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The Lithic industry of the Pharaonic site Kom al-Ahmar in Middle Egypt and its relationship to the flint mines of the Wadi al-Sheikh

Abstract

The University of Tübingen Institute of Egyptology is conducting archaeological investigations in Middle Egypt. Its fieldwork focuses on several locations in the Province of Miniya near the village of Šaruna, situated at the river Nile. The lithic material excavated at the site of Kom al-Ahmar does not only include a complete spectrum of characteristic Old Kingdom stone tools but shows numerous new types and tool forms as well. The presence of various blanks and cores in the assemblage and the analysis of the debitage suggest the presence of local tool production workshops.

Excursions and field surveys conducted by the same team at the flint mines of the Wadi al-Sheikh traced the origins of the majority of the lithic raw material from Kom al-Ahmar back to this vast mining area. The relationship between Kom al-Ahmar and the Wadi al-Sheikh is obvious. The Wadi al-Sheikh flint is a tabloid silex of excellent quality and, due to its tabular form, especially appropriate for the production of the flat bifacial knives and adze blades found in Kom al-Ahmar.

Keywords: Egypt, Old Kingdom, Lithic technology, Bifacial knives, Adze blades, Blade production, Flint mining.

Introduction

The Institute of Egyptology of the University of Tübingen has been conducting investigations in Middle Egypt for several decades. Since 1991, fieldworks supported by the German Research Foundation (DFG) have focused on several localities in the Province of Miniya near the village Šaruna, close to the river Nile. They are situated mainly on the site Kom al-Ahmar („Red Hill“), a mound formed by habitation layers since the Neolithic (Huber 1998). Today there is still a small village located on top, the so-called „Izba“ which simply means „hamlet“ (Fig. 1).

Attached to the Pharaonic village was a large necropolis with numerous shaft and chamber graves and several surrounding outposts which are interpreted as watch towers. The necropolis was investigated by the same team earlier (Gomaa 1983). It was continuously used from the 6th Dynasty of the Old Kingdom up to the Ptolemaic epoch (Fig. 2).

To explore the complexity and continuity of the Pharaonic site at Kom al-Ahmar, a network of test and profile trenches was laid within the Izba. Since this site is still occupied, some difficulties were encountered in the planning of the

Fig. 1: Excavations at Kom al-Ahmar.



Fig. 2: The necropolis at Kom al-Ahmar.





Fig. 3: Mudbrick structure in the Old Kingdom layer.

excavations. Most of the trenches and pits had to be positioned according to the available empty spaces between the village's buildings and could not always follow actual archaeological considerations.

The settlement area of the Old Kingdom period was larger in dimension than the present village. Settlement structures made of mudbricks like house foundations, alleys, storage silos, stables etc. have been extensively excavated (Fig. 3). It appears that Kom al-Ahmar was mainly a peasant community. No indications for religious or administrative buildings have been found yet. Instead, workshops for the production of pottery and especially stone tools have been detected.

The author had the chance to study the lithic artefacts mostly in the afternoon after the day's excavations had ended. The very limited time during the fieldwork and the existing legal restrictions to bring the artefacts for further analysis to Tübingen allowed only a brief examination of the huge material (Pawlik 2000a). In 1995, the artefacts were recorded with a simple attribute system and photographed. During the 1996 campaign, technical illustrations of the most characteristic tools were made.

A large number of lithic artefacts have been found, mainly from layers of the Old Kingdom and a few from Middle Kingdom layers. Almost all artefacts were made of a high quality, fine-grained flint or "silex", to use the general term for this material (Hahn 1993, 12). The lithic inventory includes the complete spectrum of characteristic Old Kingdom tools as well as several new tool forms. The analysis of the debitage indicated the existence of local workshops with an own distinctive craft tradition. Furthermore, it can be assumed that these workshops produced not only for local demands but also for trading or exchange with other localities and for the use at the nearby necropolis (Gomaa 1983; Huber 1998, 575). Evidence for this assumption can be found in the presence of bifacial "butchering knives" which were produced in a great variety of forms and sizes and used for the rituals during the burial ceremonies.

Preliminary analysis of the lithic material

Raw material

After the first examination of the lithic artefacts from Kom al-Ahmar, a classification of the silex raw material into eleven categories was made. Additionally, the occasional use of local wadi pebbles, often showing typical desert patination, has been observed. The following listing presents in short the raw material types. The numbering follows the recording at the site in 1995, which was also used for the artefact descriptions:

RM 1: Black, medium grained silex. Some artefacts made of this material show thermal alteration in form of small potlid breaks.

RM 2: Light grey to black grey fine grained silex with a dull surface. Occurs mostly in tabular form.

RM 3: Middle brown to black fine grained silex with a more lustrous surface. In thin-section, respectively along thinner edges, semi-opaque. Homogenous texture, almost no visible intrusions. Mostly in tabular form, but also nodules. RM 2 and 3 are the most common raw material types.

RM 4: Dark grey, coarse grained silex with a dull surface. Artefacts made of this material appear sometimes with thermal cracks. In 1996 a blade core was found made from a wadi pebble with reddish-brown, smoothed surface („desert patina“) whose reduction face had the same colour and texture, so that wadi pebbles from a local origin can be assumed as potential source.

RM 5: A greyish-white silex with similar structure as RM type 2, which was therefore regarded as a rare variation of type 2.

RM 6: Greenish-brown or beige-brown. Represented in only few artefacts which show intensive desert gloss.

RM 7: Milky quartz. Only one artefact made of this material was found.

RM 8: Reddish-brown, fine grained and sometimes semi-opaque silex.

RM 9: A dark brown coloured, fine-grained and very homogenous silex without any visible intrusions. Resembles in colour and texture the so-called „chocolate flint“ from Poland.

RM 10: A rare variation of RM 9 in black.

RM 11: Semi-opaque greenish silex with lots of microfossil intrusions. Single specimen.

The dominance of RM types 2 and 3 (app. 90% of all tools and almost all blanks) clearly shows the relation between the Pharaonic village at Kom al-Ahmar and the flint mines of the Wadi al-Sheikh were in an economic relation to each other (see Appendix). Already during a first survey of our team conducted in the Wadi, RM 3 could be identified as being local. The very common light brown tabular Wadi al-Sheikh "hornstein" first described by Weisgerber (1982) has a great similarity with RM 2, although its fresh surface appears with a slight quartzitic flare. Further investigations on the raw material should focus on the effects of post-depositional surface modifications during the sedimentation process to confirm the assumption, that the Wadi al-Sheikh is indeed the source for RM 2 as this author strongly believes.

During a study visit in Luxor, some nodules of raw material type 9 were found in the gravels of the Valley of Queens by the author. This might indicate relations to the southern areas of Middle Egypt as well. A study of raw material provenience will contribute to the reconstruction of production systems inside the Izza and at the sources of origin. The following questions have to be raised: Which tool types were manufactured in the village's own workshops? Which were traded as preforms or imported as finished tools? And where did they come from? The answers will certainly become an important source of information for socio-economic studies of Dynastic Egypt.

Debitage and blanks

This category includes all artefacts resulting from tool production, like preparation flakes, waste flakes, cores, shatter or (yet) unmodified target flakes. Most of the unmodified artefacts in the Kom al-Ahmar assemblage were flakes and blades (Tab. 1). The flakes are mostly debris from the production of bifacial tools, *i.e.* the butchering knives (Chapter 2.4.2). Another production line was the manufacturing of regular and highly standardised blades. Also, their cores and remnants of the core preparation were found. Their technological analysis allows the reconstruction of the blade production sequence and production techniques used at Kom al-Ahmar.

Flakes

Trimming flakes are the most common blank form in this assemblage. These usually thin flakes were classified in

Tab. 1: Blank types at Kom al-Ahmar.

| Blank type | total no. |
|------------------------|--------------|
| large trimming flakes | 251 |
| small trimming flakes | 470 |
| blades | 315 |
| primary ridge blades | 7 |
| Secondary ridge blades | 56 |
| core tablets | 26 |
| plunging flakes/blades | 17 |
| cores | 12 |
| shatter | 13 |
| platform flakes | 4 |
| levalloid flake | 1 |
| TOTAL | 1.172 |

two size categories: smaller than 50 mm and larger than 50 mm (Fig. 4). The larger flakes were mostly of trapezoidal shape, rarely longer than 100 mm and mostly between 5 and 7 mm in thickness. The smaller flakes have irregular shape and are less than 3 mm thick. They are wastes from the final preparation of bifacial tools, *i.e.* the butchering knives, while the larger flakes were chipped off during previous stages in the production of these tools, especially the initial preparation of the raw tabloids. The numerous cortex flakes show, that at least a share of the silex raw material was brought unprepared into the site (Tab. 2), although the preparation of freshly quarried silex directly at the mines was favourable to a more efficient transportation from the mines to the workshops of Kom al-Ahmar, as the presence of one complete and several fragmented preforms shows.

