Figure 3**). Cont. 401 was much thinner than 400 (about 0.2 m of thickness) and was accumulated on the steep slope of ancient dune (falling to N-E). Its characteristic feature was significant admixture of pieces of black slag from copper smelting (ca 10%). In the beginning of work in square T9 context 401 was visible on a surface of flat, area explored in 2017, as a thin line of slag fragments cut-off the N-E corner of square. Only in this corner fragment of original slope of 401 was uncovered and documented. Excavated material contains mostly copper bands and copper smelting waste (slag and pieces of copper drops). Whole context was explored plastically, as a one level (not divided for internal, mechanical levels) in 27.03.2019.

Context 402

Most of the top of context 402 in the beginning of works was formed by erosion and falling of dry sand to the south. Upper (northern) part (along of northern baulk) was explored in season 2017 and was left more or less horizontal and flat (levels: 103.84 m ASL – 103.86 m ASL). Original slope of context's top was preserved and uncovered only in small fragment of square T9 (in its N-E corner) (**Figure 4**) under the bottom of slag context 401. Exploration of c. 402 was carried out by horizontal, mechanical levels about 5cm thick, from highest area along northern baulk, gradually covering of all square. Sand in context 402 was much harder and compacted than contexts previously excavated in square T9, but amount of finds was quite low. Most of finds was excavated in upper parts of soil thickness.

STRUCTURE 1 Under about 8 mechanical layers (0.2 – 0.7m of sand depends on point of measurement) and two days of works (led mostly in northern and central part of square T9), in eastern and

central part of square a western half of structure 001 was uncovered. Eastern part of this structure (about half, with 5 slabs) was localized and uncovered in related level of square U9) (**Figure 7**).

Western part of structure 001, in square T9 (**Figure 5**) consist of 9 sandstone slabs and it's fragments of different size and irregular shape, ca 5 - 9cm thick. Three of it were for sure *in situ*, on the slope of low mound falling to the N-E (levels: 103.13 m ASL, 103.27 m ASL, 103.30 m ASL). Another 4 (in which 3 fragments belonged probably to one, bigger but broken slab lay on the top of fourth, long and narrow one) was uncovered more or less *in situ*, but on lowered level (central point of highest fragment now 103.34 m ASL) (due to erosion of sand blown out from below of slabs). Close to the south baulk of square two other, large slabs, more or less square in shape were visible from the beginning of works. These plates, however were almost for sure sloped down out its original localizations and level (**Figure 8 and 9**). Area covered by plates localized in situ (in 2019 season only) (**Figure 6 and 7**) was 5.07 sq. m. Whole length of structure 001 (SW-NE) measured 4.74 m. Max. width (N-S) was 2.04 m. Slope from horizontal for slabs in situ localized in sq. T9 and U9 was 6.3 degrees.

Both parts of structure 001 (in squares T9 and U9) were documented the same way, by general photo, orto-photography, localization and level measurement by total station. Measurement of level of each slab's central point was taken too. The shape of each slab was then precisely measured by total-station and drawn on the map with leveling of slope of dune (or mound) on which slabs were placed in antiquity. Shape and length of structure 001 can indicate that it was a kind of reinforcement of sandy slope (**Figure 10**) of enigmatic mound falling to the N-E or (more probably) a kind of pavement of path leading from the lower area (visible to the north of polish squares, behind a first line of today's dunes) on the top of low hill with it's top in more or less center of Saruq site explored area.

Context 402 under slabs of structure 001 was exactly the same in color and structure as it was above of s.001. Only one visible difference was extremely low amount of any finds (even waist material from copper smelting). Exploration was still carried in the same way, by mechanical levels 5-8cm thick and in 14.03.2019 a flat, explored area finally covered all trench. In this moment southern, artificial/eroded slope disappeared. Since this moment exploration was led by flat, mechanical levels with observation of plan to find any specific features which can mark an appearance of the top of new context which will be explored plastically.

After brake in exploration of square T9 between 31.03.2019 and 24.04.2019 works were start again and context 402 was finally explored.

Context 403

Below c.402 top of next context 403 (102.06- 102.1 m ASL) (**Figure 11**) was visible very well because its admixture of small (ca.0.5-1cm in diameter) fragments of soft charcoal and grayish spots (maybe decomposed wood). Highest concentration of charcoal was observed close to the northern baulk. Top of c. 403 not like top of c.402 was almost flat, with minimal slope to NE. This context (especially in comparison with extremely thick c.402) was very thick, but contain most of complete (and interesting) metal finds of all square T9 (see finds summary). C.403 was explored between 24.04.2019 and 25.04.2019, with the same method as the previous contexts, plastically as a whole context and by mechanical levels (ca 2-3cm thick) inside the context.

Context 404

Top of context 404 (101.72- 101.64 m ASL) was not so steep sloping down as top of c.402 but its shape was more complicated than top of context 403. Its highest point was located in the SW quarter of trench, close to the SW corner (101.72 m ASL) and sloping down to NE and E. Sand of context 404 was even harder and more compacted than sand of c.403. but amount of finds was extremely low. Context was on the first sight identified as a high top of post-Wadi Suq dune (**Figure 12 and 13**), but further works identified it as a local subsoil between two thin levels of sand with charcoal

(c.403 and c.406) (see **Figure 14 and 15**) related probably with two events of metallurgical production dated to iron-age. Context 404 was explored in 25.04.2019, plastically with a few mechanical internal levels about 5-6cm thick.

Context 406

Below ca 0.2m thick sandy subsoil (c.404) next level of fine, yellowish-brown sand occasional admixture of soft charcoal was uncovered (top: 101.47– 101.40 m ASL.). Amount of charcoal pieces in comparison with c.403 was smaller, but still well visible. Top of context 406 was almost flat (**Figure 14 and 15**), bottom lay directly on the top of hard level of sand with gravel of Wadi Suq period (without any post-Wadi Suq dune). Amount of finds and its kinds were very similar to c.403 and both contexts can be dated to iron-age cultural horizon. Context 406 was explored in 28.04.2019.

Context 405

In square T9, similar to sq. W9, charcoal levels of iron-age lay immediately on the flat top of context of pale yellowish-brown, fine sand with admixture of gravel (different kinds of small stones ca 1cm in diameter, fragments of bedrock and grains of sand concreted by gypsum or salt) (**Figure 16**). Context 405 was quite thin (ca 10cm thick) even, very hard and compacted (especially in bottom part) with unexpected high amount of bones fragments (much higher than in the rest of squares) and flint flakes. Context 405 covers the top of bedrock with its natural cracks filled with hard sand of c.405 but with much smaller amount of gravel. Exploration of c.405 was carried out by one level, 28.04.2019

Context 88

Bedrock of researched square T9 (top: 101.27 – 101.22 m ASL) (**Figure 17**) was built by gypsum or calcareous rock with its surface cut by network of natural cracks different width and depts. These cracks were filled with pale yellowish brown, hard (concreted by salt or gypsum) sand without any remains of human activity. In such a formed bedrock a human-made structure were cut.

STRUCTURE 2 Consist 3 postholes (in central to NE part of square T9) (see **Figure 17**). Two of it (Ph2 and Ph3) close each other, one (Ph1) a little bit (ca 1.1m) further to the NE. Ph1 dimensions- 0.12m in diameter, 0.16m deep. Ph2 dimensions- 0.13m in diameter, 0.1m deep. Ph3 dimensions- 0.13m in diameter, 0.13m deep.

ARTIFACT SUMMARY

The number of artifacts recovered from upper part of excavation in square T9 (from context 402 and higher) was very low compared to other squares in Area F at the same levels. Copper/bronze objects overwhelmingly form the main proportion of material type. Most of the copper objects represent smaller or fragmentary utilitarian items (e.g. copper rods/sticks, fragments of copper cups or enigmatic fragments of copper sheets, beads etc.) (**Figure 18-24**). In terms of bulk finds, the most interesting are fragments of copper bands; possibly a kind of waste from final stage of production of other copper items. Other copper finds are copper smelting waste and further stages of metal production (slag, pieces of “unworked iron and copper”, copper drops and fragments of copper from the process of melting). Such an assemblage of finds can suggest some relation of explored contexts with different kinds of metal production carried out in close vicinity to Area F (possible that upper contexts were trash dump of some area of metallurgical production with recycling of older materials even from iron-age).

Lower contexts however represents completely different set of artifacts. In thin context 403 almost all complete copper items excavated from sq. T9 were found. All set of copper finds in c.403 was much more similar in its “civil/cosmetic?” character to set from sq. S8 and U9 than this from W8 and

W9. Between of artifacts found in T9 was only three copper arrowheads- one in c.403 (GR20530), two in lower context of charcoal- c.406 (GR20375, 20376) (**Figure 36-37 and 44-46**) and two models of swords (GR20529 and 20531) (**Figure 34-35 and 42-43**), but 3 complete copper cups (GR20533, 20534, SHP19-0957) (**Figure 27-28, 50-51**), 2 fragments of cups (SHP19-0958, SHP19-0924), 2 copper sticks (“drills”) (GR20532, SHP19-0954) (**Figure 38-39 and 47**) and 1 copper model of scrapper (SHP19-0923) (**Figure 25-26**). In c.403 a wide, well made, copper bracelet (GR20526) (**Figure 31-33**) was excavate too, and another fragment of second, similar object (GR20374) (**Figure 29-30**) was found in lower level of charcoal- c.406. From context 406 origins even one fragment of gold wire (GR20405) (**Figure 40-41**) and two pieces of copper snakes (GR20373) (**Figure 49**).

Between non-metal finds the biggest group were of course beads (found in c.403) (**Figure 60**), made of different materials as semiprecious stones, glass, bone or shell (GR20528) but most unique was, complete steatite seal (GR20527) (**Figure 48**) in form of pyramid, with cross or rosette/sun pattern on the flat “stamp side” (from the same 403 context).

However amount of finds in “charcoal levels” c.403 and c.406 is more or less similar its distribution in both contexts was different. In c.403 objects were found mostly close to northern and southern baulk of square, in c.406 finds were more evenly distributed on all square.

Bottom of context 406 (similar to another squares) was in the sq. T9 the borderline for any traces metallurgical activity visible in finds and in soil. Even drops of “copper not worked” and pieces of “iron not worked” disappeared with finish of exploration of c.406. In next context 405 the same as eg. in c. 503 in sq. S8 only two groups of finds were identified- lithics (71pcs) and fragments of animal bones (390g). Between lithics was a few interesting finds: 2 cores (GR20372, 20535) (**Figures 52 and 53**) and 6 flakes (GR20378-20383) (**Figure 54-59**), what was similar to situation in sq. W8 much more than to the rest of square. The same with fragments of bones - its amount was highest of all squares excavated in season 2019. Most of them, however was very small the same as in another squares.

Table 27. Summary of Small Finds from entire square T9.

Summary of Small Finds	Count	Weight (g)
Arrowheads	3	22
Beads	30	3.2
Ceramic	1	73.4
Copper Band	1	3.5
Copper Blades	2	20.1
Copper Cups	11	38.3
Copper Drill	1	1.7
Copper Object	1	1.4
Copper Sticks	4	11.4
Flint Cores	2	53
Flint Flakes	6	28.6
Gold	1	0
Ornamental Copper	3	48
Scrapers	2	8.2
Snakes	2	2.8
Stone Seal	1	3.2
Worked Copper (Sp)	1	5.2

Note: All artifact categories and counts refer to complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 28. Summary of Bulk Finds from entire square T9.

Summary of Bulk Finds	Count	Weight (g)
Faunal Bone	1254	401.8
Copper Bands	198	66.5
Debitage	64	87.7
Shell	3	1.6
Slag	10	872
Stone	12	113.5
Unworked Copper	92	932.7
Unworked Iron	335	1545.2
Worked Copper	11	29.6
Worked Iron	7	4.2

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.



Figure 1. Top of Context 099 in square T9.



Figure 2. Top of Context 400 in N-E corner of square T9. Visible line of pieces of slag (in context 401) and to the right, the top of context 402.



Figure 3. Top of Context 401 in NE corner of T9: Lower (older) slag slope.



Figure 4. Top of Context 402 in NE corner of T9: Original surface of sand dune beneath lower slag slope.



Figure 5. Exposure of the west half of Structure 1 within Context 402. March 12 2019.



Figure 6. Structure 1 within squares U9 (left) and T9 (right). (Discolored sand in foreground is from plastic tarp water condensation)

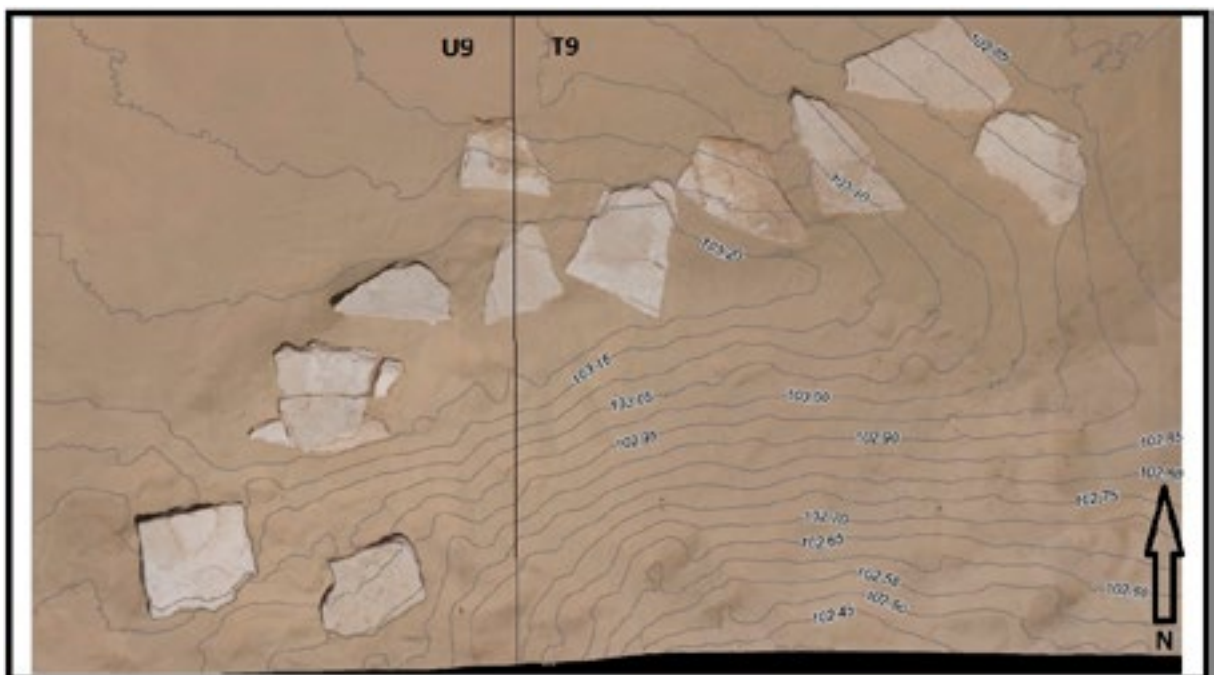


Figure 7. Orthophoto and contours of Structure 001 in Squares T9 and U9, March 12 2019.

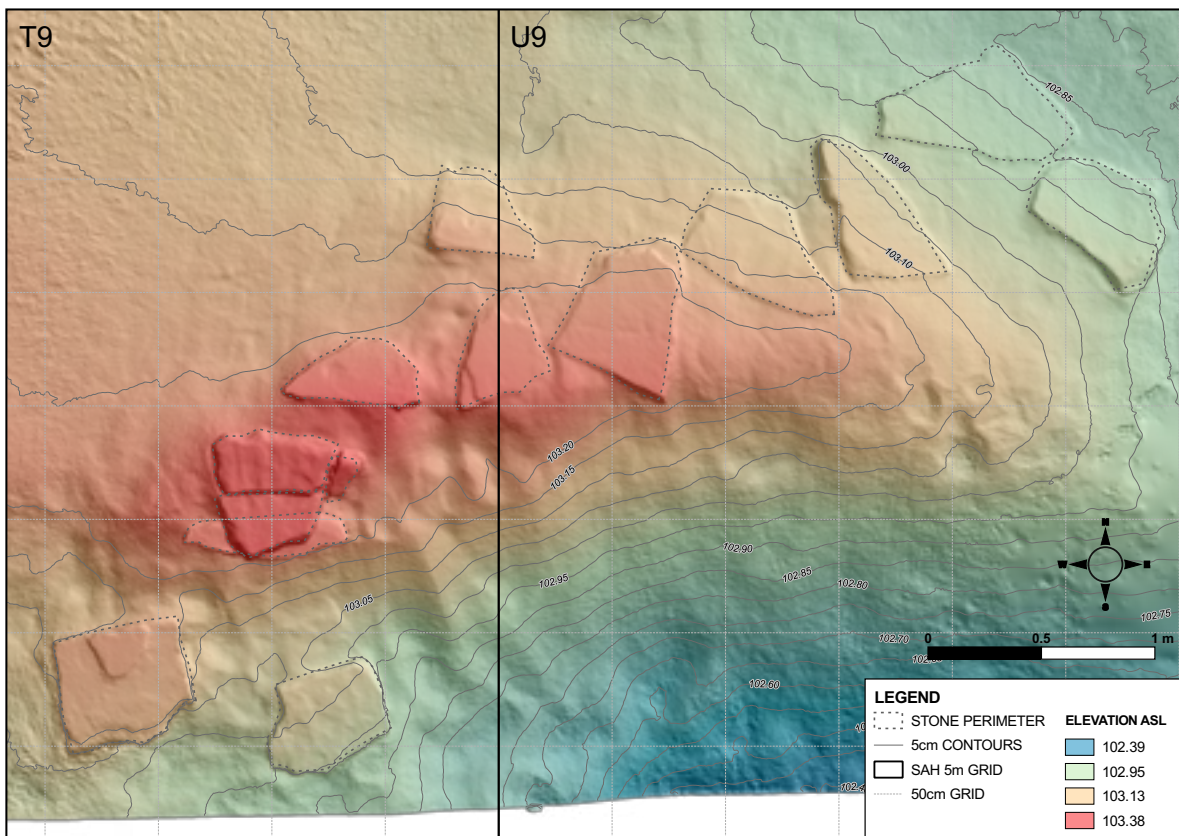


Figure 8. Digital elevation model of Structure 001, March 12 2019.

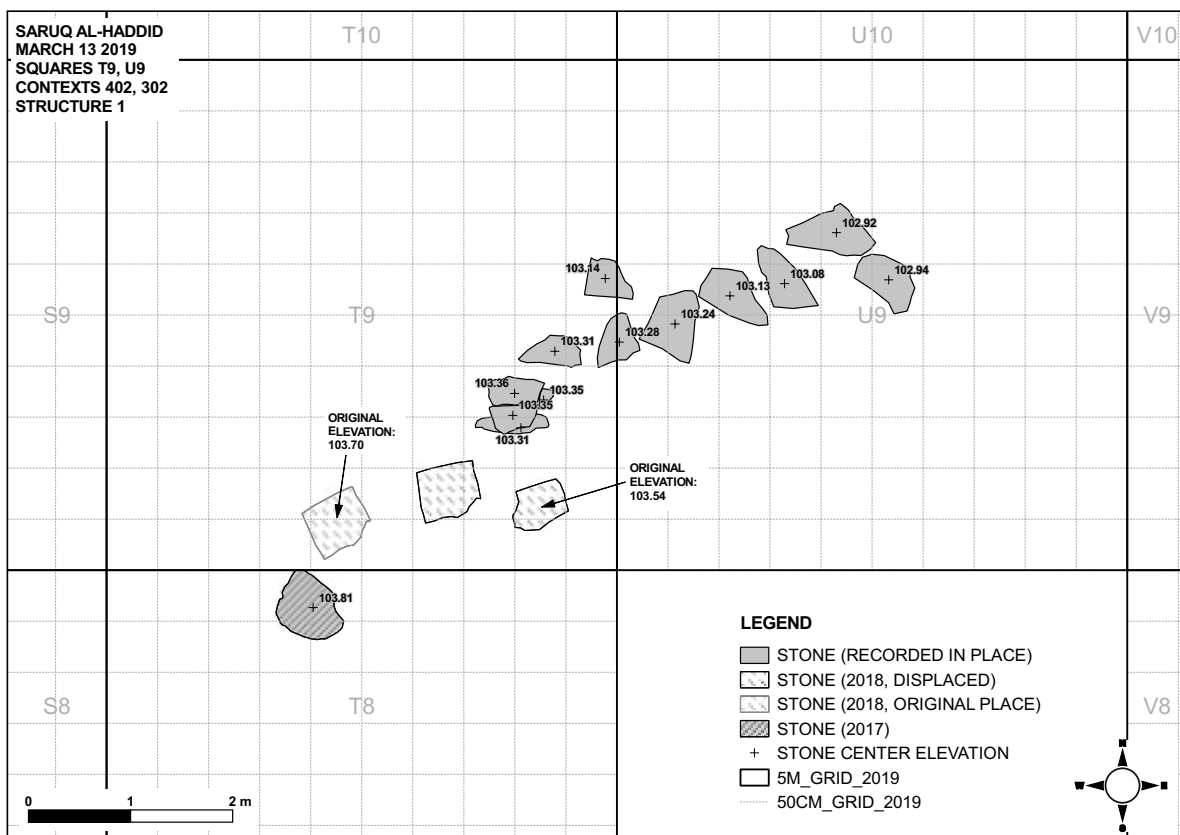


Figure 9. Structure 1 showing stones observed in 2017 and 2018 by previous mission.



Figure 10. Cross-section of Structure 001 through T9/U9 square line.



Figure 11. The top of context 403 in SW corner of square T9.



Figure 12. Southern part of western baulk of square T9 contexts 402 and 403.



Figure 13. Northern part of western baulk of square T9 contexts 402 and 403.



Figure 14. Northern baulk of square T9 contexts 402 – 406.



Figure 15. Eastern part of northern baulk of square T9 contexts 402- 406.



Figure 16. Top of context 405 Wadi Suq level.



Figure 17. Top of context 088- bedrock surface in square T9.



Figure 18. Copper stick (SHP19_0118) Context 99.



Figure 19. Folded copper object (SHP19_0190) Context 99.



Figure 20. Copper stick (SHP19_0128) Context 401.



Figure 21. Copper cup (SHP19_0243) Context 402.



Figure 22. Copper stick or drill (SHP19_0244) Context 402.



Figure 23. Flat copper object (SHP19_0153) Context 99.



Figure 24. Flat copper object (SHP19_0154) Context 99.

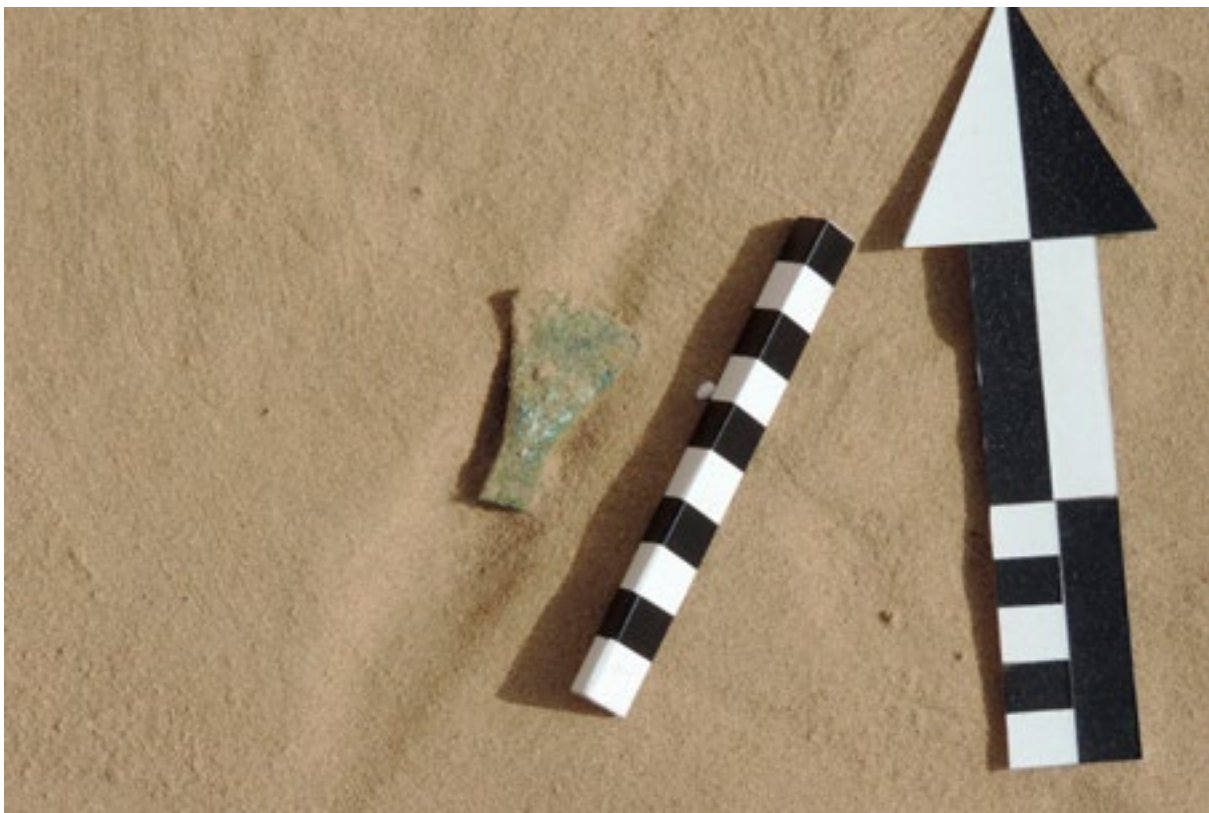


Figure 25. Copper model of scrapper (SHP19_0923) as was found in situ in context 403.



Figure 26. Copper model of scrapper (SHP19_0923) found in context 403.



Figure 27. Copper cup (GR20533) as was found in situ in context 403.



Figure 28. Copper cup (GR20533) found in context 403.



Figure 29. Fragment of copper bracelet (GR20374) as was found in context 406.



Figure 30. Fragment of copper bracelet (GR20374) found in context 406.

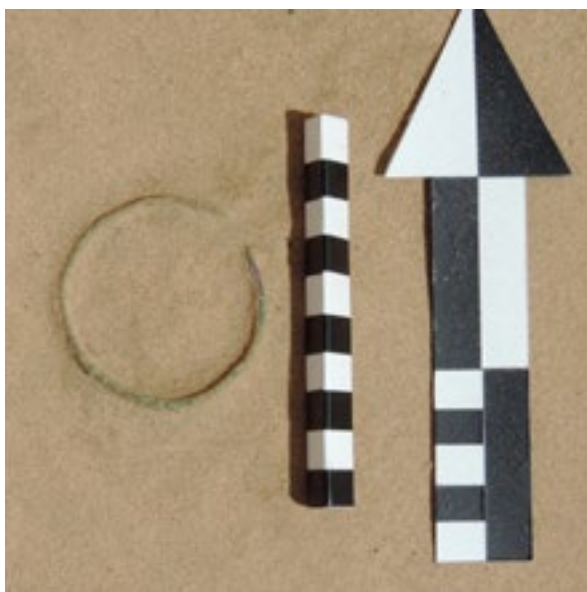


Figure 31. Copper bracelet (GR20526) as was found in situ in context 403 top.



Figure 32. Copper bracelet (GR20526) as was found in situ in context 403 side.



Figure 33. Copper bracelet (GR20526) found in situ in context 403.



Figure 34. Long model of copper sword (GR20529) as was found in situ in context 403.



Figure 35. Long model of copper sword (GR20529) found in situ in context 403.

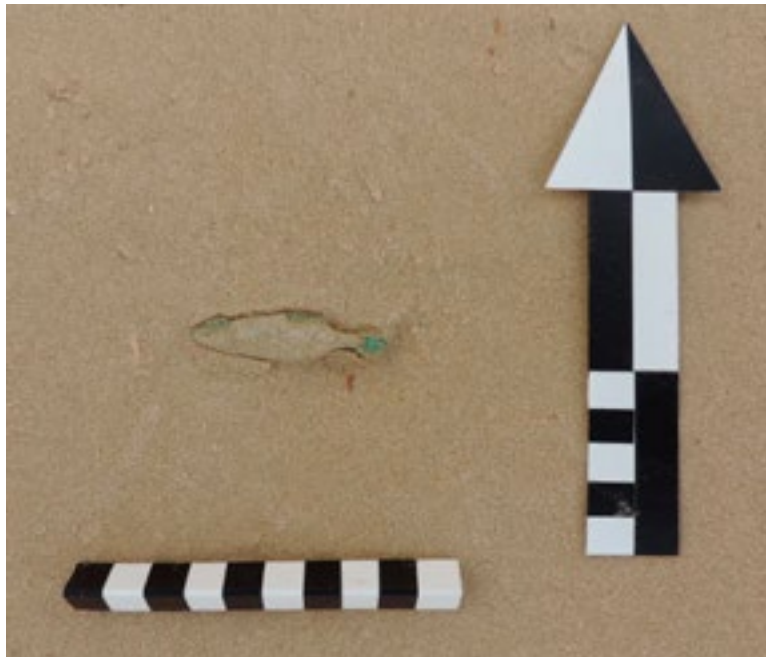


Figure 36. Copper arrowhead (GR20376) as was found in situ in context 406.



Figure 37. Copper arrowhead (GR20376) found in context 406.

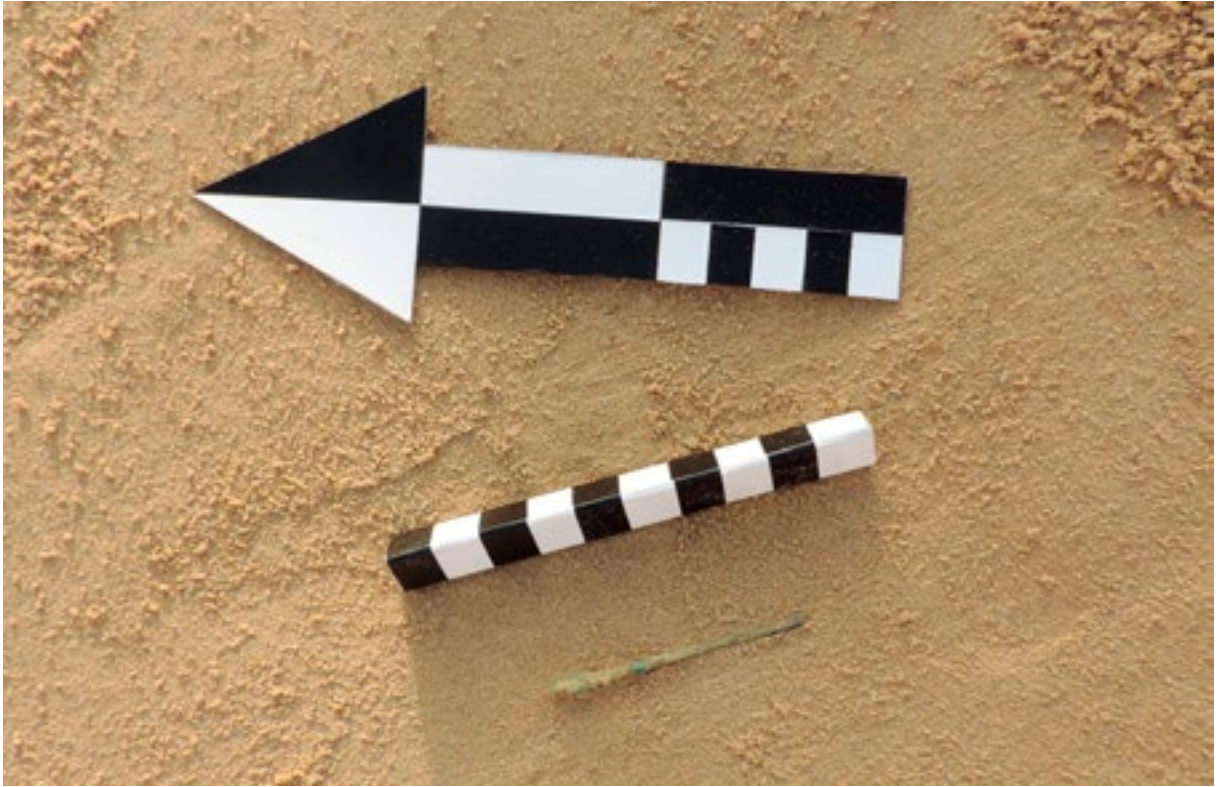


Figure 38. Copper stick or drill (SHP19_0953) as was found in situ in context 403.



Figure 39. Copper stick or drill (SHP19_0953) found in context 403.

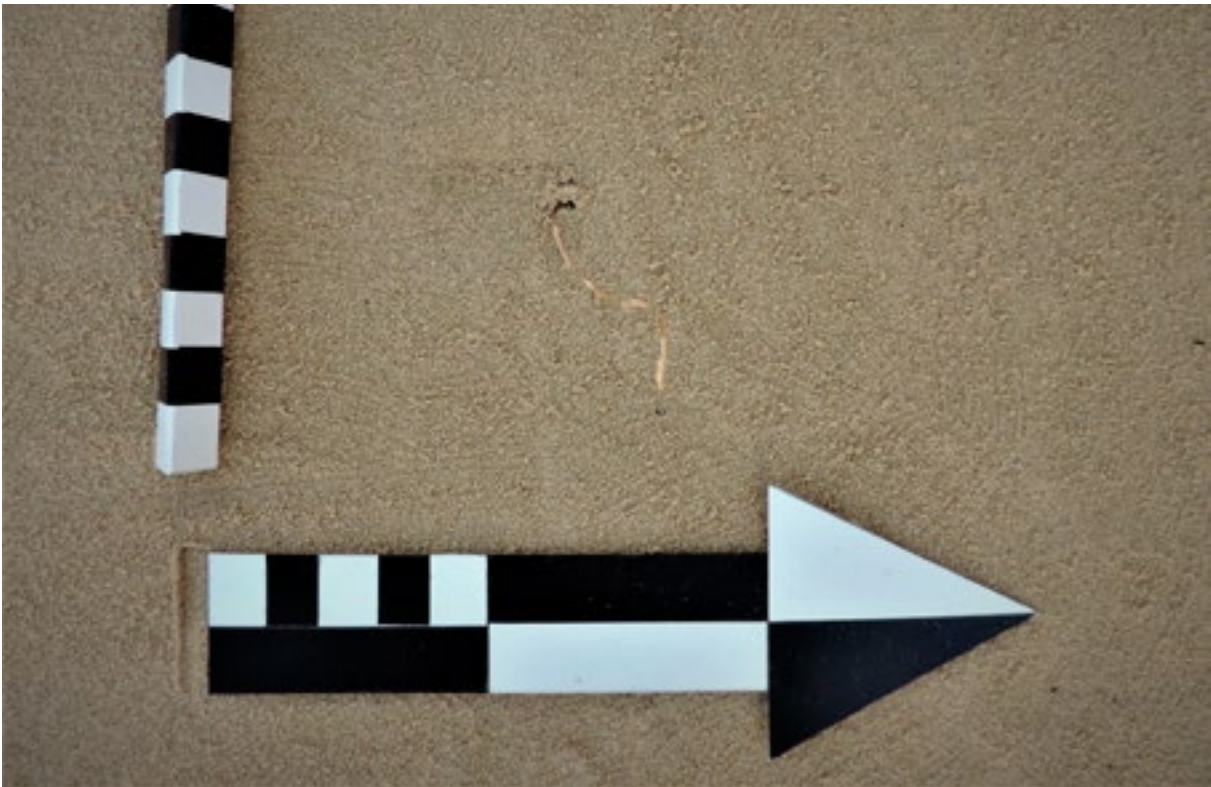


Figure 40. Gold wire (GR20405) as was found in situ in context 406.



Figure 41. Gold wire (GR20405) found in context 406.



Figure 42. Wide model of copper sword (GR20531) as was found in situ in context 403.



Figure 43. Wide model of copper sword (GR20531) found in situ in context 403.



Figure 44. Copper arrowhead (GR20530) as was found in situ in context 403.



Figure 45. Copper arrowhead (GR20530) found in context 403.



Figure 46. Copper arrowhead (GR20375) found in context 406.



Figure 47. Copper stick or drill (GR20532) found in context 403.



Figure 48. Steatite seal (GR20527) found in context 403.



Figure 49. Copper snakes (GR20373) found in context 406.



Figure 50. Copper cup (GR20534) found in context 403.



Figure 51. Copper cup (GR20957) found in context 403.



Figure 52. Flint core (GR20535) found in context 405.



Figure 53. Flint core (GR20377) found in context 405.



Figure 54. Flint flake (GR20379) found in context 405.



Figure 55. Flint flake (GR20378) found in context 405.



Figure 56. Flint flake (GR20380) found in context 405.



Figure 57. Flint flake (GR20381) found in context 405.



Figure 58. Flint flake (GR20382) found in context 405.



Figure 59. Flint flake (GR20383) found in context 405.



Figure 60. Beads (GR20528) from square T9.

Square U8

JOANNA CIESIELSKA, SIDNEY REMPEL

Contexts:

C99Clearing and screening of windblown sand, and sand slumped in from Squares U9 and T8, and V8. Mixed sediment with objects mainly from Iron Age II

EXCAVATION SUMMARY

Work in Square U8 was limited to clearing windblown sand off the already excavated bedrock to allow greater workspace in Area F as a whole. During cleaning (C99), several copper bands, unworked and worked copper, and worked and unworked iron fragments were recovered. These objects are presumed to have slumped downward from Square U9 which, at that time, also bore similar objects on its unexcavated surface.



Figure 1. View of Area F, Row 7 prior to excavation in 2019. Square U8 shown in red. View west.

Table 29. Summary of Small Finds from Square U8, Context 99.

Small Find Summary	Count	Weight (g)
Copper Stick	1	1

Table 30. Summary of Bulk Finds from Square U8, Context 99.

Bulk Find Summary	Count	Weight (g)
Copper Bands	17	5.5
Unworked Copper	9	47.1
Unworked Iron	1	7.1
Worked Copper	2	1.6
Worked Iron	2	11.9

Square U9

MAREK WOŹNIAK, JOANNA RĄDKOWSKA

Excavation dates: February 27 to April 10, 2019

Contexts:

C99 Cleaning of plan of trench (e.g. after sandstorm) and trimming of baulks after collapse of sandbag walls.

C300 Slightly compacted (loose when dry), yellowish-brown sand, with more yellowish, a little more rough and loose bands (subsoils), with minimal admixture of fragments of black slag. Belongs to post iron-age cultural horizon.

Top: 103.86 m ASL – 102.81 m ASL (shaped by falling of sand on artificial/eroded slope to SSE).

Bottom: 103.50 m ASL – 102.06 m ASL (original, falling to N-E).

C301 Slightly compacted, (loose when dry), yellowish-brown, fine sand with frequent admixture (about 10%) of black slag fragments from 2-3cm to 10-12cm in diameter. Belongs to post iron-age cultural horizon.

Top: 103.50 mASL - 102.06 mASL (original, intact slope falling to N-E).

Bottom: 103.39 mASL - 102.83 mASL

C302 Compacted, yellowish-brown, fine sand, very homogeneous in structure.

Top: 103.39 mASL - 102,83 mASL

Bottom: 101.65 m ASL

C303 Charcoal layer, Iron Age II deposits

Top: 101.65 m ASL Bottom: 101.40 m ASL

C304 Post Wadi Suq dune.

Top: 101.40 Bottom: 101.30 m ASL

C305 Wadi Suq gravel layer.

Top: 101.32 Bottom: 101.24 m ASL

C88 Gypsum bedrock, Top: 101.24 m ASL

Includes 2 postholes, Structure 1

Excavation metrics:

Starting elevation: 103,34 m ASL. (avg.)

End elevation: 101.30 m ASL (avg.)

Maximum excavation depth: 2.04 m

Area under excavation (excluding north baulk sand bags) = 5,0 x 3,5m (17,50m²)

Estimated total volume removed (accounting for slope) = 35.70 m³

EXCAVATION SUMMARY

In starting moment of works in square U9, after cleaning of surface disturbed by wind erosion in almost year of hiatus, three original soils were visible, cut by artificial/erosion slope of this part of site. Works were led simultaneously in square U9 and T9 to compare all soils and potentially dis-

covered structures. On the eroded slope of both trenches in very beginning of work three, sloped down, sandstone slabs were visible (two of them in T9, one in U9). It suggested that in some level of under-slag sand a kind of structure (probably ground reinforcement or pavement of path/surface) can be uncovered. Potential localization of this structure was marked by edges of next three plates (two of them one on the top of another, in square T9, one – small fragment of corner in U9) still visible *in situ* in the southern, eroded slope ground of area. Structure was finally uncovered in one of upper layers of context 302 (under-slag sand) with two mostly eastern plates (and one discovered later under the northern baulk) even in slag soil cont. 301. Whole area with slabs measured in seasons 2017, 2018, 2019 was 10.7 SQ M. Its length (SW-NE) was 7.04 M. Slope from horizontal (from first plate measured in 2017 to last measured in 2019 in sq. U9) was 8.8 degrees. Such a shape and localization of Structure 1 allowed to research small but interesting and difficult to investigate in another way, fragment of geomorphological history of this fragment of site. It is probably important as a unique example of structure related with a communication on the site and between of its parts.

After a break between 2019-03-20 and 2019-04-01 works started in U9 with new the supervisor. The goal was to work in two squares U9 and V9 at the same time with one person. Stratigraphically these two squares were on the same level, the sub slag sand. C302 in U9 and C805 in V9. To keep the information about the changes and differences between these two squares, the 1 m wide baulk was left. Works in both squares were conducted simultaneously with two different teams. The baulk was removed after its orthophoto documentation. The eastern profile of square V9 was documented (Figure 8), showing the stratigraphy: sub slag sand C302, lower charcoal “sweet zone” layer C303, post Wadi Suq Dune C304, Wadi Suq gravel C305 and the top of the bedrock C88. The purpose of leaving the baulk was to explore both squares and at the same time to have information about the stratigraphy. Square U9 was finished together with square V9.

EXCAVATION DETAILS:

Context 300

Stratigraphically context 300 (identical with 400 in square T9) was a soil of fine, windblown sand with yellowish subsoils, probably accumulated on the slope of ancient dune or mound, between two slag covers- upper (younger) and lower (older). The same as in square T9, in Square U9 upper slag was completely explored in previous seasons. Exploration of context 300 the same was start in 2017 season, but was carried out only in narrow fragment along northern baulk. The rest of soil was untouched but cut by artificial/eroded slope of ground of whole area falling to the south. After cleaning of surface of square U9 (C99.), in the beginning of recent works, context 300 was clearly visible in its N-E half, to N-E from the line of slag of next context 301. This line runs across the square from NW to SE. Excavation works carried out by at first, in upper part of context's slope by 5 layers, then, in lower part of slope, by one layer more. Context was excavated between 3.03.2019 - 10.03.2019 and then 20.03.2019. Exploration uncovered original slope of soil (visible as a slope of bottom of context 300 and top of next context- 301). It was quite steep (especially in its upper part) and falling to the N-E. Lower part of c. 300 was excavated later, but fell with the same slope to the very N-E corner of square U9.

Context 301

Not like in square T9, in square U9 quite significant fragment of original top of context 301 was excavated. It was uncovered mostly in N-W quarter of square. In U9 the same as in T9 cont. 301 was much thinner than 300 (about 0,11 - 0,01 m of thickness) and was accumulated on the steep slope of ancient dune or mound (falling to N-E). Its characteristic feature were significant admixture of chunks of black slag from copper smelting (ca 10%) but unevenly distributed on the slope. It was

visible more of slag pieces in western part of slope (close to the border with sq. T9) than on its eastern, lower part, however slag was still present on the slope even in very N-E corner of square. From the beginning of work (after cleaning of surface. in square U9 context 301 was clearly visible on a surface as a thin line of slag chunks runs across the whole square, from more or less northern half of eastern baulk to southern part of eastern baulk (and further to the square V9). To the N-E from this line a fragment of original slope of 301 was uncovered and documented. It was done in two stages- one in 10.03.2019, second, on the lower part of trench was carried out (after brake for exploration of Structure 1) in square T9. Relatively many finds, was excavated, but the same as in sq. T9, without any spectacular objects (only one fragment of stone vessel SHP19-0231, two large fragment of pottery: one fragment of base (SHP19_0449), one big, not diagnostic sherd (SHP19_0450) and rectangular copper ingot SHP19_0227). Excavated material consist mostly copper bands (SHP19-0226), and copper smelting waste (slag, and a little of pieces of iron and iron oxide and copper drops- see summary of bulk finds Tab.2). Whole context was explored plastically, as a one layer (not divided for internal, mechanical levels) in 10.03.2019 and (lower part in N-E corner of square) in U9 .

Context 302

South and south-western part of top of context 302 in the moment of start of its exploration was formed by erosion and falling of sand to the south . Original slope of top of cont. 302 preserved under cont. 301 in north and north-eastern part of square, it was quite steep (highest point- 103.39 m ASL, lowest point 102.06 m ASL). Between both slopes (original and artificial/eroded) was ridge with highest point in highest noted level of the top of context 302 (103,39 m ASL) and falling to SE, to 102,85 m ASL. Exploration start in 10.03.2019 was carried by horizontal, mechanical levels about 5-8cm thick, from highest point of the ridge, with the shape of original slope. The same as in square T9 in context 402, in square U9 in context 302 sand was much harder and compacted than sand of contexts previously excavated here. Amount of finds was quite low and consist mostly copper smelting waste. Most interesting objects were: small copper ingot (SHP19-0338), nail-shape object (SHP19-0236) and fragment of arrow head (SHP19-0237).

Under one, thin (0.02 – 0.20m thick) mechanical layer, in western and central part of square an eastern half of structure 001 was uncovered. Western part of this structure (about half, with 9 slabs) was localized and uncovered in related level of square T9. Eastern part of structure 001, in square U9 consist of 5 sandstone slabs of different size and irregular shape, ca 7-9cm thick. All of it were for sure *in situ*, on the low slope of ancient dune or mound falling to the north (levels: 102.94, 102.91, 103.08, 103.12, 103.24). Close to the south baulk of square one more, large slab, more square in shape was visible from the beginning of works. This plates, however, is for sure sloped down out its original localization and level. In time of exploration of lower part of context's 301 slope, in this context, between pieces of slag, one more slab, partly under northern sandbag wall, was uncovered. It can indicate that structure 001, however with gaps, is much longer than part uncovered in squares T9 and U9. Area covered by plates localized in situ (in 2019 season only) was 5.07 sq. m. Whole length of structure 001 (SW-NE) measured 4.74 m. Max. width (N-S) was 2.04 m. Slope from horizontal for slabs in situ localized in sq. T9 and U9 was 6.3 degrees.

Both parts of Structure 1 (in squares T9 and U9) were documented the same way, by general photo, ortho-photography, localization and level measurement with total station. Measurement of level of each slab's central point was taken too. The shape of each slab was then precisely measured by total-station and drawn on the map with leveling of slope of dune or mound on which slabs were placed in antiquity.

Context 302 under slabs of structure 001 was exactly the same in color and structure as it was above of s.001. After exploration of one mechanical level (mostly in western part of trench, under

structure 001), however 20.03.2019 in N-E quarter of trench lower part of context 300 and below of it top of cont. 302 were identified once again (lower part of slope). It was necessary to stop the work in cont. 302 area and explore of remains of c. 300 and 301.

After the break the exploration of C302 was resumed. The northern profile of U9 and V9 shows clearly that in the area of U9 the sub slag sand C302 is much thicker than in square V9 C805 and sloping intensively toward West (Figure 9).

Context 303

So-called sweet zone, sand with charcoals. Layer slightly different than the same C805 in the next square V9. On the distance of 3 meters charcoal layer is getting much thinner. From ca. 0.5 m thickness in V9 it became nearly 0.10 m in the western part of U9. The distribution of charcoal is also less dense and sometime it's difficult to find them within the layer. It's reasonable while taking into account that the charcoal heap C807 was 4 meters toward East and the windblown charcoal from the heap didn't reach western edges of U9 so intensively. Also finds had slightly different character comparing to V9 (more in artifacts summary).

Context 304

So-called post Wadi Suq dune. About 0.10 m thick layer of sterile sand recording in the entire F area but with different thickness. From About 0.06-0.07 m in the eastern part of excavated F area to almost 0.70 m in the western part. The eastern profile of U9 (Figure 8) shows it still more or less flat but the western profile of U9 shows that it also getting thicker toward the South (Figure), further West. No finds were recovered in this layer in square U9.

C305 Wadi Suq gravel layer (Figure 11). About 0.06 m thick layer of gravel, sand, gypsum, pebbles mixed with bone material, flint flakes, fishbones. Covering the surface of gypsum bedrock, also two postholes, Structure 002, cut into bedrock.

Context 88

Gypsum bedrock, in the SW part of the square two postholes were recovered (Figure 12). PH1 dimensions: 0.15 m by 0.18 m, depth 0.14 m. PH2 dimensions: 0.08 m by 0.10 m, depth 0.05 m. They are not connected with other features.

SUMMARY

Excavation led in square U9, similar to works in square T9 has provided some further information on stratigraphy and activity in area F. It let to reconstruct a stratigraphic situation in the levels below upper slag cover with at least three main contexts/soils- inter-slag sand (cont. 300), lower slag level (cont. 301) below of it, and sandy soils of bigger mound with small dunes or sub-slopes on its surface (context 302). Especially interesting was correlation between shape of terrain in moment of accumulation of context 301 and upper part of cont. 302 with eastern part of structure 001. Not like in square T9 in U9 fragment of researched slope of top of cont. 301 and 302 was quite large and it was possible to observe not only its shape but a change in distribution of slag in c. 301 too. The same as in T9 works carried out in U9 shows clearly the changing of slopes of dunes or mound slopes built this part of site, which probably were quite frequent. Context 301 was accumulated on one, long slope falling steep to N-E and uncovered in both squares T9 and U9. In U9 slabs of structure 001 lay on the west, close to the baulk with sq. T9, about 20cm below the bottom of context 301, but in eastern part two plates (or even three with last one excavated under northern sandbag wall) were uncovered in the slag context 301. It is clearly visible that structure 001 was built on the completely different, bow-shape slope of much smaller (in diameter) and lower mound, falling for addition to the N (not like c. 301 to the N-E). So significant difference between shape and direction of falling

of both slopes clearly show that researched area was very “active” from geomorphological point of view. Whole excavated area was a long slope on which winds and falling of ground washed by rains shaped a fast changing soils. On this slopes a slag covers were deposited as a trace of metal production still active in direct vicinity of researched area.

