Materiali e documenti

# Abu Tbeirah Excavations I. Area 1

## Last Phase and Building A – Phase 1

edited by

Licia Romano and Franco D'Agostino

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# Abu Tbeirah
# Excavations I. Area 1
## Last Phase and Building A – Phase 1

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In copertina: Modified satellite imagery of Abu Tbeirah site (courtesy of © DigitalGlobe, distributed by e-GEOSx). Logo: Iraqi SBAH

*This book is dedicated to Amir Doshi,*
*whose friendship is the pillar*
*of our work at Abu Tbeirah*

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# CHIPPED STONE ARTIFACTS: TECHNOLOGICAL ANALYSIS

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## 14.1 Introduction

In this chapter an integrated analysis, which combines preliminary data about raw materials and a classical technological study, of the chert[1] artifacts excavated from the ED III/Akk. layers of the Abu Tbeirah mound will be presented. This study was conducted in order to reconstruct all the phases of the *châine opératoire* aimed at the production of lithic tools. In the specific, this contribution will be focused on three main topics: characterization of the raw materials, *débitage* techniques and economy, blank transformation through retouch.

Lithic industries in metal using societies of the Bronze Age southern Mesopotamia had received little attention in the archaeological literature.[2] Few studies were focused on typological aspects of the retouched or formal tools recovered from excavations, or in describing through illustrations selected lithic inventories from the sites. The technological approach allows the reconstruction of the ways in which natural resources - in this case knappable rocks - were exploited and managed during ancient times. The study of the organization of the production[3] can give relevant insights into the understanding of cultural traditions and craft practices (tool-kits, techniques, *savoire faire*) linked to economic activities such as agriculture, materials working and other subsistence activities. Furthermore, the spatial dimension of the technology can introduce the notion of "territory" as a way to understand the circulation and exchange of goods and raw materials.[4] At Abu Tbeirah, thanks to the attention paid to this artifact category during the fieldwork, it was also possible to contextualize the data acquired from this study, contributing to the general and functional interpretation of the different contexts.

## 14.2 Composition of the Lithic Assemblage

The analysed sample consists of 45 artifacts (Tab. 14.1) coming from the latest occupational phase of the Building A - phase 1, excavated on the south-eastern part of the mound and dated to the ED III/Akk. on the basis of the ceramic vessels. The artifacts were chosen from secure and preserved contexts, such as ground-surfaces and room fillings. Other contexts and materials recovered during surface scraping, although numerically consistent, were not considered in this study.

Retouched tools are the largest part of the lithic artifacts: the 60% of the entire assemblage is constituted by sickle inserts with one or both the edges transformed by direct denticulate retouch and obtained by intentional fragmentation of blades. These tools exhibit a naked-eye glossy on the edges, suggesting their use during agricultural activities (see § 15). The remaining part is represented by blades and blade fragments with

[1] The term "chert" is used accordingly to the archaeological terminolgy, including thus various siliceous minerals (*e.g.,* micrite).

[2] Angevin *forth.*; Payne 1980; Unger-Hamilton *et al.* 1987.

[3] Pelegrin *et al.* 1988.

[4] Geneste 1991; Perlès 2007.

| Technological classes | N | % |
|---|---|---|
| Sickle inserts | 23 | 51 |
| Retouched blades | 3 | 7 |
| Retouched flakes | 1 | 2 |
| *Total tools* | 27 | 60 |
| Blades | 5 | 11 |
| Semi-cortical blades | 1 | 2 |
| Surface maintenance blades | 1 | 2 |
| Neo-crested blades | 2 | 4 |
| Maintenance flakes | 1 | 2 |
| Tranchant flakes | 1 | 2 |
| Partially cortical flakes | 4 | 9 |
| Naturally convex flakes | 1 | 2 |
| Totally cortical flakes | 1 | 2 |
| *Total débitage* | 17 | 38 |
| Unifacial flake core | 1 | 2 |
| *Total* | 45 | 100 |

**Tab. 14.1** Lithic artifacts from Building A - phase 1.

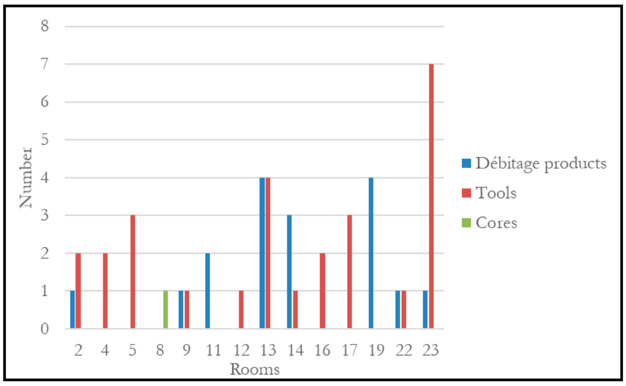


**Fig. 14.1** Distribution of the lithic artifacts inside Building A - phase 1.

marginal retouch (7%), probably used as reaping knives, and only one retouched flake.

*Débitage* products, as a result of knapping activities are very scarce (17 items) and could not be directly related to knapping activities performed inside the various rooms of Building A. Problems connected with cleaning activities of the ground-surfaces by the site inhabitants could have masked the real amount of knapping debrìs (see § 9). Among the knapping products, entire blades (2 semi-cortical) and blade fragments are the most consistent *débitage* classes represented and the presence of one neo-crested laminar element, along with core maintenance blades, could indicate that some episodes of blade production took place at the site, despite the apparent lack of cores.