Fig. 4: Flake samples from Kom al-Ahmar.



Tab. 2: Appearance of cortex on preparation flakes.

| Flake type | total no. | no cortex | cortex<1/3 | cortex<2/3 | cortex>2/3 | undeter. |
|--------------------|------------|------------|------------|------------|------------|------------|
| Large prep.-flakes | 251 | 90 | 67 | 42 | 52 | 57 |
| Small prep.-flakes | 470 | 300 | 96 | 22 | 52 | 84 |
| Total no. | 721 | 390 | 163 | 64 | 104 | 141 |

Tab. 3: Types of platform remnants.

| Platform remnant | Plain | Pointed | Linear | Prim. facet. | Sek. facet | Total no |
|------------------|-----------|-----------|----------|--------------|------------|-----------|
| Dorsal reduction | 28 | 35 | 9 | 8 | 0 | 80 |
| No reduction | 0 | 0 | 0 | 0 | 0 | 0 |
| Total no. | 28 | 35 | 9 | 8 | 0 | 80 |

Blades and blade core technology

Another main activity at Kom al-Ahmar focused on the production of blades (Fig. 5). According to the excavated material, blades have been foremost transformed into sickle implements. Almost all blades and blade fragments were either without any retouch or damage or were denticulated, rounded and covered by intensive sickle gloss, mainly along one edge. Other use-wear patterns appeared only on very few blades. These, however, were in form and size different from the sickle blades.

Evidence for the production of blades at Kom al-Ahmar is given by the presence of ridge blades, blades with plunging terminations, remnant blade cores, core fragments and core tablets. The relatively high number of ridge blades – more than one sixth of all blades in the assemblage – shows that the further preparation of the silex nodules and slabs for a regular and standardised blade production has been performed within the village. On the other hand, the presence of very few primary ridge blades among all ridge blades is a clear indication that the initial preparation of the nodules, including the creation of the striking platform, leading ridge and the detachment of the first blade, *i.e.* the primary ridge blade, was usually done outside and most likely at the quarries. This assumption is also supported by the fact that only very few platform preparation flakes were identified.

Since no successful refitting could be done between the 12 remnant cores, 26 core tablets and 17 plunging flakes, they obviously represent the remains of 55 former blade cores. The blade core technology can be reconstructed by the analysis of core and core tablet morphology (Hahn 1993,

103 ff.). All cores have only one striking platform and one convex reduction face while the shape of the cores is oval to elongated-oval in top view. All platform edges show a dorsal reduction to prepare the flaking process.

The detachment of core tablets is usually done when the angle between the platform and the reduction face becomes too shallow during the blade production and less than 60° (Hahn 1993, 112). As a result, the remaining reduction face will become smaller and the following blades shorter. The measurements of the platform angles show a variation between 55° and 75° which seems rather large considering the very uniform appearance of the core forms and core reduction technique.

A quite strange and unique technicality can be observed on cores with a more or less complete reduction face: They all possess a negative of a plunging flake in the centre of the reduction face that truncates the neighbouring negatives and therefore can be regarded as the last detachment, *i.e.* the last action done on the core. The usual reasons for the removal of a core keel by a plunging flake are the creation of a convex reduction face to avoid hinge fractures and the rejuvenation of an already worked core. However, the Izba cores haven't been rejuvenated but discarded after only one flaking cycle. This „core keel rejuvenation flake“ has therefore no technical reason. Thus, it seems that we might see a special „workshop habit“, instead. More information can be gathered in the future by refitting technique as well as comparative studies of blade cores from other Old Kingdom sites. Finally, this might even lead to the recognition of „atelier domains“ and their catchment areas.

The analysis of the platform remnants or “butts” of all complete and proximal fragmented blades show that plain and pointed butts dominate (Tab. 3). This is supported by the form of the core tablets and might point towards the use of a soft percussion technique, either direct with a soft hammer or indirectly by using a punch, as assumed by

Fig. 5: Blades from Kom al-Ahmar.



Tab. 4: Cross-sections of unmodified blades.

| Cross-section type | No. of blades |
|--------------------|---------------|
| flat trapezoidal | 179 |
| steep trapezoidal | 34 |
| flat triangular | 66 |
| steep triangular | 16 |
| irregular | 19 |
| Total no.: | 314 |

Weiner (this volume) for the blade production at the flint mines of the Wadi al-Sheikh. A dorsal reduction to remove unwanted overhangs of the striking platform resulting from previous detachments is present on all blades.

Thin, long and narrow regular blades were the target of the production (Fig. 6). The majority showed two dorsal ridges and a flat trapezoidal cross-section, second are blades with a flat triangular cross-section (Tab. 4).

Preforms

Artefacts are classified as preforms if they have already been partially prepared in order to complete the transformation process into tools later by demand. The place of manufacture of the preform and the finished product is usually not the same. Preforms can be and were made already at the source of the raw material. This has the advantage that pieces with failures or nodules of poorer quality will be recognised and sorted out. The transport to the sites also becomes more efficient when loading prepared material so that the same amount of silex allows the production of more tools. This is especially significant in the case of the large bifacial knives and adze blades. Also, the low number of primary ridge blades points to the import of already prepared blade core preforms into the Izba (cf. chapter 2.2.2).

Several broken preforms as well as one complete and obviously undamaged preform, give evidence to the production of bifacial knives at Kom al-Ahmar (Fig. 8). The preforms had been more or less completely decortified by the removal of large flakes. The back and the convex edge had been already shaped. A technological analysis of such preforms in the future can help to determine the

Fig. 6: Average lengths of unmodified blades (in mm).

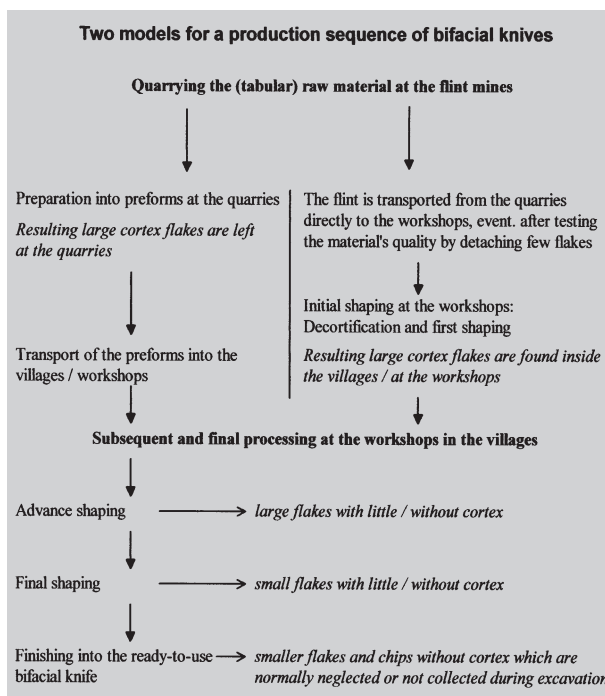
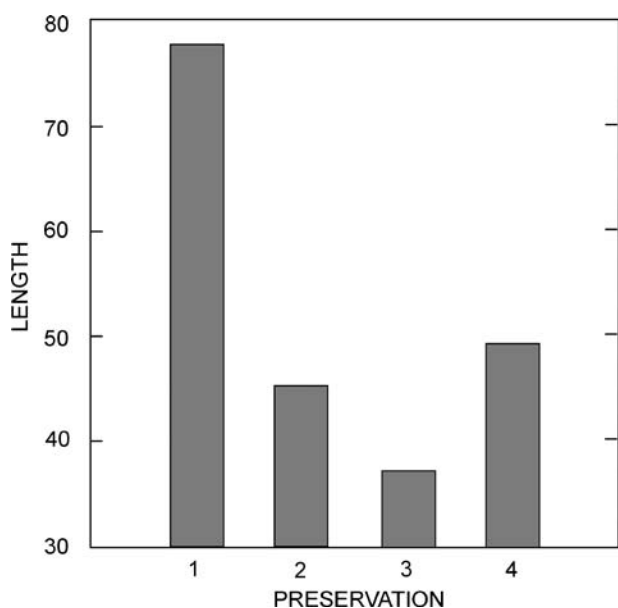


Fig. 7: Two models for a production sequence of bifacial knives.

chaîne opératoire (Pelegrin *et al.* 1988) of this fascinating tool form, which surely had a high socio-cultural meaning in the Old Kingdom (Fig. 7). It seems conspicuous that preforms of bifacial knives could be identified within the lithic material while those for adze blades are lacking. Since the number of adze blades in the analysed assemblage is rather small, this statement is still tentative. However, it is hoped to enlarge the number of adze blades from the Izba settlement in future campaigns and see if this phenomenon can be confirmed.