ARTIFACT SUMMARY

There is wide diversification in material and types of finds, but, most of it are not significant, small object (iron sword fragment, SHP19-0030, fragment of stone vessel base SHP19-0231, nail-shape iron object SHP19-0236, half of copper arrowhead SHP19-0237). In bulk most interesting group are fragments of copper bands (in U9 as in T9 quite short), the rest are typical waste of copper smelting and further stages of metal (copper) production (slag, “unworked iron and copper”, copper drops and fragments. Such an assemblage of finds can suggest some relation of explored context with metal production carried somewhere in close vicinity.

As soon as work in C302 was resumed after the break finds started to appear. They were relatively high. At level 102.35 m ASL the scraper (GR20470) (Figure 13) was recovered, three arrowheads including one normal size (GR20468) and two miniatures/models (GR20489, GR20490) (Figures 14, 15). Three sherds, one diagnostic, two with the decoration. One complete copper cup (GR20488) (Figure 16) and 1 bead (SHP19_0474) (Figure 17). The same layer in V9 C805 was almost without finds. Another difference between V9 and U9 is visible in categories of finds in the next context, charcoal layer C303 in U9 and C806/C807 in V9. In comparison to V9 the finds in U9 had completely different character. Copper cup (GR20493), scraper (GR20470) (Figure 18), (See Illustration below) pin (GR20495) (Figure 19) (See Illustration below) and copper ring (GR20501) (Figure 20), (See Illustration below) four snakes, none was complete. Not even one example of weaponry in U9 but in V9 in C806/C807 there were 6 complete copper blades. Is that difference due to the distance from the charcoal heap, it is not clear, however it is significant that square V9 belongs more to the eastern part of the Area F in which more weaponry was found and U9 already to western part where cups, scrapers, pins and jewelry are more common and not even one example of weapon was recorded.

Among typical assemblage of finds from Wadi Suq layer C305, like bone, flints and fish bone, one deserves attention. It is a sherd, fragment of rim of fine, good quality vessel (SHP19_0774) (Figure 21). Two lithics are flint flakes (GR20401, GR20407) and one is core (GR20425) (See lithic analysis section below for photos and discussion)

Both postholes in C88 were empty and didn't produced any finds.

Table 31. Summary of Small Finds for entire Square U9.

Small Find Summary	Count	Weight (g)
Arrowheads	4	14
Bead	1	0
Ceramics	8	1210,8
Copper Cups	5	30,5
Copper Pin	1	3
Copper Sticks	5	6
Flint Core	1	37,3
Flint Flakes	2	9,8
Ingots	3	2641,3
Iron Blade Frags	1	64,1
Ornamental Copper	1	4,7
Scrapers	2	28,4
Snakes	6	13,6
Steatite	1	194,5
Worked Copper (Sp)	2	3
Worked Iron	1	19,8

Note: All artifact categories and counts refer to complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 32. Summary of Bulk Finds for entire Square U9.

Bulk Find Summary	Count	Weight (g)
Ceramics	2	20
Copper Bands	59	65,7
Copper Cup	1	1,6
Debitage	64	176,6
Faunal Bones	205	100,6
Fish Bones	2	0
Stone	8	159,4
Tech Pottery	4	15,3
Unworked Copper	86	665,5
Unworked Iron	94	352,3
Worked Copper	3	7,9
Worked Iron	2	7,7

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

Table 33. Slag and technical ceramic.

Square	Slag (kg)	Technical Ceramic (kg)
U9	99,86	2,00



Figure 1. Context 300 at beginning of excavation



Figure 2. Top of Context 301 (early slag deposit) showing easternmost stone of Structure 1 (within Context 302).



Figure 3. Top of Context 302 (sub-early slag) showing easternmost stone of Structure 1.



Figure 4. Eastern half of Structure 1 within Square U9, Context 302. (See Square T9, Context 402 summary

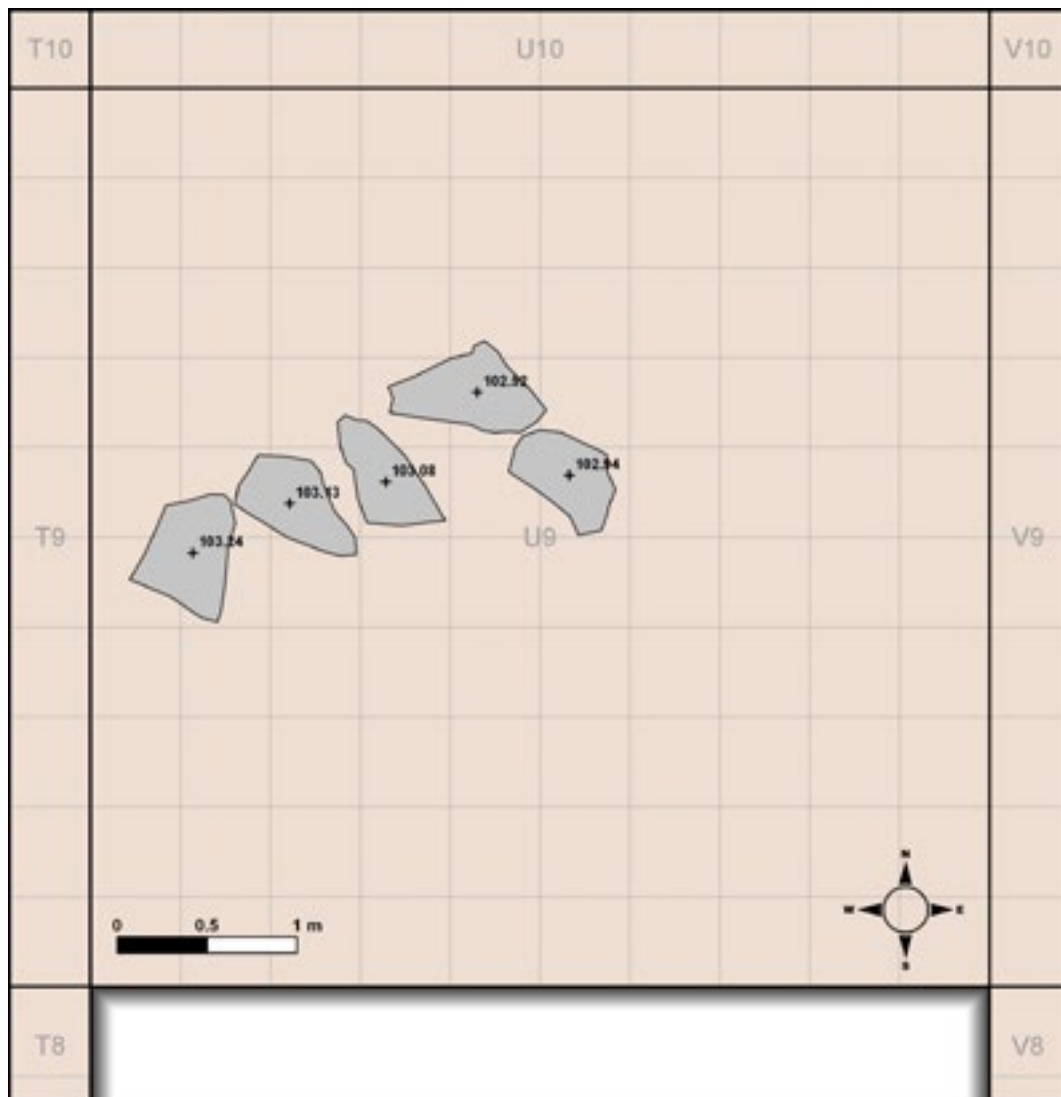


Figure 5. Eastern half of Structure 1 within Square U9 with elevations in mASL. Structure 1 (U9 Context 302, T9 Context 402)

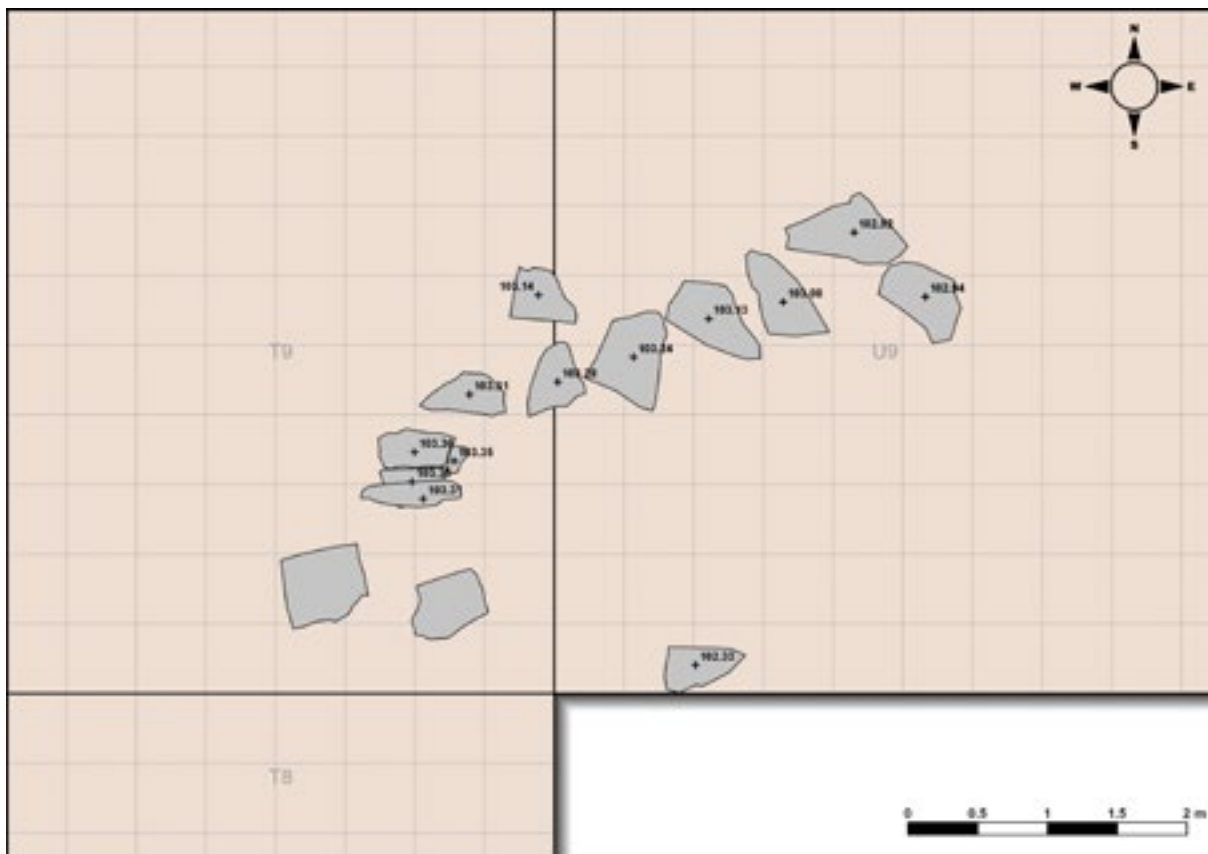


Figure 6. Complete Structure 1 as excavated in 2019. Note: SW stones were observed in 2018 and have shifted out of place since that time. (U9 Context 302; T9 Context 402).

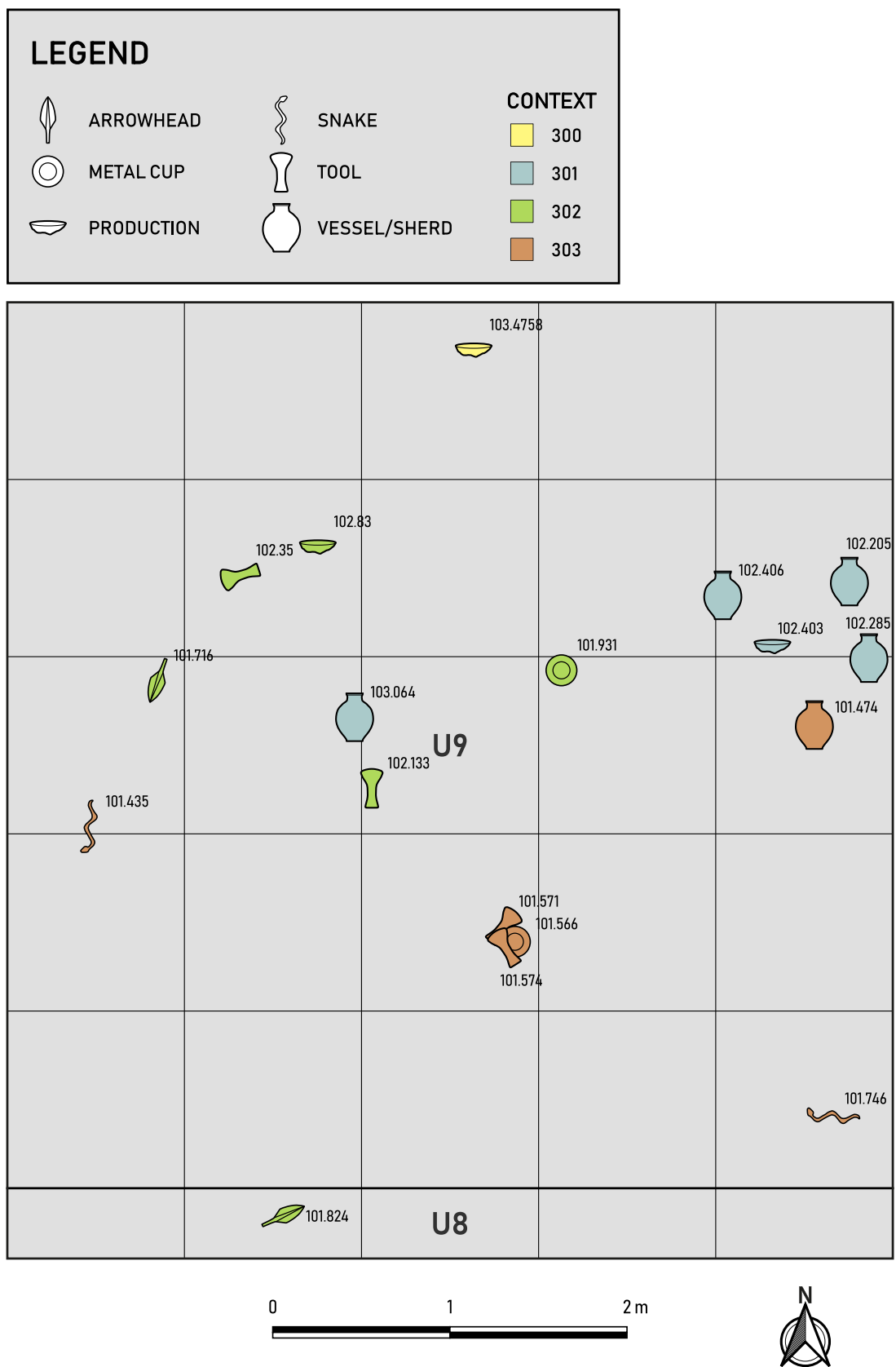











Figure 7. Generalized find distribution map for Contexts 300-303.

 		SHP19	OP14
Saruq al-Hadid Polish Mission		Area F/U8-9	302/303/304/305
		Eastern profile of U9 and part of U8 showing the continuation of the charcoal layer (C303) associated with numerous organic remains.	
Context		Suggested context div.	
Gravel		Gypsum bedrock	
Root		Wind-blown charcoal	
		Natural sand deposit	
Otto Bagi	2019-04-08	UTM Zone 40N (EPSG::32640)	Scale 1:25

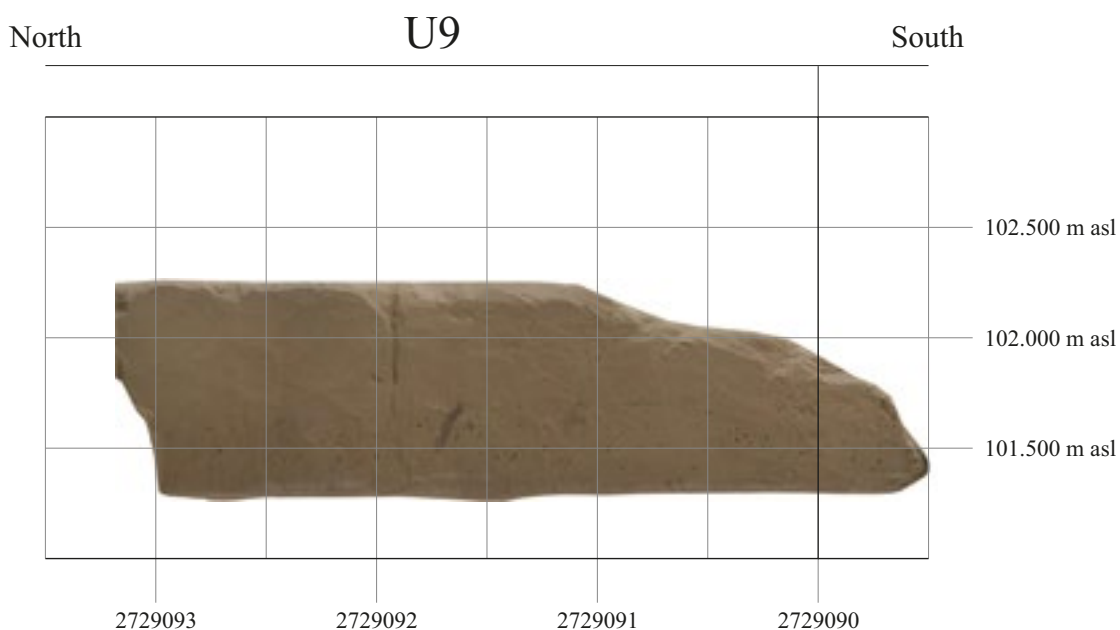
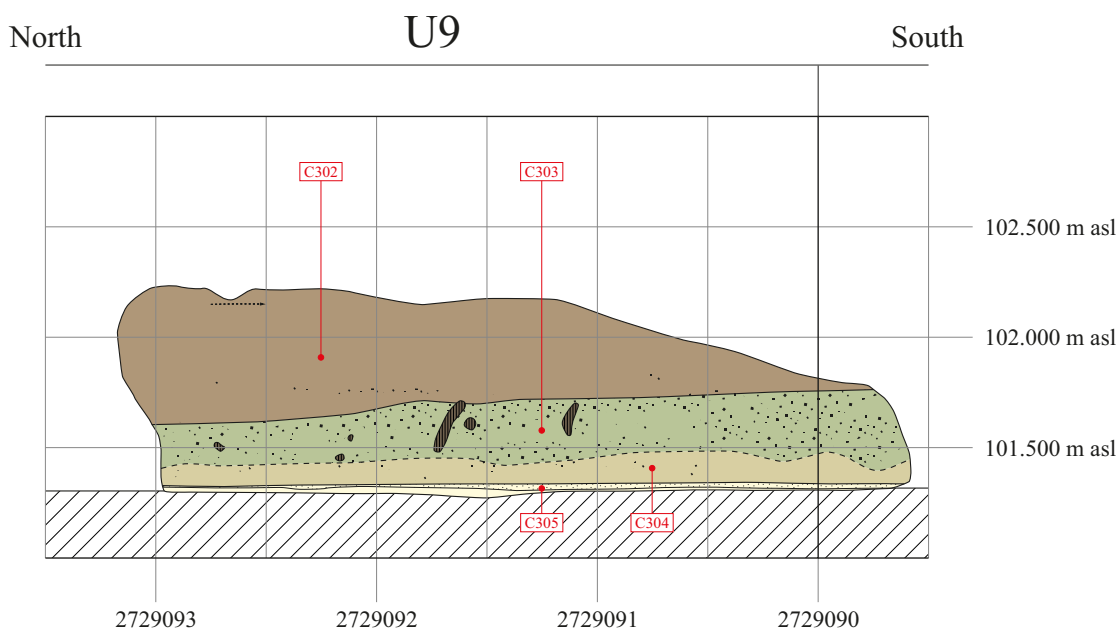


Figure 8. Eastern profile of U9 showing the stratigraphy of square.

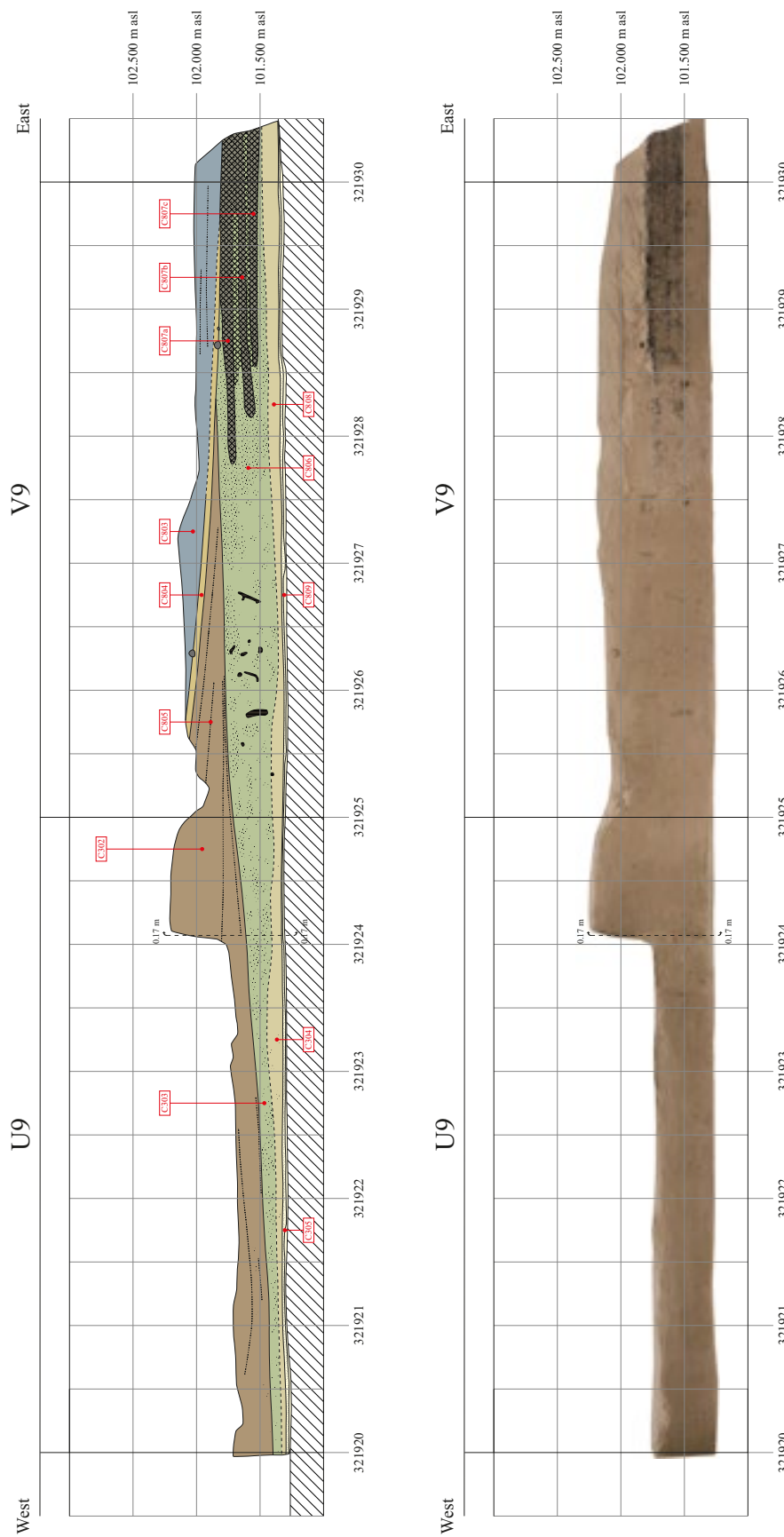
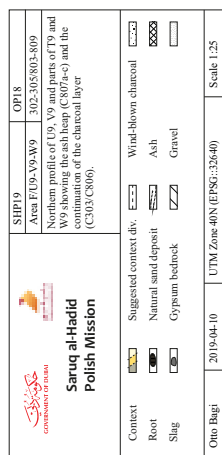











Figure 9. Northern profile of U9 and V9 showing the difference between thickness of charcoal layers in U9 C303 and V9 C606/607

  <p>Saruq al-Hadid Polish Mission</p>		SHP19	2019
		Area F/U8-9	OP19
		302/303/304/305	
		Western profile of U9 and part of U8 showing the continuation of the charcoal layer (C303).	
Context		Suggested context div.	
Gravel		Gypsum bedrock	
Root		Wind-blown charcoal	
		Natural sand deposit	
Otto Bagi	2019-04-10	UTM Zone 40N (EPSG::32640)	Scale 1:25

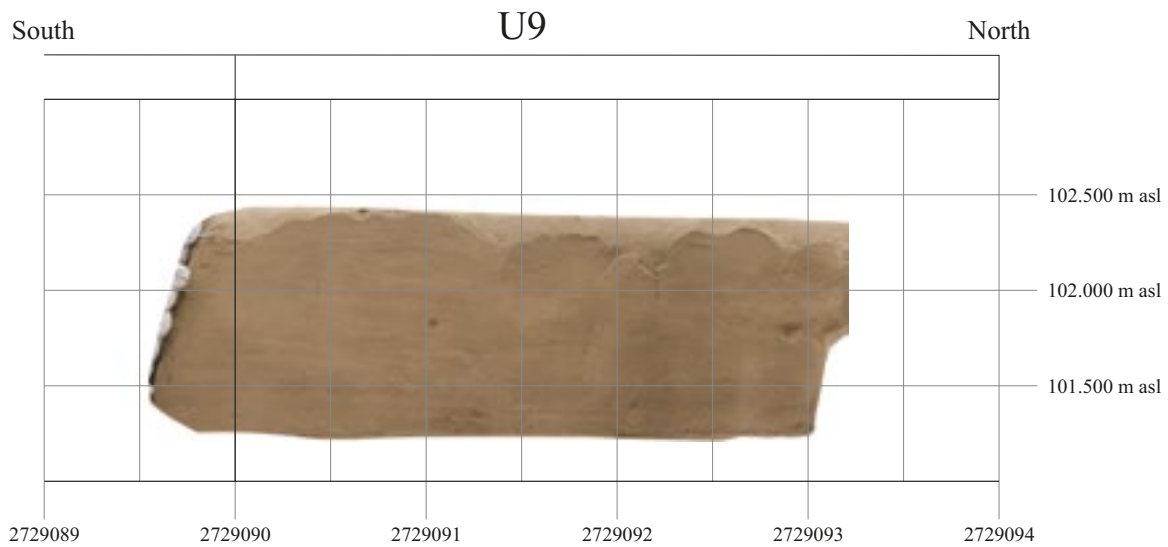
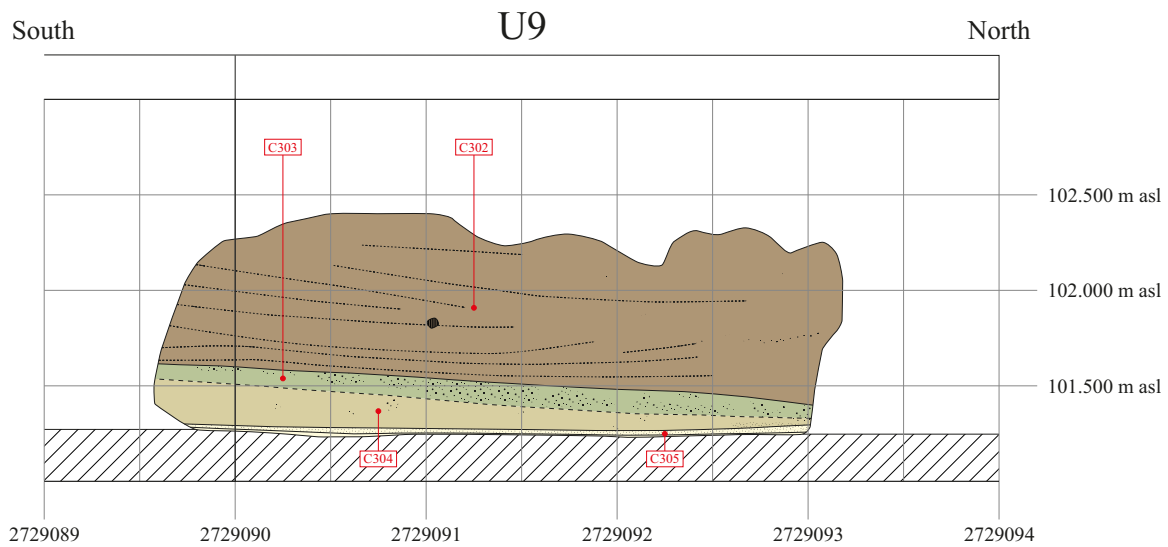


Figure 10. Western profile of U9 showing the context C304 getting thicker toward South.



Figure 11. Top of Wadi Suq gravel C305

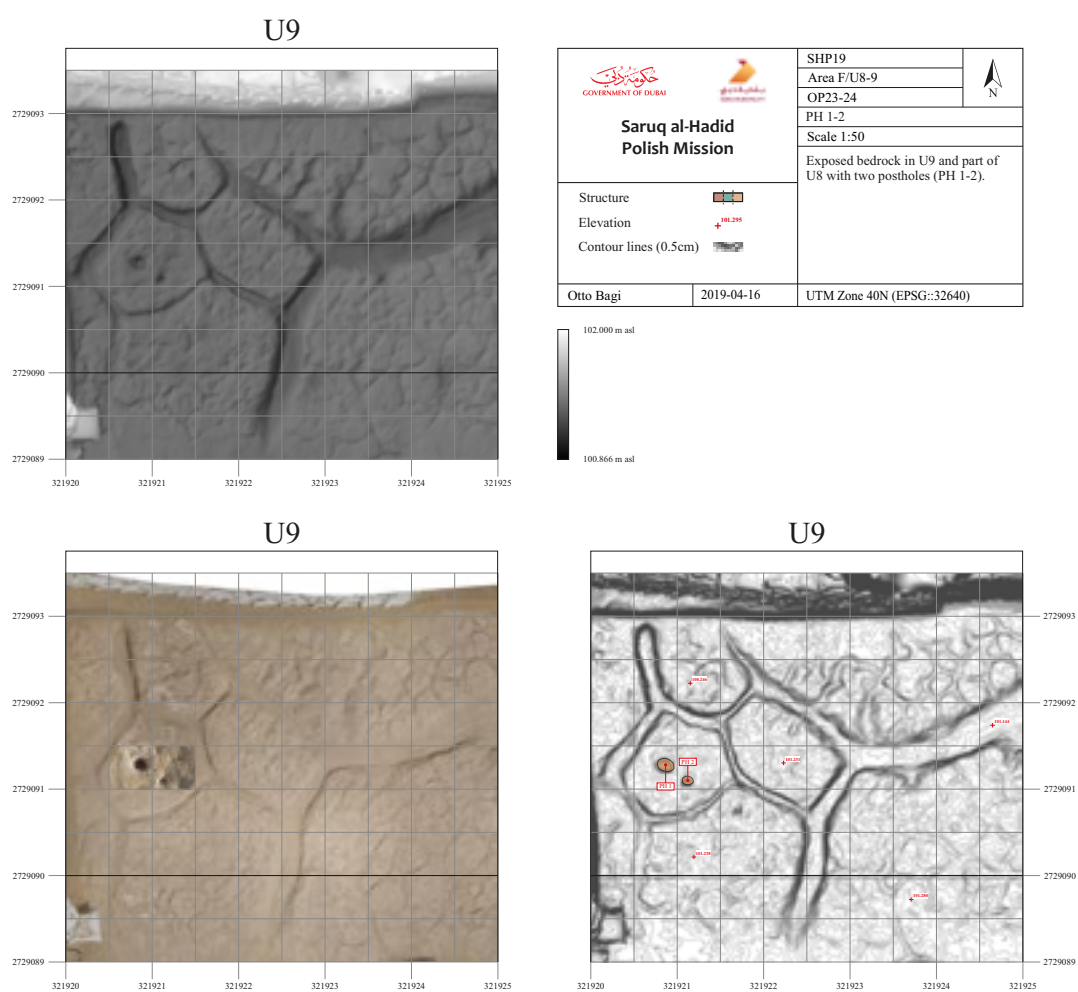


Figure 12. Exposed bedrock (C88) in U9 and part of U8 with two postholes (PH 1-2).



Figure 13. Copper scraper (GR20470) from C302



Figure 14. Miniature of copper arrowhead (GR20489) from C302



Figure 15. Miniature of copper arrowhead (GR20490) from C302



Figure 16. Complete copper cup (GR20488) from C302



Figure 17. Bead found in C303.



Figure 18. Copper scraper (GR20494) found in C303



Figure 19. Copper pin (GR20495) found in C303



Figure 20. Copper ring (GR20501)



Figure 21. Sherd with rim found in Wadi Suq gravel layer C305.



Figure 22. Iron sword fragment, SHP19 0030. Cont.099



Figure 23. Fragment of stone vessel base, SHP19 0231. Cont. 301



Figure 24. Nail-shape iron object, SHP19 0236. Cont. 302



Figure 25. Copper arrowhead, SHP19 0237. Cont. 302



Figure 26. Small copper ingot, SHP19 0338. Cont. 302

Square V8

JOANNA CIESIELSKA, SIDNEY REMPEL

Excavation dates: February 14-18, 2019

Contexts:

C99 Cleaning of previously exposed bedrock and loose wind-blown sand above plastic tarp.

C100 Compact grayish-tan sandy silt. Charcoal flecking. Iron Age II horizon.

C101 Compact sandy silt with high gravel content. Wadi Suq horizon.

C88 Gypsum bedrock

Excavation Metrics:

Top: 102.08 mAsl

Bottom: 101.11 mASL

Maximum Depth: 0.97 m

Area Excavated: 9.18 m²

Estimated Volume Excavated: 8.90 m³

EXCAVATION AND ARTIFACT SUMMARY

Cleaning in Context 99, in the NE corner of Square V8 produced one copper arrowhead and several beads which prompted a switch to Context 100 as their presence was believed to indicate the upper level of known Iron Age II deposits in this area.



Figure 1. Excavation in V8, Context 100, NE corner.

Context 100 further produced two arrowheads, a piece of gold wire, and a copper snake, along with numerous pieces of unworked copper and iron. Average elevation of object clustering was 101.80m ASL. This is in general agreement with Iron Age II object deposition elevations in the immediate area.

Context 101 represents the Wadi Suq phase deposition seen in adjacent squares, lying at 101.3-101.4m ASL in the NE corner of Square V8. This thin level produced several flint flakes (secondary, tertiary).

Contexts 102-105 represent four possible postholes (V8, Structure 1) dug into Context 88 gypsum bedrock at ~101.30m ASL. None of these contexts produced any artifacts.

Context 88 (designated for bedrock across all squares in Area F) was cleaned off for orthophoto production.

Table 34. Small finds from all contexts, Square V8.

Small Find Summary	Count	Weight (g)
Arrowheads	3	13.4
Bead	1	0
Flint Core	1	20.2
Flint Flake	1	8.5
Gold	1	0
Snake	1	10.6



Figure 2. Gold wire from Square V8, C100 (G.R. 20405)



Figure 3. Arrowhead from V8, C100 (G.R. 20403)



Figure 4. Arrowhead from V8, C100 (G.R. 20404)



Figure 5. Arrowhead from V8, C99 (G.R. 20402)



Figure 6. Copper snake from V8, C100 (G.R. 20406)



Figure 7. Flaked stone (flint) from V8, C101 (Wadi Suq) SHP19-0053) (See Lithics section for further discussion and figures)



Figure 8. Bone bead, C99 (SHP19_0003)



Figure 9. Pottery base, C99 (SHP19_0007)



Figure 10. Unworked copper, C99 (SHP19_0009)



Figure 11. Unworked iron, C99 (SHP19_0008)



Figure 12. Burned faunal bone, C99 (SHP19_0033)

Square V9 JOANNA RĄDKOWSKA

Excavation dates: March 10 to April 10, 2019

Contexts:

C99 Cleaning the windblown sand and slag

Top: 102.30 -104.26 mASL (sloping toward the south)

Trimming eastern part of the northern baulk, caused by collapsing corner.

Protecting the NE corner

C800 Natural dune above the upper slag layer

Top: 104.10 mASL Bottom: 103.48-104.00 mASL

C801 Upper slag.

Top: 103.44-104.04 (sloping toward North-East), Bottom: 102.36-103.52

C802 Sub-slag dune.

Top: 103.90 – 103.43 mASL. Bottom: 102.45 mASL.

C803 Sand with remains of organic material, single charcoal, dark spots, roots

Top: 102.45 m ASL Bottom: ca. 102.00 m ASL

C804 Lower slag slope.

Top: From 102.52 mASL (upper part of the slope) -101.82 mASL (lowest point on the slag slope).

Bottom: 102.31 mASL (upper part of the slope) – 101.81 mASL (single chunks at the very bottom of the slope).

C805 Sub-slag sand.

Top: 102.44 m ASL (upper part of the slope) – 101.81 mASL (lowest point, just below the single slag chunks, in the NE corner) Bottom: 101.80 m ASL

C806 Sand with charcoal.

Top: 101.80 mASL Bottom: 101.38 m ASL

C807 Charcoal heap in NE corner.

Top: 101.81 mASL. Bottom: 101.35 mASL

C808 Post Wadi Suq layer of sterile sand dune.

Top: 101.38 m ASL Bottom: 101.33 m ASL

C809 Wadi Suq gravel layer.

Top 101.35 m ASL Bottom: ca. 101.30 m ASL

C88 Bedrock. Includes posthole Structure 1.

Top: ca. 101.30-101.14 m ASL

Excavation metrics:

Starting elevation: 104.26 mASL. (avg.) Northern top of the slope

End elevation: ca. 101.14 m ASL

Maximum excavation depth: 3.11 m.

Area under excavation (excluding northern and eastern sand bags walls): 17.5m²

Estimated total volume removed: 54.6 m³

EXCAVATION SUMMARY

Work in Square V9 was resumed on March 10th after a two year hiatus from the previous mission. Excavation in March began with cleaning windblown sand accumulated on the old tarp as well as loose sand accumulated under the destroyed tarp

Context 99.

Directly below C99, at a span of 5m (E-W) and about 2m (N-S) from the northern baulk, the top of the uppermost dune (C800) (Figure 1) was recorded at 104.10 mASL. After about 10 to 40 cm the upper slag started appearing (C801). This slag is the western continuation of the same slag deposit in the adjacent Square W9 (C901).

The highest point recorded on the slag slope C801 (Figure 2) in its western edge was at 104.05 mASL, and the lowest in the NE corner of the square at 103.44 mASL. Full exposure of the slag indicated a moderately sharp slope toward the NNE - commensurate with that in W9, and previous mission findings.

In the remainder of the square, (about 3 m (N-S) and 5 m W-E) Context 802 was exposed as the inter slag dune between upper and lower slag deposits (Figure 3). It consisted of a 1.5 - 1.0m thick layer of sterile sand which developed into a darker deposit bearing remains of roots, dirt, and charcoal at 102.45 mASL (C803). This corresponds to the same deposition layer in W9, Context 903. In the SW quarter, the lower slag (C804) started to appear (Figure 4). The highest recorded point is at 102.55 mASL and sloping toward the NNE. A portion of Context 803 was removed on March 27 to uncover slag C804 further to the north. The lower slag deposit C804 continues to the west in squares U9 (C301) and T9 (C401). This lower slag deposit appears to level out in the north end of the square, and terminates in the SW corner of square W9.

Immediately, area southern and south west from the top most slag line got a new number C805 – sub-slag sand. It was, typical sub-slag layer of compact sand, almost sterile. It was almost 0.5 m thick, sloping gently toward West. At the level about 101.80 m ASL a layer of so-called sweet zone, sand with charcoal was reached in the entire square. In the North-East corner a different context number was given to the charcoal heap (Figure 5) continuation of the same feature recorded in square W9. Three different layers of charcoal deposition were visible at the profile (Figure 6) and during the excavations.

Both layers of charcoal C806 and C807 since the very beginning seemed to be mixed with Wadi Suq material, bones, pebbles, flint flakes and large amount of sand stones (See lithic section below). On the other hand sand below C808, so called post Wadi Suq dune (Figure 7), was sterile, not even one bone or flint flake was found within. C808 was recorded in entire square. Below the typical Wadi Suq gravel layer at ca. 101.25 – 101.15 m ASL a gypsum bedrock was reached. Just one posthole (Structure 1) was recovered in the SW part of the square (Figure 8).

EXCAVATION DETAILS

Context 99 The number was given for the different kind of activities connected with cleaning wind-blown sand and with trimming the baulks. Layer 001 was given to first day cleaning of windblown sand accumulated on the tarp during the summer break. Layer 014 was given to emergency trimming

of the northern profile. The sand bags wall in the border with the trench W9 was collapsing and the trimming was necessary to keep the northern baulk in the good condition.

Context 800 Natural deposit of the windblown sand. Context was recorded along the entire northern profile and in the NE corner at the distance: 5 m (W-E) and 1.80 m (N-S). Natural dune was covering the so called upper slag layer C801. Sterile sand with chunks of slag and Tc. The same sand was recorded in trench W9 C900. In the trenches located westward: U9 and T9 this context doesn't exist.

Context 801 So called upper slag layer. It was recovered in the north-eastern quarter of the trench on a distance 5 m (W-E) and 2.5 m (N-S). Scarce chunks of slag and technical pottery laying on and within loose sand, sloping toward North and North-East. The continuation of the slag slope was recorded also in the trench W9 the same sloping toward North and North East.

Context 802 Natural deposit of windblown sand creating so-called inter slag layer of sand. This sand gaps two phases of slag deposition on the site: so called upper and lower. Context C802 is very uniform layer of the fine, compact sand. Context almost sterile except one cut arrowhead found close to the top of the context and most probably should be counted into the upper slag layer C801. This kind of finds were characteristic for upper slag all over the site. Inter slag sand was mostly sterile. The same sand was recorded westward, in trenches T9 C400 and U9 C300.

Context 803 Separated number was given due to observed changes in the layer's character. The same fine beige, compact sand C802 became more dirty, with many dark spots, remains of roots and single charcoal spots. It not necessary means it was different deposit but it was probably the lowest part of inter-slag dune on the border with charcoal layer C806. The same change was observed in the trench W9 and different number also was given C903.

Context 804 So called lower slag layer. Sloping very gently towards North and North East. It was recovered in two trenches at the same time: V9 and U9.

Context 805 Sub-slag sand recorded in the entire square. Almost sterile, very compact, beige, yellowish brown, fine sand. Not very thick, just about 0.40 m

Context 806 Layer of sand with charcoal. Charcoal was spread within the sand almost evenly in the entire trench, except the north-eastern part, where concentration of charcoal was recovered with different context number C807.

Context 807 So called charcoal heap. Concentration of charcoal in the North-Eastern corner. Visible three phases of charcoal depositions. The same feature which was recorded in North-Western corner of the square W9.

Context 808 Post Wadi Suq layer of sterile sand. In case of this square thickness of the sand was about 0.04 m growing slightly toward West. The same dune in square S8 had more than 0.60 m, and less than 0.05 m in square W9 which is located eastward, so this was the tendency for this dune to getting thicker westward.

Context 809 Wadi Suq gravel layer. Almost 0.06 thick, even layer of very compacted, hard eroded gypsum, sand mixed with small pebbles, gravel mixed with bones and lithics.

Context 88 Gypsum surface of bedrock. One posthole (27 cm x 16 cm and 10 cm deep) was recorded, no other features.

ARTIFACT SUMMARY

As of March 28th very few artifacts were found in the Square V9 except for a small fragment of an unidentified steatite vessel (Figure 9) (SHP19_0248) from context 801 and one cut arrowhead (Figure 10) (SHP19_0249) from Context 802. Both objects were found during screening.

The assemblage of finds from the trench V9 is typical for layers recovered during the report period. The cut arrowheads are typical finds for upper slag layers, as well as broken pottery or steatite vessels fragments. Surprising is the amount of this kind of finds in the trench V9. Single cut arrowhead and one, small fragment is way to small than could be expected for these stratigraphical units. Not even one copper wire or band was found, what is also unusual for upper slag layers.

The finds within the lower slag slope look more typical. The fragment of cup (SHP19_0436), two ingots (SHP19_0437-0438) and three sherds were found (SHP19_0444 – SHP19_0446) (Figure 11) laying on the surface of the slag slope (Figure 12). Among others, the extremely eroded iron pieces which may be a remains of possible one iron object (sword?) were found in this slag context C804. Which is important the 360 grams of worked iron was found almost in the same place on different depth. (Figures 13, 14)The sand below the slag layer was almost sterile except few flakes of worked iron which were probably part of the same group which was recorded in slag C804. The next, charcoal layer C806 and charcoal heap 807 produced typical assemblage of finds in Iron Age layers, mostly weapon. Two small blades were recovered in C806 (GR20439, GR20473) (Figures 15, 16) and others two about 1 m eastward in C807, one small knife (GR20481) (Figure 17) (See Illustration below) and small blade (GR20480) (Figure 18). It is worthy to mention that all these finds, were recovered almost at the same level of 101.73-102.80 m ASL, almost in one line. Except these four small blades, one long dagger (GR20477) was found in C806 about 3 m southward, resting in the sand at the angle of about 30 degree, handle down (Figure 19). Also the blade of the spearhead (GR20482) (Figures 20, 21) (See Illustration below) was found about 2.0 m northward from the dagger. Two complete fish hooks (GR20478, GR20479) (Figures 22, 23) were recovered in C806 and both of them have still remains of string in their upper parts. It is well visible especially in case of hook with GR20479 (Figures 24, 25). (See Illustration below) Nine beads were found, different kinds, made of: glass (SHP19-0623) stone, carnelian and shell, all of them from screening. (Figure 26a-d),

What was unusual for charcoal layer and wasn't observed in others squares except W9 (C905, 906), was that the layers C806 and 807 looked very mixed. Bones, small pebbles and big amount of chipped sand stones (4 full bags of small, less than 10 cm long and 1-3 cm thick stones just from square V9), which usual is a material characteristic for Wadi Suq, may well indicate that in the Iron Age period people reached layers of Wadi Suq for some reason. Fact, that in square W8 an empty hearth (Structure 001) was found, can strengthen this hypothesis. Usually hearths are filled with small, blown sand stones, exactly like these which were found within C806 and C807. The same time within C809, extremely small amount of lithics and bone was found: 26 flints and 3,9 grams of bones. Two flint flakes (GR20471, GR20504) (See lithic analys section below). The same situation took place in W9, where numbers of sand stones were found within C905 and C906 sand with charcoal and charcoal heap. Just 22 flint flakes and 2,1 grams of bones. Comparing to W8 where the stratigraphy looked like untouched and material wasn't mixed almost 70 flint flakes and 34,3 grams of bones. The difference is significant.

Table 35. Summary of Small Finds for entire Square V9.

Small Find Summary	Count	Weight (g)
Arrowhead	1	3.6
Beads	11	1.3
Ceramic	1	720
Copper Blades	7	547.8
Copper Cup	1	2.9
Copper Hooks	4	11.1
Flint Flakes	2	9
Ingots	9	3042.9
Iron Blade Frags	32	77.8
Snakes	3	11.9
Steatite	1	5.8

Note: All artifact categories and counts refer to complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 36. Summary of Bulk Finds for entire Square V9.

Bulk Find Summary	Count	Weight (g)
Ceramic	2	187.8
Copper Bands	10	3.5
Debitage	26	64.5
Faunal Bones	76	34.4
Iron Blade Frags	251	280.2
Shell	1	2.1
Stone	8	207
Unworked Copper	163	863.4
Unworked Iron	121	1066.3
Worked Copper	5	6.5
Worked Iron	95	66.9

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

Table 37. Total slag and technical ceramic weights.

Square	Slag (kg)	Technical Ceramic (kg)
V9	184.75	12.27

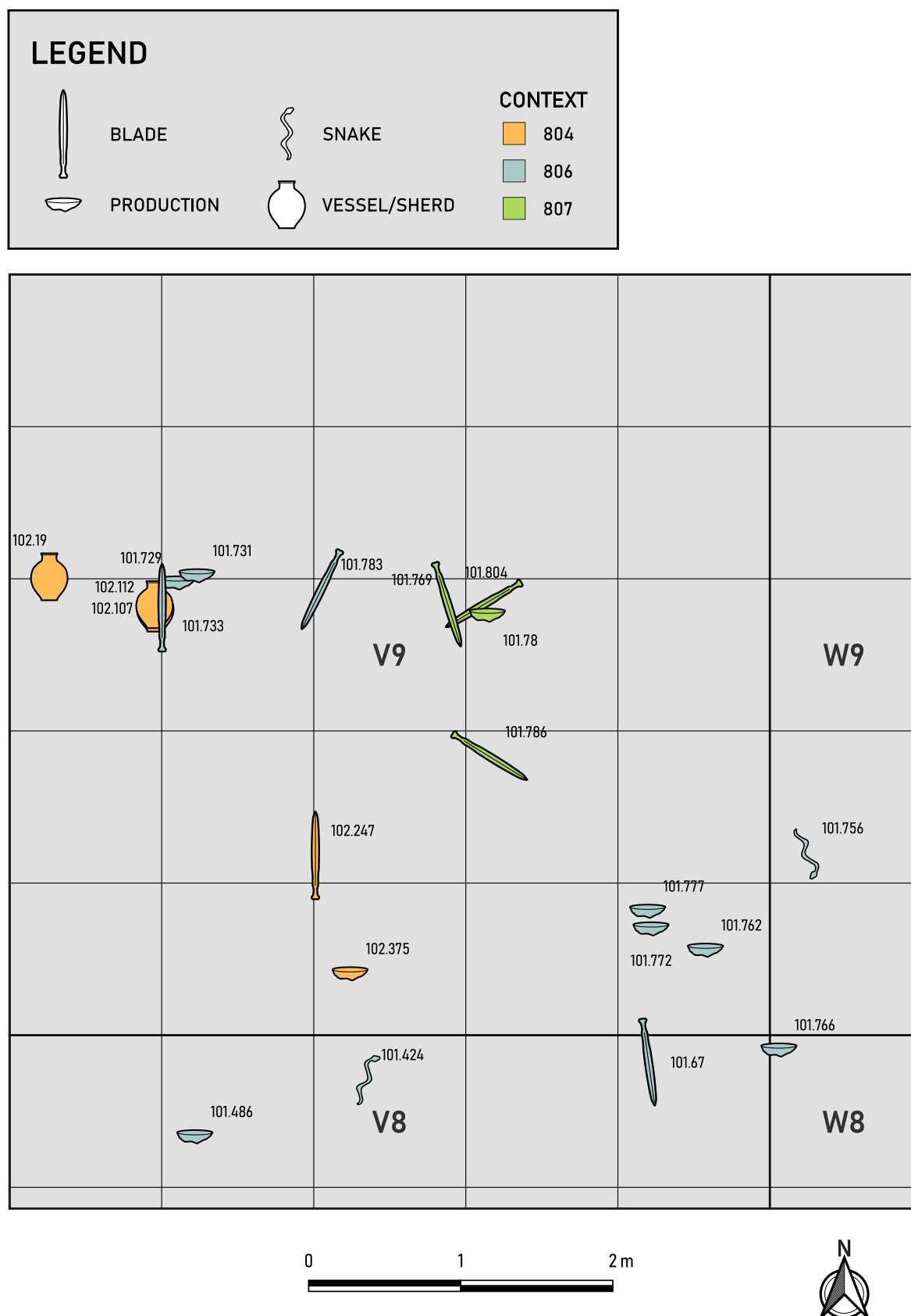


Figure 27. Generalized Small Find distribution map for Contexts 804, 806, and 807.