The remaining part of the assemblage is represented by cortical and semi-cortical flakes of very small size and an unifacial flake-core on a small pebble.[5]

Looking at the distribution of the lithic artifacts inside Building A - phase 1 (Figs 14.1-2), it is possible to note the relative ubiquity of the retouched tools - especially the sickle inserts - inside the various rooms. The other categories are under-represented, but the presence of a flake-core inside Room 8, could suggest that expedient-flake productions were performed in relation to other kind of activities.

Room 23, located along the south-eastern limit of the main excavation area, appears to be one of the most preserved context of Building A, due to the high concentration of *in situ* materials on the ground-surface and traces of hearths and to the activities related with bitumen processing (see § 9). In this context, a fragmentary bitumen handle (AbT.15.114) with three sickles inserts, and possibly a fourth, was recovered during the excavation, in association with ceramic vessels and bitumen lumps. The study of ground-surface's heavy residues and their spatial distribution analysis made possible the interpretation of this room as a place in which bitumen was processed: composite sickles might have been created or repaired here and then stored in specific locations of the available space.

## 14.3 Raw Materials

Chert represents the exclusive raw material utilised for the production of the lithic tools. Only two dark limestone flakes related to *tranchant* sharpening were recovered in the excavation. The largest part of the assemblage is constituted by non-cortical products, few cortical pieces and naturally convex flakes allowed the recognition of primary chert cortex, indicating the introduction at the site of

[5] This study was conducted during the 2015 mission field campaign. Most of the artifacts excavated in Area 1 Cemetery and Building A - phase 1 contexts during the 2012-2013-2015 were studied. It was possible to document the flake-core through the archive photos of the mission.