According to a recently published overview of the lithic industries of Ancient Egypt, preforms and preparation flakes are usually missing in Old Kingdom sites (Tillmann 1992, 198). As an explanation it has been suggested, that the production and trade of bifacial knives was organised at a production centre for the whole kingdom. However, the excavations at the Izba delivered sufficient evidence for the tool production in local workshops and at least in one case the recovery of such a workshop area (Huber, pers. comm.). One conclusion might be that our locality at Kom al-Ahmar was such a production centre. Another is that we are just dealing with an „excavation artefact“. This would mean that preparation debris and pre-forms either were not collected during excavations or neglected or overlooked in the post-excavation analysis of the findings, especially since up to now very few lithic analysts are involved in Egyptology and its fieldworks. It is obvious that an identification of such preforms is not possible without sufficient knowledge in lithic technology. Also, it is a common procedure during excavations in Dynastic sites that simple flakes and other debitage are not systematically collected and recorded. However, Tillmann as a prehistoric

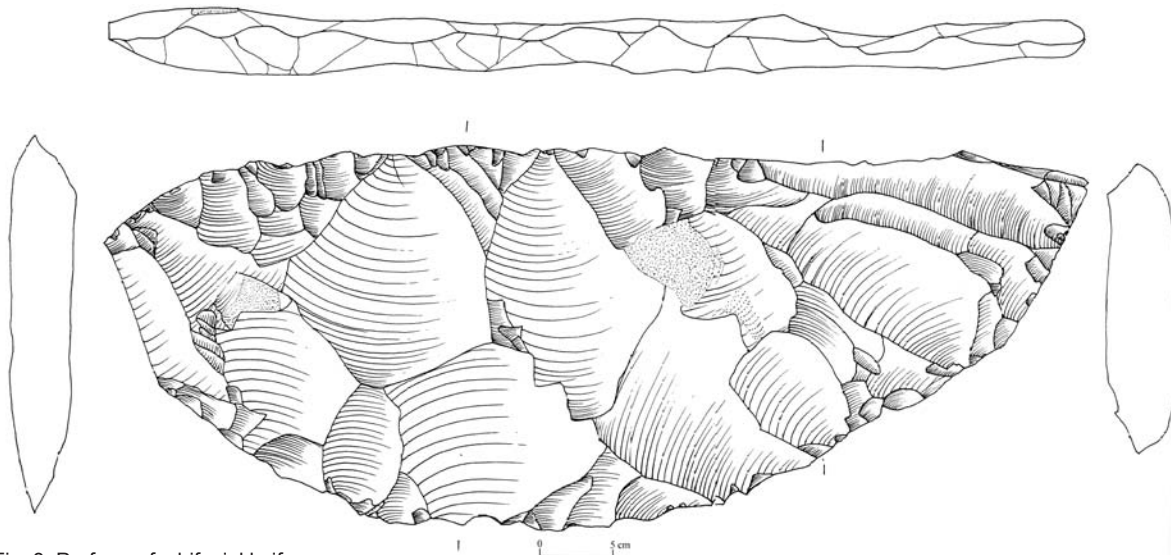


Fig. 8: Preform of a bifacial knife.

archaeologist who is well acquainted with lithic technology and artefact morphology did not find any preforms in all assemblages he analysed, either. This might have its reason in the subject itself: Tillmann’s studies focussed mostly on materials from Middle and Late Kingdom sites for which different criteria could be valid. In any case, this problematic is another strong argument for the continuation of the lithic analysis of the artefacts of Kom al-Ahmar in a wider context.

Tools and modified artefacts

Sickle implements (Fig. 9)

Although no complete composite sickle has been found at Kom al-Ahmar yet, the production and the common use of these tools are recognised by the presence of numerous blades showing the typical „sickle gloss“, and their blanks (cf. chapter 2.3.2). Like the unretouched blades, most sickle blades are trapezoidal in cross-section. Preferably, blades with two dorsal ridges were used as implements for sickles. This seems in accordance with observations made on lithic assemblages from Europe or North America. Regular blades with two (or more) dorsal ridges have been mainly used as hafted implements for various purposes (Owen & Pawlik 1993, 418 f.). They provide a higher stability and easier fixation in the shaft due to the larger contact areas (Tab. 5).

Tab. 5: Cross-sections of used sickle blades.

| Cross-section type | No. of blades |
|--------------------|---------------|
| flat trapezoidal | 23 |
| steep trapezoidal | 19 |
| flat triangular | 1 |
| steep triangular | 7 |
| irregular | 3 |
| Total no.: | 53 |

Tab. 6: Preservation of unmodified blades.

| Preservation | No. of blades |
|--------------------|---------------|
| complete | 80 |
| proximal fragments | 95 |
| medial fragments | 75 |
| distal fragments | 64 |
| Total no.: | 314 |

Almost all sickle implements are made from medial fragments. However, there is only little significance in the frequency of the preservation of unmodified blades (Tab. 6). Most common are proximal fragments since they were usually not used for further modification. Second are medial fragments, then distal fragments. In a „self-contained“ operation chain as represented by the Izba assemblage, it is expected that medial fragments are less frequent because they were chosen for further processing. It might therefore be possible that distal fragments were used for further modification as well. However, their end products are yet to be found. Another possibility could be that smaller distal fragments were ignored or overlooked during the excavation. But the average length of the distal fragments present is higher compared to all other fragment forms, so that perhaps indeed an up to now unknown use of distal fragments can be considered. So far, only the use of the medial fragments for sickle implements can be stated.

The widths of medial blade fragments and used sickle implements (all made of medial fragments) show a highly significant congruence of the median (13 mm) and the inner quartiles which appear very closely between 12 and 14 mm (Fig. 8). Also, the inner quartiles of the thickness are in both groups between 3 and 4 mm.

The use of sickle implements resulted in a denticulation of the edges and the formation of the characteristic „sickle gloss“. A measurable reduction of the width however, could

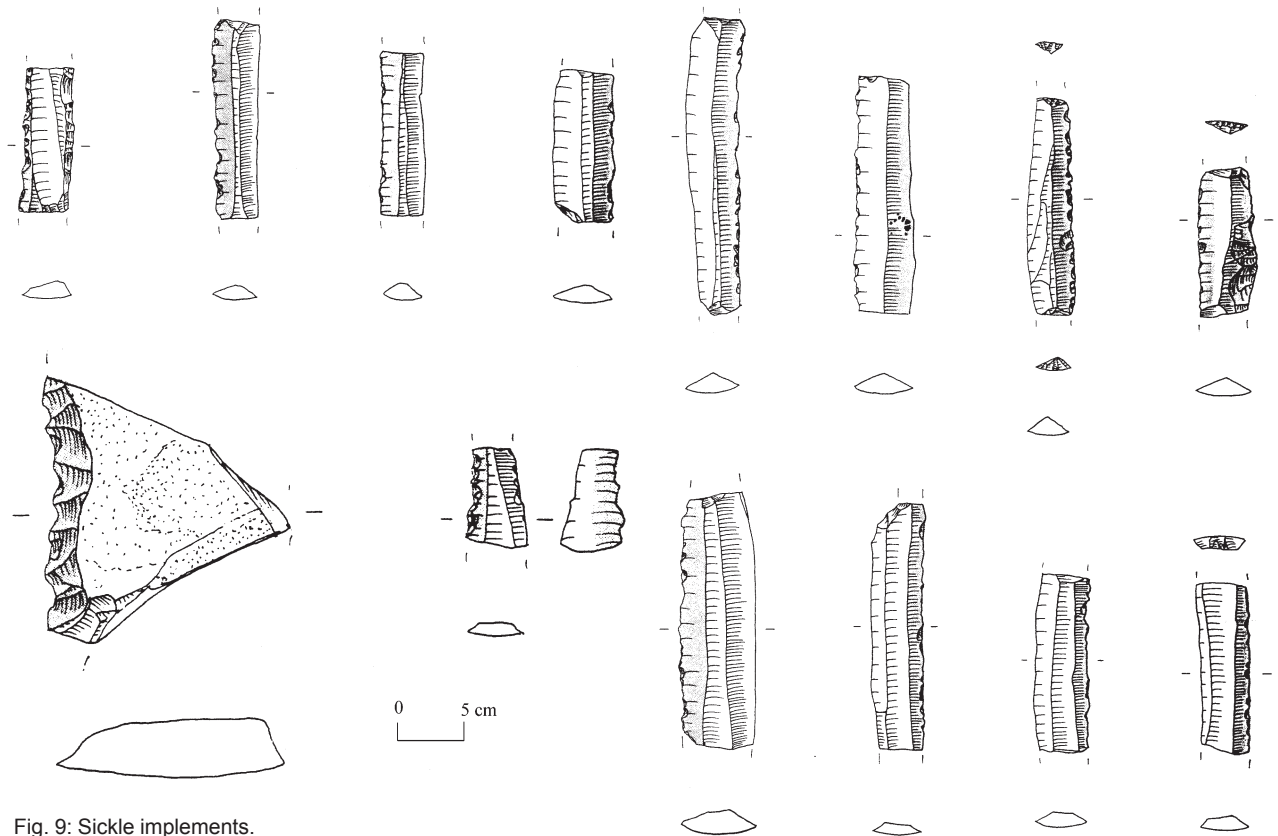


Fig. 9: Sickle implements.

