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Paleolithic stone tools of El-Ga'ab depression A techno-typological study from the surface collection

El-Ga'ab depression is one of the largest Paleo-lake in the western desert of the Nile, extending south of Third cataract on the western bank of the Nile, to the Western Desert and parallel the Nile from south to north. Archaeological investigation is carried by Khartoum University from 2007 onwards. Many archaeological sites have been discovered, the prehistoric sites were the main aspects. The Paleolithic artifacts are one of the most common data collected. This paper presents results of a classification study of Paleolithic stone tools collected from different Seasons (2009 - 2015).The main aim of the paper is to describe the techno-typological characteristics of the lithic assemblages recovered from the newly discovered sites. Sites were recorded from a variety of landscape settings mainly on the edges of the depression close to the Paleo-lake, and the density of artifacts varies from site to site irrespective of site contexts. The classification of the assemblages revealed that the common technology of the collection is the developed tip end point. This represents two main cultural entities: MSA stone tools (represented by small hand axes, Sangoan, Lanceolate point, Levallois point and different form of spear point) and Upper Paleolithic (characterized by tanged Aterian spear point, arrow head and utilized blades). Quartz and chert are the dominant raw material of the assemblages. Previously, Paleolithic stone tools in the Sudan have been best known from the central and northern parts of the country. Sites representing such cultural entities were unknown from the western desert of the northern Sudan might give a link with what is known in the Western Sahara and the Nile, resulting in inadequate knowledge of the region's Paleolithic potential. In addition to filling the existing gap in the Paleolithic record of the northern Sudan, the discovery of several Middle and Upper Paleolithic sites confirms that multiple hominid lineages inhabited the region during prehistoric times. In its initial stage, the study has made an important contribution to ascertaining the potential of the area for future systematic field investigation and to make more comparison in detail with other Paleolithic regions in the Nile Valley.

Introduction to problematic studies and hypotheses

The archaeological investigations in the Sudan increased in last decades, which revealed numerous data of Old Stone Age in the central and northern Sudan. The comparative study of stone tools has shown large archaeological and regional diversities from early to late Paleolithic. Multiple methods have been used showing that the stone tools have developed gradually from primitive beginnings, large flake and core to bifacial blade and microlithic technology (Wendorf 1968, Marks 1968, Elamin 1981, Rots &Van Peer 2006).

Since the beginning of Old Stone Age research in the Sudan, the production of large bifacial flake has been recognized as the Acheulean technology (Arkell 1949, Wendorf & Schild 1980, Chmielewski 1968). The Levallois core and denticulate Mousterian is the MSA technology developed to the Upper Paleolithic sharp small tools (Marks 1968, Elamin 1987).

Recent studies have made important contributions to our understanding of the early and Middle Paleolithic stone tools, the bifacial points as the main technology of MSA in the Western Desert of the Nile Valley (Late Acheulean point, Levallois point, Aterian, Nubian Levallois point, Mousterian point) and other local term of Upper Paleolithic point (Wendorf 1968, Van Peer et al 2003, Howkins 2001, Masojć 2010, Tahir 2012, Nassr 2014).

In general the data have been collected from the Northern Sudan and the Western Desert yielded various stone tools development from late Acheulean to Upper Paleolithic technocomplex (Wendorf 1968, Marks 1968, Garcea 2000, Osypiński 2012, Rots & Van Peer 2006).

On the other hand, the late Acheulean and early MSA sites in the central Sudan showed a kind of Lanceolate point closely similar to Sangoan and Lupemban stone tools (Arkell 1949:32). In the eastern desert of Lower Atbara River bifacial point was the main typology of late Acheulean and MSA technology (Nassr 2014:117). Around the fifth and fourth cataract the common type was the Levallois point, triangular flaked and blade tip point (Maier 2012: 110, Masojć 2010:68).

Much of prehistoric research in the Northern Sudan recognized Upper Paleolithic stone tools, denticulate and tip points were mentioned. The projectile tip point was a common technology feature, the tool class include artifact displaying evidence of modification by secondary retouches (e.g. points and arrow head).

Here the main questions related to the stone tools development from the early to late Paleolithic are the links from Acheulean to Levallois and changes from MSA to Upper Paleolithic within the climate changes and adaptations shifting.

The lack of prehistoric work in the area in between the Western Desert and the Nile complicated the interpretation of Paleolithic transitions. However, the absence of long stratified sites is particularly strange, because of the rather extensive distribution of Early, Middle and Upper Paleolithic sites in northern Sudan.

The systematic collection of El-Ga'ab project yielded various large bifacial stone tools from Lanceolate point and projectile tip point, some of it collected from sites associated and other individually.

The purpose of this paper is to present the Paleolithic collection of El-Ga'ab depression and to classify the data into main initials with comparison with previous Sudan Paleolithic collection. Moreover, we want to review the development of stone tools in the area and the transition changes of the tools from the technocomplex stone tools.

This piece of works intends to know the link between the Nile and the Western Desert of the northern Sudan in the Paleolithic times.

Finally the study aims to find a comprehensive understanding of stone tools of El-Ga'ab depression and the role of the area mediating the desert and the Nile.