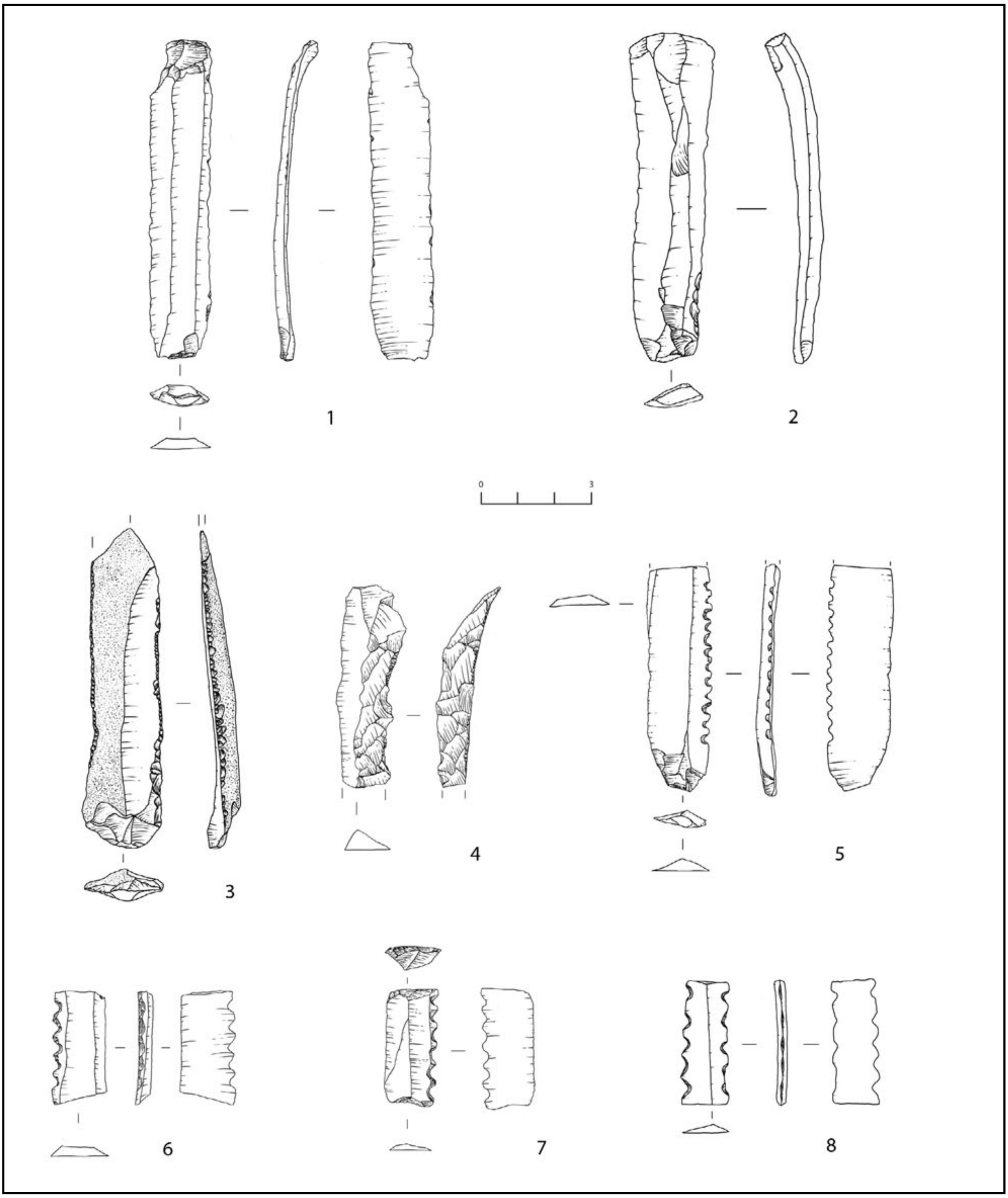


**Fig. 14.2** Chipped stone artifacts from Building A - phase 1: pressure blade (1); Retouched blades made by direct or indirect percussion (2-3); neo-crested blade (4); sickle inserts (5-8) (drawings by D. Moscone).

nodular cherts. Furthermore, the limited number of the pieces composing the assemblage and their bad preservation made very difficult the complete identification of the chert types.

### *14.3.1 Artifacts Patination*

The entire surface of the site is covered by a heavy crust of salt, which affected the preservation of the original soil structure and the underlying archaeological remains (see § 6.1.1.1). This alteration involved the development of a heavy white patina which covered, in most of the cases, the entire surface of the artifacts, provoking small pits, visible to the naked eye, and a partial chemical dissolution of the silica phases of the internal structure of the cherts. As noted in the previous

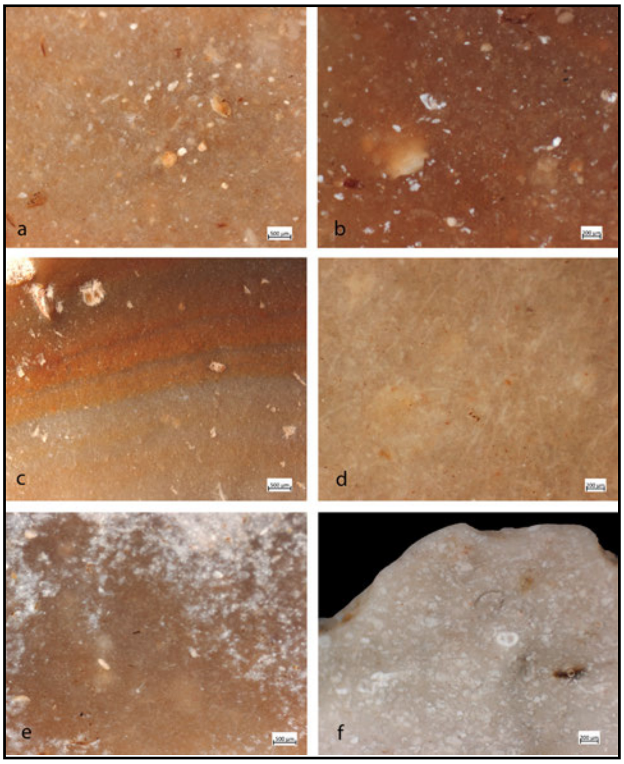


**Fig. 14.3** Petrographic features of the cherts. Type A translucent brownish chert with spotted structure, wakestone (a); foraminifera in a Type A chert (b); Type B translucent brownish chert with reddish laminations (c); abundant sponge and foraminifera in a Type B chert (d); salt alteration on a Type C chert (e); foraminifera, sponge spiculae fragments and a brachiopod test in a Type C chert (f).

paragraph, the reconnaissance and description of the chert types was very difficult. In this contribution, will be presented a preliminary list of types.

### *14.3.2 Preliminary Data About Chert Petrography*

A petrographic analysis was conducted on the best-preserved archaeological samples. The main goal was to characterize the different cherts exploited at the site.

The study was performed following the methodology outlined by Tarantini *et al.*,[6] which provides a macroscopic description of the visible properties of the chert. Regarding the cortex, five features were described by adopting pre-established variables for each feature: thickness, nature (siliceous or calcareous), induration, surface and boundary. As far as the siliceous matrix is concerned, four features were recorded: subcortex (presence or absence), structure, texture[7] and fracture. Obtained data were integrated with a microscopic observation of the fossil fauna component, by using a stereo-microscope at different magnifications (10x-40x) as proposed by Delluniversità *et al.*[8]

Preliminary results allowed the recognition of three main chert types, of very good quality (Fig. 14.3):

- Type A: translucent brownish chert, spotted structure, wakestone texture, with fossil fauna (mainly foraminifera);
- Type B: translucent brownish chert, reddish laminations and light grey mottled structures, wakestone texture, smooth and thin nodular primary cortex, with fossil fauna (abundant sponge spiculae and foraminifera);
- Type C: translucent greyish chert, spotted structure, wakestone texture, with fossil fauna (abundant foraminifera, sponge spiculae, rare brachiopods).

### *14.3.3 Chert Availability in Southern Mesopotamia*

The geological setting of southern Mesopotamia, in which the site of Abu Tbeirah is located, is characterised by a thick alluvial fan and late quaternary deltaic sediments originated by the effort of the Euphrates and the Tigris Rivers transport (see § 3). In this picture, the area around the site has to be considered lacking primary chert resources suitable for knapping.