not be observed. The width can therefore be regarded as relatively constant. As a result, it is highly probable that the blade production at Kom al-Ahmar served mostly for the manufacture and maintenance of harvesting sickles.

Thickness and width of the sickle blades at Kom al-Ahmar show similarities with the measurements of sickle implements from Buto as the only Old Kingdom site with recorded and published morpho-metric data so far (Tillmann 1992, 158). In contrast to the Buto implements only few sickle blades from Kom al-Ahmar have an end retouch. In most cases they have been just broken to the desired length. This is of importance for the reconstruction of the position in the shaft, the hafting method, and the overall design of the sickles. A future detailed technological analysis should include experimental framework, replication and use of sickles as well as microscopic use-wear analysis for the identification of functional zones and working directions and to reconstruct the form and size of these composite sickles. After the further analysis of the Izba artefacts, the comparison with other Old Kingdom sites should follow, if possible including the study of complete preserved sickles with shaft and implemented blades (*cf.* Emery 1938, 33 f.) and the various tomb illustrations of sickles and harvesting activities.

Systematic Auger coring was done in 1995 and 1996 to explore the geological and stratigraphic situation around the kom. One probe delivered a blade fragment with vis-

ible sickle gloss from a depth of 7 m below the excavated Early Dynastic layers. This fragment differs in form and size from the uniform Pharaonic sickle blades. Also, its raw material, a yellowish semi-opaque silex did not appear in the lithic materials of the Old Kingdom. Obviously, this artefact came from a Neolithic period yet to be identified. A preliminary geological determination points to an age approximately 2000 years earlier than the Old Kingdom artefacts. The geological survey indicated that a massive accumulation of pre-dynastic and Neolithic cultural layers built up today's Kom al-Ahmar. Unfortunately, the rather high groundwater level already at c. 2 m below the surface did not allow deeper excavations in the previous years, even though the Auger drill was able to probe down to 10 m below the present surface.

Bifacial knives (Fig. 10-17)

In total, 31 so-called „butchering knives“ have been found at Kom al-Ahmar (Tab. 7). 13 of them were complete, the others fragmented. Only some of these knives fit to the known typological and chronological scheme (Tillmann 1992, 196). The assemblage of Kom al-Ahmar seems to be more complex with new knife forms and mixtures of known forms. Almost all knives were found in Old Kingdom layers. Only one surface find belongs to a Middle Kingdom type.

Several knives fit to Tillman's type list. At least eight belong to type 3 (Fig. 10), while type 2 which appeared at the

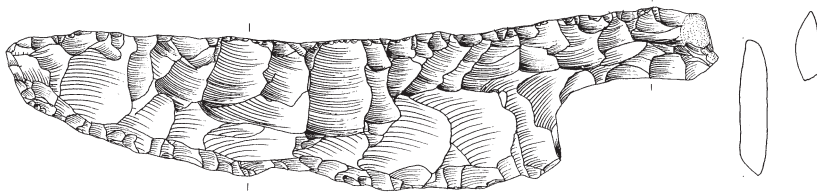


Fig. 10: Bifacial knife, Tillmann Typ 3, cat. no. 168.11.

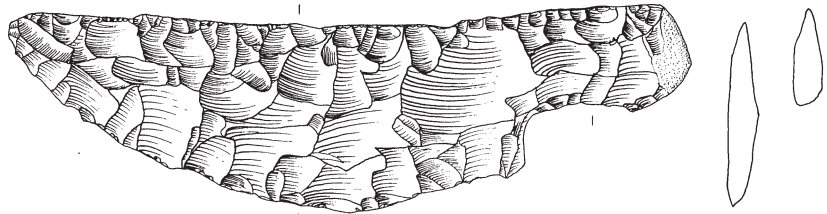


Fig. 11: Bifacial knife, new type, cat. no. 85.182.

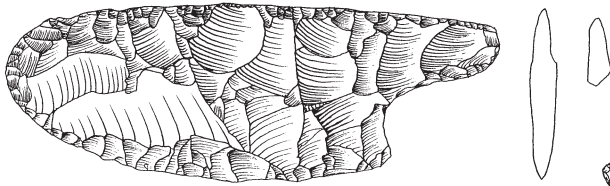


Fig. 12: Bifacial knife, new type, morphologically between Tillmann Typ 3 and 4, cat. no. 67.67.

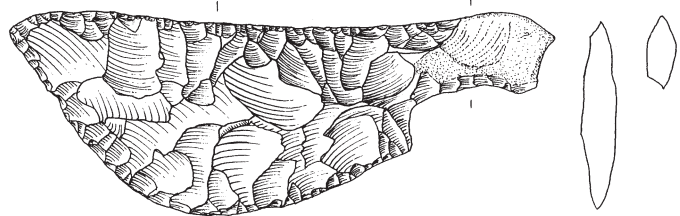


Fig. 13: Bifacial knife, new type "flounder-shaped", cat. no. 215.8.

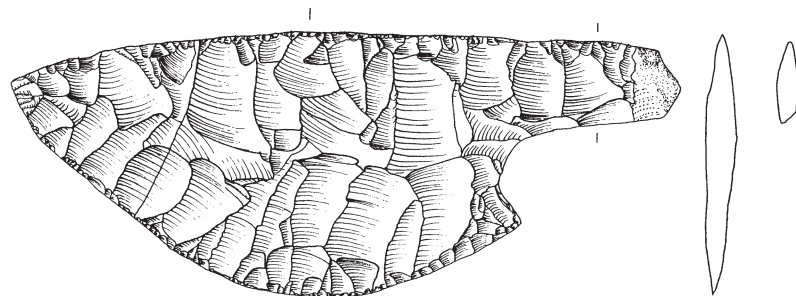


Fig. 14: Bifacial knife, new type "boat-shaped", cat. no. 163.31.

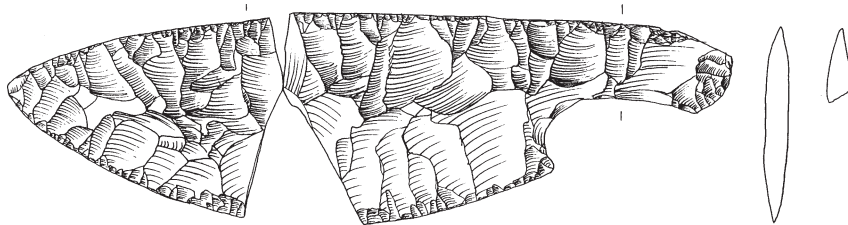


Fig. 15: Bifacial knife, new type "fish-shaped", cat. no. 215.7.

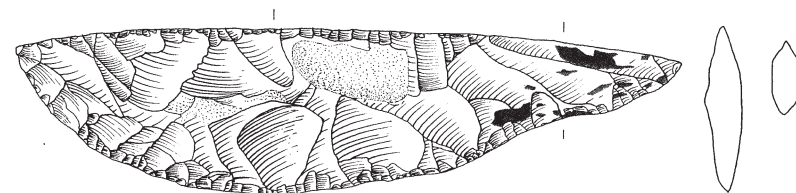


Fig. 16: Bifacial knife, new type "fish-shaped" with handle like Tillmann Typ 5, cat. no. 219.1.