SUMMARY:

Trench V9 located between U9 and W9 represents the whole spectrum of stratigraphy in this area. In comparison to U9 and W9 in which just part of the stratigraphy was represented. In V9 the stratigraphy includes upper slag layer C801 (not present in U9 and T9 but recorded in W9 C901), inter slag sand C802 and C803 (not present in U9 and T9 but recorded in W9 C902 and 903), lower slag layer [804] (almost not present in W9 but existing in U9 C301 and T9 C401, sub slag sand C805 (almost not present in W9 but present in U9 C302 and T9 C402).



Figure 1. The top of Context 800.



Figure 2. The top of upper slag slope C801.



Figure 3. The top of inter-slag sand C802.



Figure 4. Top of Context 804 (Lower slag). View west. Note charcoal heap in north part of western profile of Square W9 (Context 906).



Figure 5 North-eastern corner of square V9 showing the charcoal heap C807. Three phases, layers of charcoal deposition are visible.

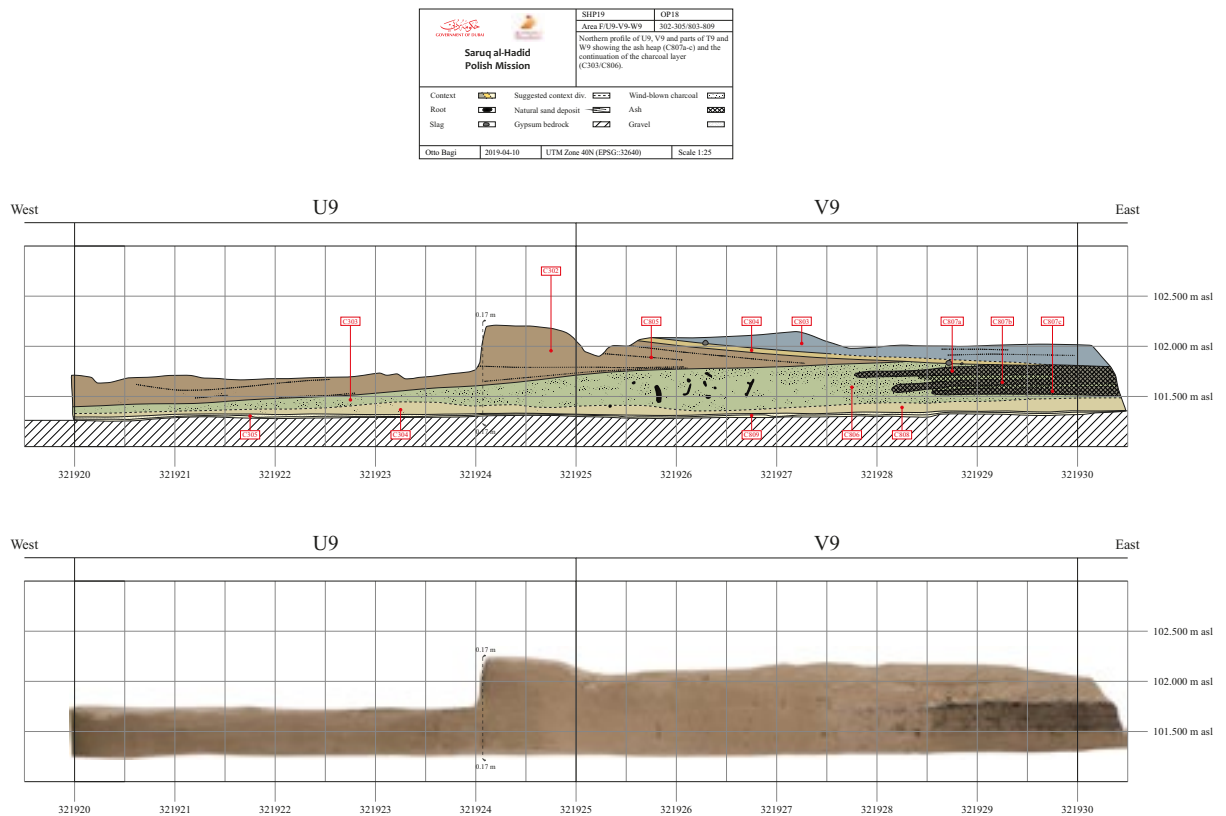


Figure 6 Northern profile of V9 and U9 showing depositions of charcoal C807



Figure 7 Top of the Wadi Suq dune C808

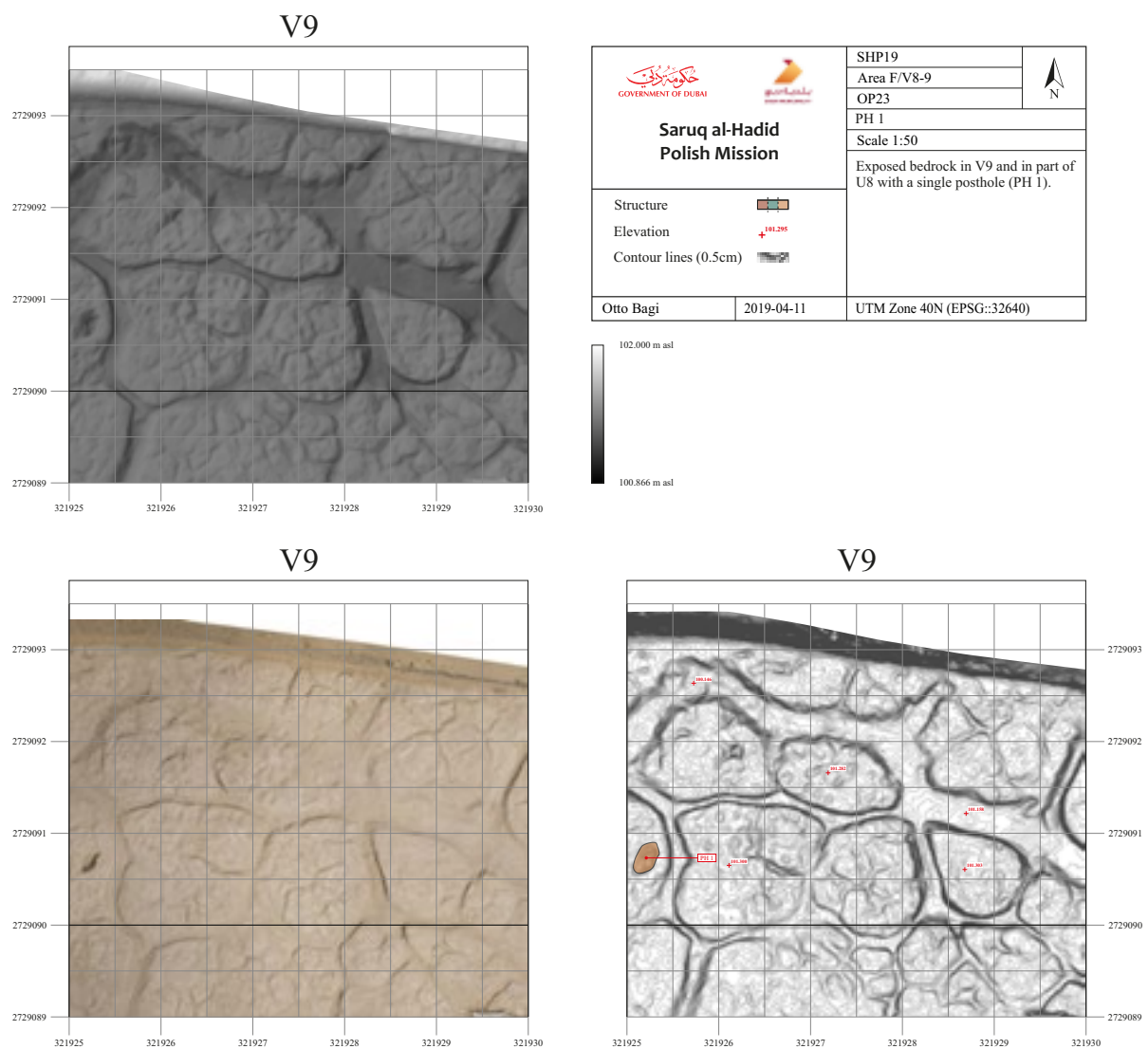


Figure 8 Exposed bedrock in V9 and in part of U8 with a single posthole (PH 1).



Figure 9. Fragment of a steatite vessel, C801 (SHP19_0248).



Figure 10. Cut Arrowhead from Context 802 (SHP19_0249).



Figure 11 One of the sherds recovered on the slag slope C804 (SHP19_0446).



Figure 12 Slag slope C804 showing the pottery and ingots on its surface. Looking West.



Figure 13 Fragments of worked iron, possible a sword or dagger found in the slag C804 and dune below C805.



Figure 14 Fragments of worked iron, possible a sword or dagger found in the slag C804 and dune below C805



Figure 15 Copper knife (GR20439) found in C806



Figure 16 Copper knife (GR20473) found in C806



Figure 17 Copper knife (GR20481) found in C807



Figure 18 Copper knife (GR20480) found in C807



Figure 19 Long dagger (GR20477) still in situ. Photo showing its position in the sand.



Figure 20 Spearhead (GR20482) in situ, found at the edges of charcoal heap C807



Figure 21 Spearhead (GR20482) found in C807.



Figure 22 Copper hook (GR20478)



Figure 23 Copper hook (GR20479). Remains of organic material still well visible.



Figure 24 Photo of the organic material, string under the microscope.



Figure 25 Photo of the organic material, string under the microscope.

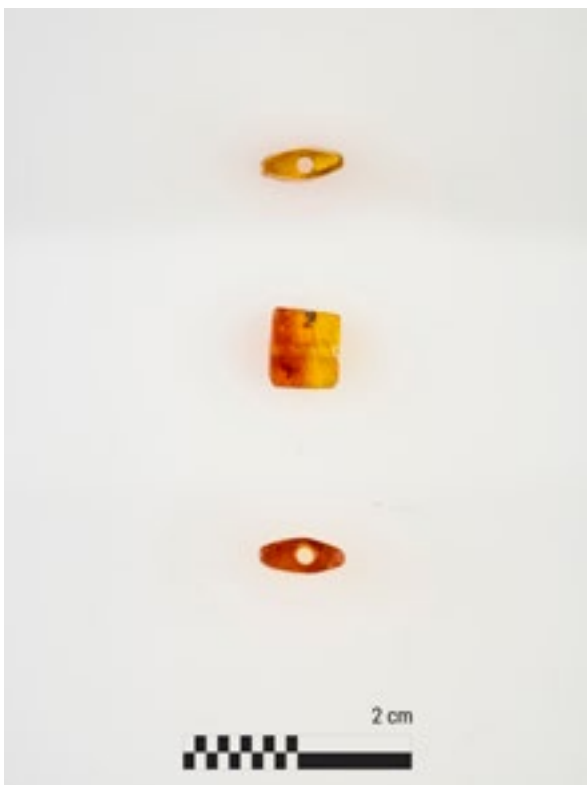
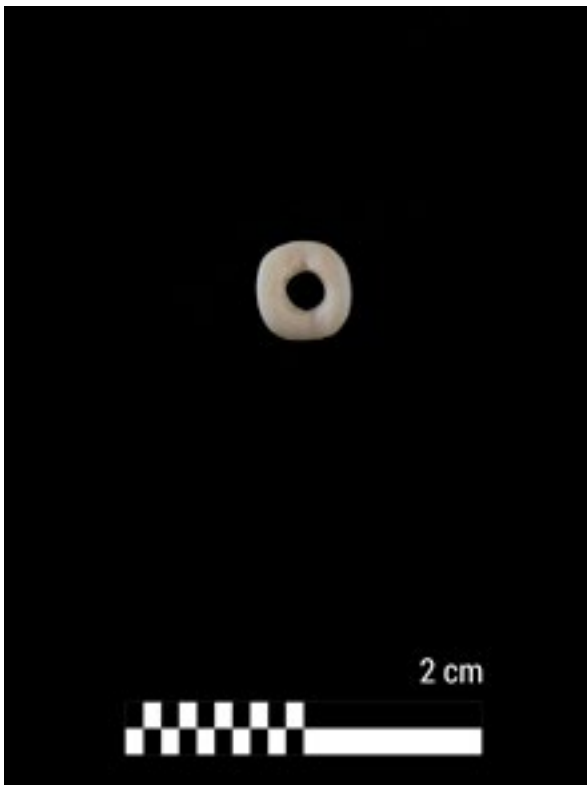


Figure 26a-d Different types of beads found in V9.

Square W8 JOANNA RĄDKOWSKA

Excavation dates: February 2 to April 4, 2019

Contexts:

C99 Cleaning the surface windblown sand

C200 a. Inter slag dune

b. Lower slag slope

c. Sub lower slag dune

Top 102.73 mASL, Bottom 102.22 mASL

C201 Compact sand with charcoal flecking. Main Iron II cultural horizon.

Top: 102.22 mASL, Bottom: 101.45 mASL

C202 Post-Wadi Suq transition layer between Wadi Suq gravel and Iron II charcoals

Top: 101.45 mASL, Bottom: 101.35 mASL

C203 Wadi Suq gravel layer

Top: 101.35 mASL, Bottom: 101.20 mASL

C88 Gypsum bedrock

Top: 101.20 m ASL

Includes: Structure 1 Hearth

Structure 2 Pit with additional hole

Structure 3 2 postholes

Excavation metrics:

Starting elevation: 102.73 mASL. (avg.)

End elevation: 101.20 mASL

Maximum excavation depth: 1.53 m

Area under excavation (excluding northern and eastern sand bags walls) 4x5 m (20 m²)

Estimated total volume removed = 30.6 m³

EXCAVATION SUMMARY

Excavation in W8 began on February 19 after one day of clearing sand accumulation from the previous season. A small selection of unworked and worked copper fragments were recovered during cleaning C99 and are presumed to have slid in by slumping and baulk erosion. The initial goal of starting W8 was to bring the sterile dune horizon between the Iron Age II and slag deposit above to a level that would allow the next team members to focus on careful object documentation/removal rather than bulk sand removal. To this end, excavation was primarily limited to a thick, evenly removed context C200. Beginning C200 at ~102.73m ASL.

Context 201 was opened on Feb. 13 due to erosion and exposure of lower levels in the southwest corner of the square. This was due in part to baulk trimming and sandbag placement originating in the adjacent Square V8 to the west. One bracelet (GR20413) (Figure 1) and one anklet fragment (GR20412) (Figure 2) were exposed in this area, and mapped before removal. It was also noted that a 10-15cm band of charcoal corresponds to the horizon in which they lay. Elevations of both objects

are 102.09 and 102.10m ASL respectively and are believed to correspond to the Iron Age II horizon, although somewhat higher in elevation than expected in this area.

Excavation in Square W8 ceased at 102.40m ASL on February 21 and it was covered with a tarp to await continuation with incoming field staff on February 25.

Works in March were the continuation of work from the previous month. The exploration of context C201 was already partly started February 13th, when copper anklet and bracelet were found. Then it was hold on and started again by another supervisor at February 27th. In March (03.03.2019-06.03.2019) , the work was focused mainly on the context C201 – sand with charcoal, recorded in the entire trench area. The excavations ceased at the level ca. 101.45 mASL, at the top of context C202 – post Wadi Suq layer of sand with small pebbles and bones.

After a 4 week long break (between 2019-03-06 to 2019-04-15) the work in W8 were ongoing again. The goal of this break was to reach the layer of Post Wadi Suq or Wadi Suq in all trenches: W8, W9, V9, U9 to remove it at the same moment. In April works resumed from layer of Post Wadi Suq dune (Figure 3). It was recorded in the entire square at level of 101.45 m ASL. It was even layer of mid-compact sand, with few spots of loose sand, especially in the western part of the square. The same day a layer of Wadi Suq was reached at 101.39 m ASL. It was about 6-7 cm thick layer of hard characteristic Wadi Suq gravel with bones and pebbles. Below at the 101.30 – 101.18 gypsum bedrock was exposed with three structures. Structure 001 - hearth, 002 – pit with additional hole, 003 – two postholes.

EXCAVATION DETAILS

Context 200

Future excavations in neighboring squares as well northern (Figure 4) and eastern (Figure 5) profiles documentation revealed that C200 should be divided into three different layers. It wasn't possible to distinguish them during the work due to their almost similar character/appearance. They started to be visible on the both documented profiles. The upper part of C200 was renamed afterward for C200a - which is so-called inter slag sand. C200b is number for yellowish, a little bit harder layer of sand marking the so-called lower slag layer. There were no slag chunks in case of W8 but C200b is a slope on which slag was accumulated in squares V9, U9 and partly in W9. Number C200c is so-called sub slag dune accumulated upon charcoal "sweet zone" layer.

Context 201

The so called charcoal layer (Figure 6), distinguishing for this part of the site, area F, in both directions: southward and westward from the trench W8. Context started already in February and continued in few first days of March (03.03.2019-06.03.2019). It's almost 0.80 m thick layer of compact, beige/yellowish brown sand filled/soaked with charcoal. The distribution of charcoal within the sand wasn't evenly. The small concentration ca. 1m x 0.5 m, few cm high was observed close to the western baulk, near to the spot where fragments of ankle and bracelet (previous report) were found in February. Mentioned concentration wasn't so big and intense like in the case of trench W9, where almost pure charcoal created a kind of heap. In the trench W8 the inclusion of charcoal was ca. 20 % of deposit spread all over the working area. Context C201 sloping a little bit northward. The same context was recorded in trenches located all around the W9.

Context 202

Just top of the layer was recorded and left for the future/further excavations. Top of the layer was uncovered in the entire trench area at level ca. 101.45 mASL (Figure 7). Still few charcoal particles were visible within the sand as well as a small pebbles and bones pieces which are characteristic feature of the Wadi Suq - gravel layer. Context C202 should be understand as a kind of transition layer between Wadi Suq and Iron Age II C201. After 2 cm the layer become pure sand almost sterile

except 24 grams of unworked copper and 3 small flakes of bones. Also 7 beads were found in the western part of the trench. Two of them were found in situ in almost the same spot (Figure 8). The rest of the beads is from screening.

Context 203

About 6-7 cm thick layer of Wadi Suq gravel (Figure 9) with pebbles and typical for the Wadi Suq material. It was even layer of very hard, greyish gypsum mixed with sand. The same context was recorded in all trenches in the area F. Another two beads were recovered from this layer, similar type like these from previous C202. Both were found in screen.

Context 88

Gypsum bedrock started at level ca. 101.15 – 101.35 m ASL (Figure 10) Four main natural channels were observed. In the most western a hearth was recovered. What was surprisingly it was empty. Usually these are filled with sand stones. It is possible that stones which were originally used in this hearth were reused in the Iron Age period, which is quite possible taking into account the presence and quantity of sand stones in charcoal layers in squares V9 C806, C807 and W9 C905, C906. Structure 001 was a rectangular feature, dimensions: 0.86 m by 0.40 m, depth 0.09 – 0.10 m. Small quantity of charcoal still in situ (Figure 11)

Structure 2 was a rectangular pit, cut into the bedrock in the eastern part of the square. Dimensions: 0.44 m by 0.35 m, ca. 0.10 m deep with additional hole 0.14 m in diameter cut in the SW corner of the pit. The depth of this additional hole was 0.27 m. (Figure 12)

Structure 003 includes two postholes. PH2 and PH3. PH2 is located about 0.80 m northward from Structure 002 and its dimensions are: 0.09 m by 0.10 m, depth: 0.07 m. PH3 is located on the northern edge of square W8, dimensions: 0.12 m by 0.15 m with depth 0.07 m. (Figure 13)

ARTIFACT SUMMARY

Excavation was resumed in W8 between February 26-28 in the Iron II horizon C201, which produced four noteworthy objects in that time: A copper knife (Figure 14) (GR20421), copper snake (GR20422) (Figure 15), copper pin (GR20423) (Figure 16), and a copper spearhead (GR20424) (Figure 17).

All artifacts recovered in square W8 came from context C201 and represent a typical Iron II collection/assemblage. Artifacts recovered in March, started at the level from ca. 101.90 mASL and lower, were concentrated just in the eastern half of the trench, especially in the north-eastern quarter of the working area.

The majority of the finds were the copper/bronze objects, mainly weaponry: knife/dagger (GR 20429), 8 cm long, found at 101.88 m ASL (Figure 18) (See illustration below) and small knife (GR20430) (Figure 19) An interesting cluster of objects (Figure 20) consisting 28.6 cm long dagger/spearhead/blade (GR 20437) (Figure 21), (See illustration below) two small pins (one was probably a kind of needle) 8.7 and 9.9 cm long (GR20434, GR20435) (Figures 22, 23) and 16.2 cm long axe (GR20437) (Figure 24) were found during the trimming of the eastern baulk. The haft (4.0 cm long, 6.58 cm high) of the axe was broken off and it was moved to touch it's blade. The group of objects was found at 101.80 mASL.

Two steatite objects were recovered: one small bowl (11.5 cm in diameter, 3 cm high) with the incised decoration in form of plant petals (GR20431) (Figures 25, 26) (See Illustration in Appendix) found at 101.75 mASL and the decorated lid (GR20436) (See Illustration in Appendix) with ornamented holder(?) on top recovered at 101.90 m ASL (Figures 27, 28) . Both steatite objects were decorated the same plant petals pattern.

Also three beads were recovered (Figures 29, 30, 31) , one arrowhead (GR20438) (Figure 32) at the level 101.53 mASL and copper snake (GR20428) (Figure 33). One unidentified heavily corroded, circle iron object/iron ring was recovered at 101.98 mASL (SHP19_0173) (Figure 34)

Apart from worked objects almost 2.9 kg of unworked copper drops and 8.4 kg of iron drops were found within the sand and charcoals. Their distribution was regular in the entire trench. Noteworthy but still unclear is the lack of objects in the WE quarter of the working area.

For C202 there was almost no finds, except 2 grams of bones, one shell, 12 pieces of copper not worked and 7 stone beads. Another two beads, the same type were found in the context below C203, the Wadi Suq layer (Figures 35 and 36). These are probably the same group. C203 produced typical material: 83 pieces of bones and, flints. One core (GR20510) and 6 flint flakes (GR20511-GR20516) (See lithic analysis section below). Unusual are 2 tiny pieces of copper not worked.

Table 38. Summary of Small Finds for entire Square W8

Small Find Summary	Count	Weight (g)
Arrowheads	2	13.65
Axehead	1	562.9
Beads	12	19.5
Copper Blades	5	160.55
Copper Cups	3	56.4
Copper Pins	3	25.15
Flint Core	1	21.3
Flint Flakes	6	42
Ingot	1	19.4
Ornamental Copper	4	593
Snakes	2	1.65
Steatite	2	466.3
Worked Iron	1	25.8

Note: All artifact categories and counts refer to both complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 39. Summary of Bulk Finds for entire Square W8.

Bulk Find Summary	Count	Weight (g)
Ceramic	1	8.5
Copper Bands	2	0.7
Debitage	70	165.2
Faunal Bones	147	54.3
Shell	2	1.6
Stone	2	350.7
Unworked Copper	398	3297.9
Unworked Iron	194	2160.4
Worked Copper	4	34.4

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

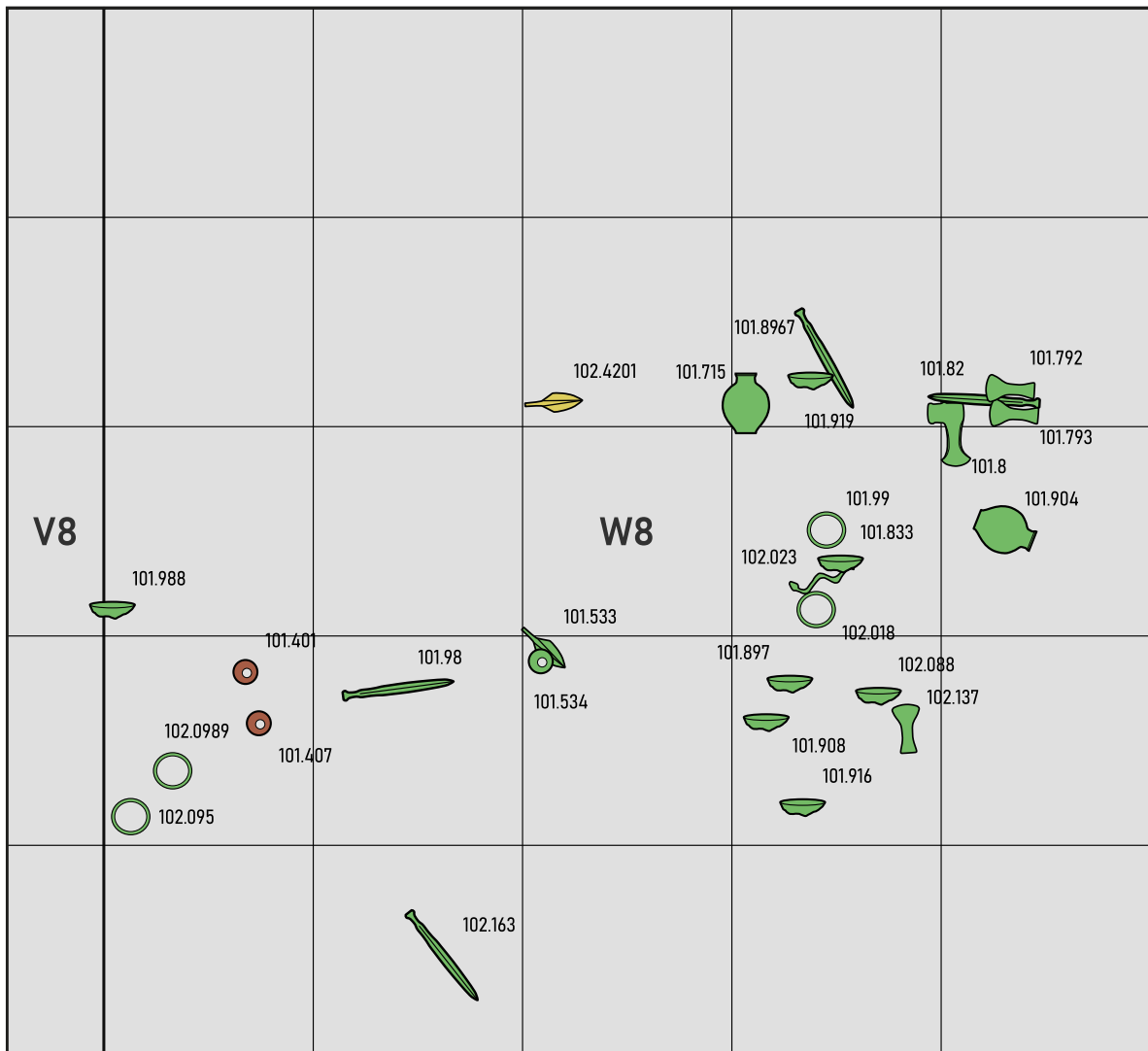
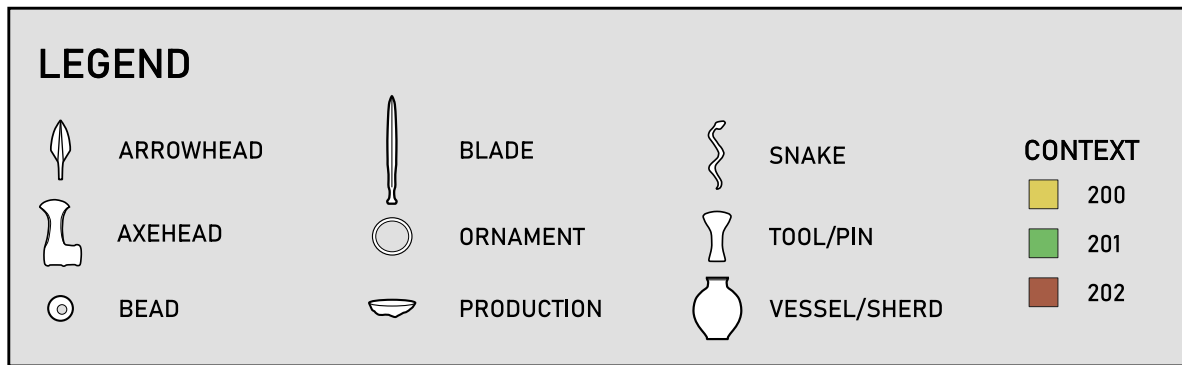


Figure 37. Generalized Small Find distribution map for Contexts 200, 201, and 202.









Figure 1 Figure ZZ Copper bracelet found in C201 (GR20413)



Figure 2 Figure ZZZ Copper anklet found in C201 (GR20412)



Figure 3 Figure A Top of post Wadi Suq dune C202.

  <p>Saruq al-Hadid Polish Mission</p>		SHP19	OP6
		Area F/V8-W8	200a/200b/200c-203
Northern profile of W8 and part of V8 showing the continuation of the charcoal layer (C201) and the surface associated with the earlier slag deposit (C200b). The post slag (C200a), slag (C200b) and sub-slag (C200c) layers were not differentiated during excavation.			
Context		Suggested context div.	
			Wind-blown charcoal 
			Natural sand deposit 
Otto Bagi	2019-03-05	UTM Zone 40N (EPSG::32640)	Scale 1:25

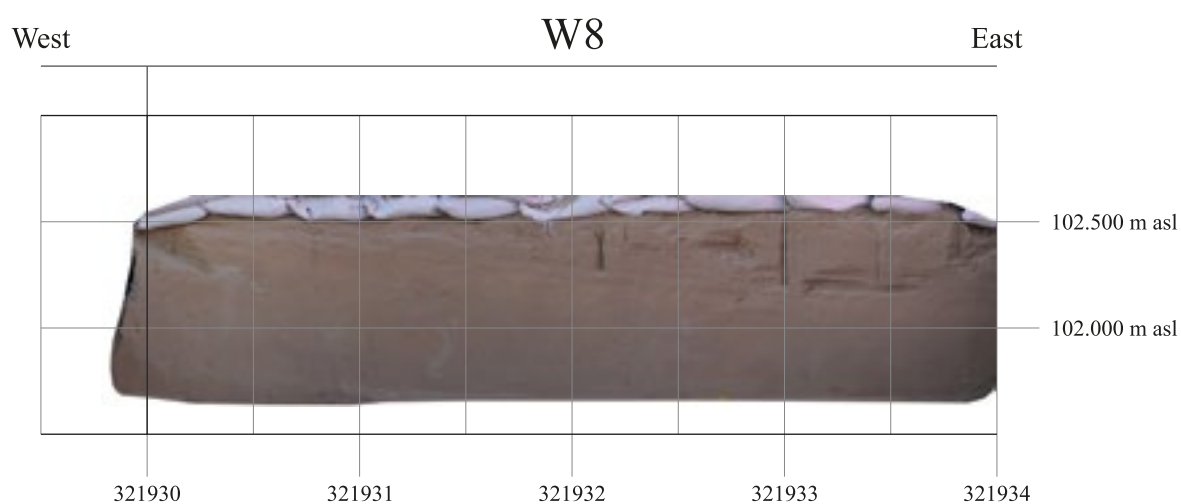
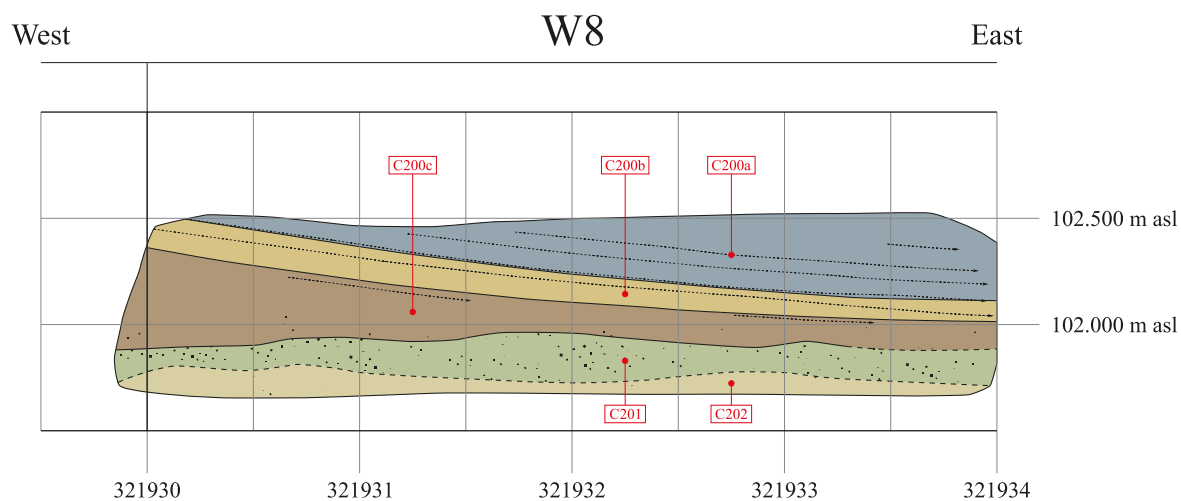









Figure 4 Figure X Northern profile of W8 showing the stratigraphy of C200

  <p>Saruq al-Hadid Polish Mission</p>		SHP19	OP5
		Area F/W8	200a/200b/200c-203
Eastern profile of W8 showing the continuation of the charcoal layer (C201) and the surface associated with the earlier slag deposit (C200b). A copper axehead (SHP19_0194) and a few unworked copper objects are visible in the profile cut.			
Context		Suggested context div.	
Copper obj.		Unworked copper	
		Natural sand deposit	
Otto Bagi	2019-03-05	UTM Zone 40N (EPSG::32640)	Scale 1:25

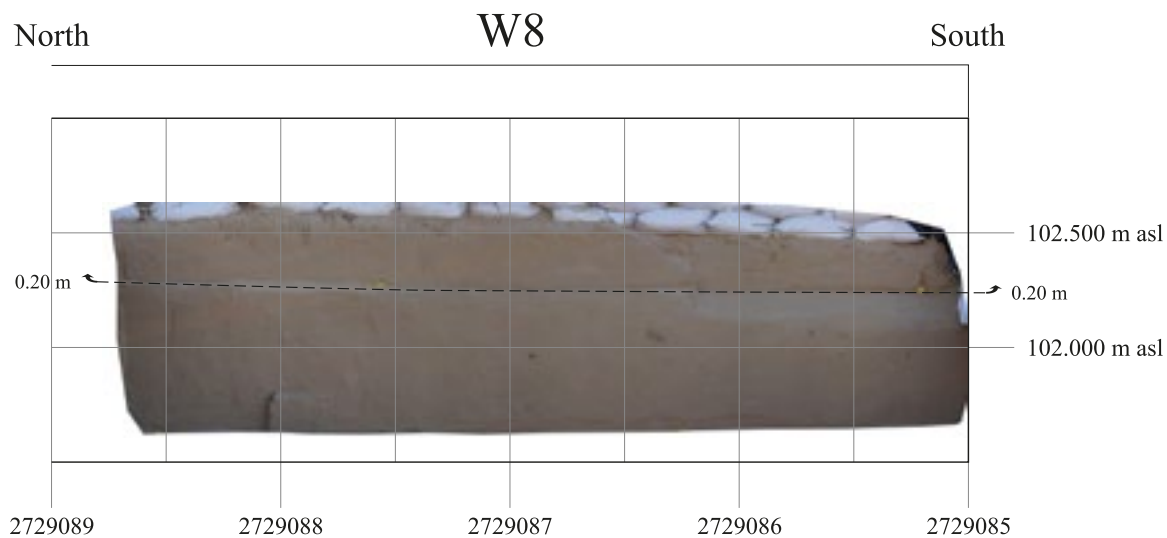
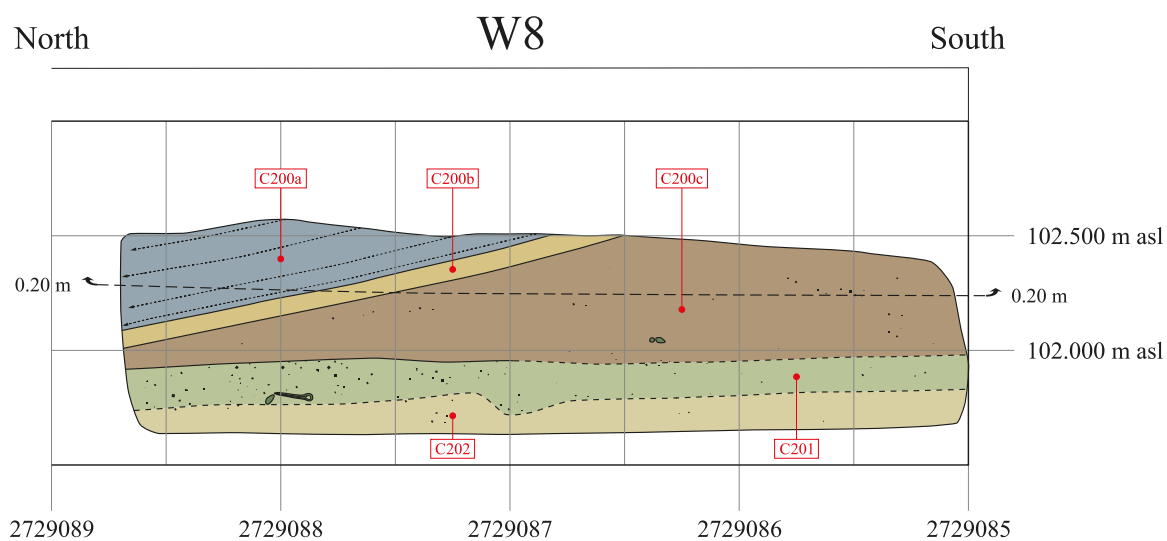


Figure 5 Figure Y Eastern profile of W8 showing the stratigraphy of C200



Figure 6 Figure 1 The top of the C201. The sand with charcoals layer.



Figure 7 Figure 2 The top of the C202. The post Wadi Suq layer.



Figure 8 Figure B One of the seven beads found in C202, still in situ.



Figure 9 Figure C Top pf Wadi Suq gravel C203.



Figure 10 Figure D Gypsum bedrock 88



Figure 11 Figure E Hearth, C88, structure 001.



Figure 12 Figure F Pit with additional hole, C88, structure 002.

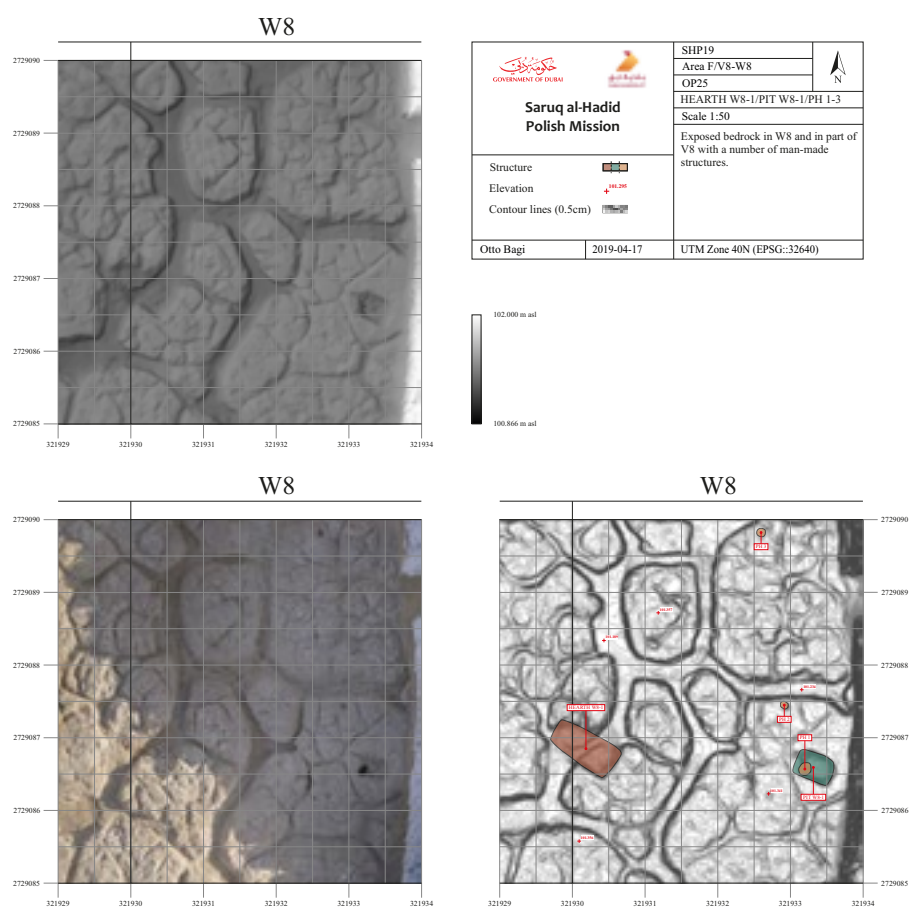


Figure 13 Figure G Orthophoto map of gypsum bedrock.



Figure 14 Figure XX Copper knife uncovered in C201 (GR20421).



Figure 15 Figure XXX Copper snake found in C201 (GR20422).



Figure 16 Figure YY Copper pin found in C201 (GR20423).



Figure 17 Figure YYY Copper spearhead uncovered in C201 (GR20424)



Figure 18 Figure 3 Dagger (GR20429)



Figure 19 Figure 4 Knife (GR20430)



Figure 20 Figure 5 The cluster of copper/bronze finds *in situ*. (GR20434, 20435, 20437, 20433)



Figure 21 Figure 6 Blade (GR20437)



Figure 22 Figure 7 Needle/pin (GR 20434)



Figure 23 Figure 8 Pin (GR20435)



Figure 24 Figure 9 Axe (GR20437)



Figure 25 Figure 10 Steatite bowl *in situ* (GR20431). C201.



Figure 26 Figure 11 Steatite bowl (GR20431)

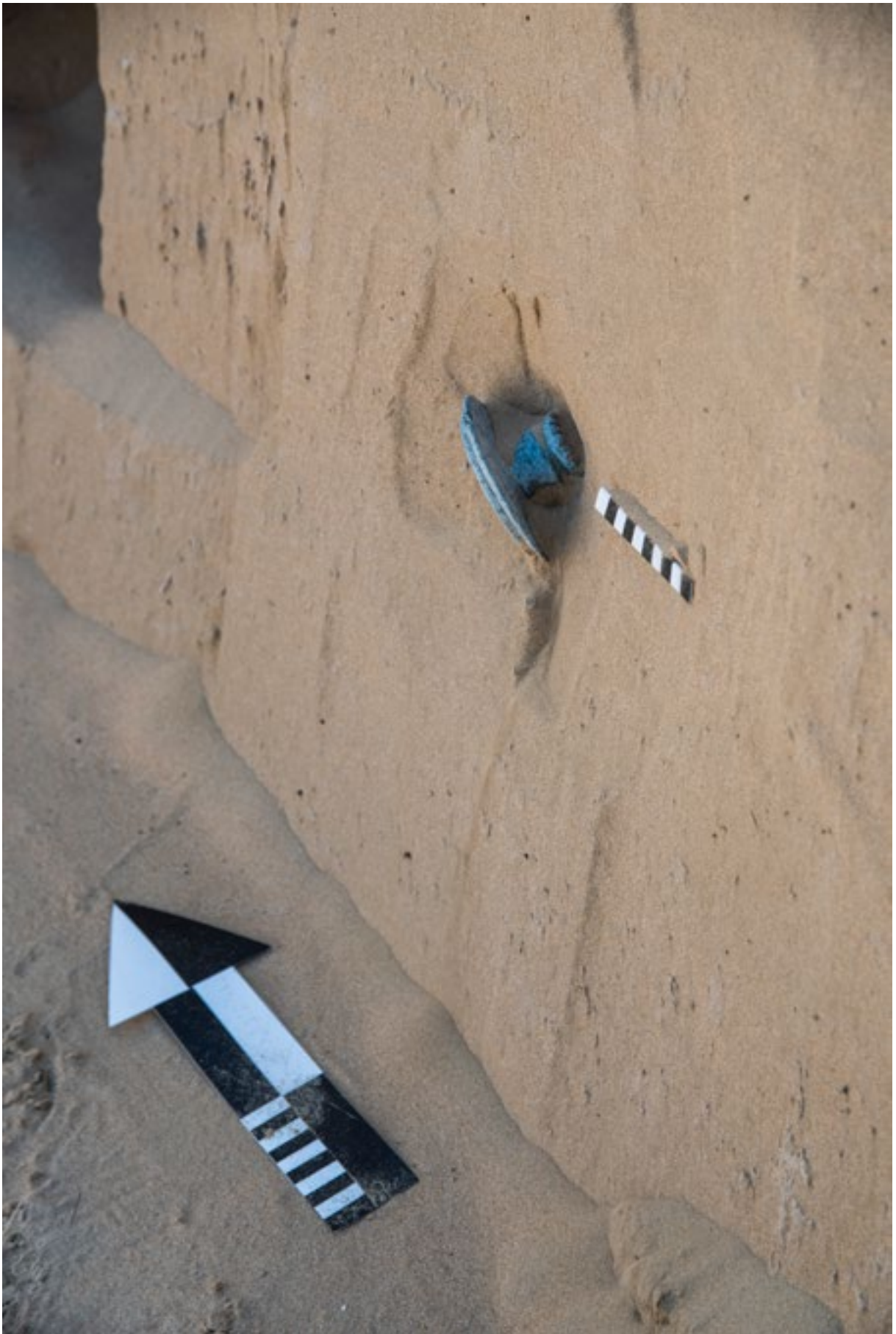


Figure 27 Figure 12 Steatite lid *in situ* (GR20436). C201.



Figure 28 Figure 13 The steatite lid (GR20436)



Figure 29 Figure 17 Bead (GR20427 – SHP19_0165)



Figure 30 Figure 18 Bead (GR20427 – SHP19_0179)



Figure 31 Figure 19 Stone bead (GR20427 – SHP19_0206)



Figure 32 Figure 15 Copper arrowhead (GR20438)



Figure 33 Figure 14 The copper snake (GR20428)



Figure 34 Figure 16 Iron object (SHP19_0173)



Figure 35 Bead from Wadi Suq level, Context 203 (SHP19_0842)



Figure 36 Bead from Wadi Suq level, Context 203 (SHP19_0843)

Square W9

MARTA BAJTLER, JOANNA RĄDKOWSKA

Excavation dates: March 3 to April 15, 2019

Contexts:

C99 Collapsed N baulk, mixed contexts.

Trimming of NW corner of N wall and sand bags step.

Trimming of E sand bags step.

Trimming of W sand bags step.

C902 Loose windblown sand. Upper part of inter-slag dune

Top: 103.35 mASL

Bottom: 102.53 mASL

C903 Loose windblown sand with single charcoal and darker spots – remains of organic (roots).

Lower part of inter-slag dune

Top: 102.57 mASL

Bottom: 101.77 mASL

C904 Very compact, coarse sand. Yellowish in color.

Top: 102.20; 102.07; 101.82 mASL.

Bottom: 102.12; 101.97; 101.80 mASL

C905 Grayish sand with charcoal.

Top: 101.82 mASL

Bottom: 101.34 mASL

C906 Heap of accumulation of charcoal and ashes.

Top: 101.81 mASL

Bottom: 101.35 mASL

C907 Cut of pit in NW corner.

Top: 102.12 mASL

Bottom: 101.55 mASL

C908 Loose grayish sand beneath lower slag. Recorded in profile.

Top: 102.16 mASL

Bottom: 101.85 mASL.

C909 Lower slag. Recorded only in west section.

C910 Post-Wadi Suq,

Top: 101.37 mASL

Bottom: 101.33 m ASL

C911 Wadi Suq gravel layer

Top: 101.33

Bottom: 101.26 m ASL avg

C88 Gypsum bedrock , Top: 101.26 m ASL avg.
Includes postholes Structure 1

Excavation metrics:

Starting elevation: 103.25 mASL (avg.)

End elevation: 101.20 mASL (avg.)

Maximum excavation depth: 2.05 m.

Area under excavation= 3.5 x 3.5 m (12.25m²)

Estimated total volume removed= 25.11 m³

EXCAVATION SUMMARY

Excavations in trench W9 were continued from 2017 season. Season 2018 works were started in February with context 900 (sand) and 901 (upper slag). March 2019 begin with C902, at 103.25 mASL (avg.). At 31st March works were stopped at the top of post-Wadi Suq layer (C910), at 101.35 mASL (avg.). Area of works covered entire W9 trench and 1.5 m of the northern part of W8 (this part was under sandbags wall). Under excavation was an area of 5 m north-south on 3.5 m west-east. Rest of trench area was under sandbags walls and baulk: 1.5 m wide northern wall, 1 m wide eastern wall and 0.5 m wide western baulk.

This season discoveries in trench W9 allowed to determine the range of the lower slag and deposition of layers beneath it. In SW square corner was recorded the end of the slag slope (C909) and the layer of windblown sand beneath it (C908). Based on observations in trench W8, was expected that layer of charcoal (C905) will be sloping, but it appeared that is getting flat. In NW corner C905 was covered with an accumulation of ashes and charcoal (C906) - very flat heap which continues westward and northward. This layer was cut by a pit, but it was recorded only partially in NW corner.

EXCAVATION DETAILS

Context 99

This context number was given to all baulks trimming. Contexts 900, 901, 902 and 903 were mixed here. Among the finds were found small golden wire (GR20405) (Figure 29) and broken arrowhead (SHP19_0261) (Figure 30).

During the rebuilding of the east wall, sand bags step was trimmed. Two arrowheads (GR20445 (Figure 31) and GR20446 (Figure 32)) were found during screening. Last C99 layer was trimming of west sand bags step. No finds were found.