Given the total absence of studies regarding chert availability for the southern Iraq, a survey of the recent geological literature of south-western Desert of Iraq[9] and south-western Zagros Mountains[10] allowed the recognition of different formations, dated between the Early Jurassic and the Middle Miocene, in which several chert horizons in primary deposition were reported. These areas

[6] Tarantini *et al.* 2016.

[7] The study was conducted following the Dunham's classification of sedimentary rocks (Dunham 1962).

[8] Delluniversità *et al. forth.*

[9] Mohammed - Sissakian 2007; Sissakian *et al.* 2017; 2018.

[10] Haynes - McQuillan 1974; Rezaee - Ali Nejad 2014; Tamar-Agha - Al-Sagri 2015; Yavari *et al.* 2017.

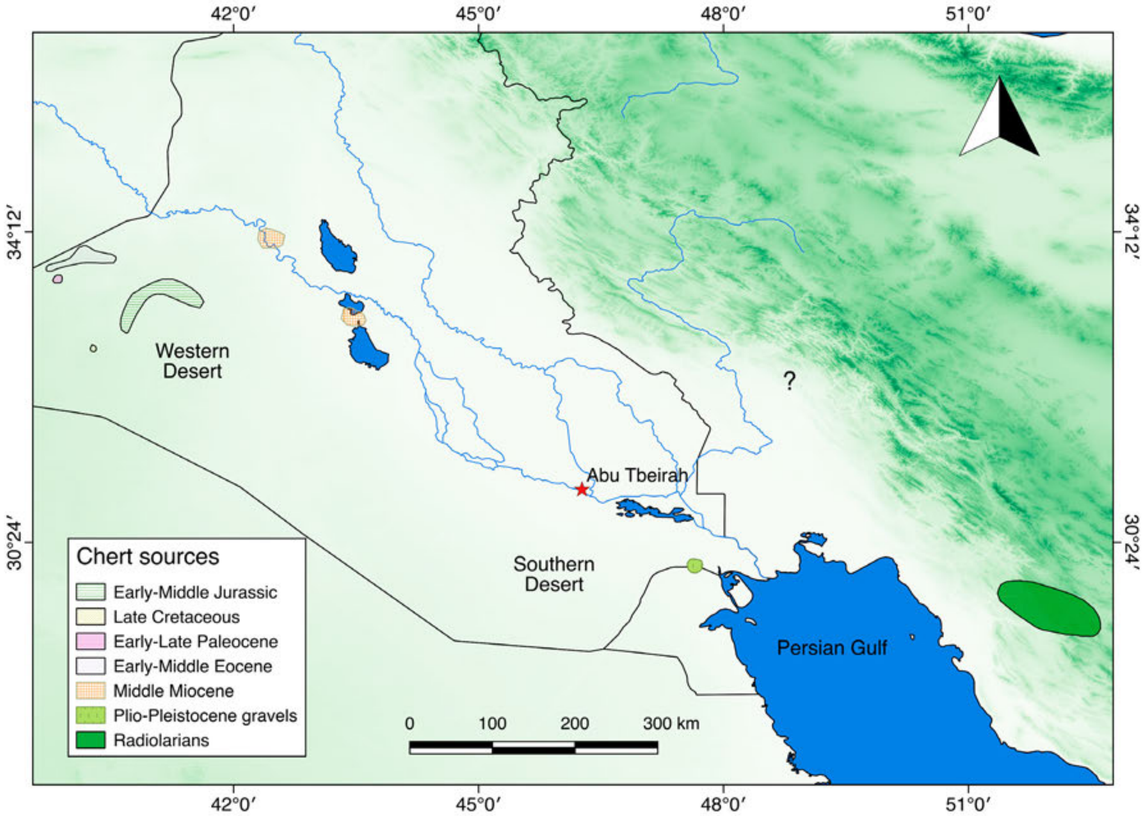


**Fig. 14.4** Map based on the geological literature showing the location of of the potential chert sources of southern Mesopotamia (GIS elaboration by D. Moscone).

are located about 400-500 km from the site. The lack of specific data about the chert types available do not allow to formulate hypotheses. Although, the presence of not yet investigated outcrops could shed light on new scenarios regarding the procurement of chert raw materials during the 3rd mill. BC. A summary is presented in Fig. 14.4.

The presence of secondary sources of pebbles transported from the northern areas by the Euphrates and Tigris rivers could only be hypothesized on the basis of the archaeological literature.[11] Plio-Pleistocene conglomerates of the Jabal Sanam, several kilometres south-east from the site, are the nearest source of chert pebbles. The suitability of this source remains to be verified.

As show in fig. 14.4, the Western Desert sources are located about 400 km from the site. The occurence of chert raw materials in these outcrops needs further researches in the light of the regional availability. The west-southern Zagros sources, consisting of Late Cretaceous radiolarians bedded cherts, have been not encountered so far in the lithic evidence. Other chert types, hypothesized as imported raw materials at the Bronze Age city of Mari,[12] comes from the Syrian Desert.[13]

## 14.4 Blade Production

The largest part of the assemblages from Building A - phase 1 is characterised by blades processed in order to obtain sickle inserts. Despite the heavy intentional segmentation, it is possible to note the extreme regularity of the blanks by which these agricultural tools were obtained. The majority of the blades exhibit very regular and parallel previous blade removals on the dorsal face, configuring thin trapezoidal or triangular sections. Other blades, less regular and thicker, were not selected for sickles production.