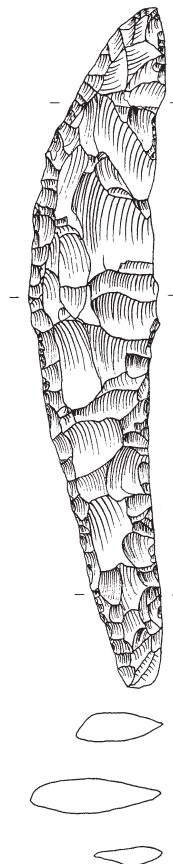


Fig. 17: Bifacial knife, Middle Kingdom Typ 5, surface finding.

beginning of the 1st Dynasty is not represented. New is a form that has the shape of a type 3 knife but its asymmetric steep retouch of the cutting edge goes untypically on the bottom side if the knife is oriented with its handle to the right (Fig. 11). Some fragments would also fit to type 4. A complete knife with a regular oval shape and a round tip seems to stand between type 3 and type 4 (Fig. 12).

Beside these known forms, Kom al-Ahmar delivered a variety of unknown or at least unpublished knife forms, like a type tentatively named „flounder-shaped“. This type appears short and wide with a convex cutting edge and a slightly curved back (Fig. 13). The back has been excellently shaped, is relatively thin and displays a perfect control of the edge, either by symmetric or by asymmetric alternate retouch. The fine and regular negatives appear steep-shallow with an oblong shape. According to the suggested orientation of the knives (Tillmann 1992, 196), the asymmetric retouch of the back shows steep-shallow negatives on the upper face. The convex curved cutting edge is either sharp or rounded on its tip. The modification of the edge shows variations but the edge retouch appears

in every case on both sides. The rather short handle is similar to type 3 knives. A variation of this new type appears in one specimen (Fig. 14). Its form is similar to the flounder-shaped type except for its concave back. This knife form was called „boat-shaped“ in the preliminary recording system for the Kom al-Ahmar artefacts. It shows visible wear traces together with some unusual „cutting marks“ on the cortex-covered handle. These traces are currently beyond interpretation.

Another new type – here called as „fish-shaped“ is of elongated shape with a slightly convex back and an asymmetric curved cutting edge (Fig. 15). The cutting edge rises steep towards the tip of the knife. Handle and the back show various modifications, always resulting in an excellent edge control along the thinly worked back. The handle was either firmly prepared similar to Tillmann's type 5 or formed like his type 4.

One remarkable feature was observed on a fish-shaped knife with type 5 handle, no. 219.1: A very thin layer of

Tab. 7: Recorded bifacial knives from Kom al-Ahmar.

| Preservation | Plate no. | Silex | Type after Tillmann 1992 | Inventory no. |
|------------------|-----------|-------|-----------------------------------|---------------|
| Handle | - | 3 | 3 | 66.113 |
| handle w/o tang | - | 3 | 3 | 46.362 |
| tang | - | 2 | 3 | 32.87 |
| medial part | - | 3 | 3 | 46.349 |
| complete | 5 | 2 | between 3-4 | 67.67 |
| blade | - | 2 | 3 | 67.71 |
| incomplete | - | 2 | ? | 67.72 |
| handle | - | 2 | ? | 67.77 |
| back | - | 2 | ? | 67.77 |
| complete | 4 | 2 | new | 85.182 |
| complete | - | 3 | 3 | 89.294 |
| complete | - | 2 | new; „flounder-shaped“ | 87.152 |
| complete | - | 3 | new | 91.117 |
| tip | - | 3 | new; „flounder-shaped“ | 87.154 |
| tip | - | 2 | new | 86.15 |
| handle | - | 3 | 3 | 85.183 |
| incomplete | - | 3 | ? | 81.44 |
| incomplete | - | 5 | ? | 82.44 |
| ? | - | 5 | ? | 86.17 |
| complete | - | 3 | new, oval | 87.153 |
| complete | 3 | 3 | 3 | 168.11 |
| complete | 9 | 5 | new, „fish-shaped“, handle type 5 | 219.1 |
| complete | - | 3 | new, „fish-shaped“, handle type 4 | 175.83 |
| blade w/o handle | - | 3 | new, „fish-shaped“ | 163.30 |
| complete | 6 | 3 | new, „flounder-shaped“ | 215.8 |
| complete | 7 | 3 | new, „boat-shaped“ | 163.31 |
| tip broke off | - | 3 | new, „flounder-shaped“ | 179.48 |
| broken | 8 | 3 | new, „fish-shaped“ | 215.7 |
| complete | - | 3 | new, unifacial | 96.152 |
| complete | 10 | 3 | „banana-shaped“, type 5? | surface (MK) |

blackish residues (Fig. 16). They might be remnants of hafting mastics to fix the stone blade in a (wooden?) shaft. This tiny amount of residue is probably not sufficient to conduct a chemical analysis with thin-section chromatography (Rottländer 1977), nevertheless it could be possible to identify the nature of these traces with the aid of a scanning electron microscope (Pawlik 1995).

Only one knife from the Middle Kingdom has been found at Kom al-Ahmar (Fig. 17). Its shape is mostly identical to Tillmann's type 5. However, it seems to be a more „advanced“ form compared to the one illustrated in Fig. 132 (Tillmann 1992, 1996). The handle is no longer separated from the blade. From the tip to the rear end, the edge forms a continuous convex and the back a continuous concave line, a „banana-shape“. This artefact is a surface find from the north-eastern part of the Izba, a designation to the excavation area is not possible.

Most bifacial knives were made of the silex type RM 3 (17 knives) and RM 2 (11 knives). Only three knives are made of RM 5, which seems to be a variation of RM 2 with a different colour (see chapter 2.1). During field trips into the Wadi al-Sheikh in 1995 and 1996, the huge flint mining area situated on the middle terraces could be identified as the most probable source of the silex (see Appendix).

This initial analysis of the bifacial knives of Kom al-Ahmar showed a larger variety in tool forms than previously known. This variation is not limited to the shape but is also seen for the size, the retouch of the edge, the back, and the handle. A fine-stratigraphic relation of the knife forms according to the documentation of the excavation at Kom al-Ahmar is intended for the future. Reasons for this variety

of knife forms other than chronological are possible and might be based on the use and the intention of their makers and users. To specify this assumption, a combined technological and functional attribute analysis with reference to all available information from the excavations is required. For the future research of the lithic of Kom al-Ahmar this will be an indispensable topic.

Adze blades (Fig. 18- 21)

The same skills seen on the bifacial knives were applied for the production of the bifacial adze blades at Kom al-Ahmar. These adze blades were produced only by flaking and no grinding or polishing was done. All 19 adze blades found showed gloss and strong edge rounding caused by intensive use. This kind of use pattern resembles the sickle gloss found on the used blades. It might be possible that these adzes were used for cutting the phytolith-containing leaves of palm trees, but this has to be verified by experiments and use-wear analysis first. Other glossy areas could be detected in the area of the hafting and are seen as a result of the contact with the wooden shaft and the fixation (Weiner & Pawlik 1995). The use polishes should be further investigated to give information about the function and hafting with the aid of microscopes applying the techniques of microscopic use-wear analysis.

Six types of adze blades were distinguished, according to form and manufacture:

Type A (Fig 18, 19) is represented by ten specimens and is the most common adze blade type found. Four blades were complete while the others were fragments. Type A is very regularly manufactured. Its shape is trapezoidal with the butt being smaller than the cutting edge. Both ends are

Fig. 18: Adze blade, „Type A“, catalogue no. 87.155.

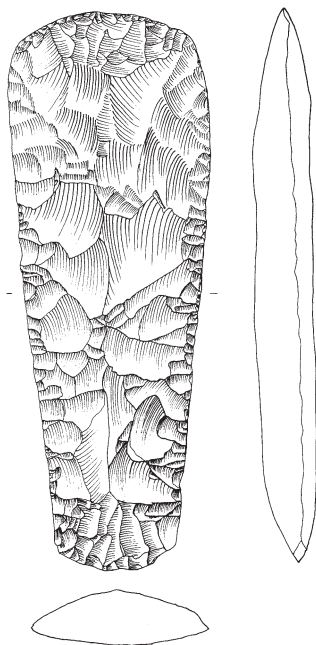


Fig. 19: Adze blade, „Type A“, cat. no. 87.156.

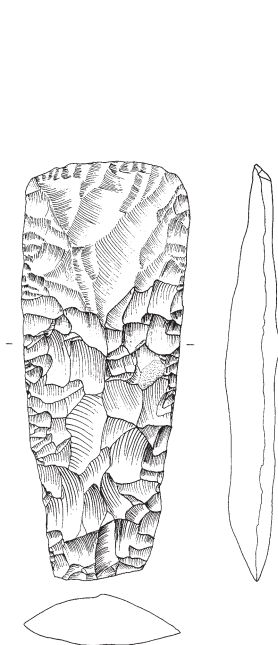


Fig. 20: Adze blade, „Type C“, cat. no. 87.158.