Context 902

Context 902 was started on March 3rd. It was a sand dune beneath a layer of upper slag 901 consists of loose, yellowish brown sand mixed with little of slag. Top of the context has the same shape as a slag slope with the highest starting point next to the western baulk (103.67 mASL). Context 902 covered area of the entire trench and continued in all directions (trench V9 C802). Thickness range from 1.10 m to 21 cm.

Mostly only baulk finds were found. Most of them were small pieces of stones, iron not worked and copper not worked. Few fragments of pottery (SHP19_0163 and SHP19_0220) and fragment of dagger blade (SHP19_0215) were also found. Only one find was included to the small finds – ingot with a hole (SHP19_0164).

Context 903

Context 903 is a continuation of the inter-slag dune. It looks like lower part of it but contain many darker sand spots – remains of organic, probably roots and single charcoal. That's why a separate

context number was given. This is the same context as in trench V9 C803. Thickness range from 48 cm to 67 cm with the highest starting point at 102.57 mASL. Context covered the entire trench (Figure 1).

The same as in C902, little of baulk finds and single small finds were found. Most numerous were fragments of iron not worked and stones. A few small bands pieces, fragment of bone and fishbone were found. Two small finds which were found during screening, were preserved fragmentarily: fragment of an iron blade (SHP19_0287) (Figure 2) and a fragment of a copper object (SHP19_0286) (Figure 3)).

Context 904

A layer of natural deposited very compact yellowish sand was covered the southern part of the trench. It was sloping down towards north and disappeared on the flat area in central part of the square but continued southwards (trench W8), westwards (trench V9) end eastwards. Maximum thickness was 10 cm. It was covered lower slag slope which ended in SW trench corner. Only find which was found was an ingot (SHP19_0364) (Figure 4).

Context 905

This context number was given to loose, greyish sand with deposition of charcoal. In the middle of the trench was maximum starting elevation at 101.82 mASL. The thickness of this layer was 46 cm. The charcoal layer was accumulated at post-Wadi Suq and covered the entire trench. It was sealed by few different layers: in NW corner by ashes and charcoal accumulation (C906), in central and SE part by yellowish sand C904 and in SW corner by windblown sand C908 (see section SD1).

The largest amount of small finds and bulk finds was found in this context. Among small finds, most numerous were beads (26: all beads have the same GR number GR20440) and arrowheads (13: GR20441-20444, GR20451, GR20453-20458). Twenty-six beads were found at all (GR20440), of which twenty-three in SE corner (an area of about 1 x 0.5 m). Only one bead was glass/faience (SHP19_0310) (Figure 5), the rest was carnelian (Figure 6) or quartz (Figure 7)). They are similar in shape and size, looks like came from one necklace or bracelet. Seven arrowheads were found close to each other on a similar elevation at 101.60 mASL (avg.) (GR20443, GR20453-20458) (Figure 8). Rest of small finds were not so numerous: two copper cups (GR20450 and SHP19_0347) (Figure 9 and Figure 10), three snakes (SHP19_0350 (Figure 11), GR20452 (Figure 12), GR20459 (Figure 13)), scraper (GR20448) (Figure 14), fragment of clipper (SHP19_0386) (Figure 15) and three ingots (SHP19_0314 (Figure 16).

One of the most interesting finds was a miniature bow (GR20447) (Figure 19) (See illustration below) found in situ (Figure 20) and miniature arrowhead (GR20449) found during screening (Figure 21). Silver (electrum?) earring/horns (GR20461) (Figure 22) (See illustration below) came also from screening. Bulk finds are represented by a large amount of copper and iron droplets, few bands and copper worked.

Context 906

Context 906 was a heap of accumulated ashes and charcoal in the NW corner of the square (Figure 23). The heap covered an area about 2x2 meters. Maximum thickness was 35 cm. Deposition of this context starts probably in the same moment when of C905 (bottom of the heap wasn't reached yet). The layer was created by a few depositions of material. In the beginning, it was covered an area of about 1.2 x 1 meter in N end of the trench, later expanded to covered entire NW corner. It was slightly sloping eastwards and southwards. Top of the layer was very flat and hard, like walking surface.

Characteristic of this layer was the presence of a large amount of burned soft stones (weight?). Among finds were found only a few small finds: three snakes, one preserved in two fragments (GR20462 (Figure 24); and one arrowhead (GR20460) (Figure 27). Only a few bulk finds were found: iron not worked, and copper not worked.

Context 907

This context number was given to the cut of a pit in NW trench corner (Figure 28). It was recorded only in small part because pit continues under the northern wall and probably westwards in V9. Pit covered corner of about 50cm x 75cm and it's 57 cm deep. Level of cut: 102.12 mASL. Fill with the pit was pure windblown sand without any finds. No separate context number was given. This feature was cut two layers: 903 (inter-slag dune) and 906 (charcoal heap). The upper part of the cut is a straight line, which becomes semi-circular in the lower unit. The bottom is uneven. Elevations range from 101.62 mASL to 101.55 mASL.

Context 908

This layer was recorded only in the western section (see section drawing Figure 33). This is grayish windblown sand, which laid directly under lower slag. It's sloping north and disappeared after 1 meter from the southern border of W9. Maximum thickness was 32 cm.

Context 909

Lower slag. Only single lumps of slag were found in the SW corner of the trench. The slope of the lower slag was recorded eastward, in trenches V9 C804 and U9 C301. In W9 was reached probably only the end of this slope (see section drawing Figure 33).

Context 910

So-called post Wadi Suq dune (Figure 33). About 0.05 m thick layer of sterile sand, similar to the same dune which was recorded in squares in F area. It seems that its getting thicker toward West. In the eastern part its thickness is not bigger than 6 -7 cm, in the western part of area F it thickness is near 0.60 m.

Context 911

Wadi Suq gravel layer (Figure 34). Recorded in the entire square.

Context 88

Gypsum bedrock (Figure 35). One main natural channel was recovered going along the southern edge and smaller going northward. One posthole (Structure 001) was uncovered in the SE part of the square (Figure 36). Round posthole with 0.12 m in diameter and depth 0.09 m.

ARTIFACT SUMMARY

Inter-slag dune layers (C902 and C903) produced a little of finds. They were mostly fragments of not worked copper and iron and small pieces of stones. Natural layers connected with lower slag are deposits recorded only in SW trench corner with almost no finds. Only context 905 produced really large assemblage of finds. Mostly, they were artifacts characteristic for charcoal layer. Snakes, arrowheads and beads were most numerous finds. What is interesting, no larger artifacts like daggers or axes were found. Beads finds from trench W9 was the largest assemblage recorded in March. Twenty-three beads were found during digging sandbags trench in SE corner.

Another arrowhead was found in situ, in the eastern profile of the square (GR20507) at the level 101.44 m ASL. Although it was found in the baulk its provenience was sure and it was count in the C905, a sand with charcoal layer (Figure 37). Context 910, post Wadi Suq dune didn't produce any finds, except 6 small flakes of bones, which can be count into the Wadi Suq layer. C910 was almost sterile, what is characteristic for this layer recorded in different squares in area F. Wadi Suq layer, C911 produced less material than expected. Just 22 flint flakes and 2.1 grams of bones. This, when to compare with W9, directly southward is small quantity. In square W8 almost 70 flint flakes and 35 grams of bones were recovered from the same layer C203. Taking into account the hypothesis that

in the Iron Age period there was a robbery activity which was recorded potentially in W9 and W8 it is possible that part of the Wadi Suq material was mixed with later layers.

Table 40. Summary of Small Finds for entire Square W9.

Small Find Summary	Count	Weight (g)
Arrowheads	19	128.95
Beads	26	6.2
Copper Blades	2	11.65
Copper Bow	1	26.7
Copper Cups	4	10.2
Furnace Fragments	3	261.5
Gold	1	<0.1
Ingots	4	4473
Iron Blade Frags	1	26.1
Scraper	1	3.6
Silver	1	7.7
Snakes	9	29.6
Steatite	2	146.7
Worked Copper (Sp)	2	7.2

Note: All artifact categories and counts refer to complete and fragmentary objects. See main GR spreadsheet for only complete/registered objects. “Blades” refers to all bladed objects (e.g. knives, spearheads, daggers, etc.)

Table 41. Summary of Bulk Finds for entire Square W9.

Bulk Find Summary	Count	Weight (g)
Ceramic	8	97.9
Copper Bands	23	4.1
Debitage	26	19.2
Faunal Bones	51	27
Fish Bone	1	0.1
Shell	11	5.7
Stone	192	3328.2
Unworked Copper	222	1321
Unworked Iron	215	1223.6
Worked Copper	5	11.6
Worked Iron	23	25.4

Note: All object categories include complete and fragmentary pieces for the purpose of general category summarization. Further details are found in the main excavation register table.

Table 42. Slag and technical ceramic totals for entire square W9.

Square	Slag (kg)	Technical Ceramic (kg)
W9	97.50	5.95

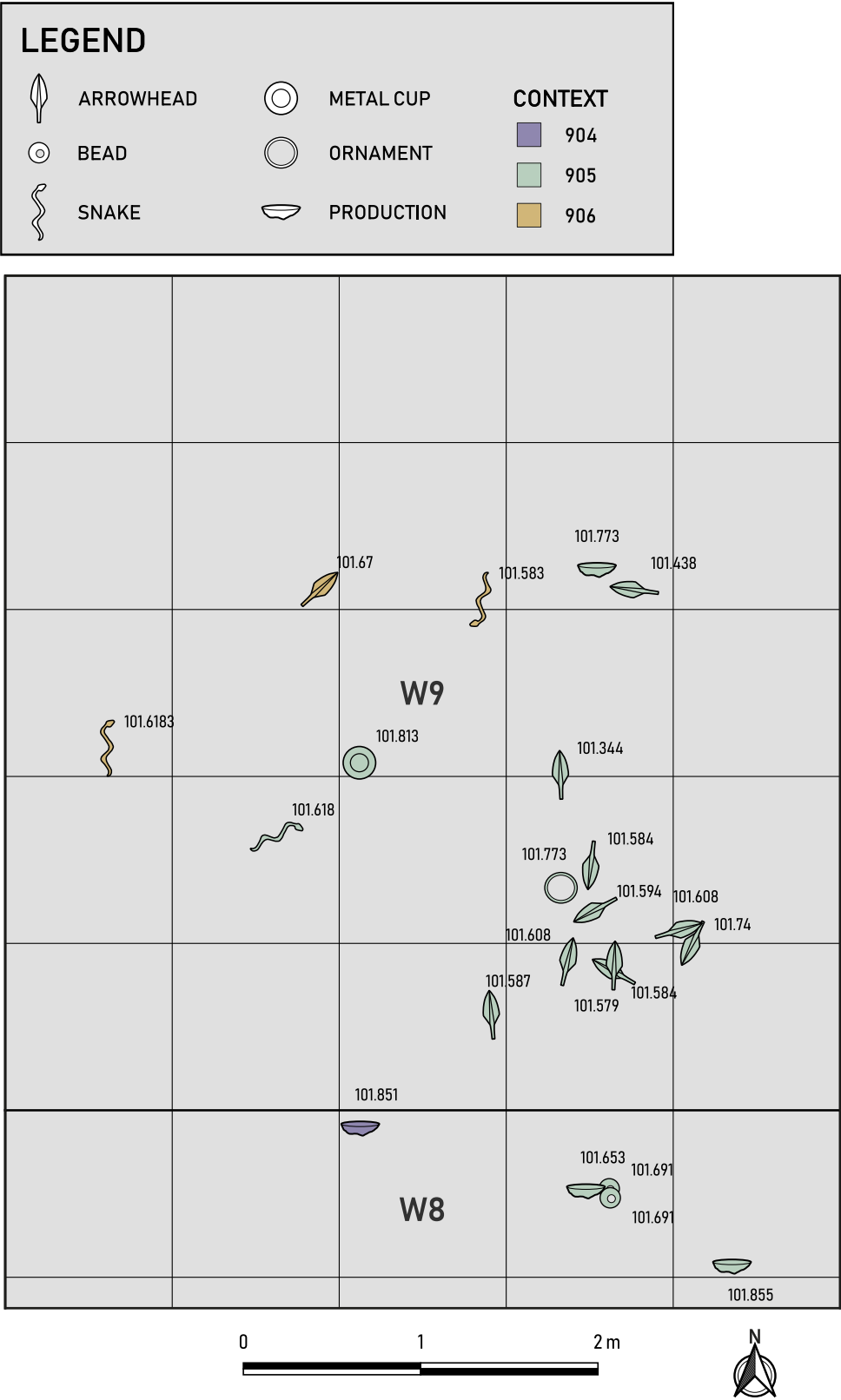


Figure 38. Small find distribution in Contexts 904, 905, 906.



Figure 1. Top of inter-slag dune (Context 903).



Figure 2. Iron blade fragment SHP19_0287 (Context 903).



Figure 3. Copper object fragment SHP19_0286 (Context 903).



Figure 4. Ingot SHP19_0364 (Context 904).



Figure 5. Glass/faience bead (GR20440) (Context 905).



Figure 6. Carnelian bead (GR20440) (Context 905).



Figure 7. Quartz bead (GR20440) (Context 905).

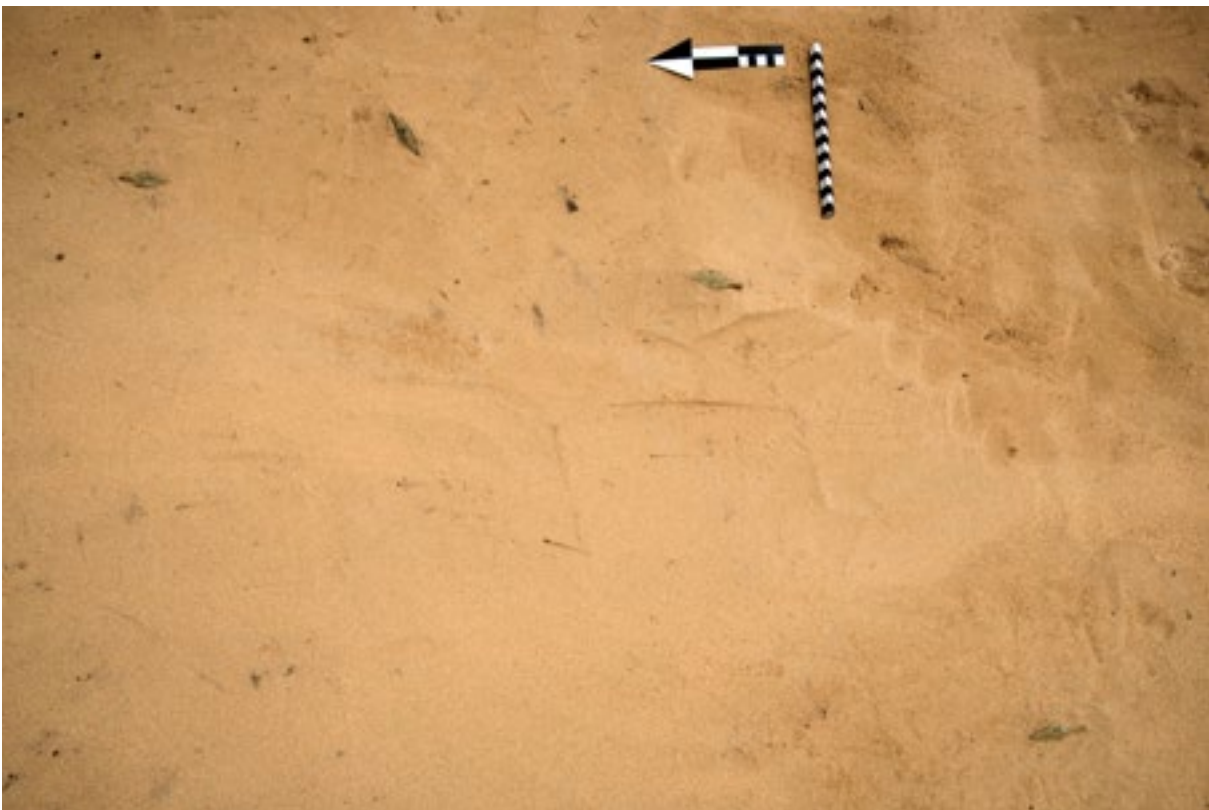


Figure 8. Cluster of 7 arrowheads (Context 905).



Figure 9. Copper cup (GR20450) (Context 905).



Figure 10. Copper cup (SHP19_0347) (Context 905).



Figure 11. Copper snake (SHP19_0350) (Context 905)



Figure 12. Copper snake (GR20452) (Context 905).



Figure 13. Copper snake (GR20459) (Context 905).



Figure 14. Copper scraper (GR20448) (Context 905).



Figure 15. Copper clipper(?) (SHP19_0386) (Context 905).



Figure 16. One of three ingots recovered from C905. (SHP19_0387) (Context 905).



Figure 19. Miniature copper bow *in situ* (GR20447) (Context 905).



Figure 20. Miniature copper bow (GR20447) (Context 905).



Figure 21. Arrowhead (GR20449) (Context 905).



Figure 22. Silver/Electrum horns (GR20461) (Context 905).



Figure 23. Top of charcoal heap concentration (Context 906) within charcoal-bearing level (Context 905).



Figure 24. One of three copper snakes recovered from Context 906 (GR20462).



Figure 27. Arrowhead (GR20460) (Context 906).



Figure 28. Pit (C907) cut into charcoal heap (Context 906).



Figure 29. Gold wire/band (GR20405) (Context 99).

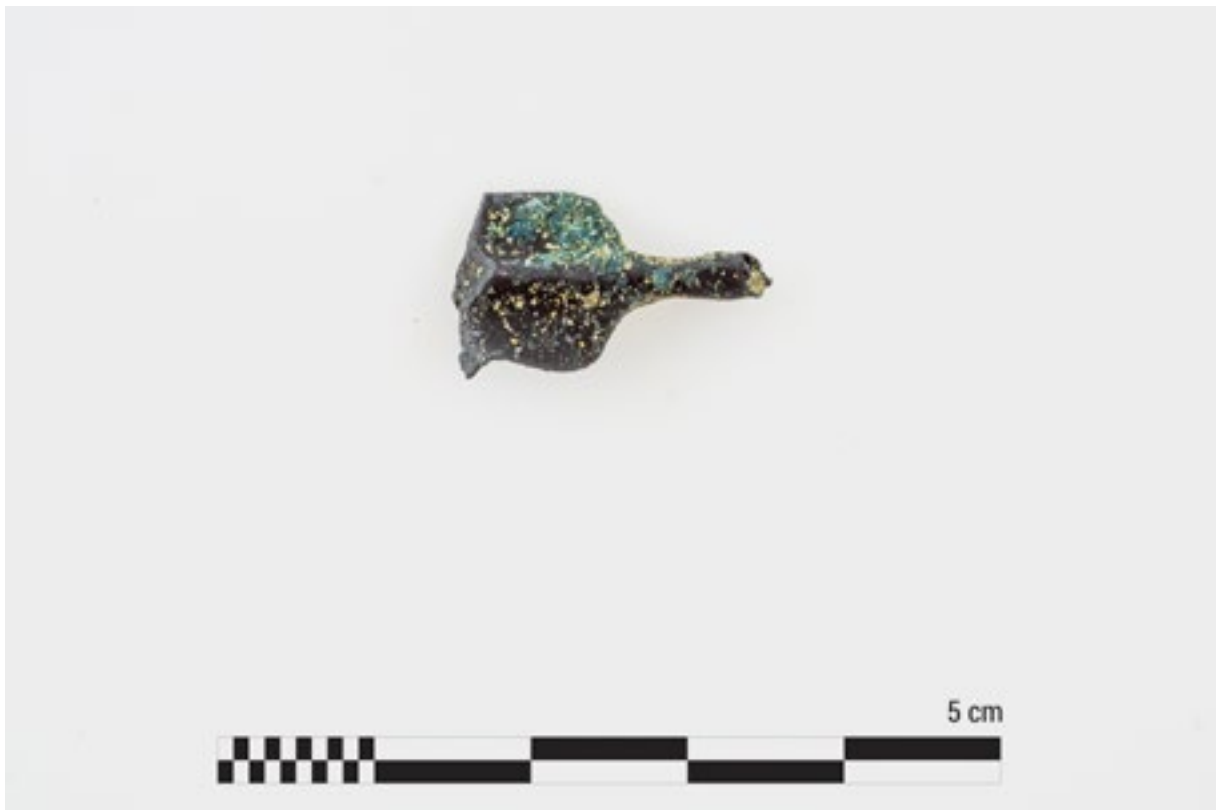


Figure 30. Cut arrowhead (SHP19_0261) (Context 99).




Figure 31. Arrowhead (GR20445) (Context 99).



5 cm



Figure 32. Arrowhead (GR20446) (Context 99).

		SHP19	2019
Saruq al-Hadid Polish Mission		Area F/W8-9	OP7/OP10-OP12
		900/901/902/903/904/905/906a-c/907/908/910	
		Western profile of W9 and part of W8 showing the connection of the continuation of the lower slag slope and the charcoal layer (C905), as well as a cut (C907) in the ash heap.	
Context		Artificial context div.	
Gravel		Suggested context div.	
Root		Gypsum bedrock	
Slag			
Otto Bagi	2019-04-02	UTM Zone 40N (EPSG:32640)	Scale 1:25

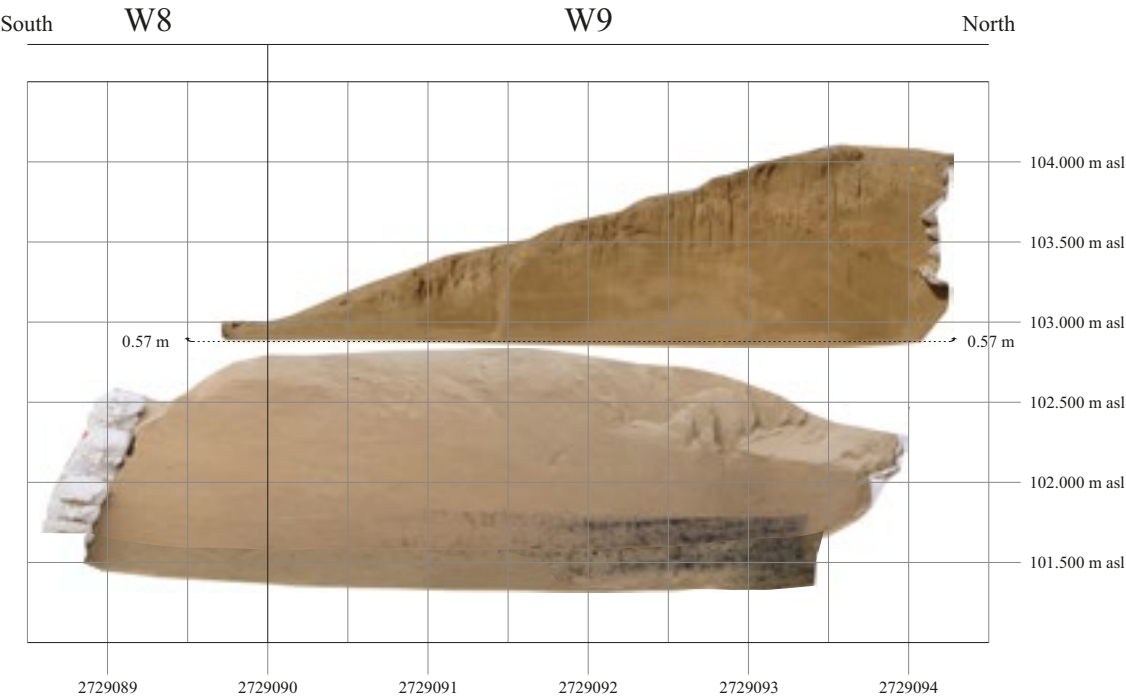
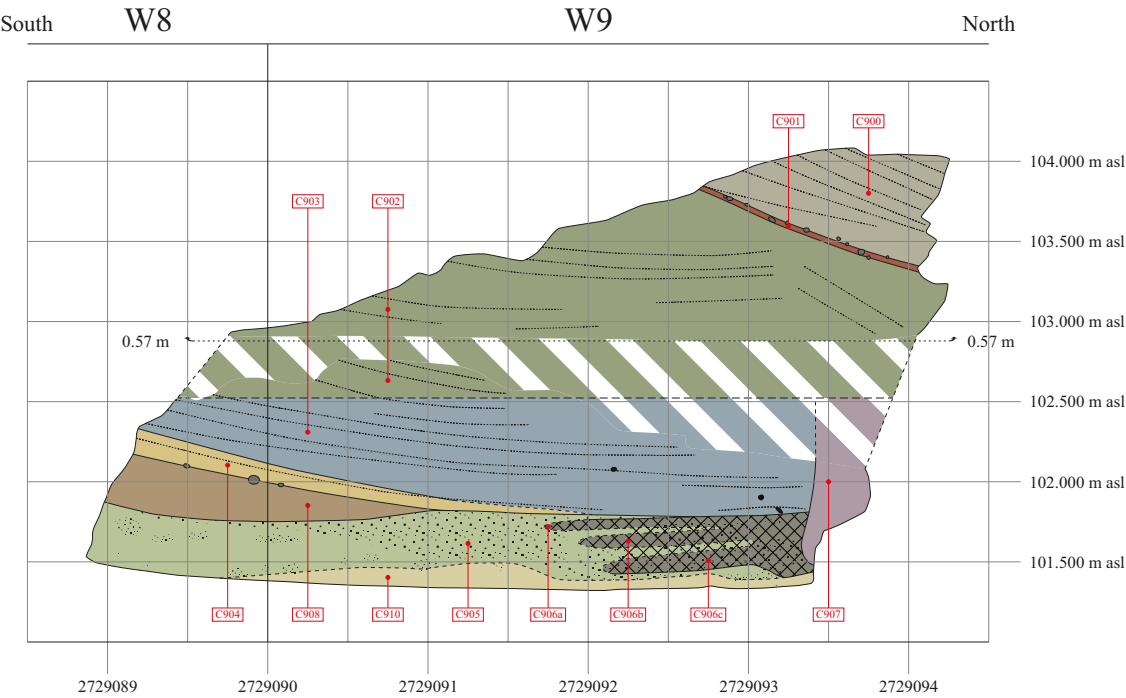


Figure 33. Western profile of W9 and part of W8 showing the post Wadi Suq dune At the bottom.



Figure 34. Top of the Wadi Suq gravel layer C911.



Figure 35. Surface of the gypsum bedrock C88.

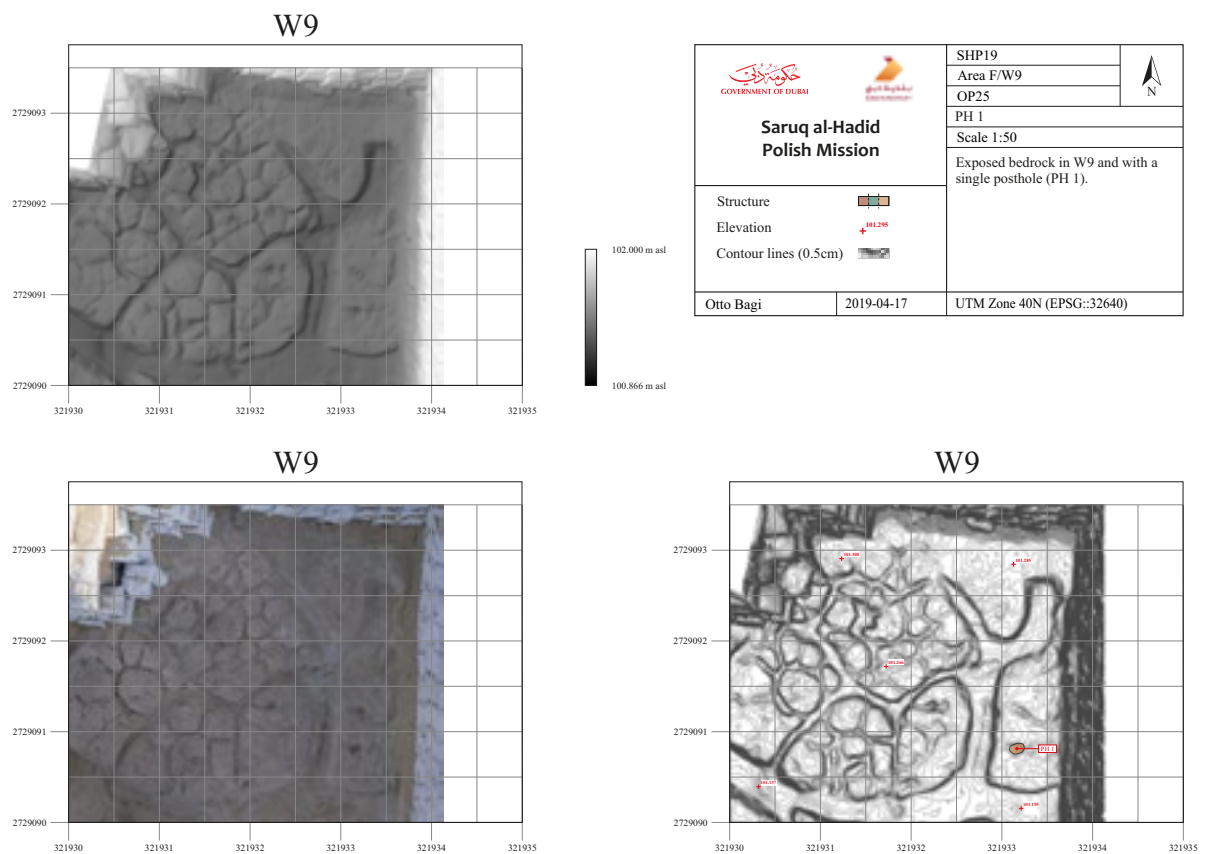


Figure 36. Exposed bedrock in W9 and with a single posthole (PH 1).



Figure 37. Arrowhead (GR20507) *in situ*.

VI. SPECIALIST REPORTS

1. Metal Object

Conservation and Analysis ŁUKASZ ZIELIŃSKI

A portion of the metal artefacts that was found in polish sector in this season, was conserved (see table 1). Complete objects and in good state of preservation were chosen for conservation. Thus, mainly arrowheads, snakes, spearheads, daggers and vessels suited for museum exhibition were conserved.

STATE OF PRESERVATION

State of preservation varied according to the stratigraphic location of the object. Artefacts from the top of the dune are generally less corroded, however, during later period this layer was heavily scavenged in order to obtain metal material for remelting. And so, objects are usually hammered, cut, rolled or folded and only few were found intact (Cable and Weeks 2017:39). The artefacts from the bottom of the dune are often very heavily corroded, as a result of high level of salinity of this layer. Most likely it is an effect of the process of slow diffusion of salts (mainly sulphur and chlorine) accumulated in the surface of dried lake which was later covered by the dune (Cable and Weeks 2017:40).

All objects reacted very strongly when tested for active corrosion. This indicates high level of contamination with salts inside the object, as salts compounds are oxidation catalysts. Thus, every metal object found in Saruq el Hadid is at risk of corrosion progression if not properly conserved.

CONSERVATION METHODOLOGY

Conservation treatment for copper based artefacts in all cases followed the same procedure. Corrosion was removed by mechanical means, using metal tools, diamond cutters, and glass brushes. Next step was testing for active corrosion to show the progress rate of corrosion in a humid environment. Krefting's method (electrolytic bath) was used for neutralization of active corrosion (observed in most cases). Re-testing for active corrosion was important to ensure, that artifact will not corrode later. Process was repeated if necessary. Than object was stabilized by immersion in a 5% solution of EDTA, followed by immersion in a 2% solution of BTA. The thin opaque film left on the surface by BTA was removed with a soft brush dipped in acetone. Conservation was completed with an application of thin protective coating of acryl resin Paraloid B44 on the surface. It seals the object in order to cut off the access of air to eliminate oxidation which is the main cause of corrosion. The acryl resin coating also protects artifacts against minor mechanical damage in storage.

In case of golden bullhorns amulet only cleaning (mechanical and chemical) and surface protection with Paraloid was done. Gold is very resistant to all forms of corrosion itself, so no stabilization was needed.

CONSERVATION STEPS

- a) mechanical cleaning: corrosion removed with metal tools, diamond cutters, glass brushes
- b) chemical cleaning: EDTA
- c) test of active corrosion: (+) (-) etc.
- d) neutralization of active corrosion: Rosenberg's method and/or Krefting's method
- e) stabilizing: sodium sesquicarbonate

- f) surface protection: corrosion inhibitor (BTA) and acryl resin layer (Paraloid B44)
g) other comments

Table 43. Conservation sequence on individual objects. (Note: See Pre- and Post-conservation photos at end of this table).

No.	Description	GR/ Inw. No.	Conservation method
1	Oval plate fragment, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0015	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
2	Rectangular plate fragment, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0016	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
3	Rod fragment, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0118	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
4	Rod fragment, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0128	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
5	Cup, made of copper, complete, rounded rim, flat rounded base, heavily corroded, and greenish color.	SHP19_0087 GR20414	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
6	Bent rod, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0086	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
7	Bracelet, made of copper, small size, incomplete, broken, rounded shape, tiny piece overlap one end, corroded, sand and greenish color.	SHP19_0083 GR20417	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
8	Oval plate fragment, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0084	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
9	Bent band fragment, made of copper, incomplete, small size, corroded, sandy and greenish color	SHP19_0068	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
10	Clip, made of copper, complete, heavily corroded, and greenish color.	SHP19_0052 GR20408	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)

11	Snake model, made of copper, almost complete, broken tail, thin and long, cut in the middle of the head, dotted eyes, sand and greenish color.	SHP19_0104 GR20420	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
12	Snake model, made of copper, complete, with pointed head, crawling position, forged on different angles, corroded with abate-ments, sand and greenish color.	SHP19_0103 GR20419	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
13	Spearhead, made of copper, complete, elongated blade, sharp edges, short handle, mid rib on both sides, corroded, sand and greenish color.	SHP19_0136 GR20424	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
14	Dagger, made of copper, complete, sharp blade, long handle, corroded, sand and greenish color.	SHP19_0110 GR20421	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
15	Snake model, made of copper, with pointed head, complete, crawling position, Forged on different angles. Slightly corroded, sand and greenish color.	SHP19_0041 GR20406	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
16	Arrowhead, made of copper, complete, almond shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0039 GR20403	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
17	Anklet, made of copper, one piece, convex, thick and heavy, ribbed body, decorated with vertical lines, horizontal and 45 degree angle incisions, heavily corroded, and greenish color.	SHP19_0078 GR20412	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
18	Anklet, made of copper, one piece, convex, thick and heavy, decorated with incised triangles on one edge, heavily corroded, and greenish color.	SHP19_0077 GR20413	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
19	Dagger, made of copper, complete, elongated triangular blade, sharp edges, midrib on both sides, short and thin handle, heavily corroded, sandy and greenish color.	SHP19_0198 GR20437	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
20	Arrowhead, made of copper, small, complete, triangular shaped, tanged, tang bent, pointed head, sharp edges, mid rib on both sides, corroded, and greenish color.	SHP19_0040 GR20404	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
21	Arrowhead, made of copper, complete, almond shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0088 GR20415	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
22	Drill, made of copper, complete, medium size, thin, sharp at one end, corroded, sand and greenish color.	SHP19_0196 GR20435	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)

23	Spearhead, made of copper, small size, almost complete, tiny piece is missing from the tip, sharp blade, corroded, sandy and greenish color.	SHP19_0178 GR20430	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
24	Arrowhead, made of copper, complete, leaf shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, sand and greenish color.	SHP19_0207 GR20438	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
25	Ring, made of copper, complete, rounded shape, open ends, corroded, sand and greenish color.	SHP19_0131 GR20409	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
26	Snake model, made of copper, incomplete, broken tail, rounded head, short, corroded, sand nad greenish color.	SHP19_0166 GR20428	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
27	Arrowhead, made of copper, complete, leaf shaped, small size, tanged, pointed head, sharp edges, corroded, and greenish color.	SHP19_0004 GR20402	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
28	Spearhead, made of copper, small size, complete, sharp blade, corroded, sandy and greenish color.	SHP19_0167 GR20429	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
29	Arrowhead, made of copper, complete, almond shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0096 GR20416	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
30	Snake model, made of copper, incomplete, broken tail, cut in the middle of the head, sightly corroded, sand and greenish color.	SHP19_0134 GR20422	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
31	Ring, made of copper, complete, rounded shape, open ends, corroded, and greenish color.	SHP19_0132 GR20410	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
32	Axe, made of copper, incomplete, broken in to two parts, pieces are missing, spigot with three rims, two holes in spigot, thick and long blade, slightly sharp and rounded edge, heavily corroded, sandy and greenish color.	SHP19_0194 GR20433	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
33	Snake model, made of copper, complete, with almost rouded head, in crawling position, heavily corroded, sandy and greenish color.	SHP19_0385 GR20459	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
34	Arrowhead, made of copper, almost complete, broken tip, leaf shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0328 GR20443	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)

35	Arrowhead, made of copper, almost complete, broken edge, triangular shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0331 GR20446	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
36	Scraper, made of copper, small size, incomplete, one edge slightly broken, flat at one edge, curved sides, corroded, sand and greenish color.	SHP19_0345 GR20448	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
37	Snake model, made of copper, incomplete, tail broken, flat head with cut in the middle, in crawling position, heavily corroded, sandy and greenish color.	SHP19_0377 GR20452	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
38	Arrowhead, made of copper, complete, leaf shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, sandy and greenish color.	SHP19_0381 GR20456	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
39	Arrowhead, made of copper, complete, leaf shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, black and greenish color.	SHP19_0326 GR20441	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
40	Snake model, made of copper, almost complete, tiny piece missing from the tail, with rounded head, in crawling position, heavily corroded, sandy and greenish color.	SHP19_0403 GR20462	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
41	Arrowhead, made of copper, complete, almond shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0329 GR20444	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
42	Arrowhead, made of copper, complete, triangular shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0330 GR20445	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
43	Arrowhead, made of copper, complete, diamond shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, sandy and greenish color.	SHP19_0378 GR20453	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
44	Cup, made of copper, small size, almost complete, tiny piece missing from the edge, rounded shape, heavily corroded, sandy and greenish color	SHP19_0348 GR20450	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
45	Arrowhead, made of copper, almost complete, tiny piece missing from the blade, triangular shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0388 GR20460	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)

46	Arrowhead, made of copper, almost complete, missing piece, leaf shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, black and greenish color.	SHP19_0327 GR20442	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
47	Arrowhead, made of copper, complete, almond shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0349 GR20451	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
48	Amulet, made of gold, almost complete, slightly cracked, bullhorn shaped, slightly overlap ends, with convexity in the middle, used for decoration, grey and yellow color.	SHP19_0395 GR20509	Conservation treatment: a), f) g) golden object (corrosion resistant)
49	Arrowhead, made of copper, almost complete, one edge slightly broken, triangular shaped, tanged, pointed head, sharp edges, mid rib on both sides, corroded, sandy and greenish color.	SHP19_0383 GR20458	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
50	Arrowhead, made of copper, almost complete, one edge slightly cracked, leaf shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0380 GR20455	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
51	Arrowhead, made of copper, complete, triangular shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0382 GR20457	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
52	Cup, made of copper, almost complete, tiny piece missing, small size, almost rounded shape, heavily corroded, sandy and greenish color.	SHP19_0410 GR20463	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
53	Arrowhead, made of copper, complete, leaf shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0379 GR20454	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
54	Snake model, made of copper, complete, broken in two pieces, corroded, sandy and greenish color.	SHP19_0418	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
55	Arrowhead, made of copper, complete, very small size, leaf shaped, pointed head, sharp toothed edges, no mid rib, tanged, heavily corroded, black and greenish color.	SHP19_0346 GR20449	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
56	Bow, made of copper, complete, small size, curved, with snake heads decoration on both endings, thin bow string, heavily corroded, sand and greenish color.	SHP19_0343 GR20447	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)

57	Arrowhead, made of copper, complete, almond shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0427 GR20464	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
58	Arrowhead, made of copper, almost complete, one edge slightly broken, diamond shaped, small, tanged, pointed head, sharp edges, mid rib on both sides, corroded, sandy and greenish color.	SHP19_0432 GR20465	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
59	Snake model, made of copper, complete, small size, with pointed head, corroded, sandy and greenish color.	SHP19_0452 GR20466	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
60	Arrowhead, made of copper, complete, triangular shaped, tanged, pointed head, sharp edges, mid rib on both sides, heavily corroded, sandy and greenish color.	SHP19_0453 GR20467	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
61	Knife, made of copper, complete, elongated and narrow, leaf shaped, thin and short handle, sharp blade edges, mid rib on both sides, corroded, sandy and greenish color.	SHP19_0533 GR20439	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
62	Knife, made of copper, complete, elongated and narrow, leaf shaped, thin and short handle, sharp blade edges, mid rib on both sides, corroded, sandy and greenish color.	SHP19_0541 GR20480	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
63	Spearhead, made of copper, complete, flat rounded tip, sharp blade edges, thick handle, corroded, sandy and greenish color.	SHP19_0534 GR20473	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
64	Knife, made of copper, complete, small size, elongated and narrow, sharp blade edges, mid rib on both sides, thin and long rectangular handle, corroded, sandy and greenish color.	SHP19_0542 GR20481	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
65	Dagger, made of copper, complete, big size, elongated, wide at the base, rounded tip, sharp edged blade, with midrib on both sides, short handle, heavily corroded, sandy and greenish color.	SHP19_0543 GR20482	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
66	Dagger, made of copper, complete, broken in two parts, rounded tip, long thick blade, slightly sharp edges, with midrib on both sides, short rectangular handle, with rim flaps, heavily corroded, sandy and greenish color.	SHP19_0532 GR20477	Conservation treatment: a) g) require further conservation in DM

67	Scraper, made of copper, small size, incomplete, one edge slightly broken, both sides concave, corroded, sandy and greenish color.	SHP19_0672 GR20494	Conservation treatment: a) g) require further conservation in DM
68	Scraper, made of copper, almost complete, tiny piece missing, broken in two parts, medium size, concaved sides, very heavily corroded, sandy and greenish .	SHP19_0475 GR20470	Conservation treatment: a) g) require further conservation in DM
69	Arrowhead, made of copper, complete, triangular shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0790 GR20503	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
70	Ring, made of copper, complete, rounded shape, the two ends are attached together , corroded, sand and greenish color.	SHP19_0670 GR20501	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
71	Snake model, made of copper, complete, medium size, elongated flat head, dotted eyes, narrow body, heavily corroded, sandy and greenish color.	SHP19_0505 GR20475	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
72	Snake model, made of copper, complete, medium size, elongated thick head, dotted eyes, thick body, heavily corroded, sandy and greenish color.	SHP19_0573 GR20484	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
73	Knife, made of copper, complete, very small size, pointed tip, sharp edges, long thick blade, slightly sharp edges, with midrib on both sides, short rectangular handle, corroded, sandy and greenish color.	SHP19_0703 GR20499	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
74	Arrowhead, made of copper, complete, small size, almond shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0480 GR20476	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
75	Drill, made of copper, complete, small size, short, thin and sharp at one end, wider in the middle, corroded, sandy and greenish color.	SHP19_0673 GR20495	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
76	Cup, made of copper, complete, small size, rounded rim, corroded, sand and greenish color.	SHP19_0619 GR20488	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)
77	Arrowhead, made of copper, complete, leaf shaped, pointed head, sharp edges, mid rib on both sides, tanged, corroded, sandy and greenish color.	SHP19_0702 GR20498	Conservation treatment: a), c) (+), d) Krefting's method, e) sodium sesquicarbonate, f)