[11] Borrell 2010; Moscone *forth.*

[12] Angevin *forth.*

[13] Delage 2007; Borrell - Vicente 2012.

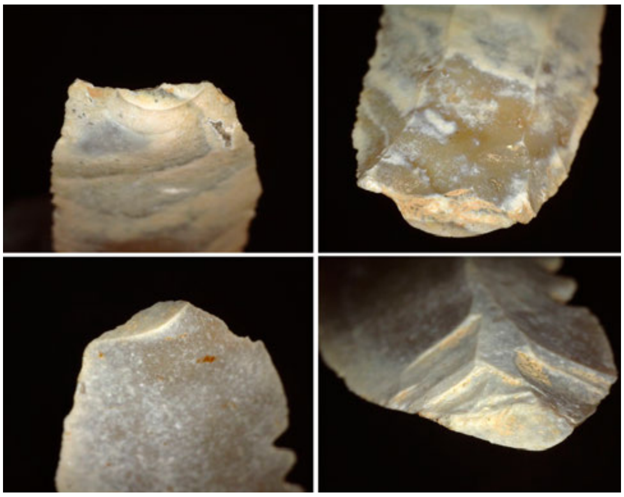

**Fig. 14.5** Proximal ends of two pressure-blades (dorsal and ventral views).

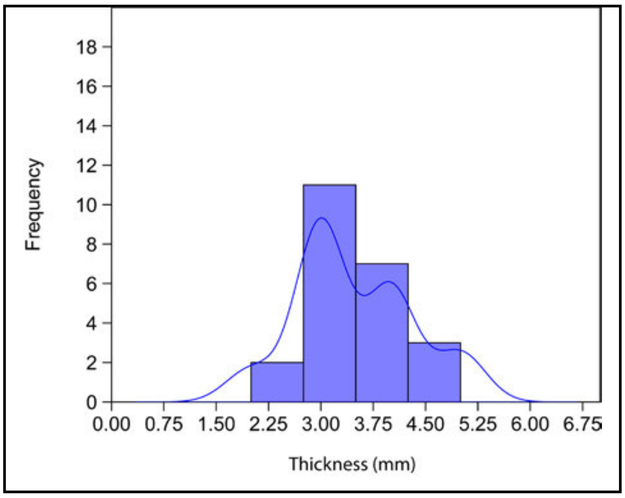


**Fig. 14.6** Histogram showing the distribution range of the sickles inserts thickness.

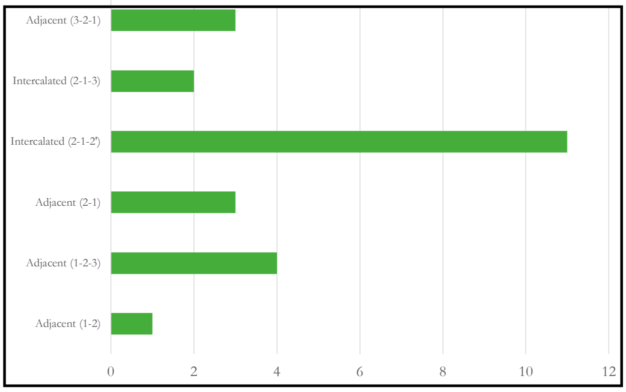


**Fig. 14.7** Chronology of the dorsal negatives of the blades.

### *14.4.1 Knapping Technique*

The analysis of the technical features (Fig. 14.5) of the blades allowed to isolate one specialized production, realized by pressure technology. The study was conducted on three entire blades present in the lithic record, on the proximal fragments (n.2), and by analysing the organization of the previous blade removals on the retouched items (n.23). Of course, this is a reduced number of objects, but the technical parameters observed resulted to be consistent with the pressure technique.

The butts are always non-cortical and flat, semi-circular in shape and of small size with respect to the general width of the blade. Any preparation negatives was observed and any cracks was recorded on their surface. The angle between the pressure plane and extraction surface is about 90° in each specimen. Some blades exhibit, in their proximal portion, repeated small lateral detachments finalized to platform isolation during the process of core reduction. On the ventral surface, the bulb of force is prominent and concentrated under the butt and is generally marked by ripples development. The profile is, in most of the cases, straight with an evident curvature observed in the distal end.

Blade terminations are rectangular and prepared, while some others distal fragments are convergent, suggesting that these items were detached at different stages of core reduction which could indicate also the reduction of different core morphologies (prismatic with a flat base and sub-conical).

The longest and almost entire pressure blade is 79 mm in length, 15 mm in width and 3 mm in thickness. Following Pelegrin's experimental research on pressure blades, the width of the blades, more than the length, is considered to be diagnostic of a specific mode of pressure.[14]

This observation is based on the fact that much wider is the blade, greater is the amount of pressure necessary to generate the fracture.[15] As a result, different range of width could indicate the employment of several modes of pressure. In the analysed lithic assemblage, due to heavy edge retouch and the scarce abundance of entire blades, it could be assumed on a statistic base that the width of 15 mm of the only one entire specimen is representative of the general situation, by comparing its thickness of 3 mm with the

[14] Pelegrin 2012.
[15] Crabtree 1968.

thickness values reported for the sickle inserts in the graph at Fig. 14.6.