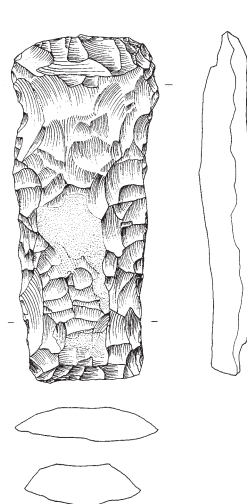
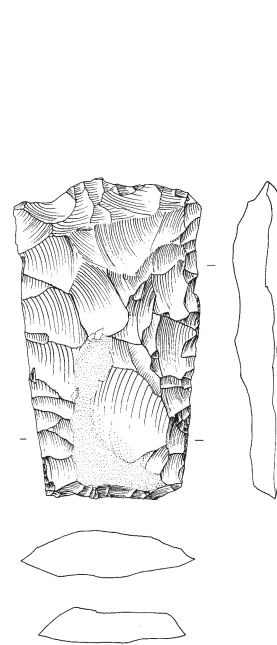


Fig. 21: Adze blade, „Type C“, cat. no. 102.60.



convex. In cross-section, these blades are triangular or show a D-form with a flat bottom face. Edge and retouch of the butt have an acute angle. The bottom face is polished near the butt. Similar traces on polished adze blades of the European Neolithic had been identified as a result of the contact with a shaft, e.g. a toe haft (Weiner & Pawlik 1995). The slightly domed upper face exhibits almost no such traces.

Type B: Only one specimen was designated to this type. It is similar to the type A adze blades, however the lateral edges and the butt are damaged by heavy scarring or have been (re-)modified in a crude and unskilled manner.

Type C (Fig. 20 and 21): Characteristic for this type is its bar-shape. In contrast to type A is the straight and steep retouched butt of this type and a more irregular fashioning. Its shape is slightly trapezoidal and the lateral edges are straight. In cross-section, this adze blade is D-shaped. Also, all adze blades of this type show visible polish zones on the flat bottom face, while the sides and upper face show no or just slight gloss.

Type D: This seems to be a variation of type C, represented in only one specimen at Kom al-Ahmar. The shape is basically identical to type C, however the hafting polish appears on the upper face. Presumably, this adze blade has been hafted “upside down”, with the domed face towards the shaft rest. The lateral edges are slightly convex and the shape of this tool is therefore somewhat oval.

Type E: The morphology of this type seems to be similar to type A. However, the retouch appears more irregular and coarse. This type is represented by three specimens. They all show large lateral impact damages like a burin blow at their cutting edges. Artefact no. 87.169 has a totally rounded cutting edge, the other two are partially damaged by scars. Artefact no. 46.350 shows none of the typical gloss in the hafting area.

Type F: One fragment of an adze blade appeared in the assemblage of Kom al-Ahmar whose form would not fit in one of the above type groups. This artefact, a proximal fragment, is along its cutting edge totally covered with intensive gloss, affecting even the use-scars of the edge. The blade was relatively wide and its remaining lateral

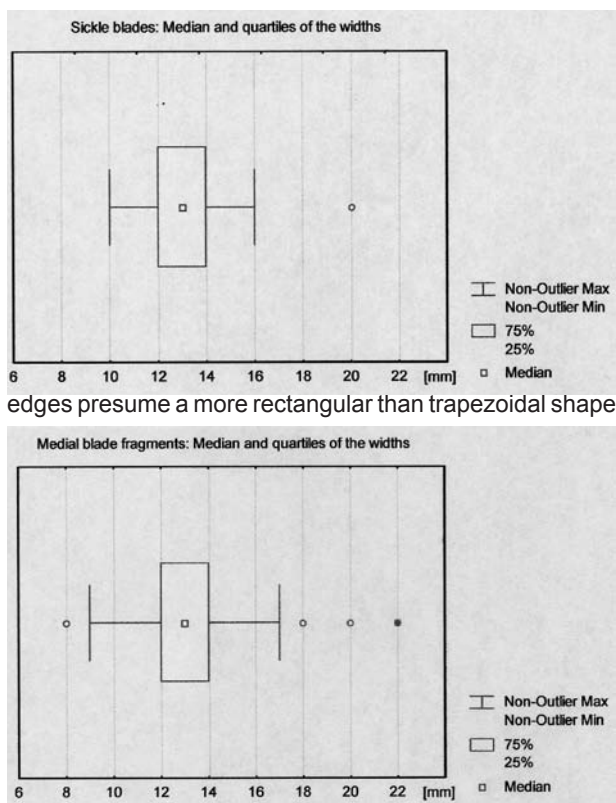


Fig. 8: Box plots with range and median of the widths for medial fragments and sickle blades.

edges presume a more rectangular than trapezoidal shape of the whole tool. Retouch and shaping was done very accurately. The fragment is rather thin, made from a thin piece of brownish tabular silex RM 3. Both upper and bottom face of the blade are partially covered by cortex. These features might indicate a modification or transformation of a knife-preform or a more or less finished bifacial knife into this adze blade.

Up to now there is only little information about these adze blades. The Izba adzes have different forms and cross-sections than those found in Giza (Kromer 1978, 50 and Pl. 15, 2) and Abydos (Petrie 1902, 204). Unlike for the butchering knives and sickle blades, no preforms or preparation flakes have been found or detected, yet. Regarding the intensive use traces on all of the adze blades, a microscopic use-wear analysis would be promising for a more detailed determination of their functions.

Tab. 8: Median and quartiles of the dimensions of adze blades from Kom al-Ahmar [in mm].

| Variable | Valid N | Median | Minimum | Maximum | Lower Quartile | Upper Quartile | Quartile Range |
|------------------|---------|--------|---------|---------|----------------|----------------|----------------|
| Length | 12 | 160.5 | 110 | 195 | 136.5 | 172.5 | 36 |
| Width edge | 13 | 63 | 51 | 88 | 55 | 64 | 9 |
| Width butt | 18 | 38 | 33 | 46 | 35 | 40.5 | 5.5 |
| Thickness edge | 13 | 11 | 8 | 16 | 9 | 12 | 3 |
| Thickness butt | 18 | 9 | 7 | 13 | 8 | 10 | 2 |
| Thickness centre | 14 | 19 | 12 | 21 | 15 | 19.5 | 4.5 |

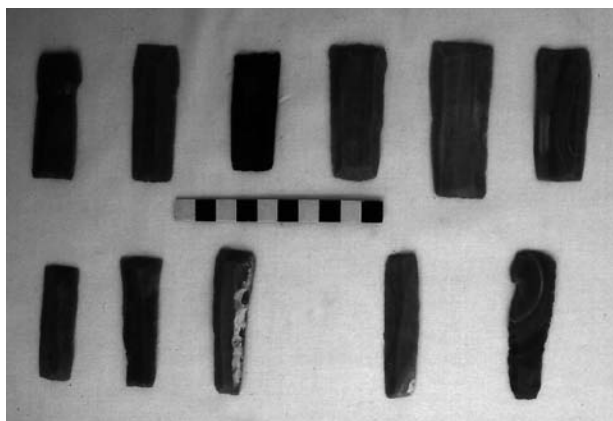


Fig. 22: Rectangular modified blades, so-called "razor blades".

„Razor blades“ (Fig. 22)

Among the excavated stone tools were 13 square-shaped blades of a type that has been described as „razor blade“ (Reisner 1927, 26), although it is hardly imaginable that the retouched and rather blunt edges really served as shavers. All tools were more or less complete and two different forms could be recognised: Type 1 is rather wide with a flat trapezoidal cross-section and rectangular to slightly trapezoidal shape. Type 2 has a narrower width but is steeper in cross-section. Visible use traces are absent, slight damages on some blades are post-depositional. The real use of this tool form is still uncertain and a microscopic use-wear analysis would be advisable here, as well.