ARROWHEADS

GR20438

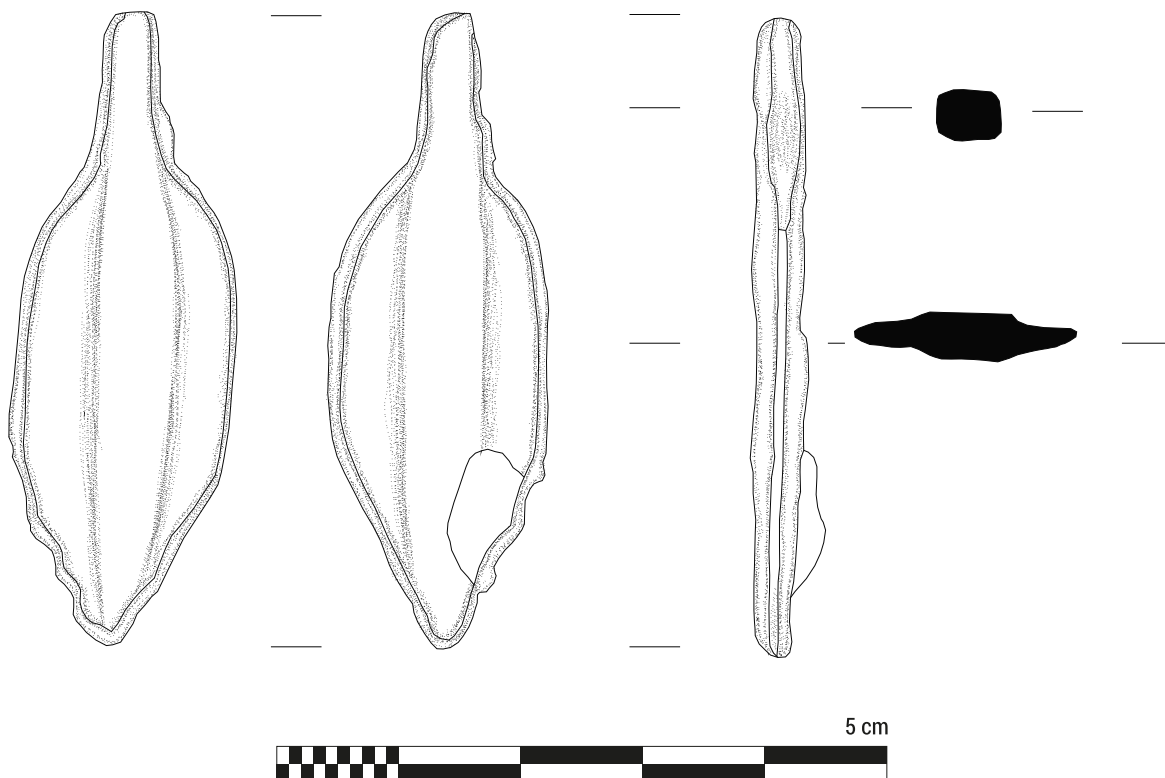
Pre-conservation



Post-conservation



Drawing



ARROWHEADS

Pre-conservation

Post-conservation



GR20403



GR20404



GR20415



GR20402



GR20416



GR20443



ARROWHEADS

Pre-conservation

Post-conservation



GR20446



GR20456



GR20441



GR20444



GR20445



GR20498



ARROWHEADS

Pre-conservation

Post-conservation



ARROWHEADS

Pre-conservation



GR20454



GR20449



GR20464



GR20465



GR20467



GR20503



GR20476

Post-conservation



DAGGER

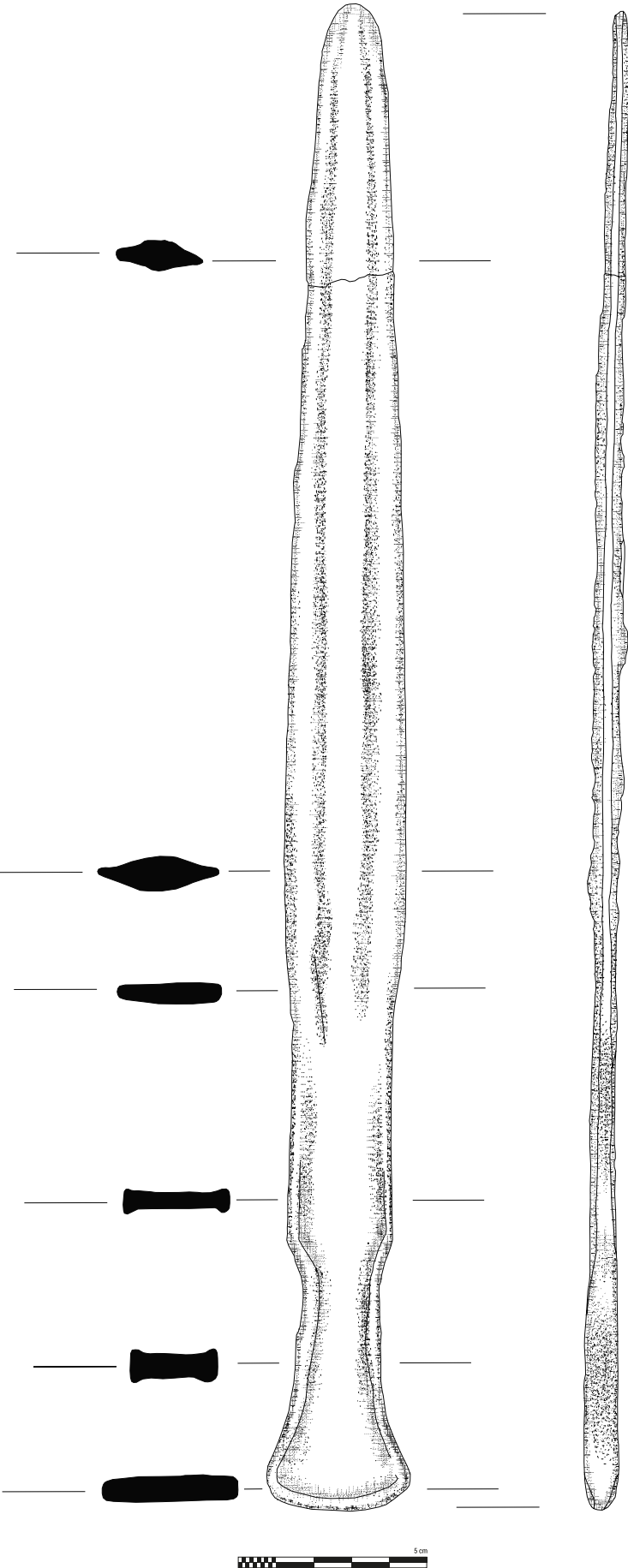
GR20477

Pre-conservation

Post-conservation



Drawing



BLADES

GR20437

Pre-conservation

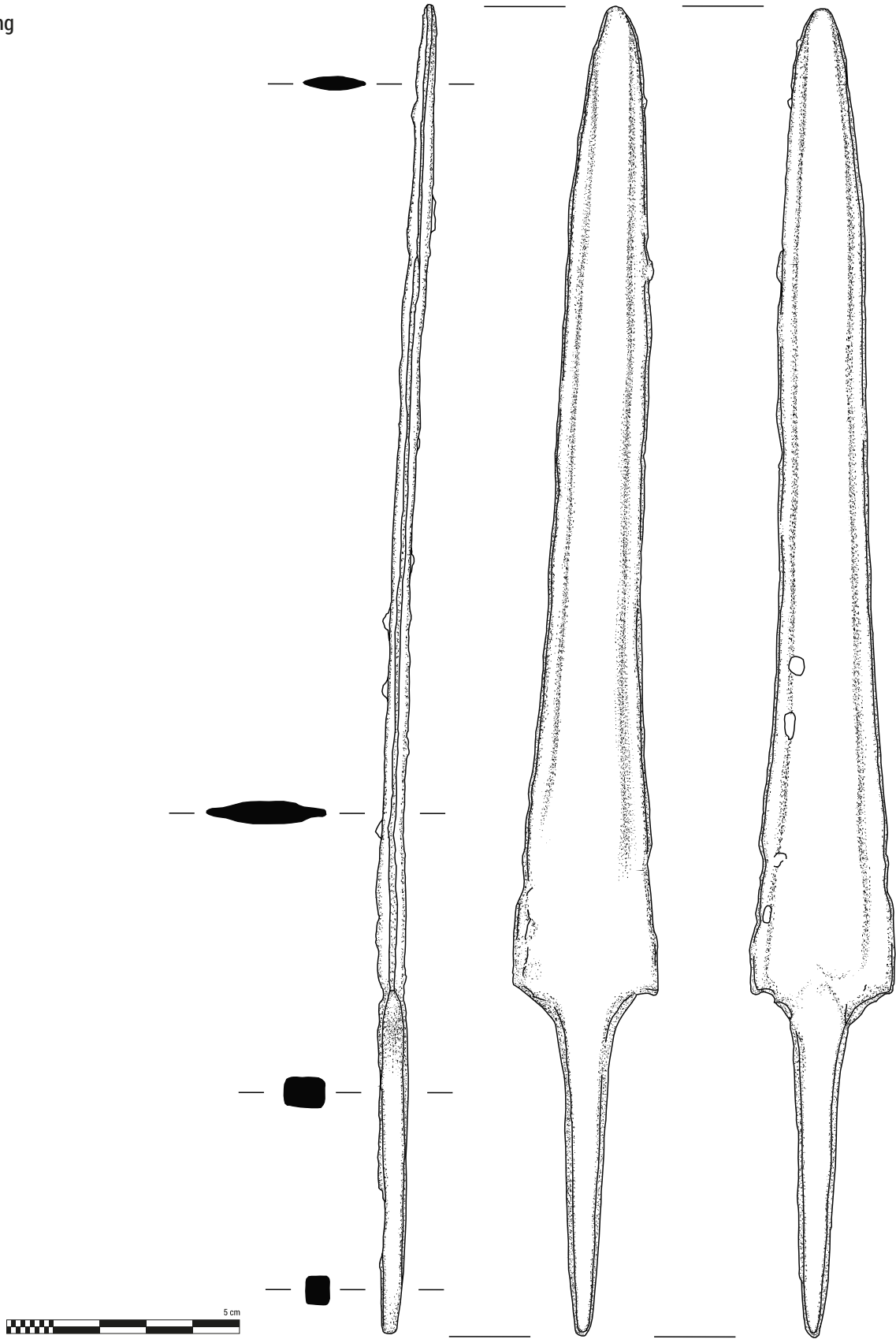


Post-conservation



GR20437

Drawing



Pre-conservation

BLADES

GR20437



5 cm

Post-conservation

GR20437



DAGGER

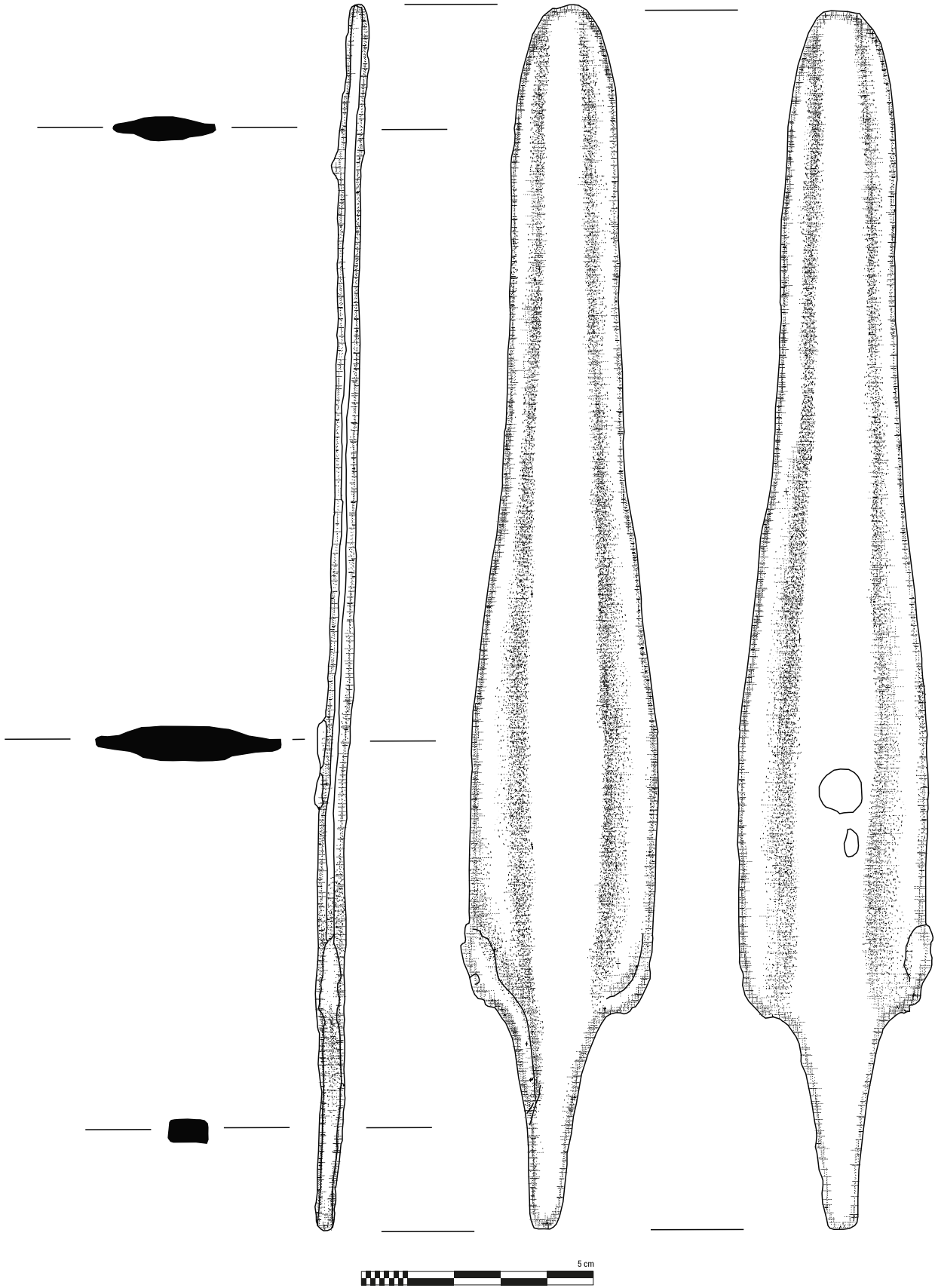
GR20482

Pre-conservation

Post-conservation



Drawing



BLADES AND SCRAPERS

Pre-conservation



SHP19_0068



GR20424



GR20421



GR20430



GR20429



GR20448



Post-conservation



SHP19_0068



GR20424



GR20421



GR20430



GR20429



GR20448



BLADES AND SCRAPERS

Pre-conservation



GR20473



GR20494



GR20470



GR20499



Post-conservation



GR20473



GR20494



GR20470



GR20499



AXE

GR20433

Pre-conservation



Mid-conservation

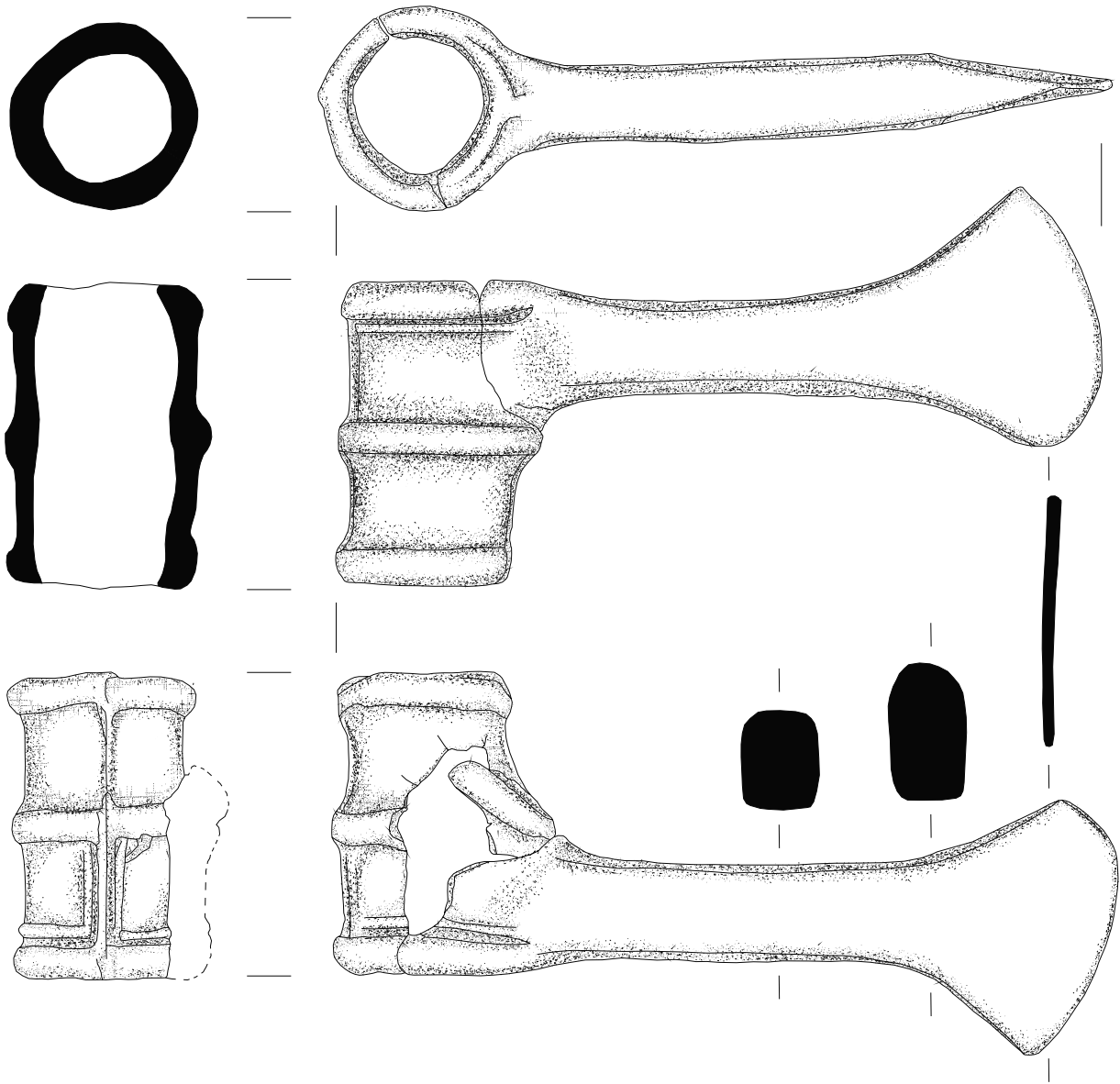


Post-conservation



GR20433

Drawing



SNAKES

GR20419

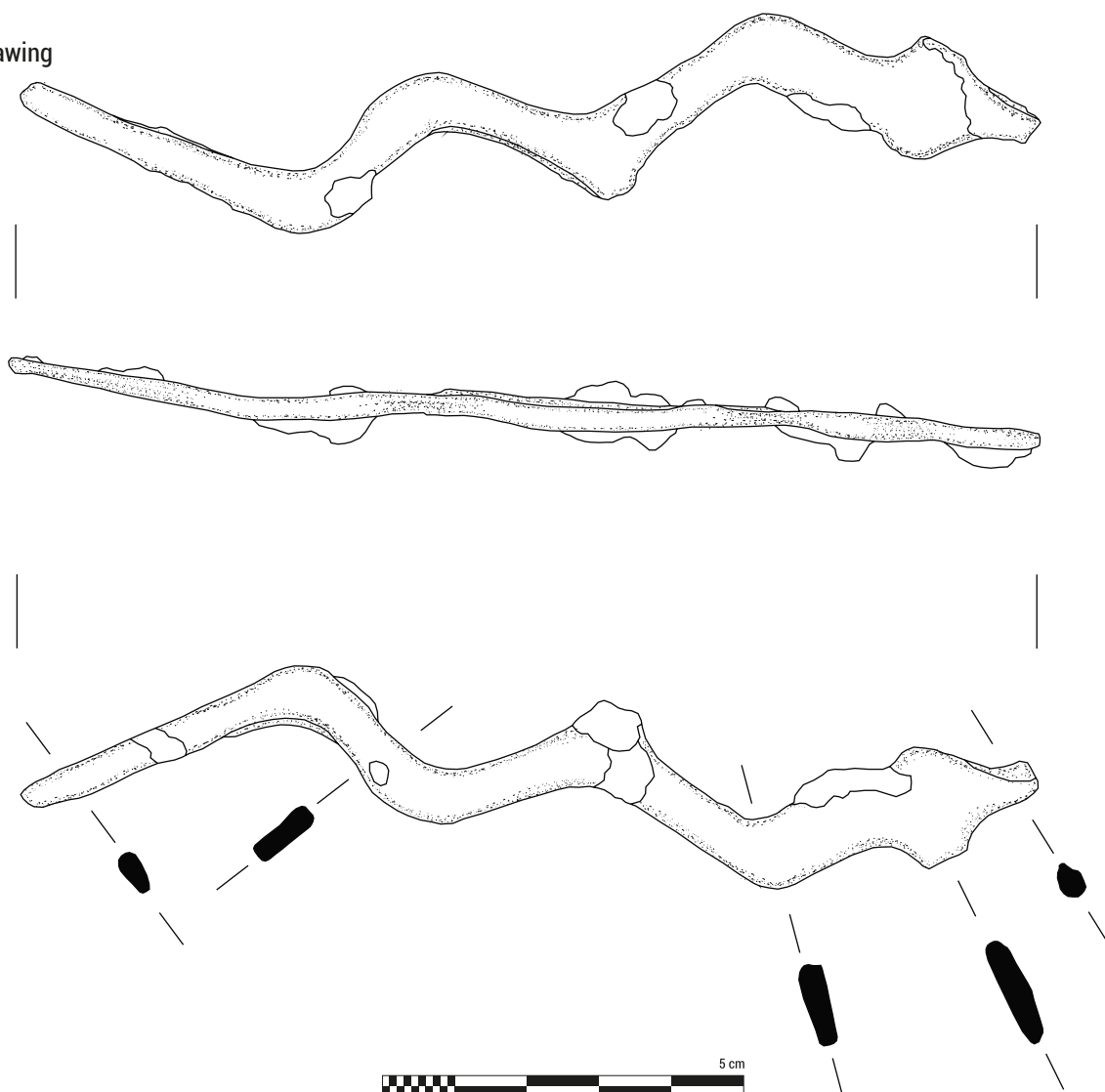
Pre-conservation



Post-conservation



Drawing



SNAKES

Pre-conservation

Post-conservation



GR20420



GR20406



GR20420



GR20428



GR20459



GR20452



GR20462



SHP19_0418



GR20466



GR20475



GR20484



ANKLETS

Pre-conservation

Post-conservation

GR20412



GR20413



AMULET

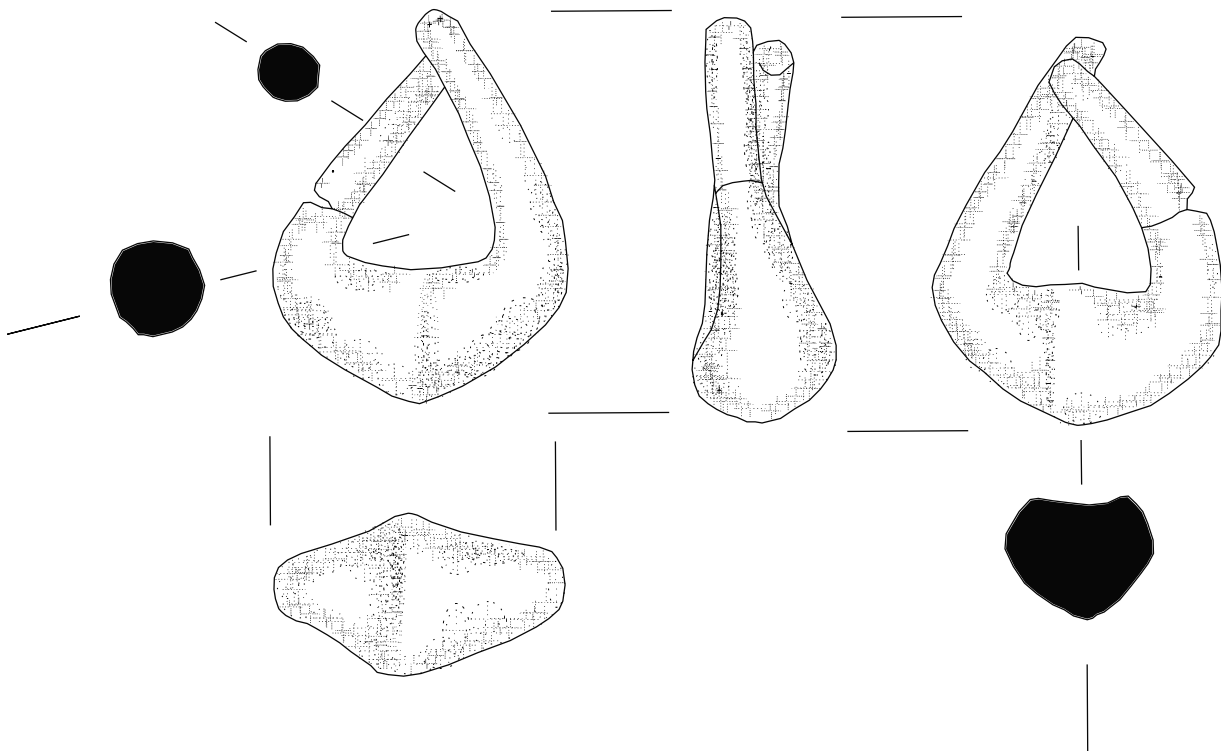
GR20509

Pre-conservation

Post-conservation



Drawing



2 cm



RINGS AND BRACELETS

Pre-conservation

Post-conservation

SHP19_0086



GR20417



GR20409



5 cm

Pre-conservation

Post-conservation

GR20410



GR20501



5 cm



CUPS

Pre-conservation
SHP19_0015



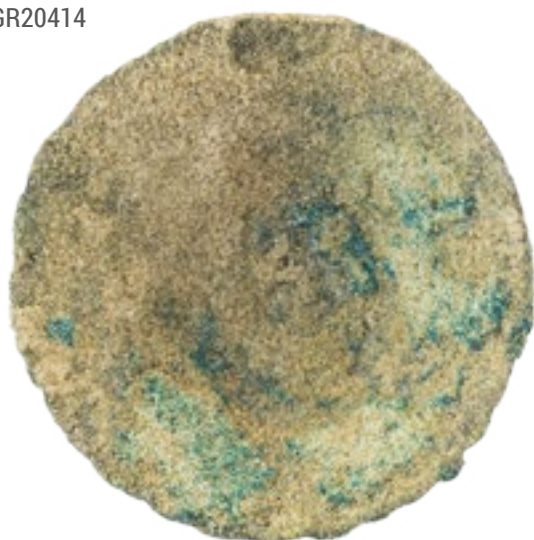
Post-conservation



SHP19_0016



GR20414



SHP19_0084



Pre-conservation
GR20450



Post-conservation



GR20463



GR20488



BOW

GR20447

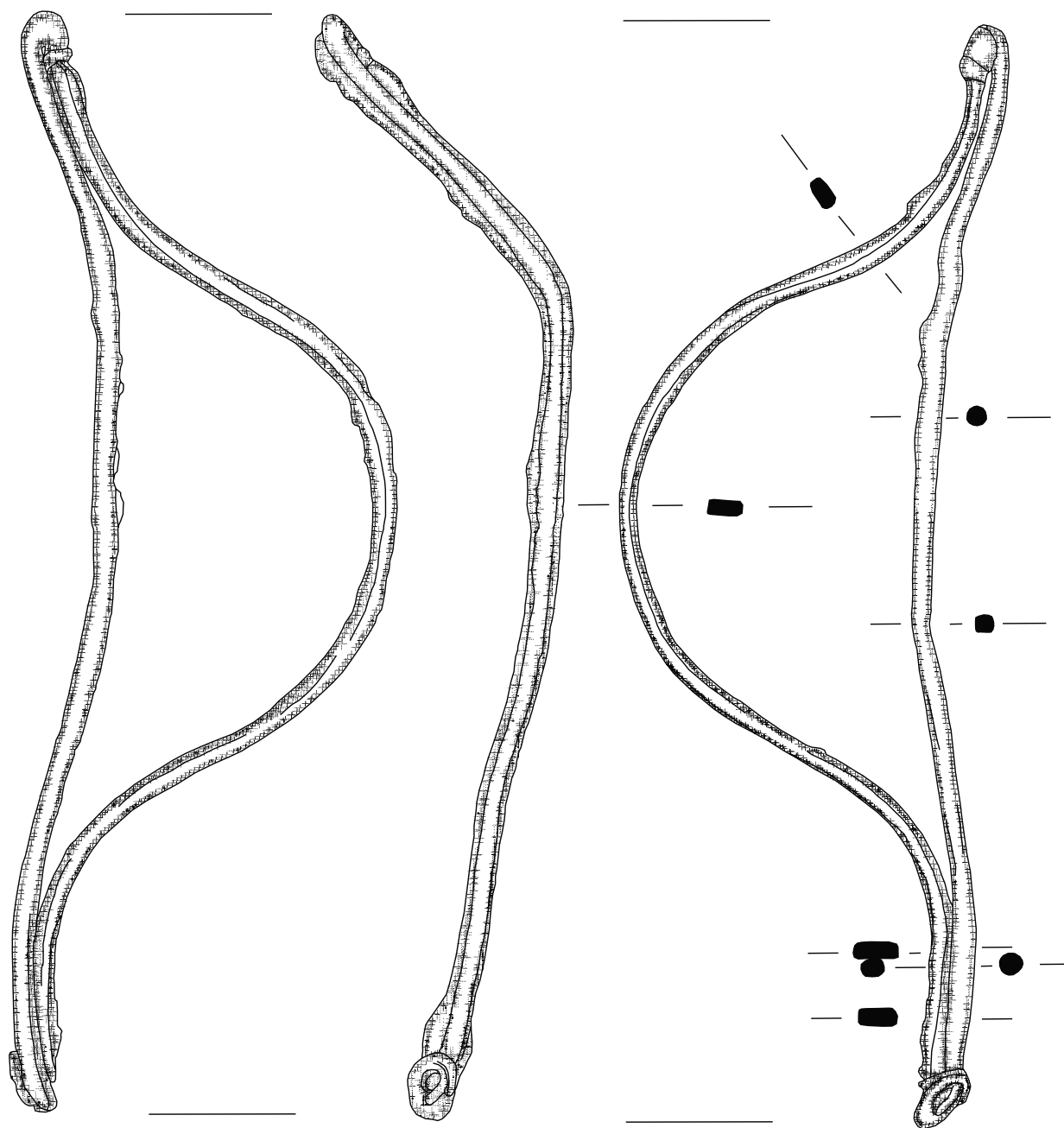
Pre-conservation

Post-conservation



GR20447

Drawing



TOOLS AND UTENSILS

Pre-conservation

Post-conservation

SHP19_0118



SHP19_0128



GR20408



GR20435



GR20495



2. Ceramic Analysis TEODOZJA RZEUSKA

INTRODUCTION

Pottery that has been retrieved in the season 2019 constitutes rather a very small assemblage. There are 38 ceramic objects, all but one are preserved fragmentarily, mainly as body sherds. There are only eight diagnostic items (rims, bases, spouts) including a complete jar. The whole assemblage has been analysed and described (see Appendix 1), selected objects have been drawn, photographed and catalogued. Beside the material from this season, ceramics from the previous campaigns (109 objects from the seasons 2016-2018), so far not studied by the pottery specialist, have been analysed.

Table 44. Distribution of ceramic objects within squares and strata excavated in the 2019 season (*matching fragments)

Stratum/square	R7	R8	S8	S9	T8	U8	U9	V8	V9	W8	W9	Total
Cleaning (C99)	0	0	0	1	1	0	1	1	0	0	0	4
Top dune	2	1	0	0	0	0	0	0	0	0	0	3
Upper slag	0	0	0	0	0	0	0	0	0	0	0	0
Inter-slag dune	0	0	0	0	0	0	0	0	0	0	0	0
Lower slag	3	4	0	0	0	0	0.5*	0	1.5*	0	0	9
Sub-slag dune/Post Iron Age	0	2	2	0	0	0	4	0	0	1	3	12
Iron II	2	2	0	0	3	0	1	0	0	0	0	8
Post-Wadi Suq	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Suq	1	0	0	0	0	0	1	0	0	0	0	2
Total	8	9	2	1	4	0	7.5	1	1.5	1	3	38

METHODOLOGY

Each of the ceramics except very small scraps has been given the individual sub-number which is composed of SRQ (abbreviation for the name of the site Saruq al-Hedid) and the following number starting with 110 (SRQ 1 to 109 are objects from the previous seasons). All these objects have been analysed in terms of the fabric, shaping method(s), surface treatment, and colour of the surfaces, firing and hardness. The colour(s) of both surfaces has been described using the Munsell® Soil Color Charts. The number of the items and the weight of each ceramic fragment/pot have estimated state of preservation.

POTTERY FABRICS

Fabric classification is based on the analysis of the fresh breaks (parallel to the wall of the pot) observed in the sunlight with the hand lens under the 10x and 20x magnifications. For the description of mineral inclusion the Grain Size Scale by the Geo Supplies Ltd. Sheffield® has been used. The fabric classification is based on the examination of the whole ceramic material from the Polish sectors at the Saruq al-Hedid (seasons 2016-2019). So far, there are 27 fabrics arranged in eight groups.

Group 1

(Probably = Handmade coarse ware in A. Benoist's typology)

So far, two fabrics have been distinguished in this group (Fabric 1.1. and Fabric 1.2). Both are characterised by large amount of black-rock particles (probably volcanic origin) visible to the naked eye in the break of the vessel's fragments and on the inner and the outer surface. The main difference between the variants is amount of sand, Fabric 1.1 is less sandy than Fabric 1.2., and it lacks red-rock particles. The fabrics are soft and break easily. Vessels produced from them have been fired in reducing atmosphere, *i.e.* without enough amount of oxygen, in lower temperature, what is attested by the zoned break with thick, greyish or blackish core in the middle. Both surface are brownish (7.5 YR 7-6/4 pink-light brown or 5 YR 6/4 light reddish brown). Among the ceramic material from the Polish excavations, there are only few, non-diagnostic sherds representing this group. All fragments bear traces of hand shaping, and judging only by the physical properties of the fabrics, *i.e.* thermal resistance achieved by the presence of large amount of rock inclusions, they might be fragments of a large cooking pot(s).

Fabric 1.1

Groundmass of brownish colour contains medium amount of fine, rounded sand; added inclusions are: large amount of black, sub-angular and sub-rounded rock particles of various sizes (up to 8 mm long), few white-grey (probably feldspar) sub-angular rock particles (up to 4 mm long) and sporadically few red-brown sub-rounded rock particles (up to 2 mm long). Sorting is very poor, porosity open and structure crumbly. There are no traces of organic inclusions.

Fabric 1.2

Groundmass contains large amount of fine, rounded sand; added inclusions are: large amount of black, sub-angular and sub-rounded black-rock particles of various sizes from fine to coarse (up to 5 mm long) and few white-grey, sub-angular rock particles (up to 5 mm long). Sorting is very poor, porosity open and structure crumbly. There are no traces of organic inclusions.

Group 2

(= Common ware with coarse red inclusions in A. Benoist's typology)

Up to the season 2019, nine variants (Fabrics 2.1-2.9) have been distinguished. The group is varied in terms of raw material, *i.e.* the clay, however, all the fabrics are characterised by the presence of red-rock particles (probably sandstone) of various sizes and amount visible in the break and on the surfaces. Plant inclusions, white-grey-rock particles and white particles (most probably crashed limestone base on the strong chemical reaction of the particles with 10% HCl) may occur in some variants. The first six variants (Fabrics 2.1.-2.6) constitute a very compact family in terms of the sandy groundmass and additional materials used to prepare the paste. The main difference between them lies in the proportions between particular type of the inclusions, *i.e.* red-rock particles, white inclusions and plant fragments; some variants are more 'organic', the others contain more limestone(?) or red-rock particles. The seventh, eighth and ninth variants, Fabric 2.7-2.9, have different groundmass that may indicate different geological (and/or geographical) provenance of the clays than that of the other fabrics in the Group 2. It is only the presence of the red-rock particles that allows assigning Fabrics 2.7-2.9 to the group.

Vessels produced from these fabrics seem to be fired usually in well-controlled process in oxidising atmosphere. Fresh breaks are mostly one-colour: orange, red, yellowish brown or greenish; those fired in the reducing atmosphere have grey and/or black zone(s) in the middle of the break or one colour break - greyish or black-greyish. Red-rock particles fired in the reducing atmosphere turned to be dark grey or black. In the material analysed so far, the fabrics have been used to produce large storage jars and small red-slipped bowls (Fabrics 2.6). In the latter variants of the fabric, the pastes used to produce the bowls, may contain only fine and medium red-rock-particles.

Fabric 2.1

The groundmass contains lot of fine sub-rounded and rounded sand. Inclusions are small amount of fine and medium sub-rounded and rounded red-rock particles (up to 2 mm) and medium organic inclusions visible mostly on the surfaces in the form of imprints and sporadically as white or greyish silica skeleton left by the burnt off straw. Sorting is fair, porosity medium, structure hard.

Fabric 2.2

The groundmass contains lot of fine sub-rounded and rounded sand. Added inclusions are large amount of fine to coarse sub-rounded and rounded red-rock particles (up to 6 mm) and medium amount of fine to medium (up to 2 mm) organic inclusions visible in the break as empty negatives left by the burnt off straw and grain hulls, sometimes with white or greyish silica skeleton, as well as imprints on the surfaces. Sorting is poor, porosity medium with elongated pores, structure hard.

Fabric 2.3

The groundmass contains lot of fine sub-rounded and rounded sand. Inclusions are few fine to coarse sub-rounded and rounded red-rock particles (up to 6 mm) and medium amount of fine to coarse organic inclusions visible in the break as empty negatives left by the burnt off straw and grain hulls, sometimes with white or greyish silica skeleton, as well as imprints on the surfaces. Sorting is poor, porosity medium, structure hard.

Fabric 2.4

The groundmass contains lot of fine sub-rounded and rounded sand. Inclusions are medium amount of fine to coarse sub-rounded and rounded red-rock particles (up to 6 mm). Organic inclusions are fine and occur accidentally. There also might be present few medium large sub-rounded white-grey-rock particles. Sorting is fair, porosity dense, structure hard.

Fabric 2.5

The groundmass contains lot of fine sub-rounded and rounded sand. Inclusions are medium amount of fine to coarse sub-rounded and rounded red-rock particles (up to 6 mm) visible in the break and less on the surfaces. This type of fabric contains large amount of white rock particles (limestone?) of various sizes (up to 5 mm). The most abundant are fine, sometimes burnt off and visible as white, white greyish or greyish hollow circles. Medium and coarse white particles are sub-angular and sub-rounded. Accidental are few amount of fine organic inclusions visible on the surfaces in the form of imprints and sporadically as white or greyish silica skeleton left by the burnt off straw. Sorting is fair, porosity medium, structure medium hard.

Fabric 2.6

The groundmass contains lot of fine sub-rounded and rounded sand. Inclusions are medium amount of fine to medium sub-rounded and rounded red-rock particles (up to 2 mm) visible in the break and less on the surfaces. This type of fabric contains also large amount of fine white rock particles (limestone?), sometimes burnt off and visible as white, white greyish or greyish hollow circles. Typical for this type are medium amount of medium and few coarse organic inclusions visible mainly in the fresh break in the form of white or greyish silica skeleton left by the burnt off straw. Sorting is fair, porosity medium, structure medium hard.

Fabric 2.7

The groundmass contains lot of fine and medium amount of medium size sub-rounded and rounded sand. Inclusions are medium amount of fine and medium sub-rounded and rounded red-rock particles (up to 2 mm) visible in the break and less on the surfaces. Few to medium amount white particles of fine and/or medium size are also present. Organic inclusions of medium to coarse

are few. Large red-rock particles (up to 6 mm) are few. Sorting is fair, porosity dens, structure medium hard to hard.

Fabric 2.8

The groundmass contains few amount of fine size sub-rounded and rounded sand. Inclusions are large amount of fine white particles (limestone?) and few amount of fine to coarse sub-rounded and rounded red-rock particles visible mainly in the break and less on the surfaces. Sorting is fair, porosity dense, structure hard.

Fabric 2.9

The groundmass contains few amount of fine sub-rounded and rounded sand. Inclusions are medium amount and of fine and medium white particles (limestone?) and few amount of sub-rounded and rounded red-rock particles of various sizes: fine to large, visible mainly in the break and less on the surfaces. Accidentally white-grey-rock sub-rounded particles of fine and medium sizes may be present. Sorting is poor, porosity medium, structure hard with elongated pores.

Group 3

(= Common ware with large sharp white grits in A. Benoist's typology)

So far, one fabric has been identified in this group. There are only few undiagnostic sherds made from this fabric representing most probably storage jar(s). It was most probably used to made storage vessels.

Fabric 3.1

The groundmass contains lot of fine sun-rounded sand. The main inclusions are large amount of sub-rounded white particles of various size from fine to large (up to 5 mm), the latter visible mainly on the surfaces. Present are also small amount of medium plant particles. Few medium pinkish sub-rounded and rounded rock particles (sandstone?) may occur as well. Sorting is poor, porosity dense, structure hard.

Group 4

(= Common ware with black grits in A. Benoist's typology)

So far, one fabric has been identified in this group. Similarly as to the Group 1, there are only few undiagnostic sherds representing this fabric, plausibly representing storage jar(s). It would be worthy to examine in the future the relationship of this group to the Group 1 due to similarity of the black-rock and white-greyish inclusions present in the both groups in abundance.

Fabric 4.1

The groundmass contains few to medium amount of fine rounded sand. The main inclusions are large amount of sub-angular and sub-rounded black-rock particles of various size from fine to coarse (up to 5 mm) with visible predominance of the latter. Present are also few amount of white particles of fine and medium size. Few large white-grey sub-angular rock particles (feldspar?) may occur as well. Sorting is very poor, porosity dens, structure hard.

Group 5

(= probably Common red wares with fine inclusions in A. Benoist's typology)

So far, six fabrics have been identified. The group is very varied in terms of the clay and the inclusions used to prepare particular type of the fabrics and definitely need further in-depth studies to reveal its relationship to the other groups, in particularly to the Group 2.

Fabric 5.1

The groundmass contains medium amount of rounded fine sand and small amount of medium to coarse sand, the two latter are sub-rounded. The main inclusions are plant inclusions: medium amount of fine and large amount of medium size. Visible are few amount of sub-rounded medium size black-rock and white-grey rock particles (up to 5 mm). Sorting is poor, porosity medium, structure medium hard.

Fabric 5.2

The groundmass contains large amount of fine rounded sand and small amount of medium to coarse sand, the two latter are sub-rounded. The main inclusions are plant inclusions: medium amount of fine and small amount of medium and coarse size. Visible are also large amount of fine white particles (limestone?). Sorting is fair, porosity medium, structure crumbly.

Fabric 5.3

The groundmass contains large amount of fine rounded sand and small amount of medium sand, also rounded. The main inclusions are fine white particle (limestone?): large amount of fine and small amount of medium size. Sorting is good, porosity dense, structure medium hard with elongated pores.

Fabric 5.4

The groundmass contains medium amount of fine rounded sand and few of medium and coarse sand, also rounded. The main inclusions are fine white particle (limestone?): medium large amount of fine and few of medium size. Plant inclusions are few amounts of fine and medium size. Red-rock sub-rounded and rounded particles of small and medium sizes may occur. Sorting is good, porosity medium, structure medium hard to hard with fine elongated pores.

Fabric 5.5

The groundmass contains medium amount of fine rounded sand. The main inclusions organic: medium amount of small, large amount of medium and few coarse. Few fine white particles may occur. Sorting is fair, porosity dense, structure medium hard with fine elongated pores.

Fabric 5.6

The groundmass contains few fine and coarser sand, medium amount of medium sand, all kind are rounded. The main inclusions are plant fragments large amount of medium size. There are medium amount of medium white particle (limestone?) and few medium, sub-rounded and rounded red-rock particles. Sorting is fair, porosity medium, structure medium hard with fine elongated pores.

The Fabric 5.6 seems to be similar to the Fabric 2.7, the main difference lies in smaller sand in the groundmass, smaller particles of red rock and at the same time more amount of white particles

Group 6

(= Sandy buff wares with fine or vegetal temper in A. Benoist's typology)

There are two fabrics identified up to now. The main difference lies in the amount of sand used to prepare the paste, Fabric 6.1 is more sandy and contains plant inclusions, the Fabric 6.2 is less sandy and has white particles (limestone?) instead of plant fragments.

Fabric 6.1

Greenish or greenish yellow groundmass contains few amount of sub-rounded and rounded sand various sizes from fine to large, occasionally large rounded sand-grains may occur in the paste. Main inclusions are medium amount of fine and medium plant particles visible mainly in the break. Sorting is fair, porosity medium, structure medium hard with elongated pores.

Fabric 6.2

Greenish or greenish yellow groundmass contains lot of sub-rounded and rounded fine sand, occasionally large rounded sand-grains may occur in the paste. Main inclusions are large amount of fine white particles (limestone?). Sorting is good, porosity dense, structure hard with fine elongated pores.

Group 7

(= Fine wares in A. Benoist's typology)

The group is composed of four fine fabrics that differentiate between themselves in type of the clay and amount of inclusions, which are mainly white particles (limestone?). Sand occurs rarely in this group. The Fabric 7.1 and Fabric 7.2 seem to be very alike, the only difference lies in the amount of inclusions. This kind of fabric was used to produce fine ware, such as cups, small bowls and bridge-spouted vessels.

Fabric 7.1

Groundmass is very fine (silty) and contains no sand, the break is very smooth. The only inclusions are medium amount of very fine white particles visible only in the break. Sorting is very good, porosity dense, structure medium hard.

Fabric 7.2

Groundmass is fine and contains no sand, the break is very smooth. The only inclusions are medium amount of fine and medium white particles visible only in the break. Sorting is very good, porosity dense, structure medium hard with fine elongated pores.

Fabric 7.3

Groundmass is fine and contains few fine rounded sand, the break smooth. The inclusions are large amount of fine and few amount medium white particles visible only in the break. There are also few fine rounded red-rock particles. Sorting is very good, porosity dense, structure medium hard with fine elongated pores.

Fabric 7.4

Groundmass is very fine and contains no sand, the break smooth. The inclusions are medium amount of fine white particles and few medium large visible only in the break. There are also few fine rounded red-rock particles. Sorting is very good, porosity dense, structure medium.

Group 8

(=Other wares in A. Benoist's typology)

Fabric 8.1

Egyptian Marl D fabric

The fabric is very dense and hard. The groundmass contains few medium rounded sand. The main inclusions are fine and medium large of white particles (limestone), the former are few, the latter more abundant. Few red-brown soft particles (marl?) are also present. Sorting is good, porosity dense, structure medium with elongated pores.

Fabric 8.2

So-called "Mineral Ware"

The fabric contain large amount of medium and coarse sub-rounded and rounded sand. Large amount of fine limestone in the vitrified white yellowish circles are visible. Few fine rounded red-rock particles may occur as well. Sorting is very good, porosity dense, structure hard with fine elongated pores.

TECHNOLOGY OF PRODUCTION

Two types of the shaping have been observed in the material from the season 2019, *i.e.* hand- and wheel-shaping. Most of the ceramic objects (86%) are hand-made, only a small group (14%) is wheel-made. Two types of hand shaping have been observed, *i.e.* slab building and coiling.

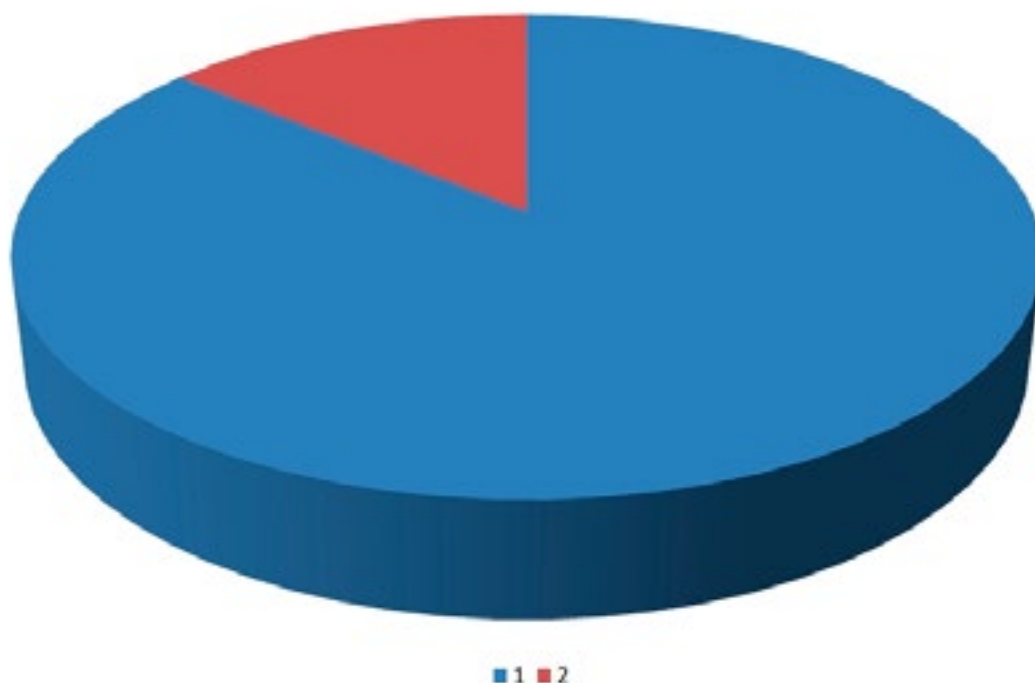


Figure 1. Diagram showing the proportion of hand-made – 1-blue colour, versus wheel-made pottery – 2-red colour (count by the amount of number of objects, the scraps have been not included in the statistics).

Surface treatment

The surface could be left natural (untreated, = N in the Appendix) or worked in a specific manner in order to tighten and smooth the walls as well as make the vessel more visually pleasing. If the surface (or surfaces) was coated in an extra layer of a mixture of water, pigment, binders and occasionally clay prior to firing it makes it slipped (=S in the Appendix) and depending on the colour of the pigment used in the mixture it could be, for example, red slipped (=RS in the Appendix) or black slipped (=BS in the Appendix). Further, the surface could be polished (= P in the Appendix) using a soft material, *e.g.* fabric. At this point it should be noted that in the vessels made of certain types of clays (Egyptian marl D) a thin layer called scum can be observed on the surface (= S in the Appendix).

Decoration

Among the pottery from this season only two types of decorations have been observed, *i.e.* painted and incised decoration, both executed prior to firing.

Firing

Two firing methods have been identified in the presented material: in the oxidized or reduced environment. The first one takes place when the clay is fired evenly and the fracture is either monochromatic or with a narrow core of a slightly different colour in the middle. The second method is evident from the fracture either with a thick dark core or of a uniform grey or black colouring.

Some vessels, especially those large with varying thickness of the walls, can show evidence of the firing in mutable conditions.

Hardness

Hardness is based on a simplified Moh's scale, adapted to field conditions: 1 –soft when the surface can be scratched with a fingernail, 2 – medium hard when it can be scratched with copper wire, 3 – hard when it is scratchable with a knife, 4- very hard when only glass can scratch it.

ANALYSIS OF THE CERAMICS

The most objects (29) originate from the three strata: lower slag, sub slag dune/post Iron Age and Iron Age II. It makes c. 77% of the total number of the ceramic objects.

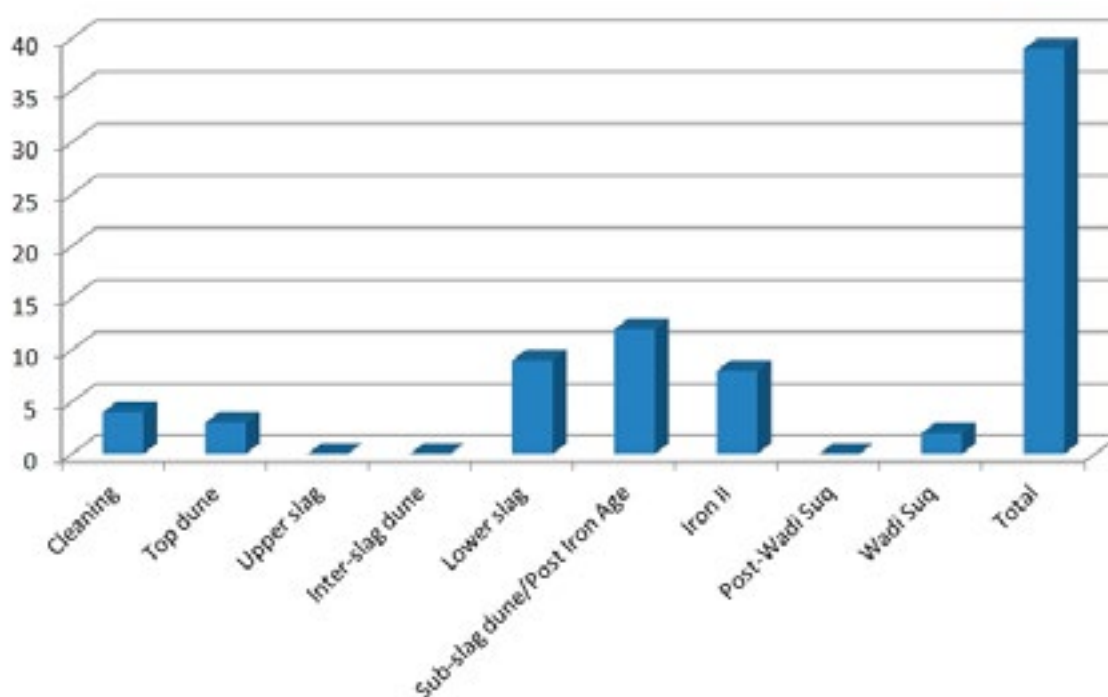


Figure 2. Diagram showing distribution of the ceramics within each stratum excavated in the season 2019 (count by the amount of number of the objects). The most numerous are finds within the strata from the Lower Slag down to the Iron II.

The majority of the vessel date to Iron Age II. All the ceramics but probably one, have been found in the secondary position. The only object that might have been found *in situ* is the medium large complete jar (SQR 14; SAH19_0072, GR 20411) found in the square T8 in the Iron II stratum (Figure 3).

Secondary position of the pottery is proofed not only by its fragmentary state of preservation, but also mostly by the fact, that matching fragments of the ceramics were scattered across several squares. Worthy to mention are lower part from of the large storage jar (Figure 4) fragments of which have been found in the sectors U9 and V9 (SQR 144 SAH19_0445, SAH19_0446, SAH19_0449, SAH19_0450) and sherds of the bridge-spouted vessel (Figure 5). Pieces of the latter vessel originate from several squares, i.e. the rim from U9 and T8 (SQR 120, SQR 129 and SQR 78, SAH19_0774, SAH19_0092, SAH18-T8/6305/027), the middle part of the spout in U7 and T8 (SQR 130 and

SQR 75; SAH17-U7/7602/bulk020, SAH19_0092), the bridge in U7 (SQR 76 and SQR 77, SAH17-U7/7602/003) and the age of the spout from U8 (SRQ 73, SAH18-U8/6217/bulk001). Moreover, the fragments of one vessel can be found in various stratum. The best example is the middle part of the spout of the mentioned above bridge-spouted vessel. One fragment, secondary fired (SQ 75, from the season 2018) has been found in Ash/charcoal and adjacent sand deposit layer above Iron Age II, the other perfectly matching to it (SQ 130) in the stratum Iron II. This proves that the vessel was broken before one fragment ended up in the fireplace where it was accidentally burnt. This is also very evidence that activity associated to metallurgic production and connected to the slag layers caused destruction of the underlying structures. It is also therefore why the pottery of Iron Age II can be found in all the strata, from the top dune to Wadi Suq.

Beside the ceramics of Iron Age II mentioned above, i.e. the complete medium large jar, the lower part of a large storage vessel (possibly the same type jar as those with appliqué snake decoration) and the bridge-spouted vessel, worthy to present is a fragment of a four-lugged pot (SRQ 115, SAH19_0776) (Figure 6) similar to the one found in the previous season (SAH18-V7/7708/009 GR17062). Slightly later, i.e. dated to Iron Age III, seems to be half of the small carinated bowl (SRQ 122, SAH19_0012) (Figure 7) originating from the Sub-slag dune/Post-Iron Age stratum. Occurrence of the Iron Age III vessel may also prove some activity during this period.

One fragment of an Egyptian Marl D fabric (SRQ0127, SAH19_0220) has been recorded in the material (Figure 8). It represents most probably the lower part of the bottom of a late New Kingdom amphora (XIX-XX Dynasties). Such a vessel had been produced rather in Upper Egypt than in Delta. This is the second fragment of the same kind from the Polish sector find up to now. How the ceramics from the Nile valley got to the site is a matter of further studies. Presence of Egyptian pottery at Saruq al-Hedid is another proof that the site was point on the ancient international trade rout.

The most intriguing finds are ceramic sherds secondary used as tools. The total number of them is 34, what makes 23% of the whole ceramic material from the Polish excavations. There are various type of the tools, some are rectangular (Figures 9a-c, 10a-b) or triangle with rounded edges that may be used e.g. as shovels, the other have the concave or convex working edge.