In fact, the distribution shows a trimodal tendency inside the population, with three peaks at 3.5 mm, 4 and 5 mm; reaching a minimum thickness of 2 and a maximum of 5 mm (mean 3.5 mm; std. dev. 0.8 mm). On the basis of this values, considering the value of 15 mm of width for the entire blade and the relative low variability of the thickness, the evidence is placed at the limits of applicability of the Pelegrin's pressure with a short crutch in a sitting position and in the full range of the pressure with a long crutch in a standing position.[16]

As mentioned above, the majority of the blades has a trapezoidal section (n.21), while the remaining blades have triangular or sub-triangular section (n.4). The analysis of the chronology of the dorsal negatives[17] on these blades, originated from the previous removals, permitted to obtain informations about the methods of *débitage*, also in absence of cores.

Leaving aside the blades with triangular section, the Fig. 14.6 clearly indicates the existence of two different groups of trapezoidal blades. The first group has an intercalated module (2-1-2' or 2-1-3) which is characterized by blades exhibiting a symmetric trapezoidal section with parallel ridges on the dorsal face, obtained by the systematic detachment of centred blades departing each time from the same side of the core. The second group is characterised by an adjacent module (1-2-3 or 3-2-1) which features a less symmetric section and a less centred distribution of the dorsal ridges, indicating a systematic detachment of blades, characterised by alternate changes in direction during knapping, from the two extremities of the core.

Given these observations, we must rule out that complete blades evidence is actually poor, and the raw material state of preservation cannot help with the understanding of the relations between these different blade-knapping processes.

[16] Pelegrin 2012: 479.
[17] Binder - Gassin 1988.

### *14.4.2 Technical Blades*

The lithic evidence includes also three blades whose features do not fit with the pressure ones. Two of these are semi-cortical while the last is non-cortical. Their morphology is less regular, larger and thicker, with a curved profile and a slightly plunged and rectangular termination (this latter supports the idea of cores with a flat base). The bulbs are less prominent with more evident and diffused ripples on the ventral faces. In one case, the butt is large and show evidence of percussion traces (large ring crack, ventral fissures). Given their morphology, these blades could be interpreted as initialization/maintenance technical solutions linked to the main pressure-blade *châine opératoire* and detached by direct or indirect percussion. The record includes also a neo-crested blade fragment, which indicates re-preparation of the core lateral convexities. Despite their low number, all these elements support the hypothesis of episodes of blade production performed at the site.

## 14.5 Sickle Production

Sickle inserts are the most represented tool category (51% of the entire assemblage). This evidence testifies the importance of the agricultural practices, as economic ad subsistence activity, at the site and will be further discussed in § 15.

### *14.5.1 Retouch*

These inserts were entirely realized on pressure blades, whose regularity could have certainly facilitated their insertion/management into a handle, processed by fragmentation and edge transformation. The retouch, always localized on the dorsal surface (direct position), was applied on all the perimeter of the lateral edge, by creating a series of continuous and regular notches, delineating a strong denticulated edge. The larger part of the sickle inserts was retouched on both the edges.

In most of the cases, the retouched edge exhibits a heavy gloss, parallel to the technological axis of the blade (see § 15). It was noted that frequent interventions of edge re-sharpening, due to intense use, removed the gloss on the dorsal face, while it remains more visible on the ventral one. These maintenance activities provoked, in some cases,

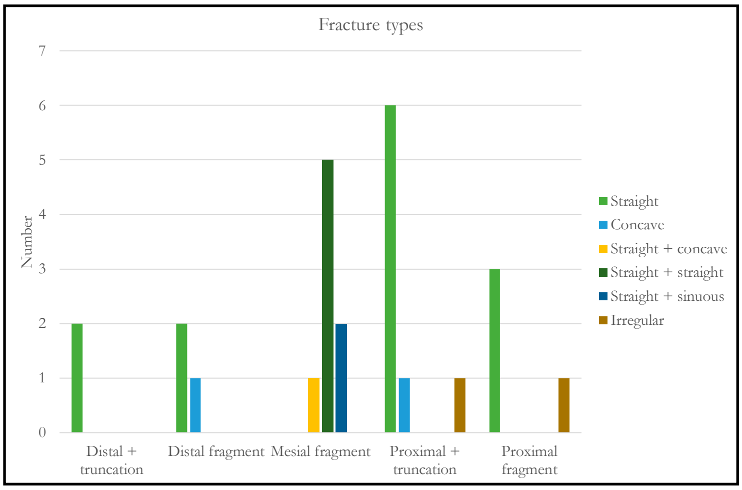


**Fig. 14.8** Localization and association of the different fracture types observed on the sickle inserts.

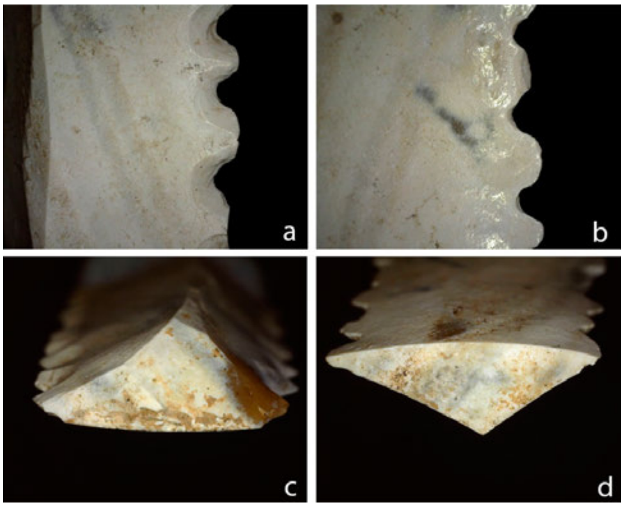


**Fig. 14.9** Details of a sickle insert: direct denticulate retouch (a); glossed edge on the ventral side (b); truncation on the distal end (c); straight fracture on the proximal end (d).