Borer heads (Fig. 23)

Two complete borers and one fragmented piece were found in 1995 and 1996. As a synonym for this tool, the term „croissants“ has been used in accordance with their shape (Lauer & Debono 1950). Their shape is crescent to triangular, the cutting edge appears semi-oval, the upper edge is slightly concave. Catalogue no. 95/290.9 is an implement with triangular shape and slight concave upper (hafting-) edge. It was crudely bifacially worked. The borer head is damaged by larger scars at the tip of the cutting edge and along its lateral „wings“, which surely made further use impossible and was the likely reason to discard the tool. This borer was made out of silex RM 3. Its dimensions are: width: 80 mm, height: 61 mm, thickness: 20 mm. Catalogue no. 96/122.6 appears more horseshoe-like with pronounced „wings“. The cutting edge shows only minor scarring and would still be usable. It was made from a coarse grey-brown silex with a sandy surface texture. Parts with heavily rounded cortex on the tool identify the silex as a wadi pebble. Its width measures 83 mm, height: 67 mm, thickness: 16 mm. The third borer, catalogue no. 95/290.9, is a fragment of a wing with a part of the cutting edge only. Its thickness seems to be very irregular, although its form could have been similar to no. 95/290.9. It was made of

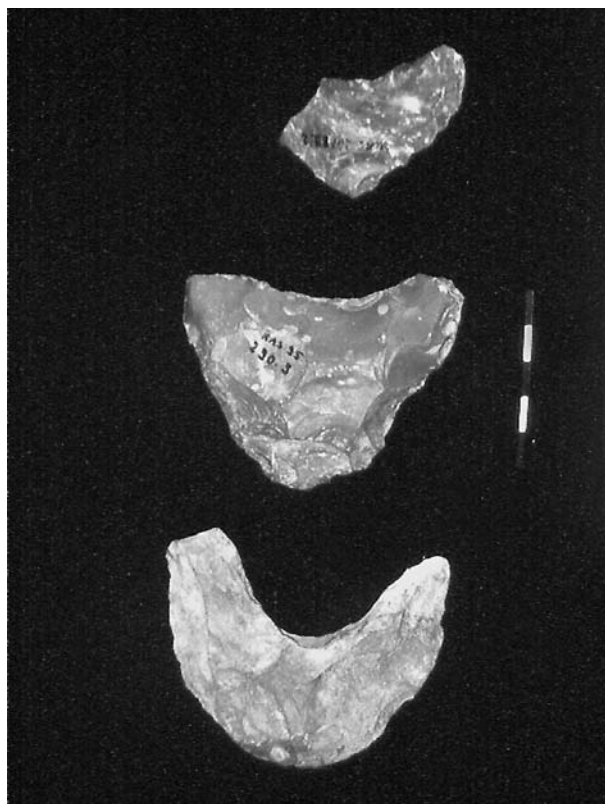


Fig. 23: Borer heads.

a raw material which does not appear with any other artefact from the Izba. It was tentatively categorised as RM 11, a glassy and fossiliferous greenish silex, probably a wadi pebble. Its preserved dimensions are: width: 43 mm, height: 42 mm, thickness: 25 mm.

All three artefacts were rather crudely fashioned, nevertheless with a good control of the straight cutting edge, especially in the area of the tip. According to Tillmann (1992, 173) the use of wadi pebbles for such borer heads was rather usual. Presumably, these borers were manufactured by the craftsmen „ad hoc“, upon their requirements. They were hafted in specialised drilling devices for the manufacture of stone vessels.

Special forms (Fig. 24/25)

In 1996, a complete bracelet (cat. no. 96/63.1) was found among several fragments in the excavations at Kom al-Ahmar. Bracelets made of silex are known already since the late Negade-period (Petrie 1896, 59) but were assumed to disappear before or with the beginning of the First Dynasty (Tillmann 1992, 165). However, this bracelet from Kom al-Ahmar was found in layers not earlier than the Second Dynasty. Mostly fragments of such bracelets have been found so far, these fragile objects are rarely preserved in a complete state. This beautiful piece is overall „trifacially“

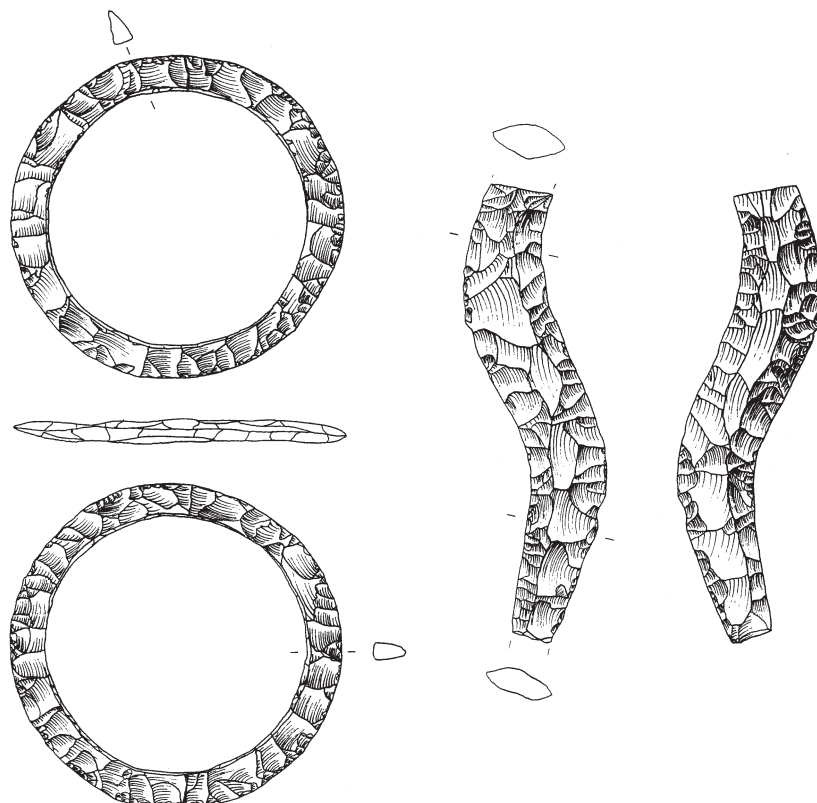


Fig. 24: (a) Bracelet and (b) S-shaped object.

retouched, but without any grinding or polishing. Only the ancient Egyptian flintknappers were able to produce these fragile bracelets using a combination of percussion- and pressure technique (Weiner, this volume). For the finishing cycle in the bracelet production, the grinding of the knapped surface has been proposed (Tillmann 1992, 165). The present author is not sure if this information is based on the existence of polished bracelets or just presumed. Nevertheless, this bracelet and the few fragments from Kom al-Ahmar do not show any signs of grinding or polishing. Neither do the bracelet fragments found during the 1995 and 1996 surveys in the flint mining area of Wadi al-Sheikh, or the bracelets mentioned in earlier reports exhibit such traces (Weisgerber 1987; Weiner, this volume). Undoubtedly, the flaked bracelets already could have been

worn as jewellery. Besides, there is not any single artefact in the lithic assemblage of Kom al-Ahmar that shows traces of intentional grinding.

Absolutely unique is a slender S-shaped bifacial artefact (Fig. 24 b)(cat. no. 96/24.1). This artefact has been manufactured in a very skilful way and precise knapping. Unfortunately, it is broken at both ends. No sign of damage or wear is seen and its function is yet unknown. Again, a microscopic use-wear analysis would help to identify the purpose and function of this artefact. Eventually, this is an absolutely new tool form. It is made of raw material type RM 3. Its remaining length is 110 mm, the width is between 11 and 22 mm and the thickness between 6 and 8.5 mm.

Also, the function of several nicely unifacial retouched drop-shaped flakes is still uncertain (Fig. 25). Although they have been previously described as „round scrapers“, no use traces that indicate such or any other function could be detected.

Fig. 25: Drop-shaped artefacts, unifacially modified.



Perspectives

The excavations within the Izba at Kom al-Ahmar delivered a rich assemblage of stone artefacts. They derive mostly from habitation layers of the Old Kingdom. Sondage drills probed Neolithic layers even down to 10 m below the present surface. While on top of Kom al-Ahmar, all layers later than the 6th Dynasty had been removed and levelled during the construction of a ptolemaic fortification, cultural layers of the Middle Kingdom are preserved in the periph-

ery of the Izba. In the excavation campaigns in 1995 and 1996 the lithic artefacts of the Izba have been studied. The assemblage contains debitage, blanks, preforms and tools, the latter partly with visible use traces. Due to the presence of debitage and preforms evidence for the existence of lithic workshops inside the village is given. Mainly regular blades used as sickle implements and bifacial „butchering knives“ in various forms had been produced. Several new knife- and tool forms were discovered in the material. Production sequences, so-called „*chaînes opératoires*“ for the sickle blades and the bifacial knives were reconstructed. Another bifacial tool form in the Kom al-Ahmar material is the adze blade. The adze blades of Kom al-Ahmar are different from other known adze blades. They were brought into the village as prepared preforms or even ready-made since no debitage and waste flakes could be identified as related to the production process. According to the macroscopic use-wear all adze blades were hafted as an adze or hoe. Rectangular „razor“ blades, borers, bracelets, and other tool forms complete the lithic material of Kom al-Ahmar. Based on the provenience of the silex raw material, the relationship of Kom al-Ahmar with the ancient flint mines of Wadi al-Sheikh was recognised. Approximately 90% of all silex artefacts presumably originate from this area.