It seems that accidental pottery fragments were not chosen. Most of them are made from the thick fragments of large storage vessels representing fabrics of the Group 2, hard and sandy. What they had been used for will be the subject of the future studies, nevertheless, it seems that in one case it was possible to determine what the tool could be used for. This is a small fragment of the tool with convex edge that fits perfectly to the large shell (Figure 11). It seems very probably that the outer surface of the shell had been smoothed just with such a tool. Therefore, beside the metallurgic activity, production of shell plaque could take place at the site as well. Reusing broken – a sort of “ancient recycling” - sherd to make ceramic tools proves creativity of the ancient workers doubtless.

As to the ceramic finds from the Wadi Suq stratum, all date to Iron Age II (fine wares, one sherd is the fragment of the mentioned above bridge-spouted vessel). There is however, possibility that sherds made from the Fabrics 1.1 and 1.1 could be associated with this period. The coarseness of the fabric preparation and the technic of shaping would vote for such a possibility.

Summary

Summarising the above analysis of the pottery from the season 2019 one has to stress that despite that the ceramic assemblage was tiny, it proves to be a valuable source of the knowledge about the site. It demonstrate the chronological frames of the human activity on the excavated squares, give data about international contact of Arab Peninsula with the Valley of the Nile and show clearly how creative were the ancient people.

Catalogue

See Appendix B (accompanying spreadsheet) for full catalogue of details for the 2019 season.



Figure 3. Complete medium large jar found in Iron Age II stratum (SRQ 145, GR 20411, SAH19_0072). Note the erosion around the bottom of the jar that could be result of placing the vessel in a pot-stand or more probably in a hole dug in the pavement(?).



Figure 4. Lower part of an Iron Age II large storage jar (SRQ0144, SAH19_0445, SAH19_0446, SAH19_0449, SAH19_0450).



Figure 5. Fragments of an Iron Age II bridge-spouted vessel (the rim - SQR 120, SQR 129 and SQR 78, SAH19_0774, SAH19_0092, SAH18-T8/6305/027; the middle part of the spout - SQR 130 and SQR 75, SAH17-U7/7602/bulk020, SAH19_0092; the bridge - SQR 76 and SQR 77, SAH17-U7/7602/003; the age of the spout - SRQ 73, SAH18-U8/6217/bulk001). Note the painted red decoration on the spout and incised on the rim.



Figure 6. Fragment of an Iron Age II four-lugged pot (SRQ 115, SAH19_0776).



Figure 7. Small carinated bowl of Iron Age III date (SRQ 122, SAH19_0012)



Figures 8a,b. The outside (on the left) and the inside (on the right) of an Egyptian Marl D amphora sherd dated to the late New Kingdom (SRQ 127, SAH19_0220).



Figures 9a,b,c. The outside (on the top) and the inside (on the bottom) and the edge (middle) of a partly preserved rectangular ceramic tool (SRQ 143, SAH19_0857). Note the smoothed working edges of the tool.



Figures 10a,b. The outside (on the left) and the inside (on the right) and the edge (above) of a ceramic tool (shovel?) made from lower part of a large storage vessel (SRQ 112, SAH19_0007). Note the smoothed edge of the tool and the partly preserved edge of the base visible on the inside view.



Figures 11a,b. Concave ceramic tool (SRQ 19, SAH17-V8/6512/001) and the shell plaque (SAH19_0551) fitting to its shape.

3. Lithic Analysis SIDNEY REMPEL

Flaked stone materials recovered during excavation in 2019 come almost exclusively from the Wadi Suq phase of the site. In the Polish Mission portion of Area F, this relates primarily to the thin deposit of silty gravel that lies above gypsum bedrock (C88). This phase is represented in each square by at least one context, except for C99 which consists of lithic material recovered during square cleaning and whose provenience is in question. It can be assumed with a high degree of confidence that lithic materials found during cleaning are also associated with the Wadi Suq phase.

The bulk of lithic material is comprised of small fragments of flint debitage, such as secondary and tertiary flakes, chunks, and chips (See Table 45). This material was mixed with non-flint gravel as a component of possible water-lain sheetwash that episodically tumbled the gravel, breaking up worked lithic debitage further. Larger, well preserved flint flakes and cores were present in several squares, but squares T8 and W8 bore a series of fine brown flint flakes that are likely from the same source core, and possibly reconstructable after labeling is completed. (See Figures 3-6, 13, 14a-f; Table 46). Five cores are also present in several squares, demonstrating local processing in the form of core reduction for smaller flakes as possible composite tools or ad hoc small blades. None of the cores found produced the larger brown flint flakes from T8 or W8 and which are entered into the general registry. The formation of a patina on portions of some cores after flaking indicates that they may have been left dormant for some time before being reused.

One flake tool was recovered from square T8, C702: A complete brown flint flake that has been retouched laterally on its dorsal side and likely represents an *ad hoc* scraper for expedient use in processing another material (e.g. wood, hide) (GR 20485. See Figure 4 and Table 46)

Table 45. Summary of Lithics recovered in 2019.

Lithic Type	Count	Weight (g)
Flint Tool	1	9.1
Flint Cores	5	172.1
Flint Flakes	20	101
Debitage	372	772.53

Table 46. General Registry Lithics recovered in 2019 with description.

GR #	Artifact	Description	Square	Context
20485	Flint Tool	Scraper. Secondary flake retouched on lateral edge, dorsal side. Brown mottled flint. Flake platform present. Ad hoc tool used as side-scraper.	T8	702
20427	Flint Core	Medium tan. Multi-directional flaking. Calcium patina on ~12% flaked surface.	R7	1203
20461	Flint Flake	Complete. Unknown color (heavy patina). Platform present.	S8	503
20469	Flint Flake	Complete. Grayish-brown flint. Secondary. Platform partially shattered. Hinged distal terminus. Patina present on half of dorsal face.	T8	702
20517	Flint Flake	Incomplete. Brown flint. Secondary. Platform absent. Partial cortex present near proximal dorsal end in flake scar.	T8	99
20518	Flint Core	Possible material test. Light brown/tan flint. Multi-directional flake scars. Cortex/patina present on 3 sides.	T8	99

20519	Flint Flake	Incomplete (split). Brown flint. Secondary. Cortex present on lateral and distal edges.	T8	702
20520	Flint Flake	Complete. Brown flint. Tertiary. Platform present.	T8	99
20521	Flint Flake	Complete. Brown flint. Secondary. Cortex present on lateral and distal edges.	T8	99
20522	Flint Flake	Complete. Brown flint. Tertiary, possible bifacial retouch flake. Cortex present on distal edge.	T8	702
20523	Flint Flake	Complete. Brown flint. Tertiary.	T8	702
20524	Flint Flake	Complete. Brown flint. Secondary. Cortex partially present on platform. Cortex on distal end.	T8	702
20401	Flint Flake	Complete. Brown flint. Secondary reduction flake. Partial cortex present. Platform present.	U9	305
20407	Flint Flake	Complete. Grayish-brown flint. Tertiary, partial platform present	U9	305
20425	Flint Core	Brown flint. Multi-angled flake removal. Cortex present on bottom and top: 15% of surface. Possible preform retouching on one edge.	U9	305
20506	Flint Core	Brown flint. Multi-directional flaking. 20% cortex present.	V8	101
20509	Flint Flake	Complete. Light brown flint. Cortex present on lateral and distal sides. Patinated platform present.	V8	99
20471	Flint Flake	Complete. Brownish-orange flint (mottled). Secondary, with cortex present on lateral edge. Platform present.	V9	806
20504	Flint Flake	Complete. Brown flint. Secondary. Cortex present. Platform present	V9	809
20510	Flint Core	Core fragment. Brown flint. Multi-directional flaking. 15% covered with patina. Surface smoothed by sand/water.	W8	203
20511	Flint Flake	Complete. Brown flint. Secondary. Platform present. Cortex present on one lateral edge.	W8	203
20512	Flint Flake	Complete. Brown flint. Secondary. Platform present. Cortex present.	W8	203
20513	Flint Flake	Incomplete. Brown flint. Secondary. Half platform. Cortex present.	W8	203
20514	Flint Flake	Complete. Brown flint. Secondary. Platform present. Cortex present on platform and lateral edge.	W8	203
20515	Flint Flake	Complete. Brown flint. Secondary. Platform present. Cortex present on platform and distal end.	W8	203
20516	Flint Flake	Incomplete. Brown flint. Secondary. Platform slightly chipped. Cortex present on lateral and distal edges.	W8	203



Figure 1. Multiple views of flint core. Multidirectional reduction, partial patina. (GR20427, Square R7, C1203)



Figure 2. Secondary flint flake with heavy patina. (GR20461, Square S8, C503).



Figure 3. Hinged Secondary flint flake with partial patina. (GR20469, Square T8, C702).



Figure 4. Retouched secondary flake tool (Scraper). (GR20485, Square T8, C702).



Figure 5. Flint core / possible material test with multi-directional flaking (GR20518, Square T8, C99).



Figure 6. Secondary reduction flint flake with partial cortex. (GR20521, Square T8, C99).

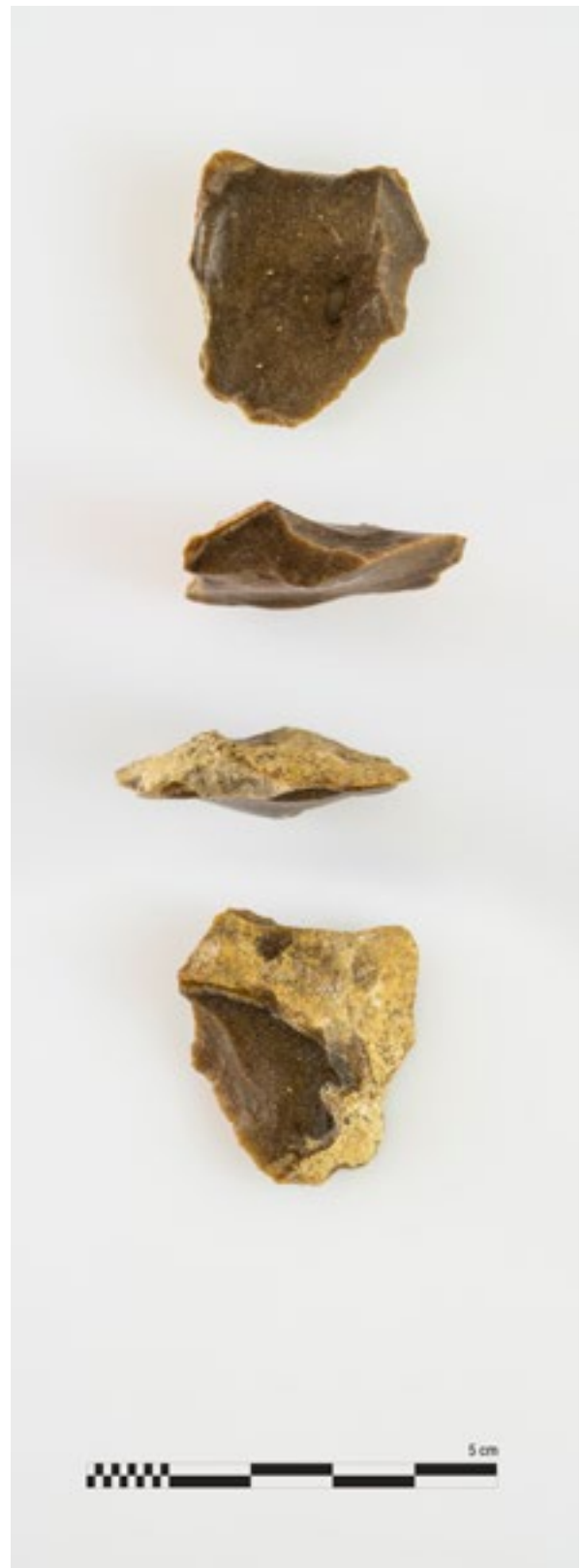


Figure 7. Secondary flint flake with partial cortex. (GR20401, Square U9, C305).



Figure 8. Multiple views of flint core with possible preform retouching (GR20425, Square U9, C305).



Figure 9. Multiple views of flint core. (GR20506, Square V8, C101).



Figure 10. Secondary flint reduction flake with partial cortex on lateral and distal sides. (GR20509, Square V8, C99).



Figure 11. Orange-brown secondary flint flake with partial cortex. (GR20471, Square V9, C806).



Figure 12. Secondary flint thinning flake with partial cortex. (GR20504, Square V9, C809).



Figure 13. Flint core with multi-directional flaking. Surface eroded by wind/water. Partial patina present. (GR20510, Square W8, C203).



Figure 14a-f. Brown flint secondary reduction flakes. Cortex present on all flakes. (Top left to bottom right: GR20511-GR20516, Square W8, C203).

4. Geospatial Management / Photogrammetry OTTO BAGI

The various aspects of spatial documentation were carried out by applying a range of methods. Information on the elevation and extent of contexts, features and structures were gathered by a Leica TCRP 1202 total station in WGS 84 / UTM zone 40N coordinate system. The collected data was processed daily in a GIS software (QGIS v3.4.2) to produce maps that aided the day-to-day documentation work of square supervisors.

Similarly, the three-axial locations of finds were recorded by total station. Either single measurements were taken at the centre of objects, or in the case of artefacts with elongated shape (e.g. blades, spearheads) the coordinates of end points were recorded. Additional information on size and orientation was collected by capturing an *in situ* top-down view photo of each object accompanied by a north arrow and a scale bar. In practice, this enabled the georeferencing of images in a CAD software (Autodesk AutoCAD 2018) which provided an efficient way for the digitization of each *in situ* artifact.

The documentation of square profiles, structures and bedrock was completed via photogrammetry. Following the preparation of the surface (e.g. trimming, cleaning, watering) and the placement of ground control points (GCP), a series of photographs was taken along a parallel path to the recorded surface. In the case of extensive horizontal surfaces, the process of documentation was streamlined by mounting the camera (Sony NEX-5R / 16 mm f/2.8 lens) on a 3 m tall pole to increase its field-of-view and consequently reduce the number of images required to cover the recorded area. The coordinates of GCPs were recorded by total station. The gathered data was processed in Agisoft Metashape (v1.5.0) to create 3D models, orthophotos and digital elevation models (DEM). In total, 10 plan-view and 16 section-view (including two well shafts in area G and H) models were created thru this method. The orthophotos and DEMs were further processed in Autodesk AutoCAD and QGIS in order to bring them to the same standard prior to digitization. The raster dataset was repositioned and reoriented to its original location within the site grid, in effect, creating a 3D mosaic that represents the site layout at the various stages of excavation.

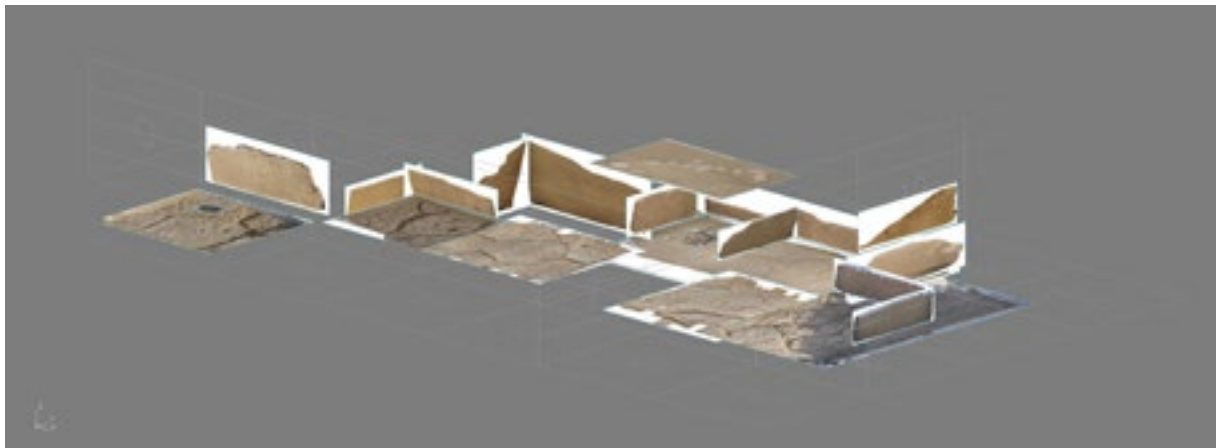


Figure 1. Georeferenced 3D mosaic of orthophoto profiles and plans created via photogrammetry and assembled in Autodesk AutoCAD.

Additionally, the DEMs were visually enhanced to increase their interpretive value, and detailed topographic maps were generated from them with 0.5 cm or 10 cm contour line intervals. Finally, the produced dataset was combined for vector drawing in CorelDraw (X8).

5. Geomorphology and Geology of Saruq al Hadid Archaeological Site and Beyond

HUBERT KIERSNOWSKI

REPORT OBJECTIVES

This report presents the results of geomorphological and geological survey conducted at the multi-period archaeological site of Saruq al-Hadid in the Dubai desert. The main goal was to understand the relationship between paleo-geomorphology of the area and paleo-environmental conditions. The second goal was to try to determine the age and origin of sediments in relation to dated human activity on the site .

PREVIOUS GEOLOGICAL AND GEOMORPHOLOGICAL STUDY.

There was several regional geological and geomorphological studies, including area of Saruq al Hadid .

The geophysical surveys conducted by Archaeological Services Durham University 2014, resulted with detection of “possible sub-surface arrangements of limestone blocks in Areas 1 and 7, which could potentially reflect the foundations for buildings or other structures. Both possible structures are in areas where slag and other cultural materials are present, as well as other larger possible features”.

According to Jason T. Herrmann (2013) “A three-dimensional model of aeolian deposits interleaved with layers of cultural materials was created from the results of a ground-penetrating radar (GPR) survey at Saruq al Hadid, a multiperiod archaeological site located on the eastern fringe of the Rub al-Khali desert in the United Arab Emirates”. It gave results in form of ground-penetrating radar profiles, enabling observation of geomorphological structures related to levels containing archaeological artifacts and “illustrates a history of occupation and sediment accumulation recorded at Saruq al-Hadid that is consistent with chronologies of environmental change and settlement proposed elsewhere for the third through first millennia BCE”.

Casana (Casana et al., 2009) have pointed to rapid climate changes that have historically resulted in establishing settlement or caused abandonment of the area. They concluded: “If our working hypothesis that the short-lived, low-intensity pluvial periods during the late Holocene, documented by Parker et al. (Parker, Goudie et al. 2006a; Parker, Preston et al. 2006b), were of sufficient strength to maintain surface and near-surface fresh water in desert areas, then other settlements contemporary with Al-Ashoosh and Saruq al-Hadid may exist”.

Authors (Casana et al., 2009) note that “traces of water sources themselves should be present at or near these two important sites. (.....). We also intend to conduct further subsurface geophysical survey at known sites and their environs in order to map architectural remains and possibly identify ancient lacustrine or other hydraulic features. Geomorphological and palaeo-environmental investigations will also be undertaken both at individual sites and across the larger region”.

This report is a reference to the above statement.

SCOPE OF FIELD INVESTIGATIONS DURING APRIL 7-20, 2019

The field work covers area of archeological site (excavations) and most of fenced archeological area.



Figure 1. Saruq al-Hadid and environs, showing location of Polish Mission excavations 2019. (Image Google Earth, January 1 2019)

The main goal was to answer questions concerning environmental conditions (possibility of access to fresh water) and landscape geomorphology during period of human settlement called Wadi Suq culture (2000 to 1200-300 BC), as well to Iron Age II (1000-600 BC).

The oldest rocks recognized on the area are limy sandstone or limestone with thin intercalations of small gravel beds. There is a characteristic occurrence of coated sand grains and fossilized drilled tunnels, possibly representing traces of the activity of the organisms of the shallow-marine environment (e.g. crabs or mollusks). It means that sandstones represent outcropped remnants of Middle Miocene Meishan Formation.



Figure 2.

Sandstones separate in the form of blocks and slabs. Such sandstone slabs were found on archaeological site, in Polish sector F.



Figure 3.

At present, these sandstones form series of small erosional forms in shape of low mounds with some small rock slabs on the surface. These mounds are covered by dispersed gravel deposits.



Figure 4.

Currently (and possibly in the past) they are being mined in a small quarry.

The next stage of deposition visible on surface is represented by palaeo-lake (playa) sediments, preserved in some lowered places in form of thick gypsum-calcareous beds. These deposits were formed during several stages of dry and wet climate periods in time of Late Pleistocene and Early Holocene (Warren, 2016).

Warren (2016) concluded for southeast Arabia: “During the Late Pleistocene, from 30 to 20 ka, the closed depression become a saline lake, and fluvial flow brought in detrital silt and clay. A drier climate prevailed from 20 to 15 ka and the lake changed to a sabkha. Wetter conditions returned towards the end of the Pleistocene, from 15 to 12 ka, and the perennial saline lake was re-established, whereby halite was dissolved but gypsum still remained. In the interval from 12 to 9 ka, sabkha conditions were again established with deposition of displacive gypsum and minor halite in a sandy matrix. During the Early Holocene wet phase, from 10 to 5.5 ka, a saline lake formed again only to terminate in the arid capillary gypsum/halite conditions from 5.5 ka to the present day (Heathcote and King, 1998)”.

According to Edgell (2006): “Most duricrust has formed where the groundwater table has been close to the surface. Sheets of gypsum crystals form duricrust, or are present as masses of gypsum crystals usually mixed with much siliceous sand (and gravels – added by HK), just above the shallow, saline groundwater table”. Calcareous duricrust, or calcrete, covers large areas of northern Saudi Arabia (Edgell, 2006).



Figure 5.

Duricrust with well-developed gypsum crystals. Note that gypsum crystal has vertical position within sedimentary bed.



Figure 6.

Duricrust surface beds visible in artificial holes, dug in the area north-east of the main excavation area

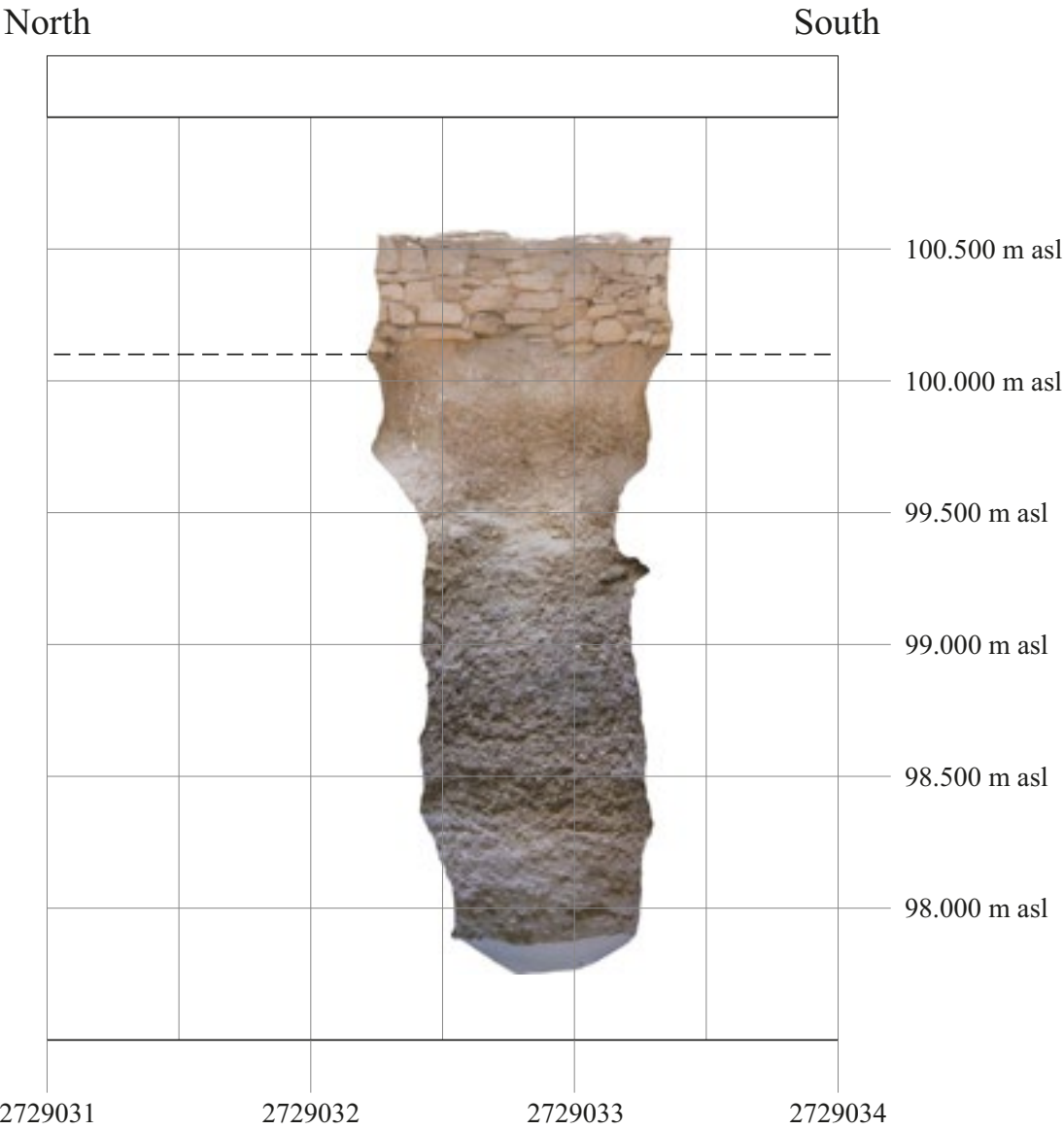


Figure 7.

Duricrust beds visible in artificial well, dug in the area of the central part of former archeological excavations. Note the share of small stones (rounded or sub-angular) within the thick crust of sediment formed as a result of evaporation.

South-east

North-west



Figure 8.

Duricrust beds visible in artificial well, dug in the area of the central part of former archeological excavations. Note the gypsum cap with intersection of large cracks (part of polygonal pattern on surface). The gypsum cap formed in places subject to capillary leakage processes and often flooded in the past (Matter et al. 2014).



Figure 9.

On the playa (sabkha) surface are large desiccation cracks originated from the last stage of strong drying. Note the more smooth surface of more fine gypsum crystals (gypsum cap).

OSL data from Saruq al Hadid (Australian Report) from sample from sand below the compact gypsum horizon give age 15 ± 1 ka.

Related to Australian Report “the formation of gypsum deposits at Saruq al Hadid relates to the presence of an inland sabkha system in the area, an indicator that a wetter climate regime prevailed at the site most probably in the Early Holocene Humid Period (EHHP) or the subsequent mid-Holocene Humid Period (MHHP, c. 5.0-4.3 ka BP). These reconstructions are broadly consistent with previous (unpublished) date 5.8 ± 0.3 ka BP for sands immediately overlying the gypsum pavement at the site (Bruckner and Zander 2004; reported in Herrmann et al. 2012), indicating dune accumulation in the arid phase between the EHHP and MHHP.

GRAVEL AND SAND SHEET

The cover of dispersed gravel sheet is observed in area of interdune playas (inland sabkhas) spread on almost flat plain between present or older dunes. These gravel sheet is registered in archeological excavations. Is interpreted as represented horizon of Wadi Suq culture, when it contains ceramic shreds, bones, beads, bronze (copper) artifacts.

Gravel sheet is coeval with sand sheet. Sandstones below are encrusted by gypsum, possibly anhydrite and calcite forming hard duricrust horizon. There were any influences of pedogenic processes on the origin and evolution of such desert pavement (semi-serir).



Figure 10.

Duricrust – gypsum pavement below sand-gravel sheet



Figure 11.

Sand-gravel sheet form a very thin bed on gypsum pavement.

Most of pebbles from gravel sheet varying in size from few millimeters to 2-3 cm. Some of them exceed more than 10 cm. Large pebbles are rounded and often broken. Small pebbles are angular or sub-angular. This is the result of prolonged weathering in desert conditions. A significant part of the pebbles showing desert varnish (an orange-yellow to black coating found on exposed rock surfaces), wind scours (rocks abraded and polished by wind-driven sand).

The origin and composition of gravel pebbles are varied. These are mostly siliceous rocks, magmatic rocks, metamorphic rocks and in the minority sedimentary rocks (carbonates and sandstones). Pebbles came from the southeast with eroded mountains in Oman.



Figure 12.

Sand-gravel sheet characteristic for Saruq al Hadid area.

A common theory for the formation of such desert pavement suggests they form through the long lasting, gradual removal of sand, dust and other fine-grained material by the wind and intermittent rain, leaving the larger fragments behind.



Figure 13.

Thin layer of sand and gravel over cemented sand-gypsum bed.



Figure 14.

Thin layer of sand and gravel over cemented sand-gypsum bed.

Described desert pavement may be coeval with Wadi Suq “surface”, just on gypsum pavement, as it is seen in some archeological outcrops.

OSL data from Saruq al Hadid (Australian Report) from sample described as water-laid (?) deposits above compact gypsum horizon give age 3.9 ± 0.3 ka.



Figure 15.

Small gravel pebbles at the border playa gypsum pavement and sand cover above.

In the past investigations in Saruq al Hadid archeological site, Wadi Suq “surface” was detected over gypsum pavement as the horizon on small dune forms (see ground-penetrating radar profiles from Herrmann, 2013) belongs to modern(?) aeolian system.

According to Australian Report : “The period from c. 4.3 ka BP onwards is generally characterized by increasing aridity with renewed dune emplacement at the site, supported by previous and new OSL (and radiocarbon) dates”.



Figure 16.

The duricrust gypsum bed (pavement) is hidden below sand-gravel sheet. During the time of wet surface (after rain) the polygons in duricrust gypsum substratum are visible.

OLDER DUNES

Older dunes developed on desert pavement. It represents remnants of large dune fields, that are precursors of modern dunes. Dunes are cemented by carbonates. Older dunes are partly covered by present dunes and partly exposed between them. They are spread in a similar way as modern dunes. The dunes age is unknown. They originated in dry period, maybe at the early Holocene.



Figure 17.

Older dune system exposed between present dunes



Figure 18.

Older dune system exposed between present dunes

PRESENT DUNES

Present dunes in Saruq al Hadid area represent part of Mega Linear Dunes System (Glenie, Singhvi, 2002). They form dune ridges up to several dozen meters high. They are characteristic by very fine-graded sand grains, unlike coarse sandstones that build older dunes.



Figure 19.

An example of linear dune of present dune system. These dune form is close to dune form defined as barchanoid ridge.

GEOLOGICAL ENIGMA

During the fieldwork different rocks were found, perhaps from another area, representing the older substrate. These rocks are formed from recrystallized carbonates with almond-like nodules, perhaps being fillings of gas blisters(?). If yes, these rock may represent former volcanic rocks. If not, their origin is unknown so far.



Figure 20.

An example of enigmatic rocks of unknown origin.

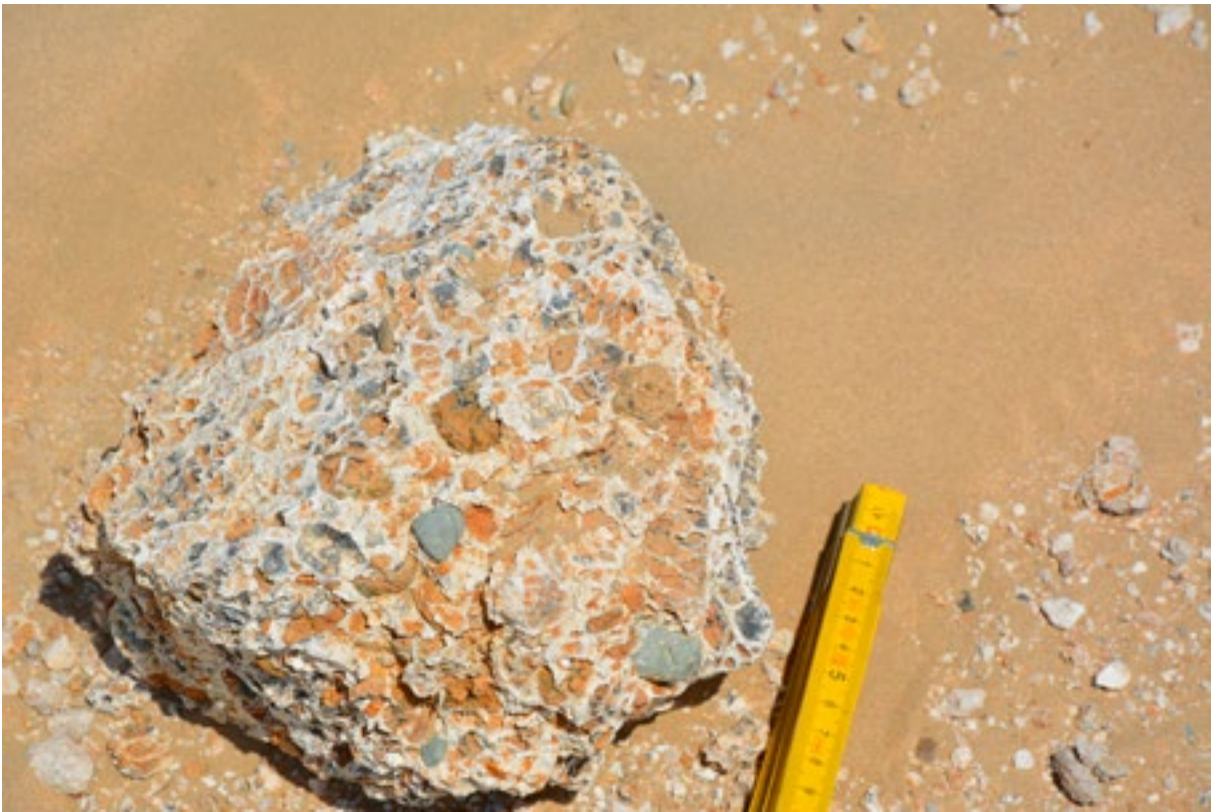


Figure 21.

An example of enigmatic rocks of unknown origin.

FURTHER WORKS

Future work requires petrographic analysis of rock samples. It necessary for understanding of the changes in climatic conditions in the aspect of the appearance or disappearance of water sources.

VIII. SUMMARY AND CONCLUSIONS

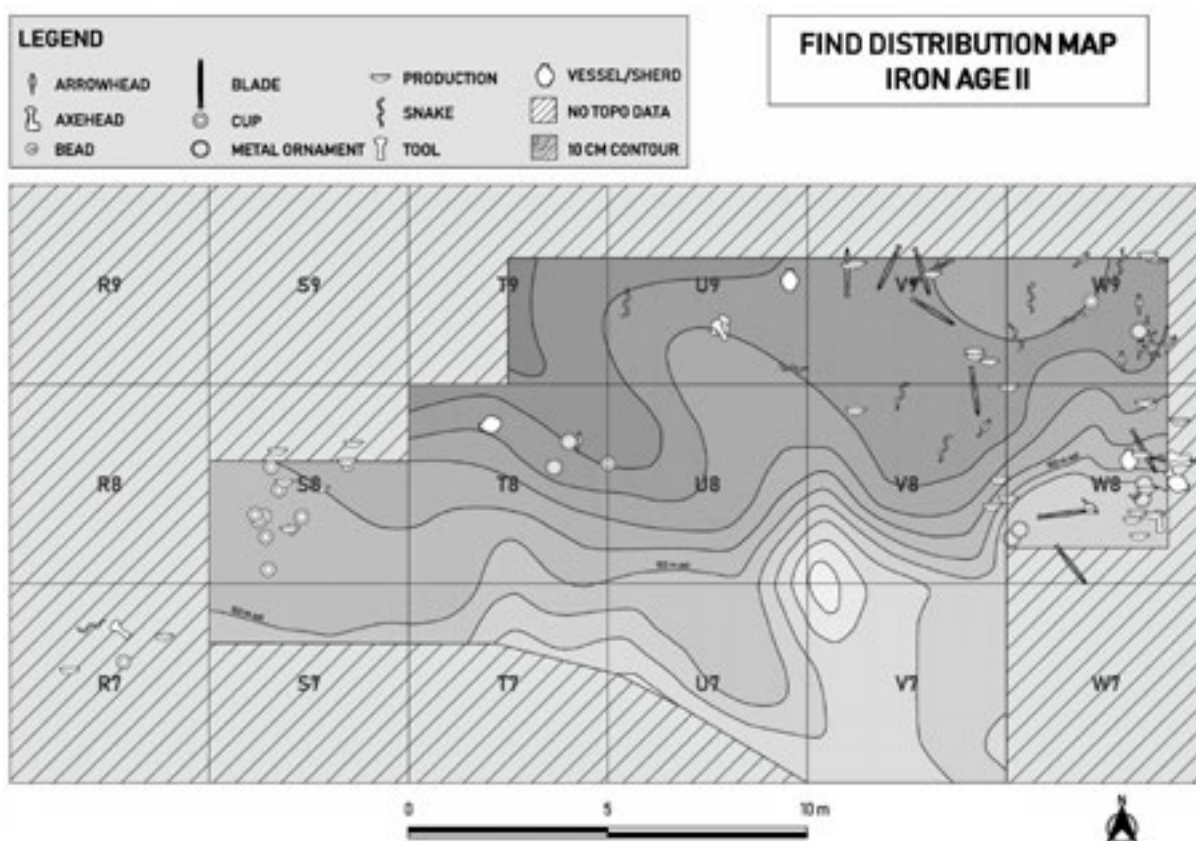


Figure 6. Overview of object categories found in Iron Age II deposits in 2019.

Note: Object locations represent only those found in situ and measured with total station. Symbols represent location and orientation: Symbol type and size is for illustrative purposes only (e.g. “Blade” represents all bladed weapons).



Figure 7. Overview of final excavations in Polish Mission, Area F, April 23, 2019. (Note: Does not show post-T9 excavation).

APPENDIX A. CONTEXT MATRIX

Stratigraphic Sequence	Square-->	R7	R8	R9	S7	S8	S9	T8	T9	U8	U9	V8	V9	W8	W9
	Cleaning/Trimming												99		
I	Top dune										99		800		900
H	Upper Slag												801		901
G	Inter-slag dune												802, 803		902, 903, 904, 907
F	Lower Slag												804	99	909
E	Sub-slag dune / Post Iron Age	1200	1100	1000								99	805	200	908
D	Iron Age II	1201	1101	1001									806, 807	201	905, 906
C	Post-Wadi Suq	1202	1102									100	808	202	910
B	Wadi Suq	1203											809	203	911
A	Gypsum Bedrock	88											88	88	88

APPENDIX B.

PRELIMINARY REPORT ON BEADS FROM SARUQ AL-HADID, DUBAI 2019

A total of 188 beads from Area F of Polish excavations and 101 beads from areas F, G and T of the DM excavations from 2019 were analyzed. Additionally, general comparative studies of a bead collection coming from different seasons and currently stored in Shindaga Restoration House was undertaken. Beads were measured and studied under a Dino-Lite microscope (magnification up to x 200) to document possible use wear traces and technological details of their manufacture such as drilling techniques and surface treatment.

Furthermore, 10 carnelian and chalcedony beads of mediocre quality were chosen for further Laser Ablation Inductively Coupled Plasma Mass Spectrometry to be performed in a laboratory in Warsaw. Aim of the analysis is establishing elemental composition and attempt to indicate possible provenience of stones.

In Area F, 172 beads were found in stratified contexts and the remaining 18 came from mixed layers. Beads were both, mixed with slag deposits and dispersed in the sand layers. They were distributed randomly, probably as a result of deflation process and a simple fact that unthreaded beads can easily move down the sand. In three cases, however, concentrations of similar types were discovered, suggesting that the beads were once threaded together as necklaces or other kind of ornaments (for example, cloth applications - a possible explanation of use of shell, ostrich eggshell and marble sequins with linear use wear traces). Whether they were found *in situ* or they were displaced as a complete necklace, is difficult to determine. The beads in Area F were found in all upper contexts above Wadi Suq gravel layer, beginning with the uppermost slag layer and finishing with the top of the Wadi Suq layer. All squares excavated this year produced certain amount of beads (R9 is not included in this report as it was excavated after my departure) apart from U8 and U9. A significant concentration was noted in squares S8 – 125 beads, W9 – 26 beads, and R7 – 23 beads. The remaining squares produced much smaller amounts from 13 to 2 beads.

Beads from the DM excavations come from Areas F and G. Uppermost slag **Context 1** yielded 17 beads. There were usually one bead per square and only exceptionally there were concentration of four-five beads. Carnelian barrels and bicones shell, quartz bicone, and ostrich eggshell sequins, white, yellow and grey vitreous beads were found in squares: Z2, Z4, Z5, Y4, Y6 in area F (with small concentration in Z4); E4 in Area G (concentration) and X 2, X5, X7 (Area not given).

Sand under the slag **Context 2** yielded 11 beads. Two were found in squares X5 and Z2 in Area F, two in W5 area T, and remaining in squares G, X2, Y3 (area not given), with concentration in Y3. Carnelian microbead, chalcedony long barrel with lenticular flat section, quartz cylinder, quartz pendant with double perforation, yellow vitreous barrel, banded glass bead, shell ring and pierced shell appeared in this level.

Iron Age II level **Context 3** yielded 10 beads found in squares W7, XZ, X, X4, in area F, and in squares X6 and Y6 (area not given). There were carnelian and chalcedony elongated and standard bicones, white glass beads, and marble sequin.

Only two beads were found in **Context 4**, dune below IA II deposit, both in square Y6. These were jasper and carnelian bicones.

Three beads came from **Context 5**, Wadi Suq level from squares Y3 in Area F, X2, X 3, Z5 (area not given). There were three shell beads and additionally, a tiny chrysoprase pebble.

The remaining beads came from stratigraphically mixed contexts. To conclude, it seems that beads were concentrated in the three upper most levels. Distribution of the bead types does not allow for attribution of any specific type to a particular level. The only conclusive observation concerns concentration in Area G of simple pierced shell beads (Type 26) from different levels.

In general, a collection analyzed in this report represents only small portion of thousands of beads coming from the site therefore, any statistical approach regarding particular materials or bead types could be misleading. However, basing on studies of beads collections from Area F and from other areas of the site that are stored in Saruq, in Shindaga Restoration House and in Saruq al-Hadid Museum in Dubai, some general assumptions will be offered here.

MATERIALS AND BEAD TYPES

STONE

Most of the analyzed beads from Saruq were made of different varieties of chalcedony, microcrystalline quartz with a fibrous structure (stones were identified by H. Kiersnowski, a geologist from Polish Geological Institute). Among them, carnelian, orange to red variety of chalcedony, is by far the most popular. Semitransparent brown and transparent chalcedony and agate are second in frequency of occurrence. These stones were used to produce similar bead types and technique of their working points to a one common workshop. Chrysoprase, another variety of chalcedony was extremely rare but it was also attested. Among the analyzed beads and materials from 2019 only one chrysoprase pebble was found, apparently brought to the site for further working.

Quite often is amethyst, a purple variety of quartz. Amethyst beads frequently occurring at the site are transparent to semitransparent with deep uniform purple hue. Similar, semitransparent light purple stone with uneven coloration was identified as quartz amethyst.

Other stones are represented by bright yellow jasper and red jasper (varieties of chert, cryptocrystalline or microcrystalline quartz of roughly equidimensional

crystals), garnet (group of silicates has a Mohs hardness between 6.5 and 7.5), white semitransparent quartz, steatite (soft mineral, also known as softstone), greenish marble or serpentine (two other broadly used varieties of soft stones). Unlike other stones, carnelian and chalcedony were used to produce beads and pendants of different shapes and sizes.

The most commonly used in Saruq was carnelian of a mediocre quality, semitransparent or opaque, orange to dark red in color, often with surface flaws and fractures. It was apparently used for mass production and is extremely widespread at the site in all areas.

BEAD TYPES:

Beads are presented here according to the material they were made of and their shape. Typology of shapes is a simplified version of broadly used beads typology introduced by H. Beck (1928). Terms 'short', 'standard', 'elongated' refer to ratio of a diameter to length of a bead.

CARNELIAN BEADS

There is a multiple collection of beads made of mediocre quality carnelian, semitransparent orange to opaque dark red, with flaws and fractures on bead surface. The beads have various shapes but they were apparently manufactured in a similar way. Their characteristic feature is drilling technique: most of them was drilled from two sides, only smaller beads have unipolar perforation. Pecking technique was also sometimes used. Perforations are usually symmetrical, cylindrical, with parallel concentric drilling grooves made most probably by a copper drill (Pl. 3.1). Ends of the beads are either flattened and smoothed (Pl. 3.2) or flattened, roughly polished (Fig. 3.3 left) and concave, rounded and smoothed; sometimes there is a transverse cut across the end perimeter, done probably prior to drilling to enable setting a drill tip on a surface (Fig. 3.3 right).

Type 1.1 Globular beads

Globular beads are made of mediocre quality carnelian, bright orange to dark orange with white spots. They have two sizes: smaller ones ranges from 4.6-5.0 mm in diameter and 3.9-4.2 in length -

Type 1.1.1 (Pl. 1.1), bigger ones – 6.9-7.6 in diameter and 5.75-6.2 in length (**Type 1.1.2**). Perforation is usually bipolar of equal length, symmetrical, sometimes unipolar, cylindrical. In case of unipolar perforation, drill holes have often different diameters ranging 2.2-1.5 mm at one end and 1.97-1.66 at the opposite end.

Type 1.2 Barrel-shaped beads

Barrel-shaped beads have various proportions and sizes that determine their classification into sub-types.

Standard barrel shaped beads have diameter equal or nearly equal to length - **Type 1.2.1 (Pl. 1.2)**. These beads are nearly globular but have clearly truncated ends. They are made of transparent bright orange to semitransparent dark orange stone of mediocre quality. Diameter varies from 7.12 to 6.30 mm, and length 5.7-4.8 mm. Perforation is usually bipolar, parallel, only slightly widening at the ends; rarely unipolar, cylindrical.

Also short barrel microbeads - **Type 1.2.2** were found in the DM Area T indicating an advancement in hard stone working techniques. The beads have 3.3 mm in diameter and 1.9-2.3 in length. They are made of dark orange semitransparent stone. Perforation diam. is 1.4 mm, ends are rough, not polished.

Type 1.3 Biconical beads

1.3.1 Short bicones with pentagonal and circular transverse section

Three beads were shaped as short bicones made of light orange transparent carnelian of mediocre quality (**Pl. 1.3**). The shape seems accidental, probably resulting from not precise initial grinding. Diameter is 5.5 mm and length 3.3 mm. They have small drill holes, ca. 1.2 mm in diam., well smoothed, without clear traces of abrasion from drilling on the bead surface.

Type 1.3.2 Standard bicones are represented by small size beads of light to dark orange carnelian of mediocre quality (**Pl. 1.4**). It is one of the most common categories at the site. They are very often made of dark red semitransparent stone. Their diameter varies from 6.8-4.0 mm and length 5.9-3.14 mm. Perforations are probably unipolar. Their diameters range from 1.5-1.63 on one end to 1.99-1.95 mm at the opposite end.

Type 1.3.3 Long biconical beads (Pl. 1.5)

This category is also extremely common at the site. Such beads are made most often of dark red semitransparent to opaque carnelian of mediocre quality. Their diameters range 4.8-9.1 mm and length is 8.7-15.2 mm. Perforation is usually bipolar. They are most often flattened and single transverse cut across perimeter was found on some of them. Perforation diam. varies 2.22-1.42 mm.

Cylindrical beads (Pl. 1.6)

Type 1.4.1 Cylindrical beads are surprisingly rare in the analyzed assemblage. They are made of transparent light orange and dark red semitransparent stone of mediocre quality. Their diameters range 4.8-5.8 mm, and length is between 3.8-4.9 mm. Perforation is probably unipolar: one end is slightly concave and there are traces of chipping around drilling hole; the opposite end is smoothed, rounded. Drill holes at opposite ends have different diameters: from 1.57-2.02 mm to 1.44-2.0 mm.

Type 1.4.2 Cylinder with lenticular transverse section (Pl. 1.7)

Such beads are rarer than above listed types but they appear in various parts of the site. Although made of stone with flaws and fractures, they are very well made, their shape is precisely executed, surface is finely smoothed. Linear traces of final polishing are visible under microscope. Such beads are made of transparent light orange carnelian. Dimensions are L. 6.3 mm, W. 7.3 mm and Th. 3.1 mm. Perforation is probably bipolar, both ends are flat and smooth and there is no grinding traces on the surface. Drill holes are equal in diameter - 1.5 mm.

Type 1.5 Carnelian pendants (Pl. 2.1-3)

Apart from the beads mostly made of carnelian of a mediocre quality, there is a multiple collection of pendants stored in Shindaga Restoration House. They are made of high quality transparent light orange stone. They are trapezoidal with flat transverse section or elongated drop pendants with a circular transverse section. Their approximate dimensions are diam. 2.5-4mm and length 13.5 mm. Their popularity in Levant at the same time suggest Egypt as a potential source. They are found also in Mesopotamia as well as in IA II grave in UAE (for example, in Dibba (Pellegrino *et al.* 2019) and Jebel al-Buhais (Archeological Museum in Sharjah). Broken pendant fragments found in Saruq (Pl. 2.3) may suggest that the valued good quality carnelian was reused and reworked at the site. There is no clear evidence if the pendant might have been produced in Saruq.

CHALCEDONY BEADS

Chalcedony is represented by transparent colorless, semitransparent light to dark brown and brown and white, semitransparent orange-brown and transparent smoky grey varieties. This material was second in frequency used for the beads at Saruq.

Type 2.1 Globular beads (Pl. 4.1)

Globular chalcedony beads are relatively big ranging 7.4-13.9 mm in diameter and 6.8-12.10 mm in length. All of them are made of dark brown semitransparent stone. They are precisely shaped, made of mediocre quality stone, with surface finely polished and smoothed. Perforations are unipolar, cylindrical. Drill holes diameters range 1.6-2.5 mm.

No chipping traces are observable on the apexes, only grinding traces from drilling are visible on one of the ends.

Type 2.2 Barrel-shaped beads (Pl. 4. 2-3)

2.2.1 Short barrel-shaped chalcedony beads are similar to globular ones but their ends are truncated and rounded. Often made of dark brown semitransparent and transparent stone of mediocre quality. Sizes are relatively big, diameters range 10.14-12.9 mm, and length - 6.9-9.9 mm. Ends are concave or, one is concave the other one flattened and smoothed. Drill hole diameters vary at opposite ends from 2.5-1.74 mm to 2.37-1.77 mm.

2.2.2 Standard barrels are represented by semitransparent brown and white chalcedony beads (Pl. 4.4). Their surface is well smoothed. Diameters range 7.3-7.7 mm, length 8.04-7.02 mm. Perforations are made from two sides, one side is often flat with traces of knapping around the edges, the other rounded with drilling traces. Drill holes have equal dimensions from two sides ca. 1.9 mm in diameter.