a backed edge as a result of the high intensity at which the edge was used.

As previously stated, pressure blades were fragmented in order to obtain the sickle inserts. Fig. 14.8 shows the occurrence of the different types of fracture observed and their relative localization and association on the blade segment. The most attested fracture is the "straight" one, which often occurs on both ends of the segment or, with less frequency, associated with "concave" or "sinuous" fractures. Other relevant types exhibit a truncation, opposed to "straight" (the most frequent), "concave" or "irregular" fractures.

Straight and concave fractures are generally associated with direct percussion,[18] while sinuous fractures can be obtained by flexion without any other technical investment (*e.g.*, creating a notch, as the case of the microburin technique), according to our experience in experimental knapping. Unfortunately, due to the bad preservation of the objects, it was very difficult to recognize a clear impact point on the blade ends. Despite this circumstance and considered the extreme regularity of the profile fractures, it could be hypothesized a very controlled percussion, maybe with the support of some kind of anvil (bipolar percussion).

Truncations was always realized by steep retouch, sometimes scalariform, on the dorsal face of the blade segment, delineating in most of the cases a rectilinear (or concave) edge with an acute angle comprised between 40° and 75°. Any traces of use were noted in these tool portions: on this base it could be hypothesized a "practical" aim, finalized at regularizing the inserts during sickle handling or maintenance activities. The graph indicates also that distal and proximal blade fragments were adopted for sickle production at occurrence.

### *14.5.2 The Sickle Fragment from Building A - Room 23*

During the excavation of Building A, a not entirely preserved sickle (AbT.15.114) was found on the ground-surface of Room 23 (US 395) inside "Concentration D" of archaeological materials, located at the south-eastern corner. The objects assemblage included also a series of ceramic vessels associated with bitumen lumps. The spatial and heavy residues analysis of this room (see § 9) allowed to understand that the room space was managed in different modalities and several activities were performed in specific locations: in the south-western portion of the room, bitumen was processed in order to be employed in artifact production, while in the area of concentration D, the objects were stored.

[18] Manclossi *et al.* 2015.


**Fig. 14.10** Sickle fragment with three retouched inserts excavated in Room 23 - US 395.

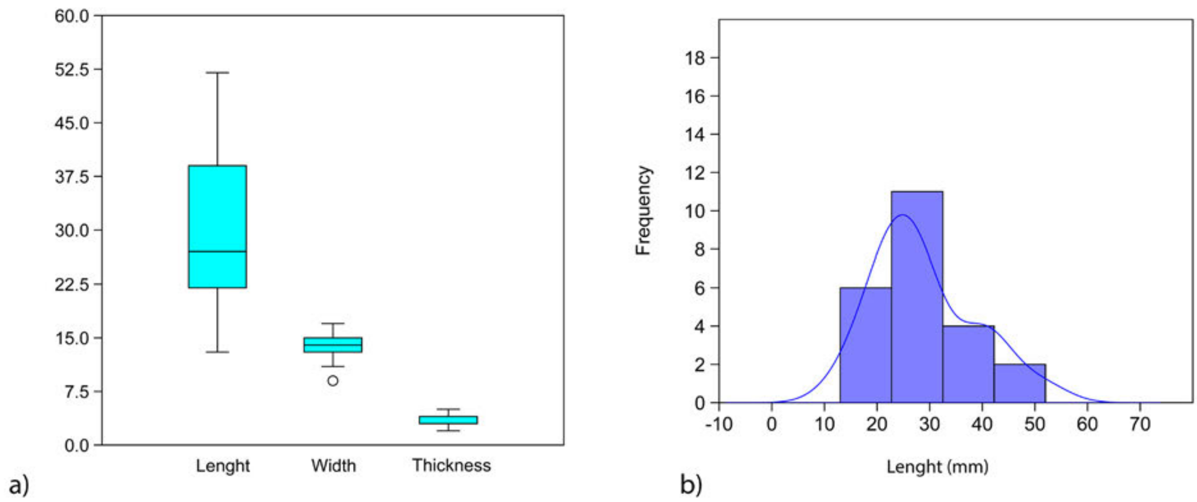


**Fig. 14.11** Boxplot graph of metrical data about the sickles inserts (a) and histogram based on the values of their length (b).