The tentative analysis of the lithic artefacts resulted already in a first characterisation of the social-economic character of this site in Ancient Egypt. Various data for the lithic technology of the Old Kingdom have been gathered. As next step, a detailed and comprehensive study of the total material from the cultural layers of Kom al-Ahmar is suggested. The following processes are proposed:

- ◆ A complete review of the lithic artefacts, including a detailed morpho-metric analysis and the reconstruction of the *chaîne opératoire* (Pélegrin *et al.* 1988).
- ◆ Illustrations of all modified artefacts and a representative selection of blanks and preforms.
- ◆ Spatial and chronostratigraphic allocation of tools and debitage, considering the context with excavated features, especially settlement patterns.

Fig. 26: The Wadi al-Sheikh.



- ◆ Functional determination of the stone tools with microscopic use-wear analysis. Using Low Power- and High Power-techniques, microwear features on stone tools give information to tool use, activities and worked materials (Keeley 1980). Residue analysis with the aid of scanning electron microscopes can be added to obtain information about the handling and hafting of the stone implements (Pawlik 1995).

A comprehensive lithic analysis will help to reconstruct activities, production techniques and craftsmanship within the Pharaonic village at Kom al-Ahmar and finally its position and importance for Ancient Egypt. To link the technological with the socio-cultural aspects will be of special interest.

Appendix: Excursions to the flint mines of Wadi al-Sheikh as a potential raw material source for Kom al-Ahmar

As most probable source for the lithic raw materials of Kom al-Ahmar, the flint mining area of Wadi al-Sheikh has been the destination of two field visits of the excavation team (Pawlik 2000b). In both campaigns excursions to this vast mining field were undertaken on very bumpy rides on the carrier of a tractor from a local transport company. Despite its fame and archaeological importance, very few expeditions ever went to this place since its first appearance in archaeological science more than a hundred years ago (Forbes 1900). One reason is the difficult geographical and political situation of this region. Another is the huge extension of the mining areas on the Eocene limestone terraces of the wadi, which still has not been prospected and surveyed in its total extension (Fig. 26). None of the few expeditions could cross the wadi in its total length and survey the silex containing wadi terraces, which show pitheaps even after 24 km from the wadi mouth. In the meantime, the result of a geodetic survey of the Egyptian General Survey Authority is available as topographic maps in 1:50,000 and 1:100,000 scale, published in 1991. As usual for scarcely or uninhabited areas, also these maps lack details, esp. those concerning the flint mines. At least the plotting of the contour lines is accurate enough

Fig. 27: Wadi al-Sheikh. Raw material samples of RM 2 and most likely RM 3.



to recognise the course of the wadi and reconstruct the excursion route of our team. Up to now, almost nothing is known about the social and economic organisation of the flint mines of Wadi al-Sheikh as well as trade relations and its technical aspects. Even the chronology is uncertain.

The Wadi al-Sheikh begins near the town of El Hiba, approximately 25 km north of Šaruna and can easily be reached nowadays via the main road from Miniya to Cairo (Map NH 36A, E.G.S.A. Series, 1991). It was discovered by Seton-Karr in 1896. Two years later, the geologist Max Blankenhorn visited the region and delivered a first geological description of the area. In 1930, Elise Baumgärtel led an expedition into the wadi. Besides a more accurate localisation of the flint mines described by Seton-Karr she published for the first time photos of the landscape and the flint mines. Despite their startling reports about the dimensions and the artefacts of this locality the Wadi al-Sheikh passed out of mind somehow. In 1981, Gerd Weisgerber from the German Mining Museum in Bochum visited this area and published an overview of the research history, artefact collections and notes of his travel diary (Weisgerber 1982; 1987). A copy of this article served the present author as a guidebook during our excursions in 1995 and 1996. Although Weisgerber's excursion was limited to a day trip, his report is very valuable since it is written by one of the few true experts in mining archaeology, able to recognise mining features and tools and familiar with their proper terminology. Weisgerber immediately recognised the need for extensive and systematic research of the Wadi al-Sheikh and also its immense importance for the archaeology of Egypt.

Our first aim was to collect raw material samples and verify the Wadi al-Sheikh as the major raw material source for the tool production at Kom al-Ahmar. Already during the first excursion, RM 2 and most likely RM 3 as well could be identified as Wadi al-Sheikh material (Fig. 27). This meant on the other hand that we were able to date the beginning of flint mining activities in the Wadi at least to the 1st or 2nd dynasty of the Old Kingdom. This is of interest since only material of the younger periods from the Middle Kingdom on had been previously identified and earlier mining was only presumed (Weisgerber 1987).

Some of the mines were briefly explored during our short survey. Very often, the working areas for the production of preforms and blades were found next to the pitmouth (Fig. 28). Significant surface structures are the pitheaps, circular limestone walls around the pitholes (Fig. 29). The workshop areas with the now dark-brown patinated flint show a sharp contrast to the limestone debris (Fig. 30). The extension of the mining area and the distribution of flint material is simply overwhelming. In both campaigns, we could not reach the end of this seemingly endless wadi and its flint mines. However, in 1996 we could pinpoint our excursion route with the aid of a GPS receiver and create a rather accurate survey map. The examination of the



Fig. 28: Wadi al-Sheikh. Workshops directly at a pitmouth.



Fig. 29: Wadi al-Sheikh. Pitmouth surrounded by limestone pitheaps.

flintknapping workshops this time showed that there was a specialised production structure. Obviously, there were separate workshops for the production of bifacial preforms and for the production of blades. Typical for the blade cores of the Wadi al-Sheikh is the so-called „donkey-hoof“ type which in general shows only few but very regular negatives. The cores were far from being exhausted (Fig. 31). However, this seems not surprising, regarding the huge amount of available flint material. Some ridge blades found



Fig. 30: Wadi al-Sheikh. The workshop areas show a sharp contrast to the limestone debris.

in these workshops reach an impressive length-width-ratio of more than 22:1 (Fig. 32).

So far, no signs of a settlement for the miners and their families have been discovered. The few stone settings found, seem to be rather contemporary. One assumption is that the miners' villages were not located at the total dry and waterless terraces 40 m above the wadi bed. More likely seems a location in the valley itself (Pawlik 2000b, 53). Today, the relatively strong vegetation indicates a high groundwater level and a good chance for digging wells (Fig. 33). To protect the settlements against the dangerous floods after heavy rains, they might have been situated near the terraces or slightly upwards the slopes. However, due to the high grade of erosion in such dry valleys it is surely very difficult to discover such a village since it requires an extensive survey of the whole area.

In any case, the Wadi al-Sheikh region, perhaps the biggest monument of ancient Egypt, is worth further exploration and more research. Extensive prospection, surveying and mapping of the Wadi and the mining fields with its pits, heaps, flint workshops and other structures is necessary to overview the geographical extension of the flint



Fig. 31: Wadi al-Sheikh. "Donkey-hoof" blade cores.

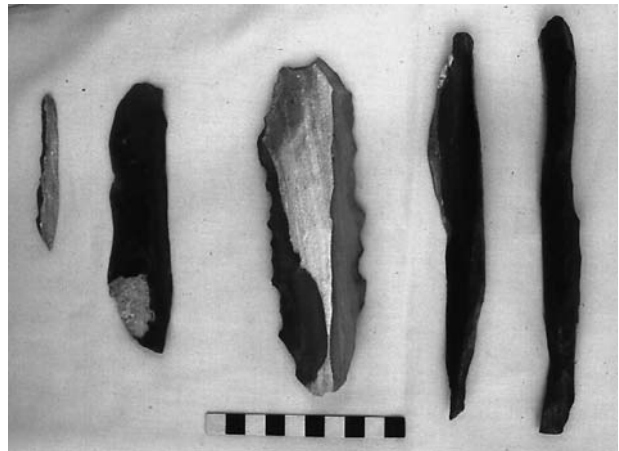


Fig. 32: Ridge blades from Wadi al-Sheikh.



Fig. 33: Wadi al-Sheikh. A rather strong vegetation indicates a high groundwater level at present.

mines, their technology, construction and organisation as well as their chronology. An examination of the different workshops and the search for settlement patterns should follow, then. It is hoped that this can be done in the near future, although a lot of governmental and financial support is needed for such an exciting enterprise.

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