2.2.3 Barrel with oval transverse section (Pl. 4. 4)

There is also a special type of a standard barrel-shaped bead with ovoid transverse section. Averaged dimensions are 7.0 x 6.5 mm in diameter and length is ca. 7.0 mm. This shape although rare is performed both in chalcedony and agate. Technical details and size are identical in both cases (see below Type 3.2).

Type 2.3 Biconical chalcedony beads (Pl. 4.5)

With two exceptions, there is no biconical chalcedony beads in the 2019 assemblage. These two are made of poor quality dark brown opaque stone. Their dimensions are 10.0 mm in diameter and 6.9 mm in length. Similar examples are known

Type 2.4 Cylinder with lenticular section (Pl. 4. 6)

This shape although rare is performed both in chalcedony and carnelian. Technical details and size are identical in both cases (see above Type 1.4.2).

3. Agate beads

Banded agate beads are relatively rare although they are found in all areas on the site. Majority of them is made of opaque or semitransparent banded white and brown variety.

The beads are either long barrels **Type 3.1 (Pl. 5.1)** or long, flattened barrels with oval transverse section **Type 3.2 (Pl. 5.2)**. They are very well made, with smoothed surface and perfect shape and they are very decorative. Long barrels found in 2019 were ca. 4.3 mm in diameter and 6.8 mm in length but there were much longer specimens from previous seasons. Barrels with oval section are ca. W. 6.10-6.20 x Th. 6.11-5.8 mm, L. 9.37-8.8 mm.

Type 3.3 There is also a special category of so called 'eye-beads' (**Pl. 5.3-5**). They are made of very high quality banded agates. Three such specimens come from Area T, Context 2, and are made of banded opaque stone. One, **Type 3.3.1** is big – 14.9 in diameter, 7.39 mm in length, tabular in shape with lenticular transverse section (**Pl. 5.3**). Perforation is drilled through the diameter of the bead, it is bipolar. Drill holes are very small and precise drilled – 1.37 mm in diameter, with only minor traces of drilling around the hole (**Pl. 5.4**).

Two of **Type 3.3.2** are much smaller, round with pentagonal longitudinal section (**Pl. 5.5**). They have ca. 5 mm in diameter and 4.5 mm in length. Rarity of this type, quality of the stone used for its production and precision of working indicate that such beads were imported, possibly from Pakistan or India. They were very popular from Iron Age II to Persian period in Mesopotamia and Levant.

Type 4. Amethyste (Pl. 6.1)

Amethyst beads are represented by short barrels **Type 4.1** or bicones **Type 4.2** only. They are all made of deep purple semitransparent stone. All amethyst beads are small, max. diameter is 4.3 mm, min. is 3.45 mm; max. length is 2.9 mm, min. is 2.5 mm. The beads are usually not very precisely shaped although surface is polished and smoothed to a high luster. Perforation is most probably unipolar: one end is often concave while the other is flat indicating pecking technique. Perforation diameter is relatively big for these small beads, ranging from 1.9-1.2 mm.

Type 5. QUARTZ AMETHYSTE beads differ in color and transparency from these of amethyst as they are made of semitransparent and light violet uneven colored stone (**Pl. 6.2**). They are only rarely represented in Saruq assemblage and only two beads of this type were found in area T of DM excavations. They are represented by middle size (diam. 7.74, L. 4.75 mm at average) standard bicones **Type 5** only. Perforation is probably bipolar, slightly tapering toward the middle. One end is usually flattened, roughly polished; the other one rounded with minute chipping traces. This rare bead type is most probably of different origin than tiny barrel-shaped amethyst beads. Parallel finds come from Mleiha and are dated to 250-0 BC (Archaeological Museum in Sharjah) indicating that this type might be associated with later layers, perhaps post-Iron Age II layers in Saruq.

Type 6. Garnet Pl. 6.3

Garnet beads are rare but not unique in the assemblage. Stone has dark burgundy hue and is semitransparent. Only two beads of this type were found in Area F in 2019. Surface is well polished and smoothed. Their standard shape is short or standard barrel. Average diameter is 5.8-4.4 mm, and length 3.6 mm.

Type 7. Jasper

Jasper is an opaque variety of silica, an aggregate of micro-granular quartz and chalcedony and other minerals. It can have various colors - yellow and red are present in the Saruq bead collection. Yellow jasper beads are represented solely by short forms: barrels **Type 7.1 (Pl.6.5)**, cylinders **Type 7.2 (Pl.6.4)**, and bicones **Type 7.3**. All beads have similar sizes ranging 6.5-5.5 mm in diameter and 4.3-3.0 mm in length. Ends are flat and smoothed and there is no drilling traces around perforation. Perforation diameter varies 1.79-1.64 mm. These stone beads are apparently imitated by yellow paste beads.

Red jasper is much rarer and was used to produce short forms: bicones **Type 7.3** and barrels **7.4**. Occasionally, red jasper pebbles were used as pendants (**Pl. x**). They were not specifically shaped only pierced.

Type 8. Green marble sequins (Pl. x)

Soft green marble or serpentine was used to produce specific type of adornment: small squarish disks with rounded corners **Type 8**. All of them bear linear indentions on both surfaces either a single line across perimeter or two crossed lines. These indentions are possible use-wear traces created by friction of a thread used to attach the bead onto cloth. Hence, the term 'sequin' to indicate that this specific bead type was not used as a part of a necklace but rather as a cloth decoration. Edges and both surfaces are smoothed. Such sequins are ca. 5.4 x 5.4 mm and 1.2 mm thick. They are pierced centrally, perforations have 1.9-2.0 mm in diameter. Shell and ostrich eggshells were also often used to produce same type of sequins. This type of adornment is so far known only from Saruq.

It is evident that apart from semiprecious stones also other stones were used occasionally for beads making. These are represented by rare or single finds. Among them are white semitransparent quartz bicone **Type 9 (Pl. 6.7)** or steatite short barrel **Type 10 (Pl. 6.8)**.

LOCAL PRODUCTION AND IMPORT EVIDENCE

There is a high probability that stone beads production was undertaken somewhere at the site. Traces of the production are scanty and occasional but unquestionable. Basing on *debitage* coming from areas excavated by the DM as well as material stored in Shindaga, individual stages of a *chaîne opératoire* can be identified. Most of the evidence regards mediocre quality carnelian beads. There were no drills nor stone nodules present at the site but there were some semi-products as well as waste found: carnelian blanks already modelled by chipping (GR 16592, Shindaga Restoration House), bead roughouts, and occasional splinters. **Plate 7** presents semi-products and by-products from successive steps of a production: carnelian and agate bead blanks with initial shaping (Pl.7.1-2), roughouts (Pl.7.3), roughout with a flaked off fragment removed to prepare the bead for drilling (Pl.7.4), shaped, grinded and perforated bead before final polishing and smoothing (Pl.7.5), carnelian bead roughout waste after unsuccessful drilling attempt (Pl.7.6), splinter from already polished not smoothed bead broken during drilling process (Pl.7.7). Remains from various steps of production are also evidenced for other stones. These are for example, a single green chrysoprase pebble (Pl. 8.1) as well as much more often white quartz pebbles. **Plate 8** presents a collection of beads made of different materials, stone and shell including, at various stages of production (Pl.8.2), a soft stone blank (Pl.8.3) and a soft stone cylindrical blank after initial grinding (Pl.8.4), a white quartz bead blank before shaping (Pl.8.5).

There is also a collection of broken fragments of carnelian elongated drop pendants and trapezoidal pendants (Pl.8.6-7). These ornaments were made of a very high quality transparent light orange or light red carnelian and, unlike the beads of mediocre quality carnelian, they are apparently high-class products. Their working: surface treatment and perforation technique are of exceptionally high precision. Such pendant are widely distributed in IA II period not only in UAE and Oman graves but also in Mesopotamia and Levant. These observations raise a question of an original place of the pendants production. There is no direct evidence that they were manufactured in Saruq al-Hadid. The registered broken pendants fragments suggest that the precious high quality carnelian pieces might have been reworked into beads at the site.

There are two unperforated agate elongated barrels (stored in Restoration House) fitting well larger agate beads known from the site (Pl.8.8). Although they look like unpierced beads, it seems that they were rather used as balance weights. They are both finished forms and polished to a high luster, while drilling – a high damage risk step, was usually undertaken after initial shaping of the bead.

SOURCE OF THE SEMIPRECIOUS STONES

Lack of evidence for stone nodules from the site may be accidental but it also suggest that only initially worked semi-products were traded to site and then made into beads by local specialists. The mediocre quality carnelian and chalcedony beads were certainly mass-produced. The source of the chalcedony might have been distant, for example in Pakistan, but much closer source as the one in Jebel al-Ma'taradh in R'as al-Khaima containing deposits of chalcedony, agate, carnelian and chrysoprase also cannot be ruled out (Charpantier *et al.* 2017). Also garnet and amethyst pebbles were possibly brought to the site for further working.

VITREOUS MATERIALS

There is a variety of vitreous or glassy beads discovered in different parts of the site and they are abundantly represented. None of the beads is transparent. Opaque paste without glaze resembles rather frit than glass from appearance. The term 'vitreous' is most fitting here as a character of a paste used to produce the beads is difficult to identify without chemical analysis. Most of the vitreous beads is extremely fragile, even deteriorating, glaze is almost always entirely worn and thus, original color is impossible to determine. It is probable that at least some if not all of the types, were produced at the site.

Type 11 is so called 'white glass' – the only glassy type discovered this year which preserved its original color. These beads have white or creamy core and white surface which is most often flaking. State of preservation of smaller beads is usually very bad, surface of bigger beads is more vitrified and firmer. Almost all beads are barrel shaped and have three variants of size: **Type 11.1 (Pl 9.1)** is ca. 4.4-5.0 mm in diameter, and ca. 2.1- mm long; **Type 11.2 (Pl 9.2)** is 5.1-6.1 mm in diameter and ca. 2.8-4.1 mm long, **Type 11.3 (Pl 9.3)** is ca. 8.7-13.4 mm in diameter, 5.9-9.4 mm long. Only Type 11.3 have biconical variants.

Type 12 are small, ca 4.0 mm in diameter and 2.4 mm in length, barrel-shaped beads with dark grey core and dark grey surface (**Pl 9.4**). In some cases outer coat is entirely destroyed (**Pl 9.7**), in some – it is preserved as a thin friable light grey or whitish layer (**Pl 9.6**). Original color is not possible to determine. Core is sometimes strongly vitrified dark grey with white spots. Such beads were very abundant in the 2019 assemblage from Area F. They were most probably produced at the site as sometimes fused beads - wastes from a production, are found (**Pl 9.5**).

Type 13 are biconical (**Pl. 9.8**) or barrel-shaped beads (**Pl. 9.9**) with entirely destroyed light grey opaque surface. Sometimes they are covered with a layer of sand (**Pl. 9.10**). Original color is not possible to determine but remains of a whitish coat around perforation suggest they might have been white. These beads are relatively big ca 12.7 mm in diameter, 8.0 mm in length.

Type 14 are 'brown glass' beads (**Pl.9.11**). They are small ca. 4.9 in diameter, 2.0-3.5 mm in length barrels made of opaque brown paste with vitrified, lustrous surface. They were most probably produced at the site which is indicated by a find of a brown glass thread in Area F in 2018.

Type 15 is a single find of a conical bead with a collar. Glaze was worn, outer layer is sandy but well preserved core is light blue (**Pl. 10.1**).

Type 16 are banded brown and white glass beads, either standard barrels **16.1** or elongated barrels **16.2 (Pl. 10.2-3)**. White paste is not always properly vitrified and has a rough look. Some examples are, however very precisely made and are really decorative as for example a bead from a collection in Shindaga (**Pl. 10.4**).

Type 17 are Egyptian blue beads (**Pl. 10.5**). It is almost certain that such beads were produced of Egyptian blue which was imported to the site in solid ingots that were later crushed into powder, formed into beads and once more fired. Through secondary firing the beads obtained considerable hardness and their state of preservation is perfect. Egyptian blue beads are almost always short cylinders, only rarely long cylinders or segmented cylinders are found such as the ones in a necklace

from the Restoration House (Pl. 10.6). Some of the short cylinders are still fused together. Standard size is ca. 3.5-4.3 mm in diameter and 2.4-3.5 in length.

SHELL, OSTRICH EGGSHELL, FISH VERTEBRAE

Shell beads is another category appearing at the site in big numbers. It is represented by worked beads, sequins and disks, and pierced shells. Multiple finds of unworked shells not occurring locally (such as for example, *Engina mendicaria*) as well as occasional bead blanks indicate that shell beads production took place at the site.

Type 18 is for short cylindrical beads made of white to creamy shells Type 18.1 (species not possible to determine) (Pl. 11.1). All of the beads of this type are characteristically very small, sizes range from 3.1-5.10 mm in diameter and 2.2-2.8 in length. There is a group of beads intentionally cut out of bicolor orange-white or brown-white shell (possibly striped whelk) (Type 18.2) (Pl. 11.2).

Type 19 is standard biconical bead made of white shell. Average dimensions are 8.7 mm in diameter and 6.6 mm length (Pl. 11.3).

Type 20 is standard bicone with flattened lenticular transverse section. Average dimensions are 11.30 mm length, 9.5 mm width, 3.5 mm thickness. Perforation is made from two sides which is evidenced by bead waste found at the site (Pl. 11.4)

Type 21 is folded disk bead Pl. 12.1. It is a plano-convex type made as if to fit an uneven surface. Sizes are bigger than in case of regular disk beads, ranging 8.5-12.0 mm in diameter, 1.2-2.00 mm in thickness. Perforation is big, ca. 3.0-4.5 mm. This type seems suitable to be sewn onto fabric, however, unlike sequins, it has no use wear traces. Such beads were found only in areas G and Z in 2019.

Type 22 is a squerish disk bead made of shell Type 22.1 (Pl. 12.5) or, more often, of ostrich eggshell Type 22.2 (Pl. 12.3-4). Average dimensions are 4.9-7.4 x 5.2-7.4 mm, and 1.1-1.7 mm in thickness. Perforation is rather big 1.67-2.02 mm in diameter. Most of the examples bear linear indentions on both surfaces, exactly the same as on marble sequins, either a single line across perimeter or two crossed lines (Pl. 12.4). It is clear they were used for the same purpose. This type is very popular at the site and is found in all areas but until now it has no analogy at other sites.

Type 23 is a round disk bead made of shell Type 23.1 (Pl. 12.7) or of ostrich eggshell Type 22.3 (Pl. 12.6). They are rather small, ca. 4.8-6.9 mm in diameter, 1.4-1.9 in thickness. Their perimeter is often not precisely abraded and smoothed. Clear linear traces of polishing are visible on both surfaces. There were no use wear traces detected.

Type 24 is shell ring made of abraded *Conus* shell apex (Pl. 12.2). They vary in sizes from the small ones, ca. 5.5 mm in diameter, 3.5 mm in length to big ones: 23.5 mm in diameter, 6.0 mm in length. Perforation is big, done by cutting off tip of the apex, hence the term ring. In some cases, apart from central perforation there was also a hole drilled longitudinally through the perimeter. Ring Type 25 were found in Areas G and Y in 2019.

Type 25 is a simple bead made of fish vertebrae. It did not need special working apart from piercing. Such beads are not very frequent but they appear in all parts of the site. Average dimensions are 5.0 mm in diameter, 1.49 mm thickness.

PIERCED SHELLS

Type 26 There is a quite rich collection of very simple beads made by piercing a shell (Pl. 11.6-7). Some of the shells must have been brought to the site from more distant littoral areas, for example from Oman. Identification of species and their provenience needs however further studies. It seems at first glance, that these simple beads might have been concentrated in specific areas of the site. They do not occur in Area F, many of the finds come from Area G of the DM excavations.



Type 1.1 Globular carnelian



Type 1.2 Carnelian barrelshaped beads



1.3.1 Carnelian short bicone with pentagonal section



Type 1.3.2 Carnelian standard bicone



Type 1.3.3 Carnelian elongated bicone



Type 1.4.1 Carnelian cylindrical beads



type 1.4.2 Carnelian cylinder with lenticular section

Type 1.5 Carnelian pendants stored in Shindaga Restoration House





Example of bipolar, symmetrical perforations of equal length in carnelian beads produced locally.(magnification x 50).



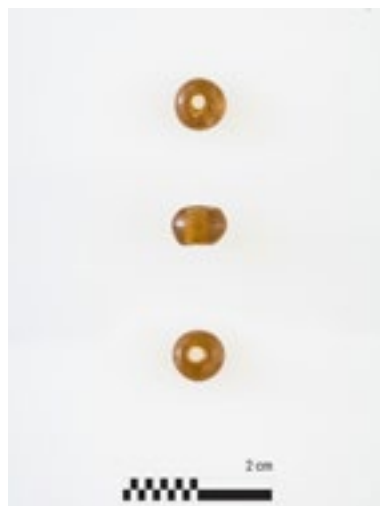
Flattened ends of a carnelian bead (magnification x 50)



Flattened roughly polished end (left) and concave rounded end (right) (magnification x 50)



Type 2.1 Chalcedony globular bead



Type 2.2.1 Short chalcedony barrel



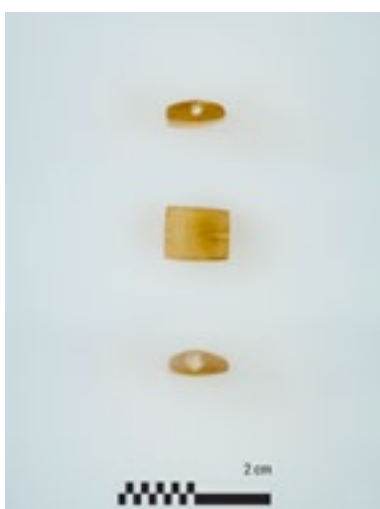
Type 2.2.2 Standard chalcedony barrel



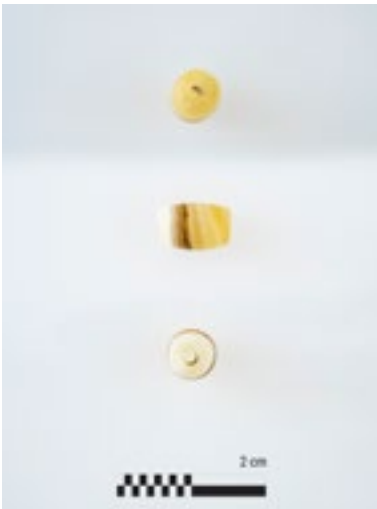
Type 2.3 Biconical chalcedony bead



Type 2.2.3 Barrel with oval transverse section



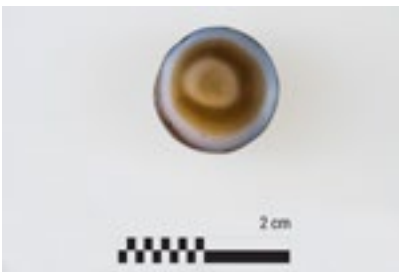
Type 2.4 Chalcedony cylinder with lenticular section



Type 3.1 agate long barrel



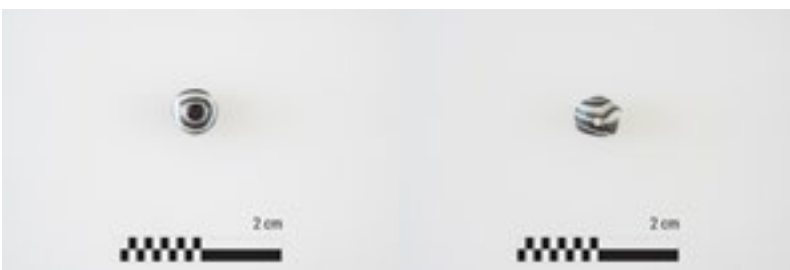
Type 3.2 Agate flattened barrel bead with oval section



Type 3.3.1 Tabular agate eye-bead (SA12104)



Drill hole in tubular eye-bead (SA 12104) (magnification x50)



Type 3.3.2 Agate eye-bead with pentagonal longitudinal section (SA 12104)



Type 4. 2 Amethyst short



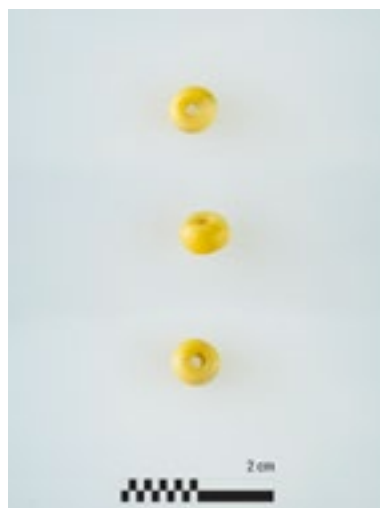
Type 5. Quartz amethyst bead
(SA 12104)



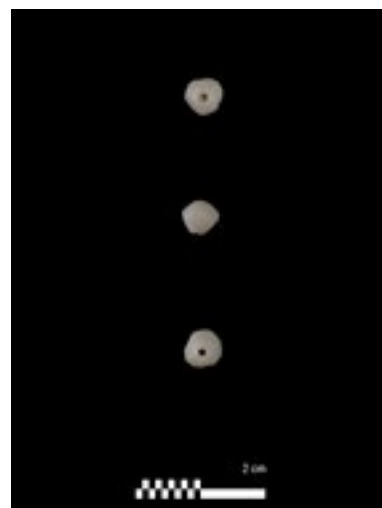
Type 6. Garnet short barrel



Type 7.1 Yellow jasper short
cylinder



Type 7.2 Yellow jasper
short barrel



Type 9. White quartz bicone



Type 10. Steatite barrel
shaped bead

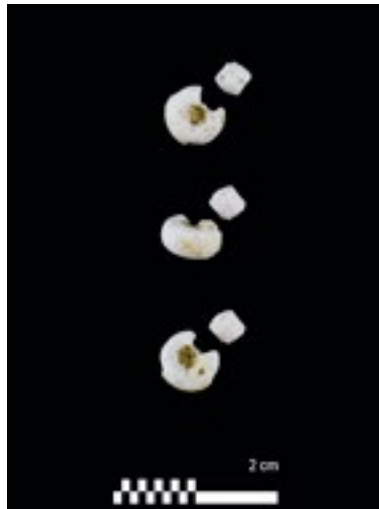
Various steps of production of chalcedony beads



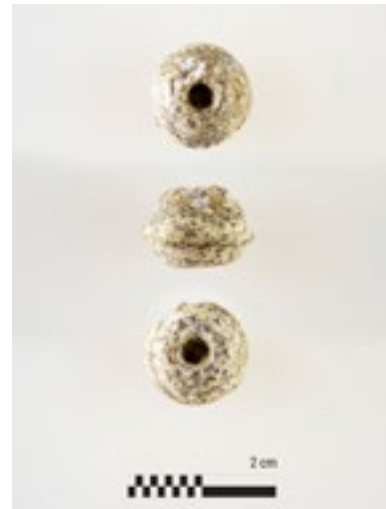




Type 11.1 white glass



Type 11.2 white glass bead



Type 11.3 white glass bead



Type 12 Dark grey short barrel



Fused beads Type 12



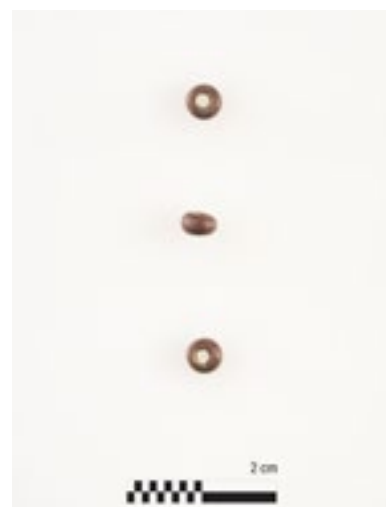
Type 12 with remian of white coat and with vitrified surface (magnification x 50)



Sandy layer on surface of bead Type 13



Type 13 big grey bicones and barrels



Type 14 Brown glass bead



Type 15 Biconical vitreous bead with collar



Type 16.1 Banded glass standard bicone



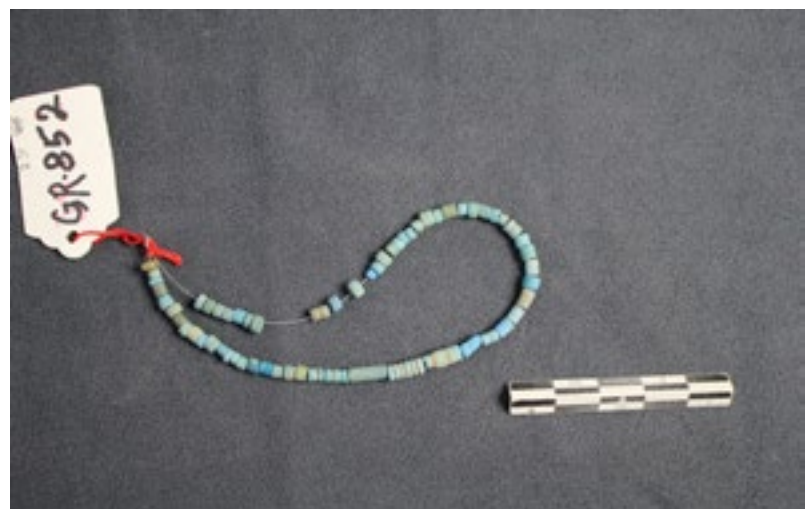
Type 16.2 Banded glass long bicone



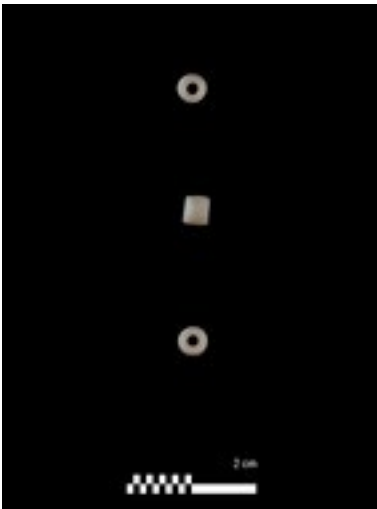
Fragment of banded glass long bicone Type 16.2 (magnification x 20)



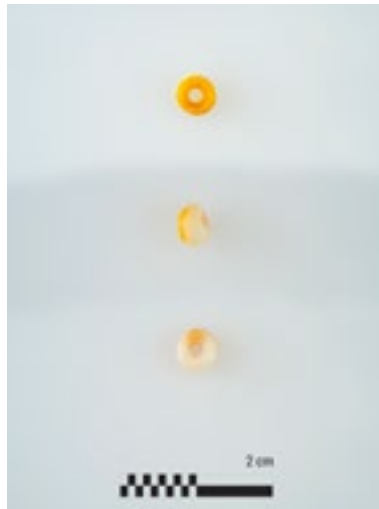
Type 17 Egyptian blue short cylindrical



Short and long cylindrical and fused Egyptian blue beads Type 17 from Shindaga Restoration House



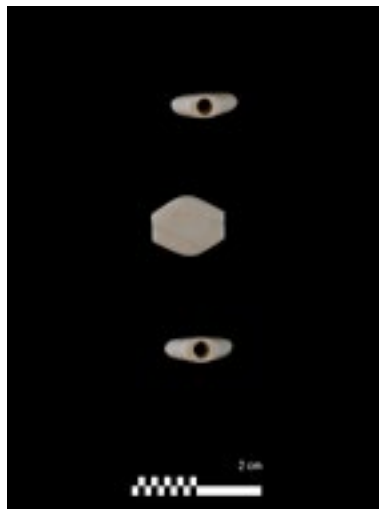
Type 18.1 Cylindrical shell bead



Type 18.2 Cylindrical bicolor shell bead



Type 19 Standard shell bicone



Type 20 Biconical shell bead with flattened lenticular transverse section



Type 26 Simple pierced shells

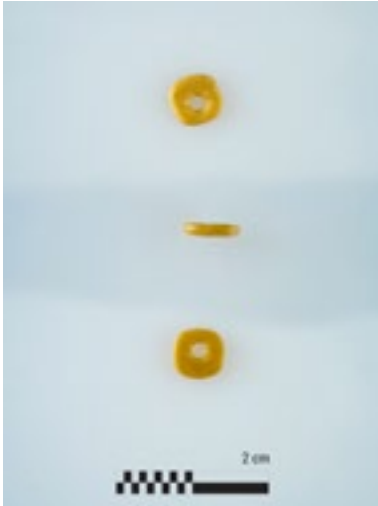




Type 21 Broken folded shell disk bead (magnification x 20)



Type 24 Ring of Conus shell apex pierced longitudinally (magnification x 20)



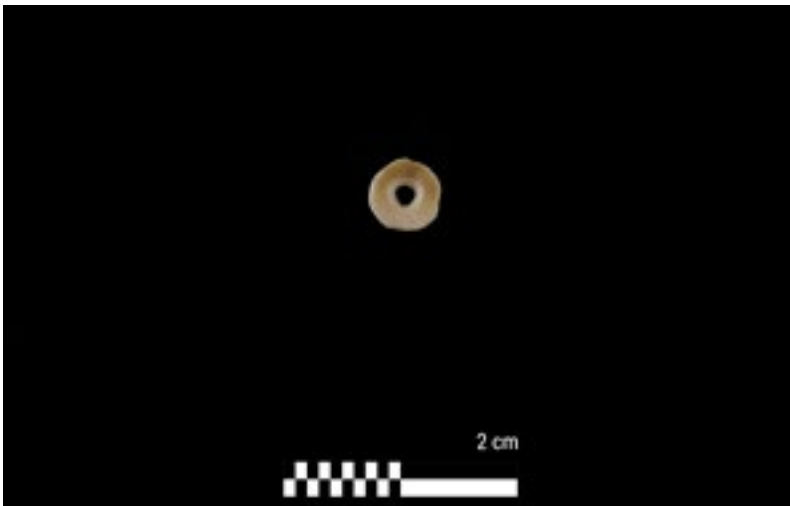
Type 22.2 Ostrich eggshell square



Type 22 Ostrich eggshell sequin with visible indentions (magnification x 20)



Type 22.1 Shel square sequin



Type 23.2 Ostrich eggshell round disk bead



Type 23.1 Shell round disk bead

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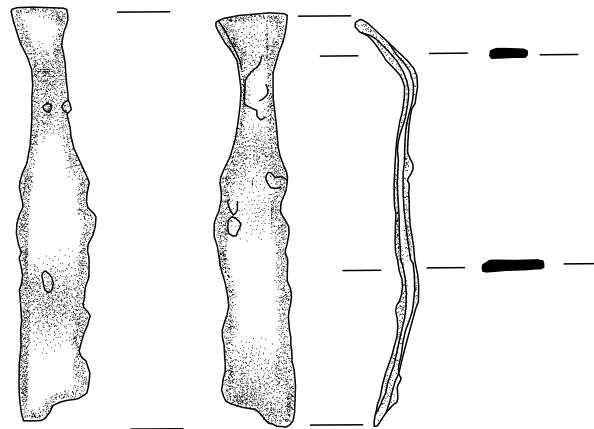
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APPENDIX C.

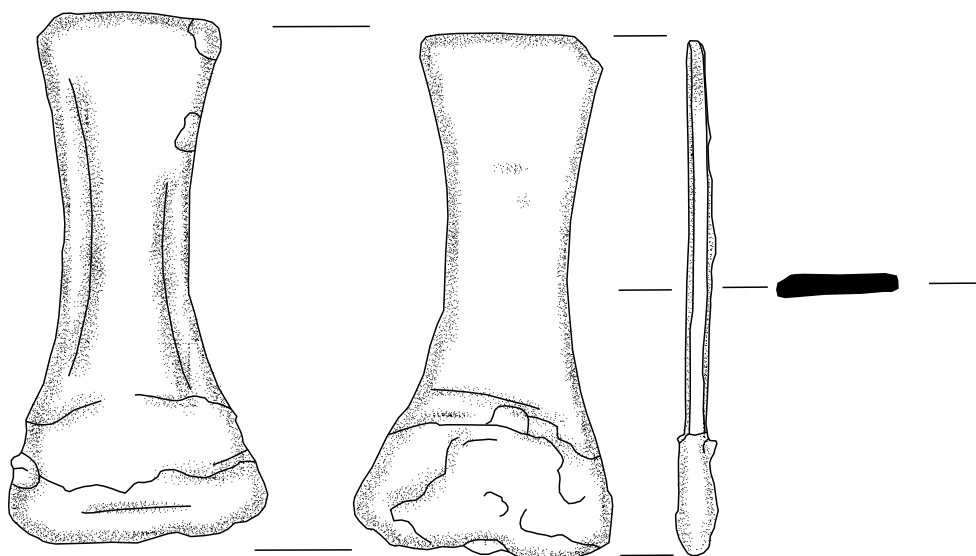
Drawings

KATARZYNA MOLGA

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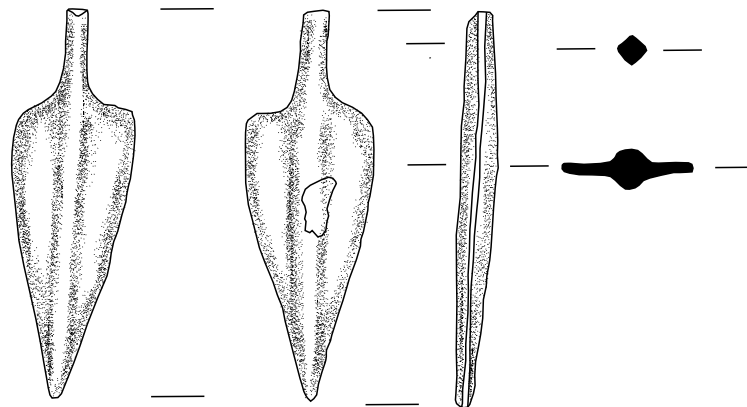
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SHP19_0512



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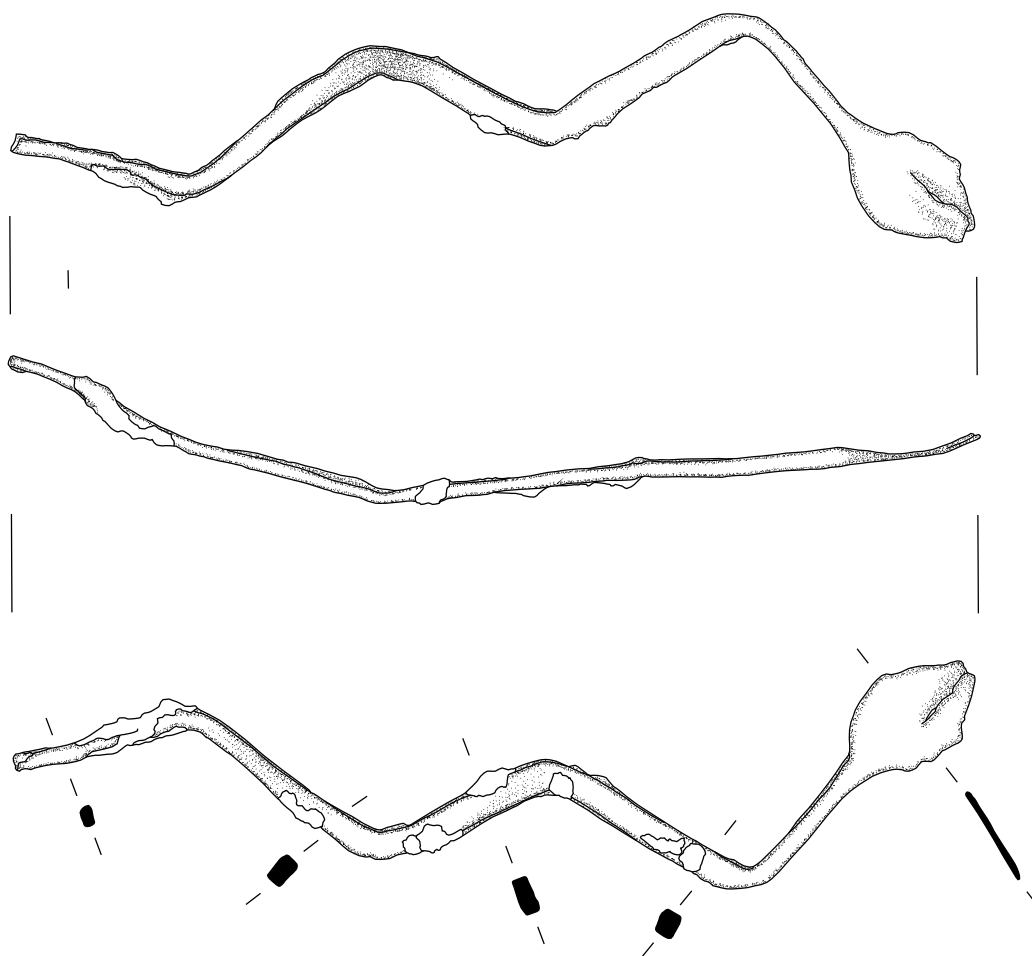


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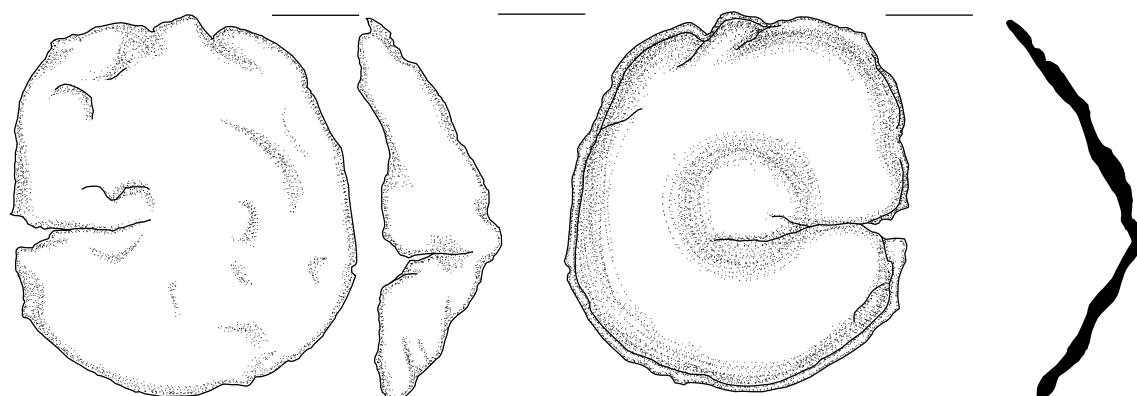
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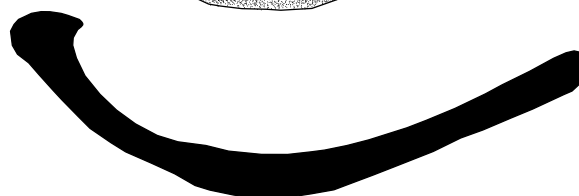
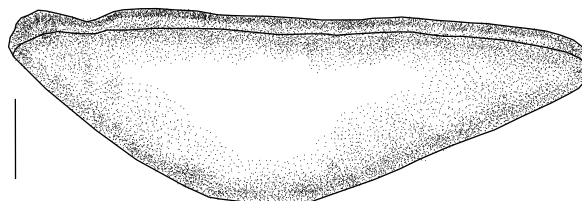
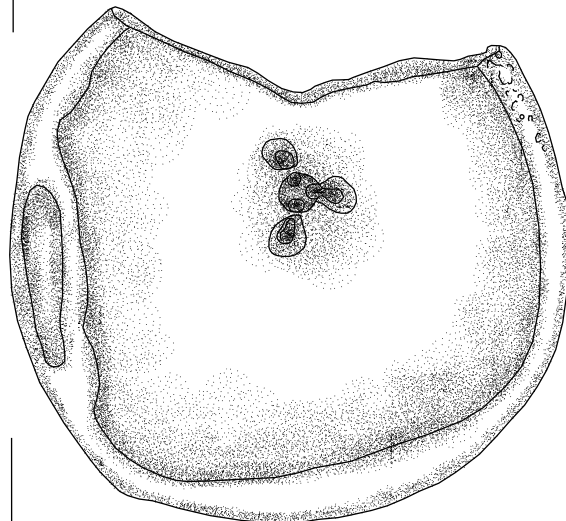
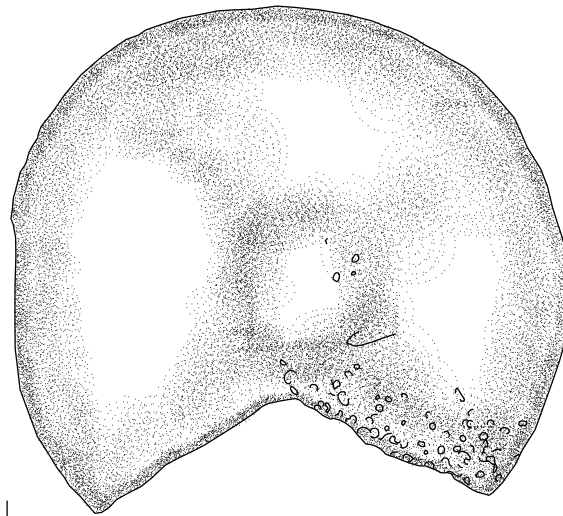
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Square S8

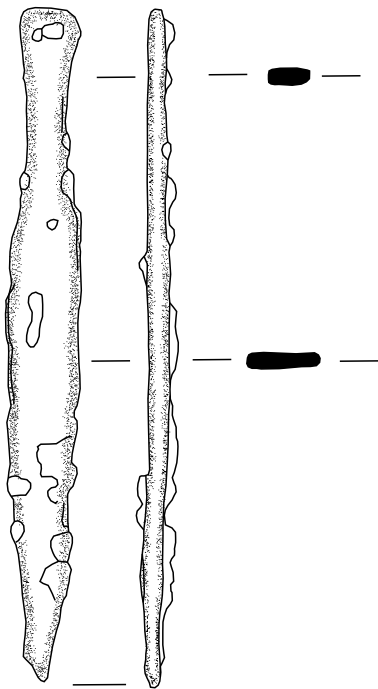


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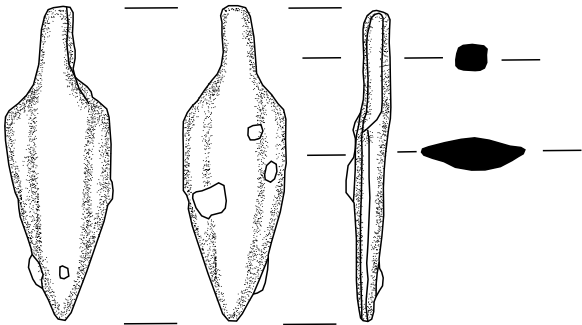
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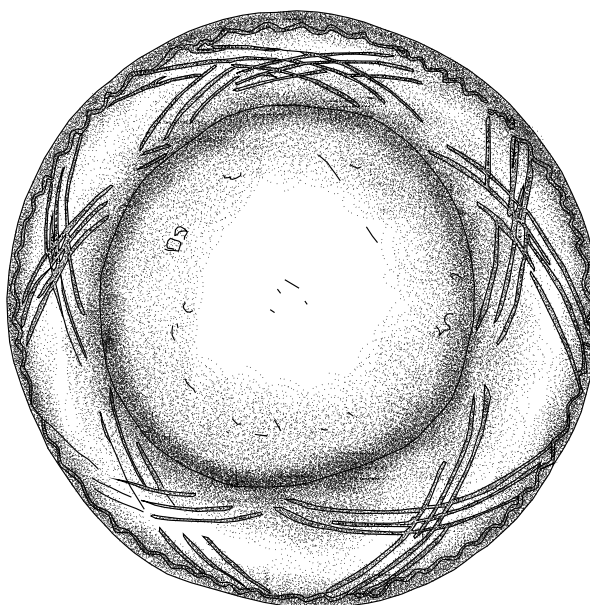
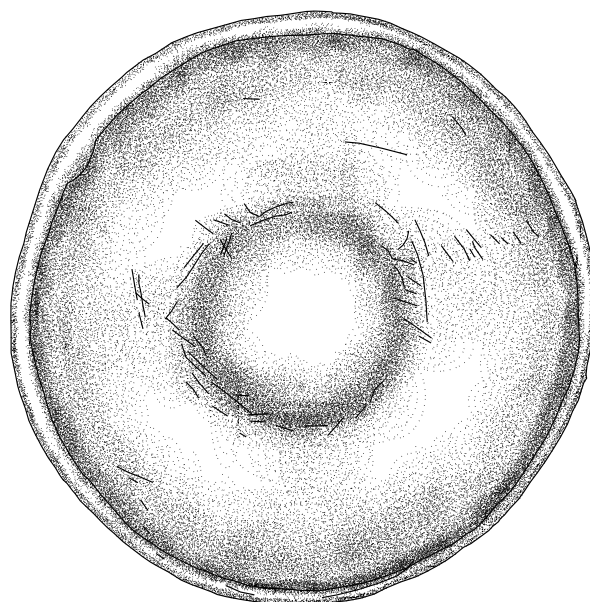
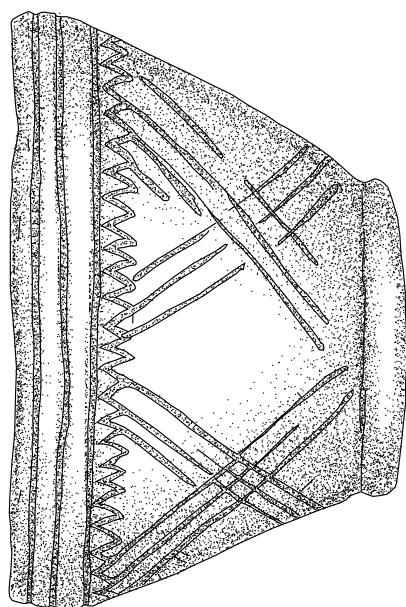
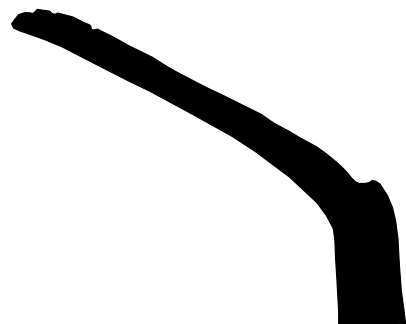
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SHP19_0702
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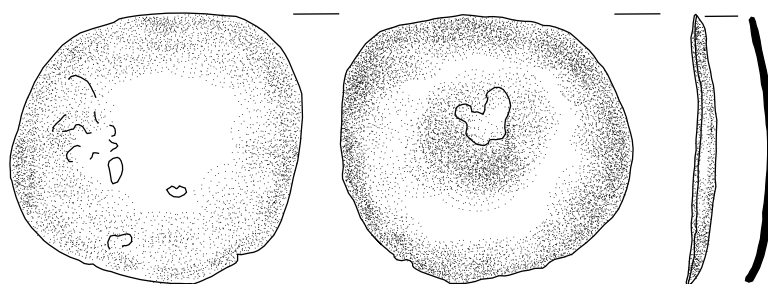


Square S9

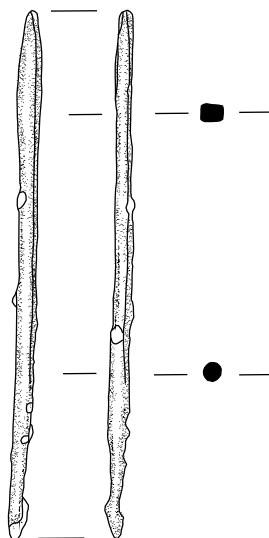


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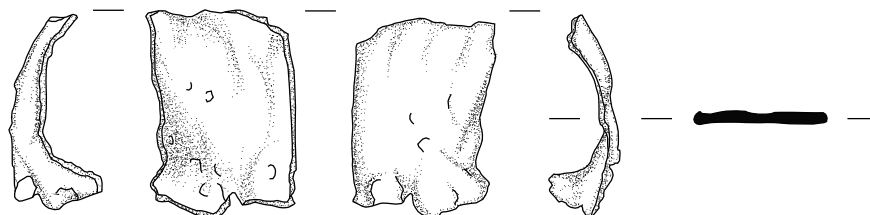
Square S9



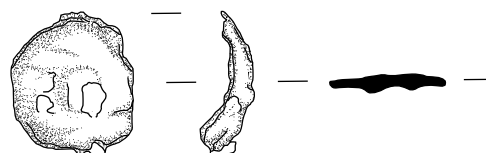
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SHP19_0413



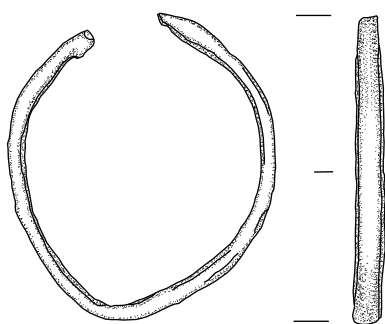
SHP19_0016



SHP19_0015

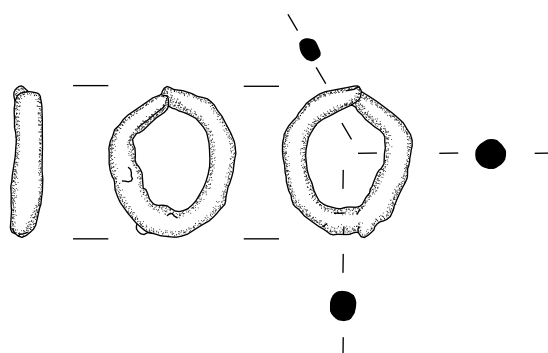


Square T8

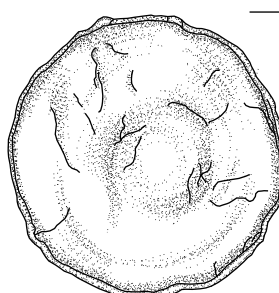
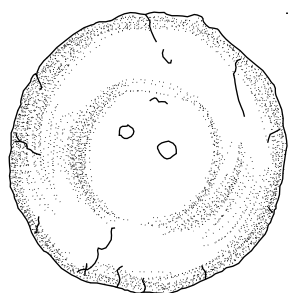


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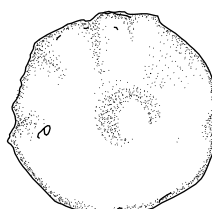
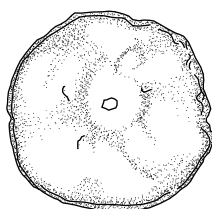


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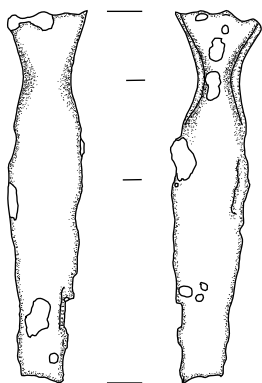