The preserved portion of the sickle[19] is about 9 cm long and 2 cm wide. Three inserts were in their original position inside the handle, which unfortunately was not preserved, apart from the bitumen used as adhesive. In Fig. 14.10, the smaller item (length 23 mm; width 13 mm; thickness 3 mm) is located in the centre, the largest (length 30 mm; width 15 mm; thickness 3 mm) at the top, and the last (length 24 mm; width 14 mm; thickness 3 mm) at the bottom. They were fixed with the same orientation and in direct contact with each other, in order to create a continuous and straight denticulated working edge sharing the same angle. The value of thickness (3 mm in all the three inserts) and the profile morphology (straight in each case) could be significant for a better fix of the inserts into the same handle. However, the items clearly belong to different blades, as the raw

[19] When discovered, the object was very damaged. We decided to withdraw the portion of sediment in which it was incorporated, to conduct a micro-excavation in the laboratory at the mission-house. We wish to thank G. Barella who carefully excavated and put together all the small fragments, completely restoring the original shape of the tool.

materials and their technical attributes suggest: the largest item has a trapezoidal section (2-1-2' module) featuring a wide central negative, while the others, despite they share the same module (2-1-2'), exhibit a less large central removal. All the edges were retouched and, obviously, damaged due to use which caused the development of a wide gloss (see § 15) and show evidence of re-sharpening.

In the boxplot graph at Fig. 14.11a, we used the maximum values of the sickles inserts three dimensions (length, width, thickness) to investigate the standardization of these tools. The thickness values are classifiable into a very reduced interval. In fact, as we noted in the previous paragraph (Fig. 14.6), the thickness is a technological parameter very well controlled at the site, therefore depending by the needs and choices made by the knappers during blade production. The width values, instead, represent an indication of the scale of retouch of the inserts edge, which features different values depending from retouch intensity and working time, therefore it cannot be used in this analysis, but deserve more attention.

When dealing with length, a high variability must be noted. The graph in Fig. 14.11b shows that there is a bimodal distribution of the values with two peaks at 27 (higher) and 42 (lower). In explaining these values, any correlations between range size, presence/absence of truncations and spatial distribution of these items was found. We also must note that the state of preservation of certain rooms is low, due to the later occupations (see § 6.4), and the archaeological assemblages could be not representative of certain parts of the building.

However, the evidence of the sickle fragment from Room 23, tells us that standardization in sickle inserts was first searched in blades production and selection, then in retouch regularity and handle fixing. Variability in length could be explained as individual choices, depending by the modalities in which every living unit acquired the blades, produced and managed these tools.

Finally, the present state of research does not permit speculations or hypothesis about the entire shape of these composite tools. The distribution of the gloss on the edges, always parallel to the blade axe, along with the evidence from Room 23, certainly will address future researches at the site.

## 14.6 Conclusions

Technological analysis of the lithic artifacts from the ED III/Akk. layers of Building A, integrated with a preliminary petrographic study of the raw materials, allowed to identify a specific *châine opératoire* aimed at the production of sickles.

Chert was the exclusive natural resource used as raw material for the production of lithic tools. Petrographic analysis allowed to preliminarily recognize three main chert types of very good quality, coming from primary nodules of unknown size. As known, the southern Mesopotamian alluvium is poor of rocks suitable for knapping. The survey of the available geological literature highlighted the presence of primary chert sources far distant of about 400-500 km. Investigations of these outcrops, and new field-researches in the southern Zagros Region might reveal the existence of previously unknown sources and circuits of raw materials and/or finished products exchange to which the centers of Southern Mesopotamia may have adhered. Conversely, secondary sources, in shape of small pebbles were locally available but there is only a little evidence of their exploitation. Finally, the course of the Euphrates and Tigris Rivers, being navigable, could certainly have encouraged communication routes linked to the supply or exchange of these raw materials, as evidenced by other types of resources (timber, precious stones, metals *etc.*), as reported by the Ur III texts.[20]

The blades, from which the sickle inserts were obtained, were produced by specialized knappers who carefully managed the pressure technique, performed by the employment of a long crutch. Only future excavations at the site will definitely clarify if the blades were produced on-site or were imported as blanks. Data available allowed to hypothesize only some sporadic episodes of blade-knapping.

The blanks were probably processed inside Building A rooms, as the evidence of Room 23 strongly suggest. Sickle inserts were obtained

[20] Laursen - Steinkeller 2017.

by controlled fragmentation of the blades through direct percussion or flexion, and then by transformation of the edges in order to obtain very regular denticulated working edges. Composite sickles were hafted adopting the bitumen as adhesive, which is a natural resource very common in Mesopotamia, and by fixing the inserts into the handle in direct contact with each other, creating a continuous straight edge.

The specificity of this technology seems to be a cultural trait of the Sumerian lithic technological systems, which evolved from a local tradition of small blades, starting from the 5$^{th}$ mill. BC, in opposition to the large blade technologies of the northern Mesopotamia.[21]

There is only a little evidence of expedient productions at Abu Tbeirah. The cause of this lack is not known to us on the basis of the available data. Certainly, the coexistence of metal tools could have produced diversified behaviours that could be understood only through the continuation of the field research at the site. However, lithic industries were not a secondary craft, but of greater importance in the sphere of subsistence and socio-economic activities. The almost exclusive presence of sickle inserts underlines the relevant role of the agricultural practices inside the Sumerian society of the half of the 3$^{rd}$ mill. BC.

[21] Angevin 2018.

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