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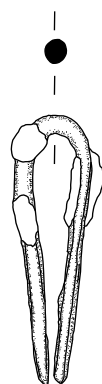
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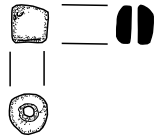
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SHP19_0083



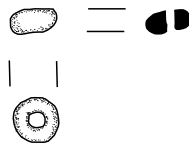
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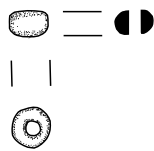
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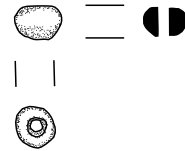
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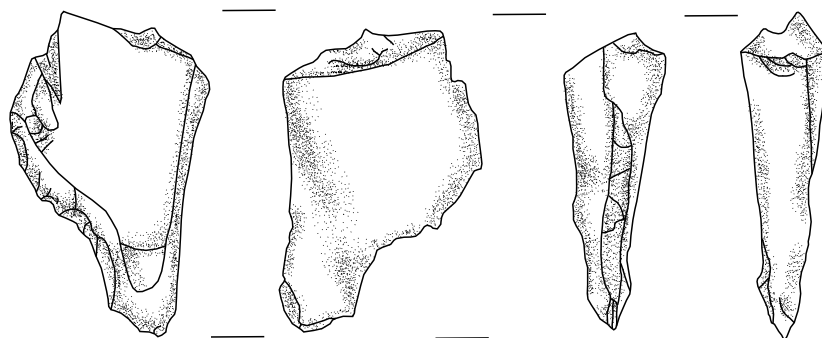
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GR 20407



SHP19_0061
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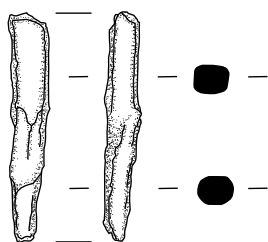
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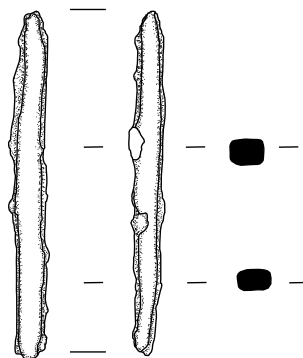
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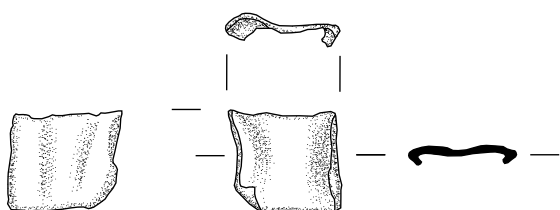
Square T9



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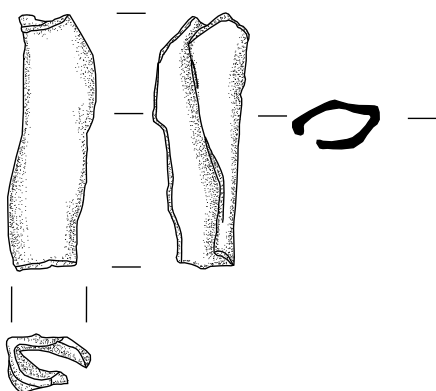
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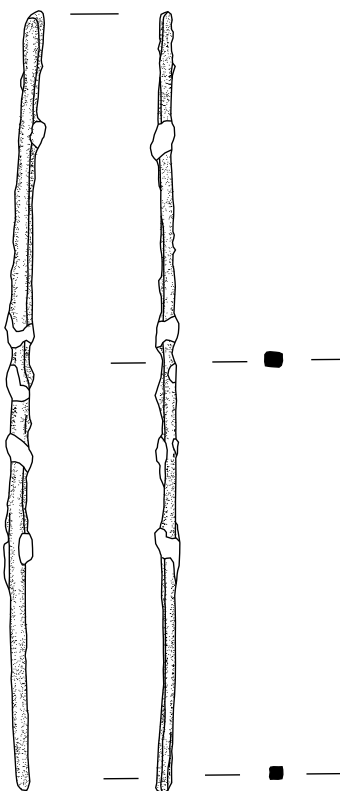
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SHP19_0154



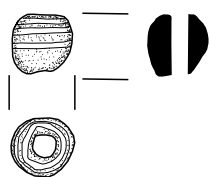
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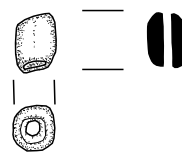


Square T9



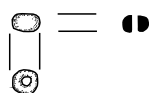
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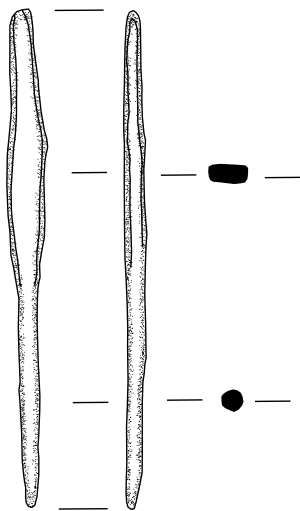


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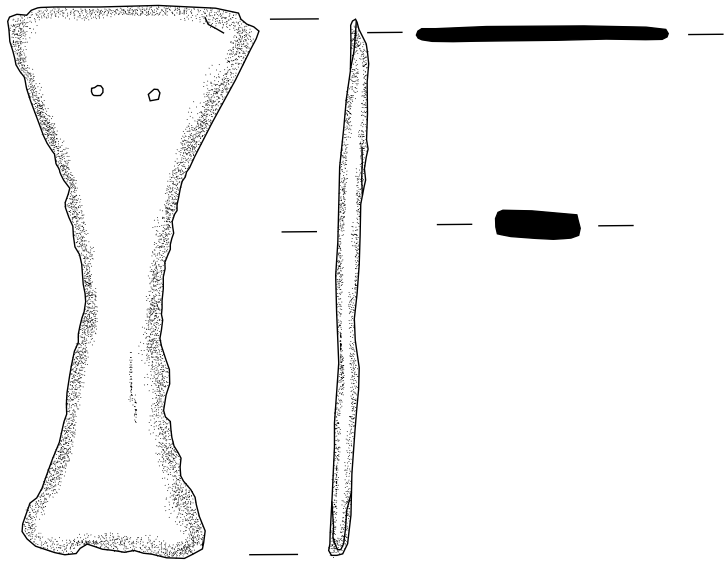


Square U9



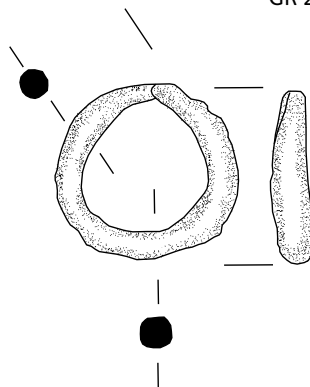
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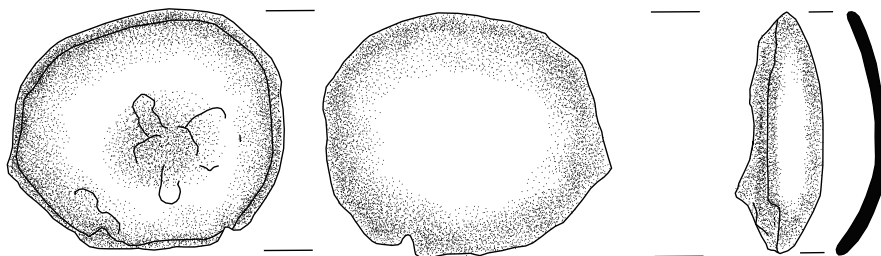
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SHP19_0670

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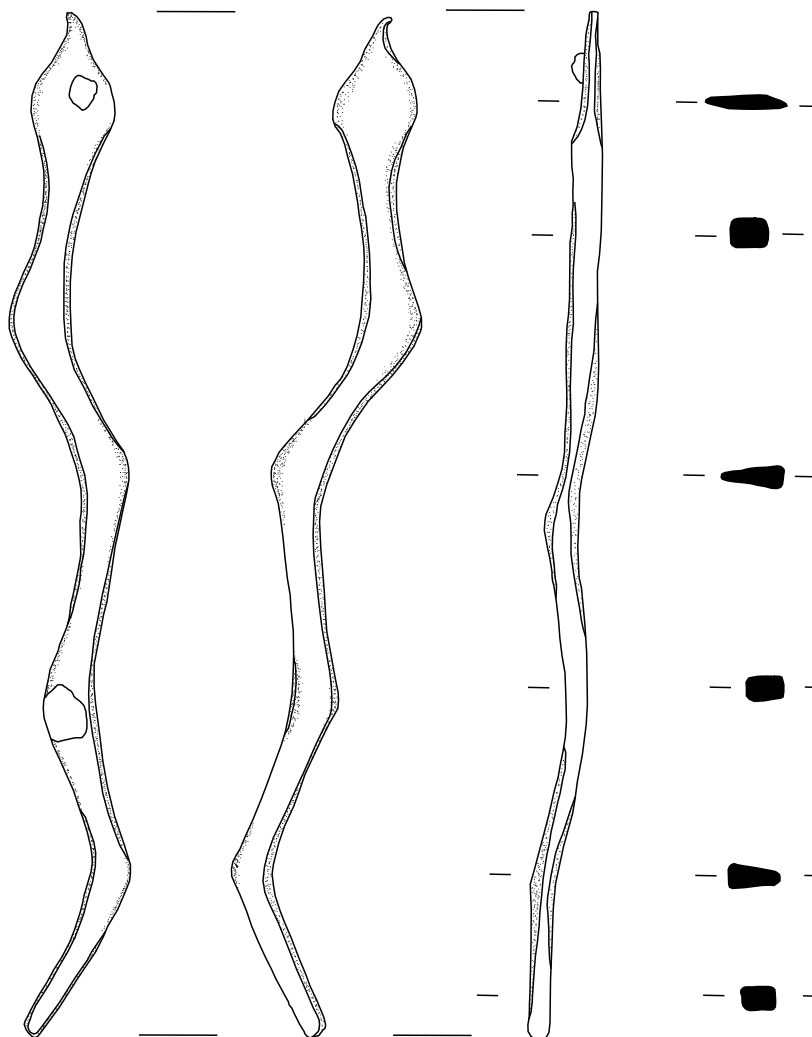


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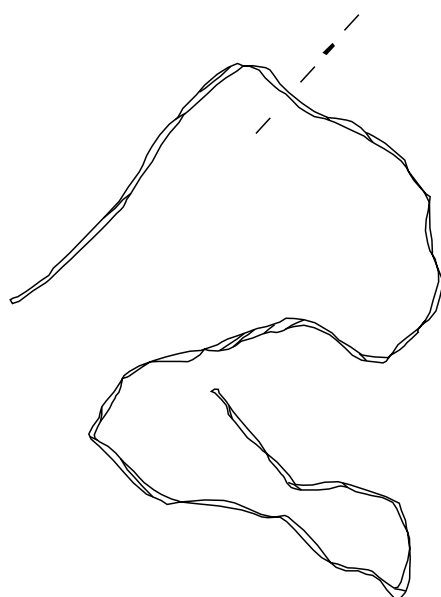
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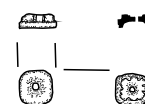
Square V8



SHP19_0041
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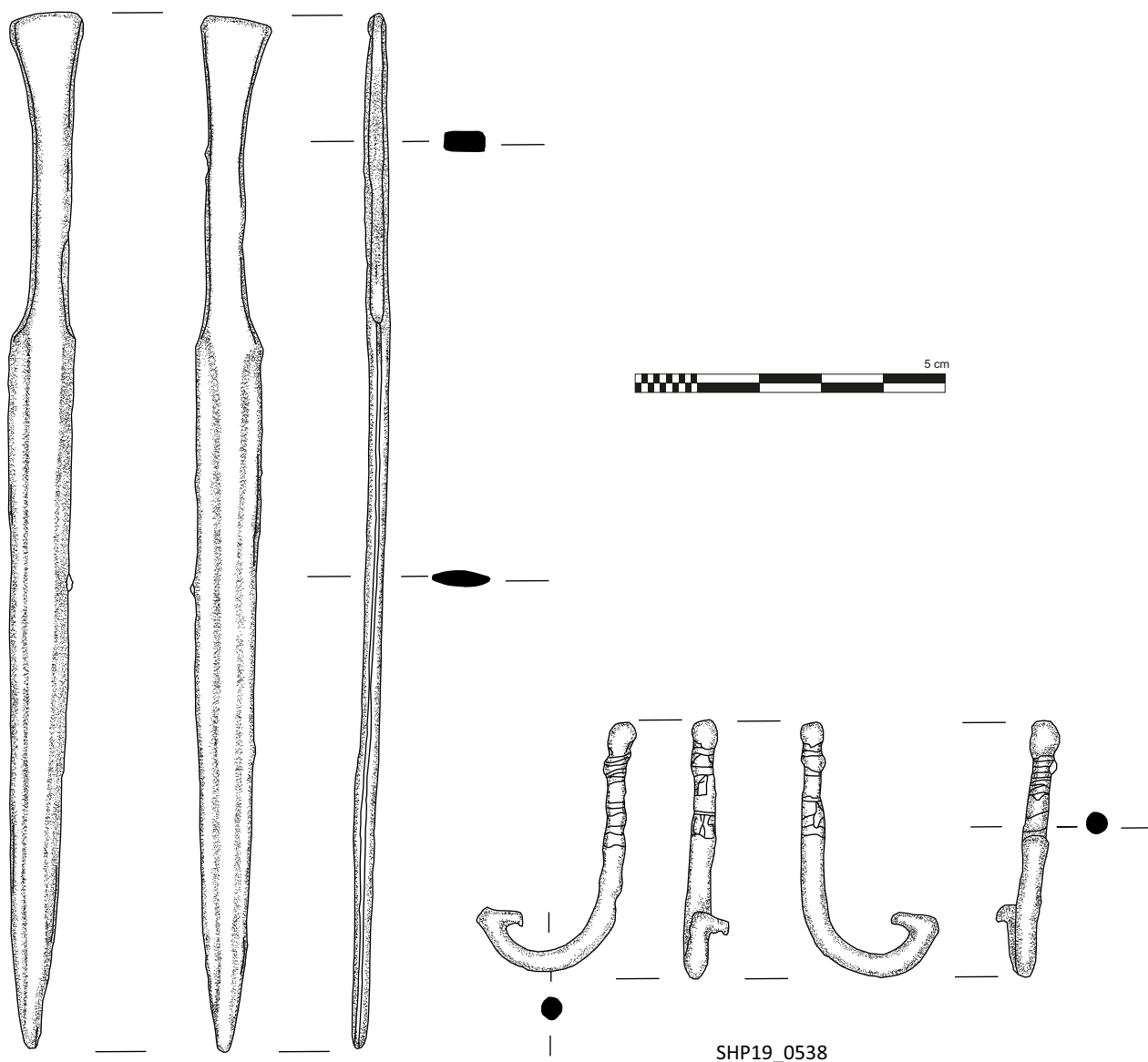
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SHP19_0003
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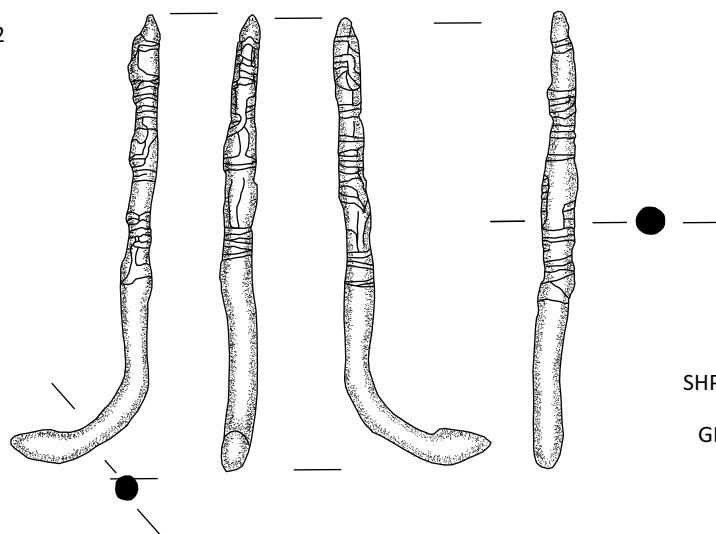
Square V9



SHP19_0538

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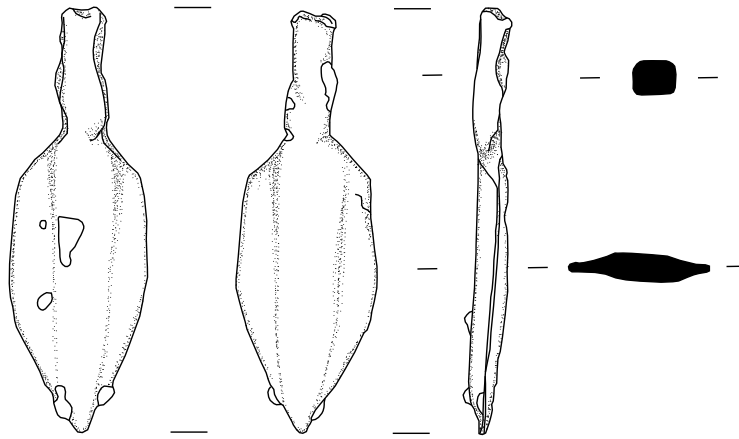
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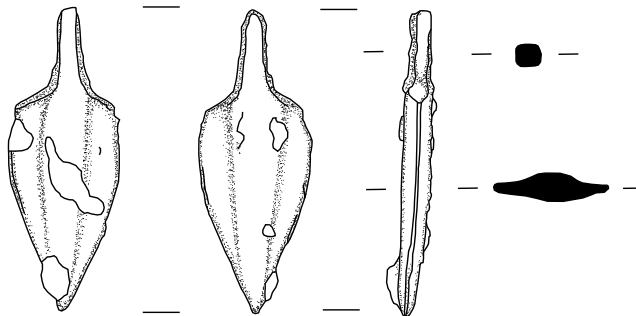
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Square W8



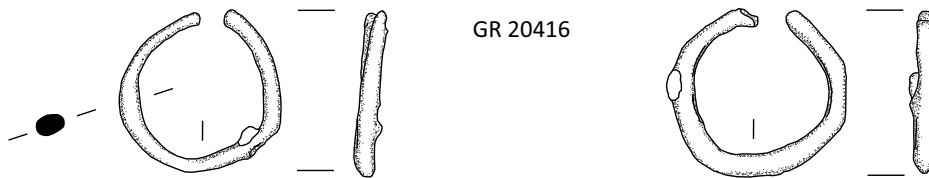
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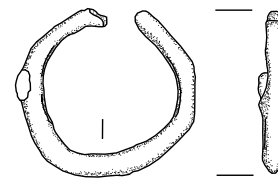
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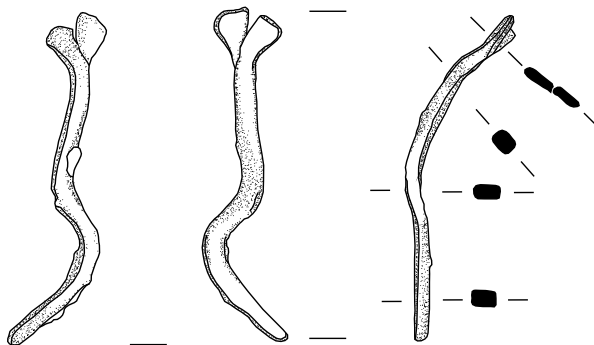
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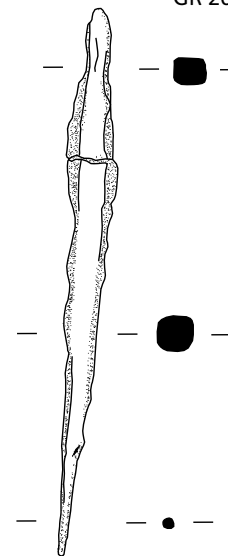
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GR 20409



SHP19_0134

GR 20422

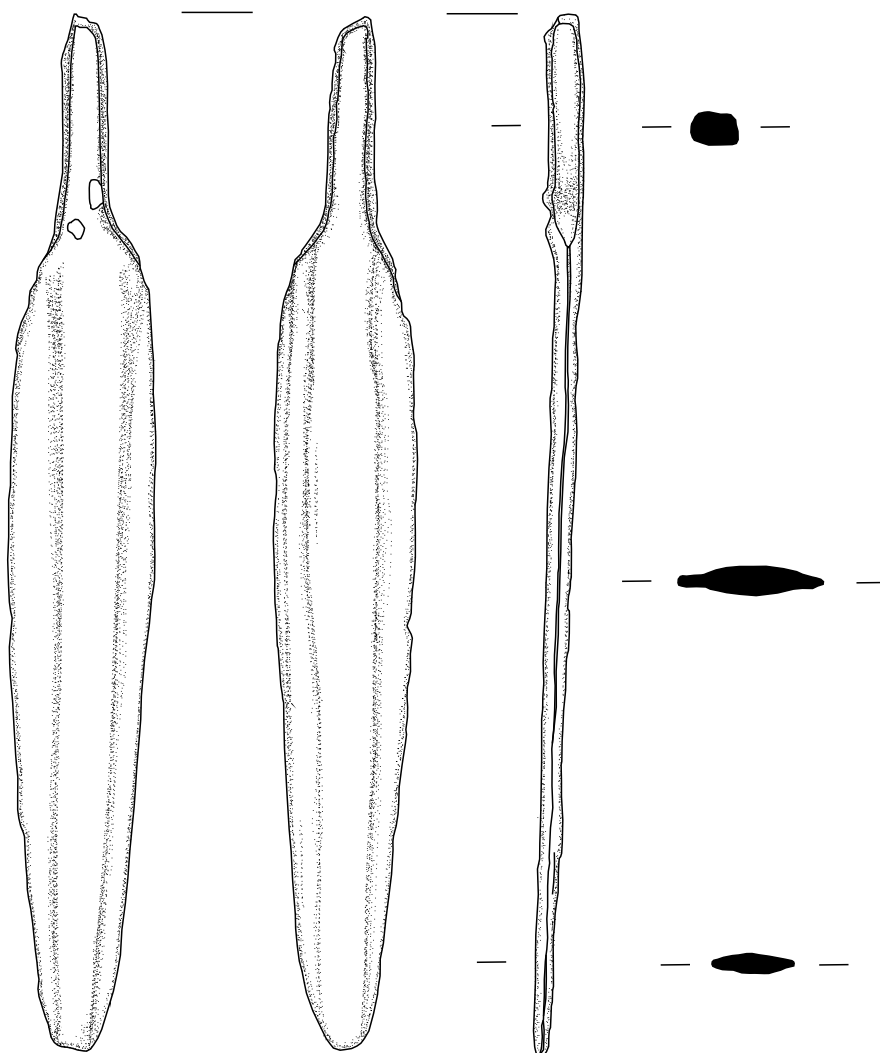


SHP19_0135

GR 20423



Square W8

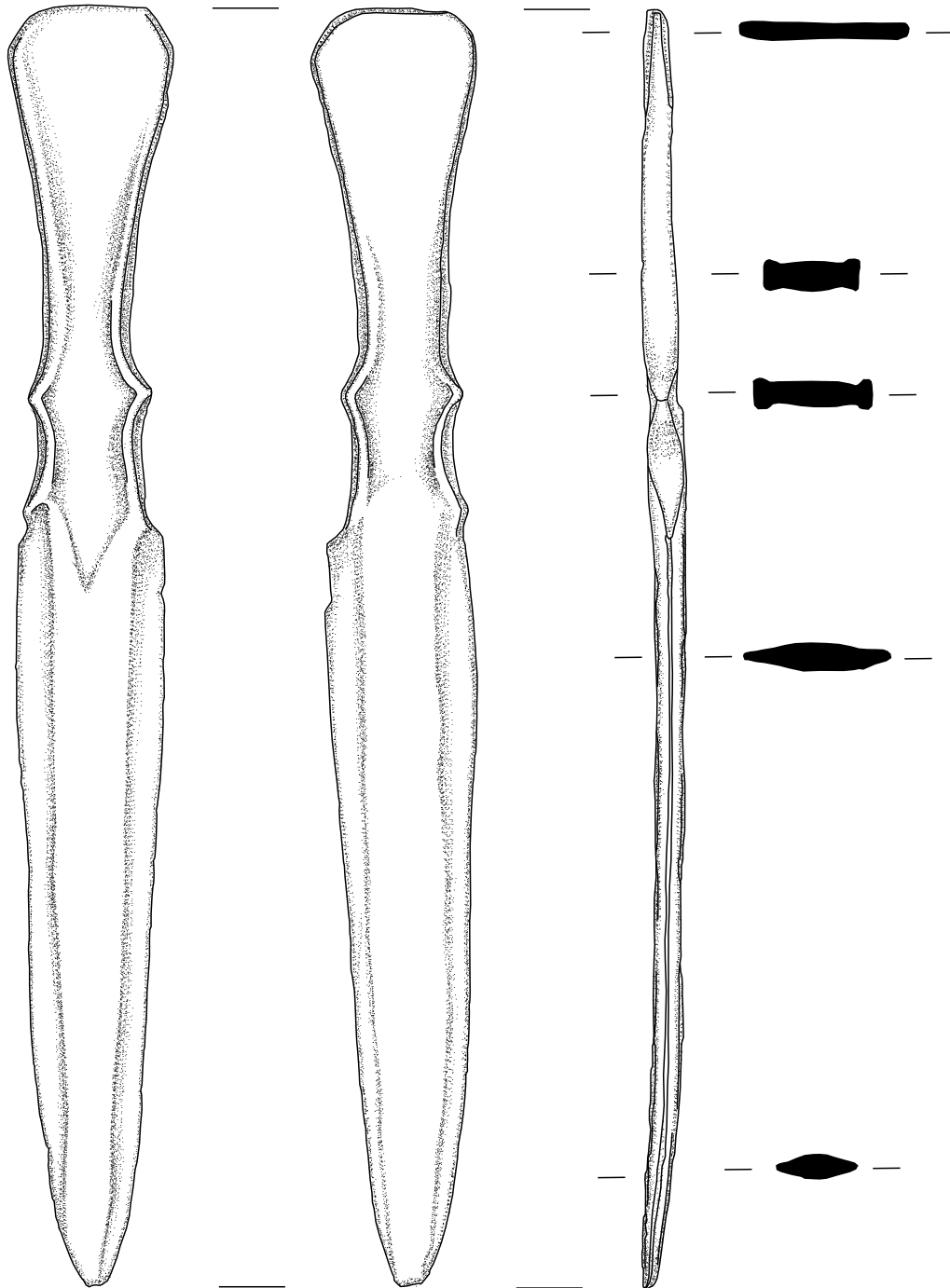


SHP19_0136

GR 20424



Square W8

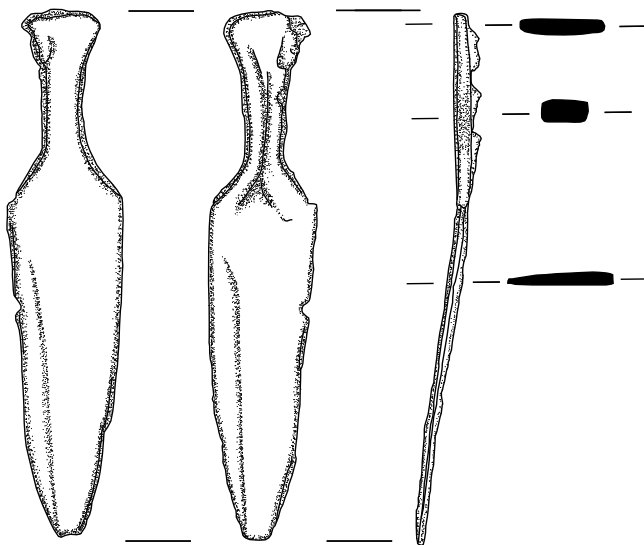


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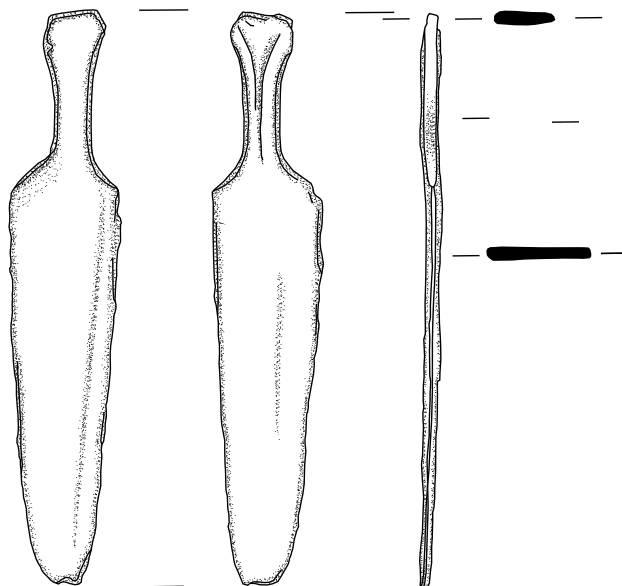


Square W8



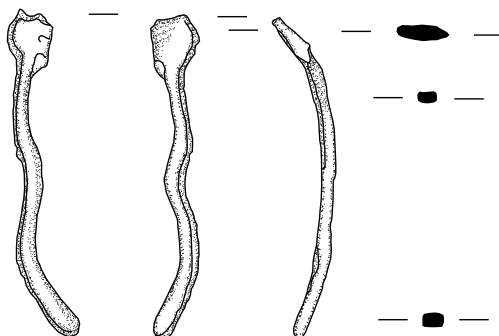
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GR 20429



SHP19_0178

GR 20430

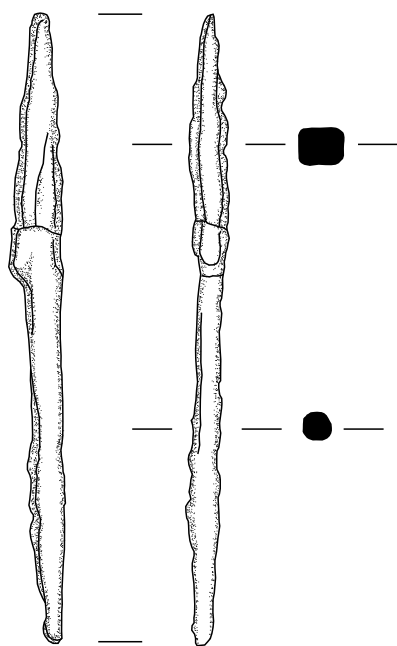


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GR 20428

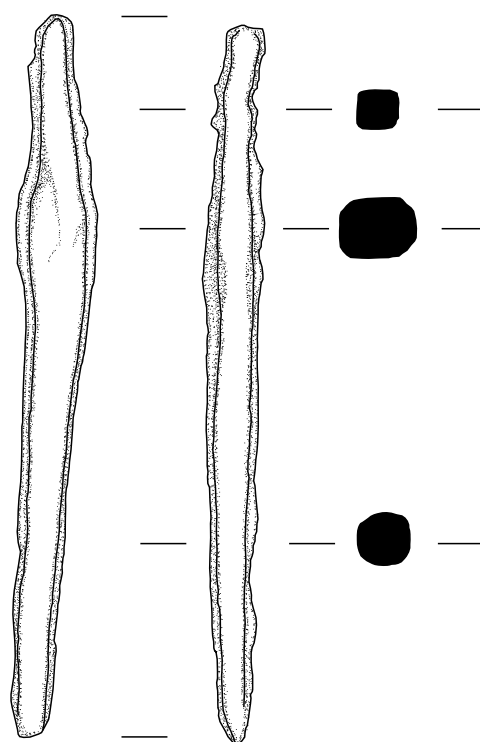


Square W8



SHP19_0195

GR 20434



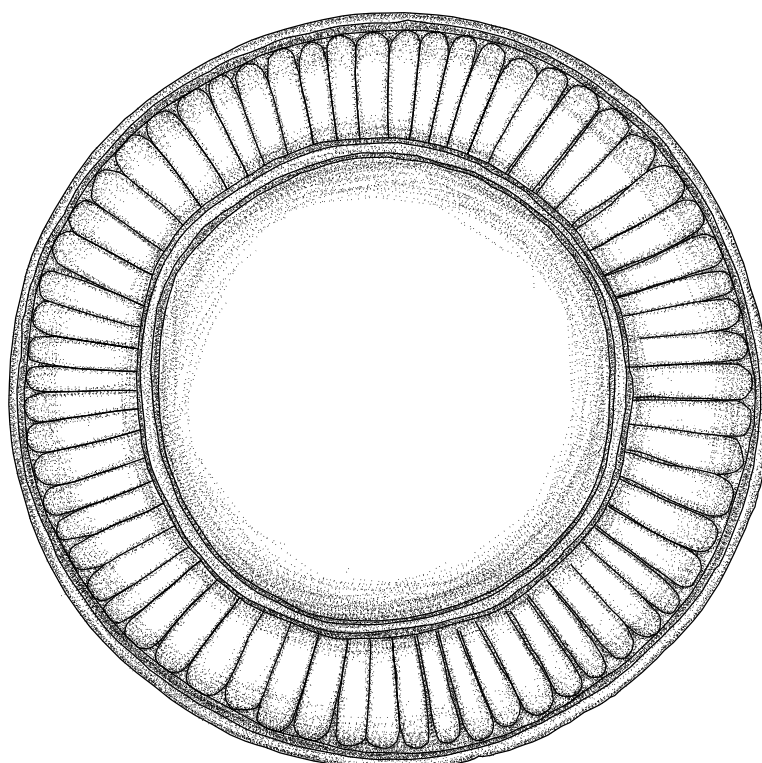
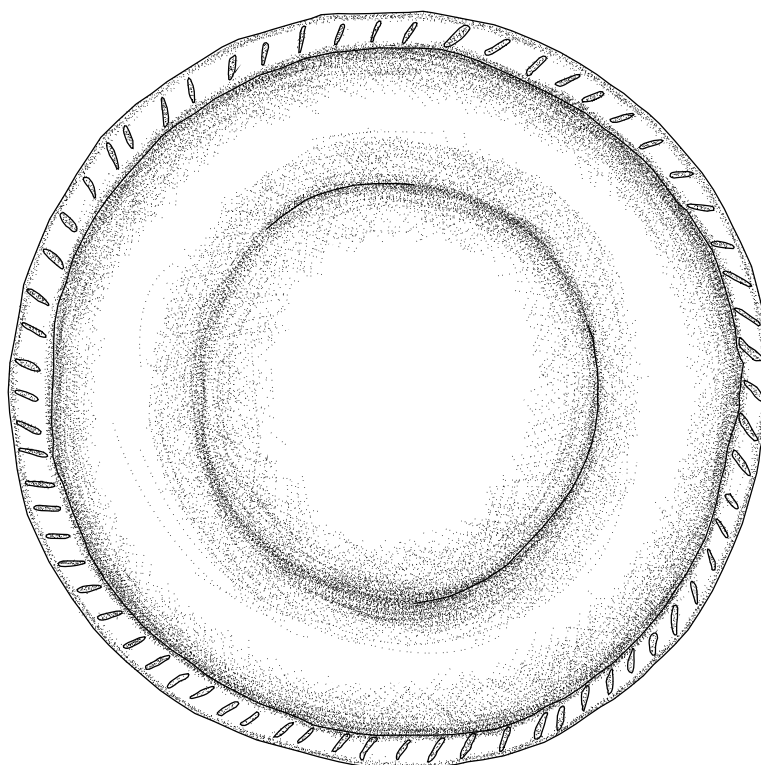
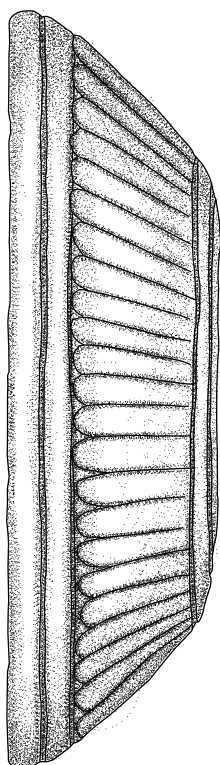
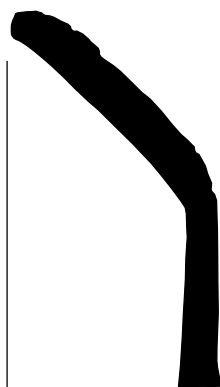
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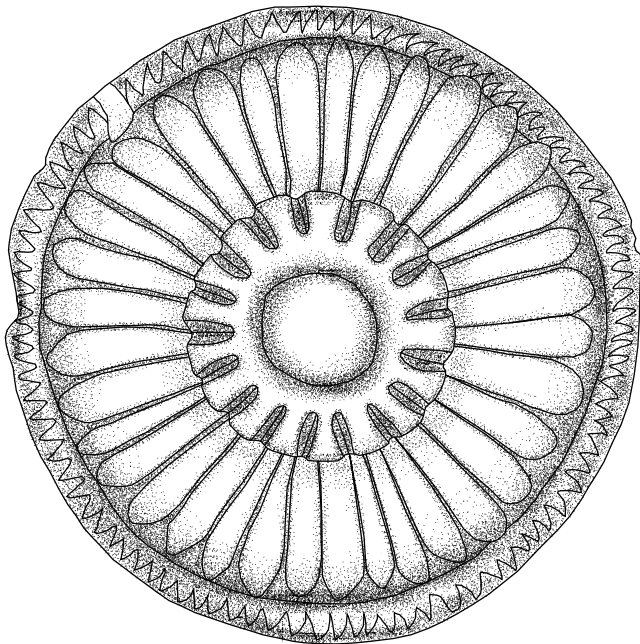
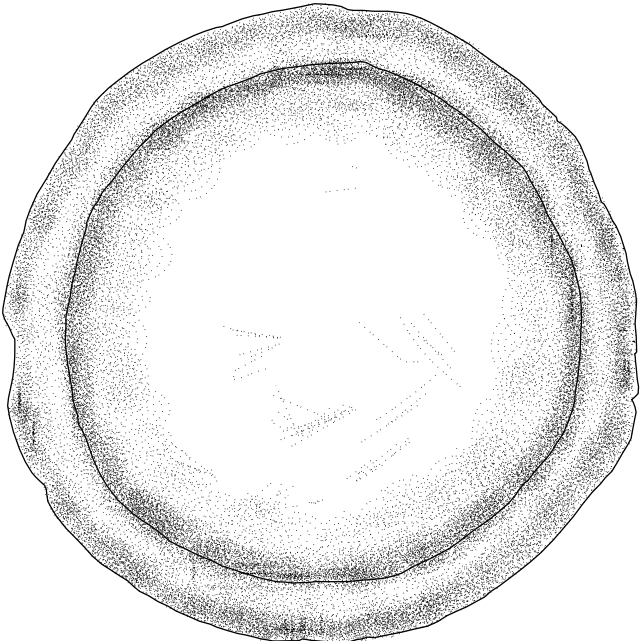
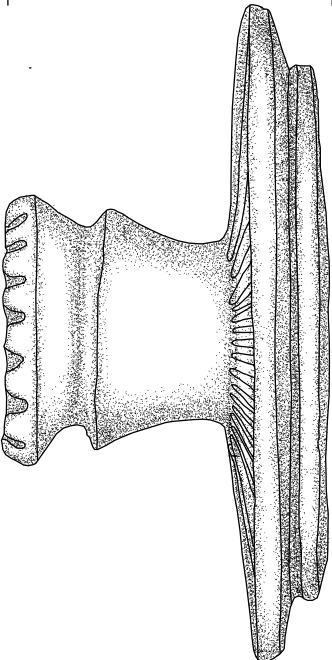
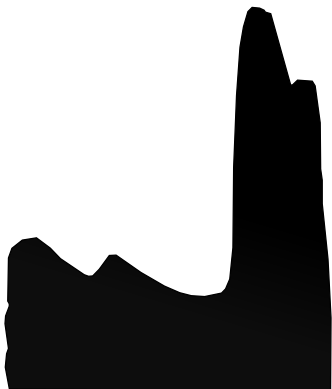
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Square W8



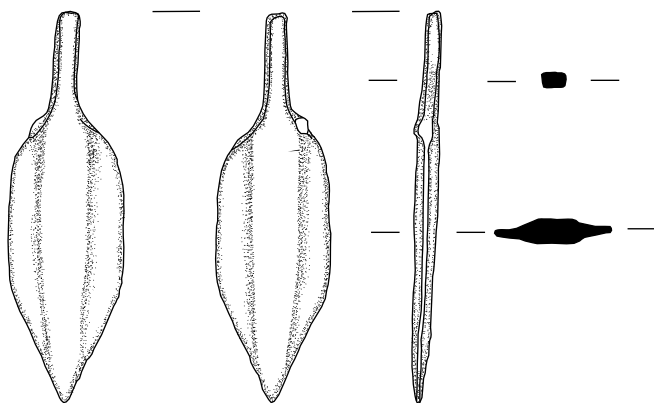
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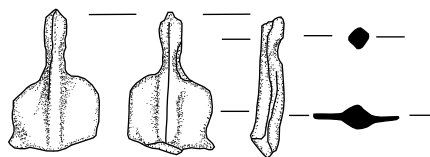


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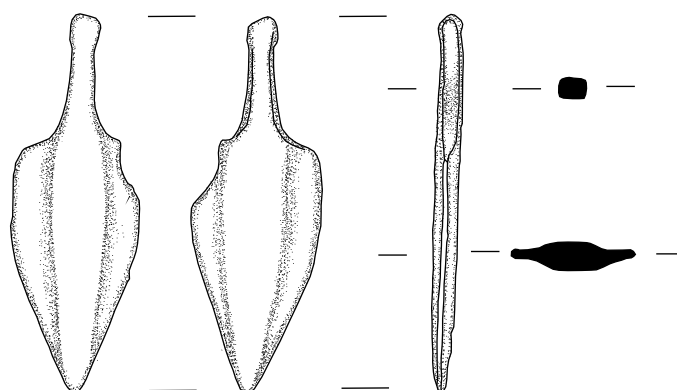
Square W9



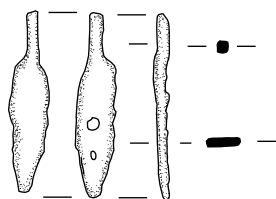
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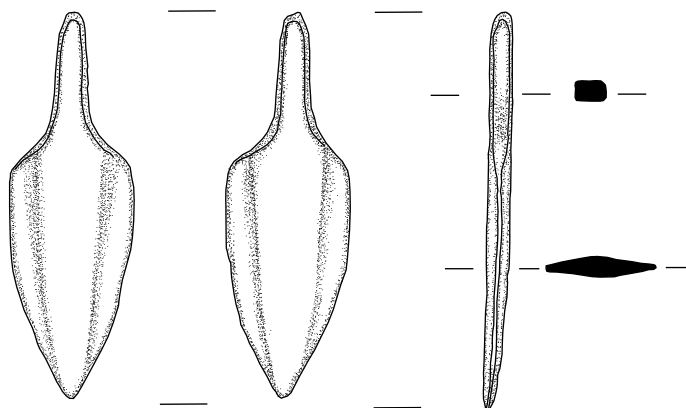
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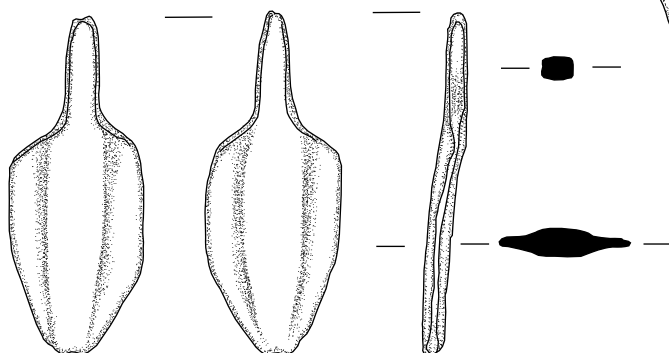
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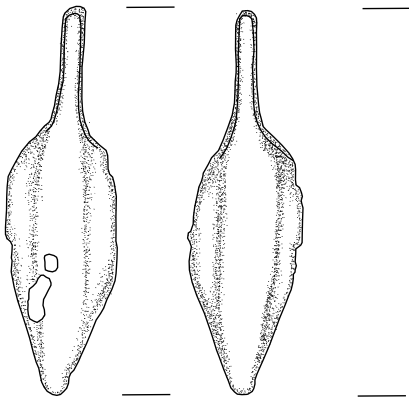
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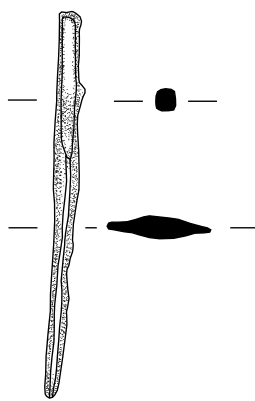
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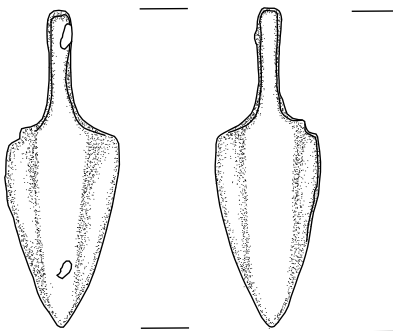
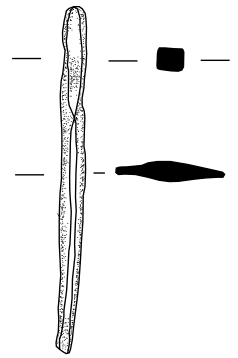
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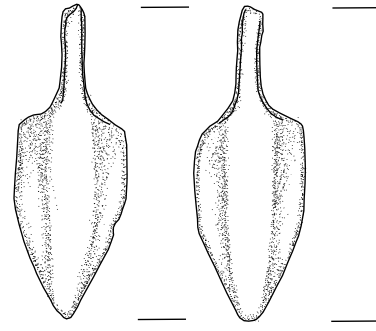
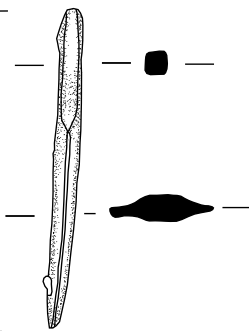
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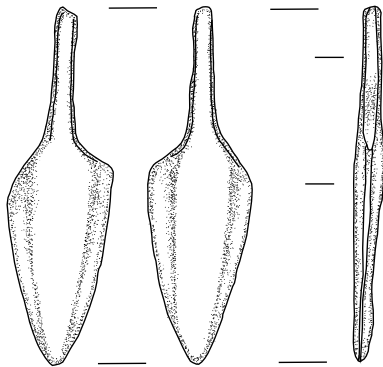
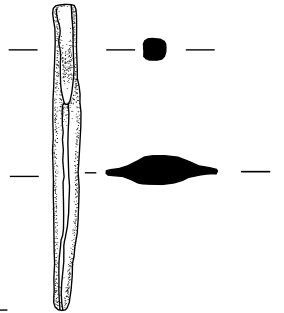
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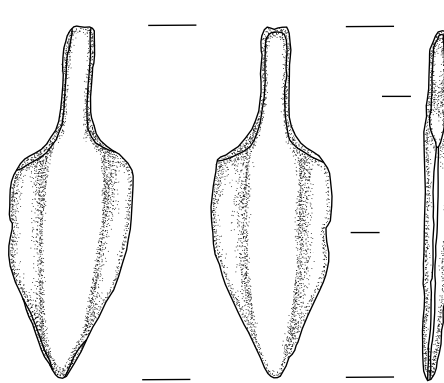
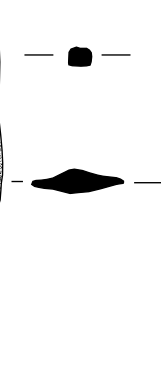
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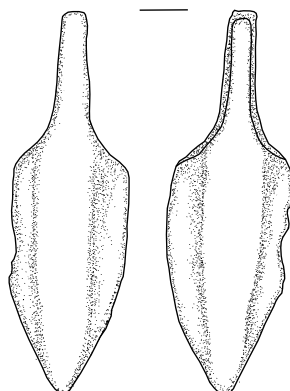
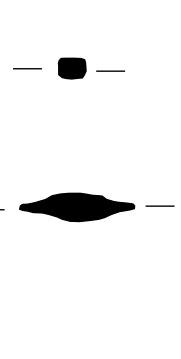
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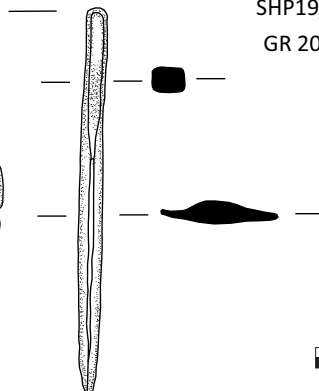
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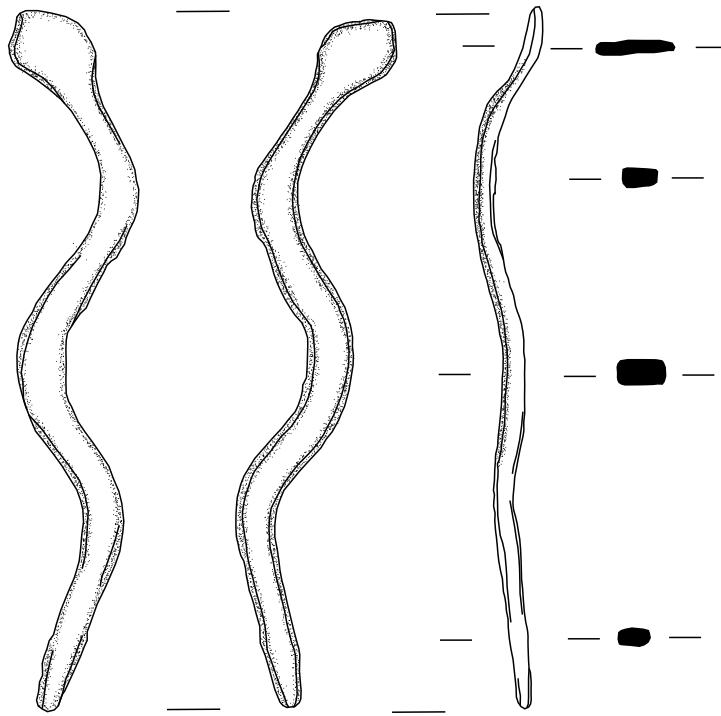
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GR 20458



SHP19_0380
GR 20455



Square W9



SHP19_0358
GR 20459



ISBN 978-83-963880-8-7



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