El-Ga'ab depression and research history

El-Ga'ab is the largest depression and Paleo-water source in the Western Desert of the Nile, extending south of Third cataract on the western bank of the Nile, to the Western Desert and parallel to the Nile from south to north for 123 km (Fig 1).

From a geographical point of view the area is a large depression formed by many oases. The landscape of the area is formed by a depression connecting to the Nile in the north part. Some small flat areas like an oasis and short deeper channels belong to the main depression (Whitemann 1971).Today the sand dunes are covering some parts of the channel and oasis with sand layers.

Within the increase of archaeological activities in southern Egypt and northern Sudan, El-Ga'ab was untouched. The primary anthropological descriptions have been written on some geographical notes of the water (Turner 1905, Garstin 1897, Barbour 1961 and Vantini 1987).

In general, early descriptions focus on the geographical features and contemporary cultures, however there are some stone tools mentioned. Acheulean hand axes and small bifacial flakes and cores are noted by G.Y Karkanies according to Arkell (1949) on the right bank of the depression. In the publications of CPE in northern Sudan and Western Desert some hypotheses about the extension of Paleolithic camps around the area are written (Wendorf 1968, Schild & Wendorf 1977).

The El-Ga'ab project was conducted by Khartoum University in late 2007, a documentary and explorations field work carried out from 2009 to 2015 (Tahir 2012, 2013, 2014). Multiple interdisciplinary approaches of archaeology and related sciences have been done, many stone tools have been discovered. The systematic samples collected from the sites will be described here.

Archaeological field work and methods

The El-Ga'ab project research consists of multiple different approaches, geology, paleontology and archaeology are the main branches (Tahir 2012, 2013 and 2014). The prehistoric research is one focus of the project. Paleolithic sites are recorded within the survey and a general map of the sites is drawn. The Paleolithic assemblage is collected from the sites' surface (Tahir 2012:107). This study tries to classify the stone tools from various applications; technology and typology are the main aims to test the theoretical hypotheses set above and to realize the general characteristics of Paleolithic stone tools of El-Ga'ab depression; however the stone tools are collected from different parts of the depression (Fig 1).

Paleolithic studies in Africa rely on different methods: stone tools, site setting and reconstruc-

tion of the site environment. In the Sudan there are two facets, the first types concentrated on the stone tools description and comparison of regional diversities (Arkell 1949, Wendorf 1968, Chmielewski 1968). The second was involved in the recognition of a specific stonecraft tradition, by placing sequential development in the stone tools and changing geographical pattering (Van Peer et al 2003, Masojć 2010 Osypiński 2012 and Nassr 2014).

To provide a basis for the general Paleolithic stone studies of El-Ga'ab depression, this study was adapted to three main differences, sites setting and stone tools concentration on the surface, technology and typology of stone tools. That is to make a statistical classification of stone tools to realize the Paleolithic stone tools and to make a comparison with the Sudan Paleolithic discoveries.

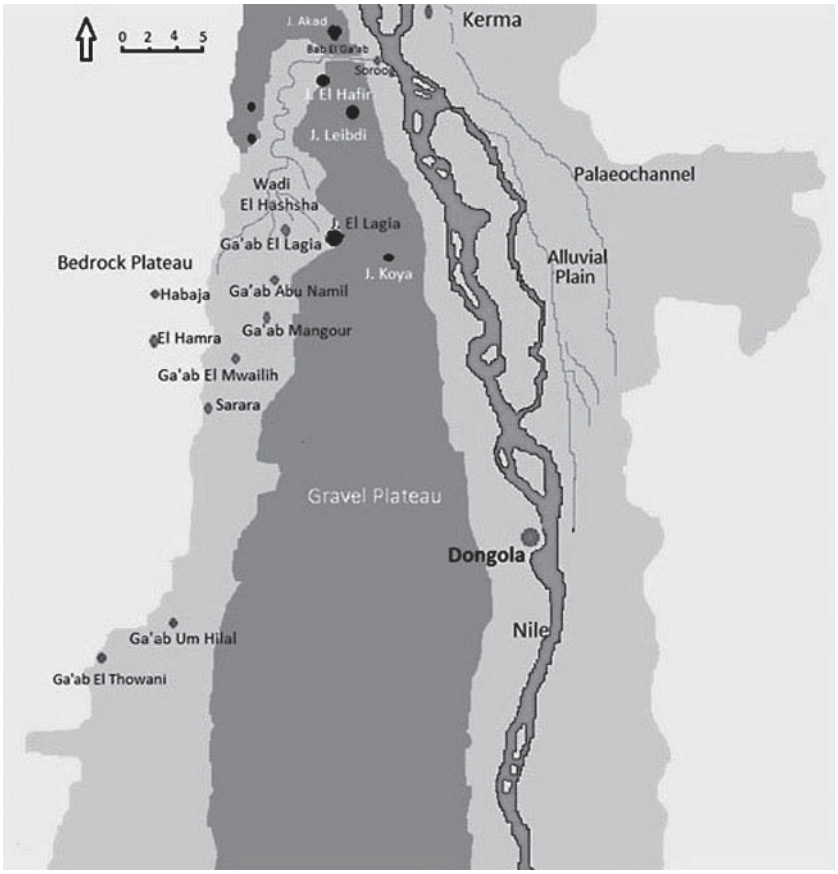

Fig. 1: The main sections of El-Ga'ab depression (Illustration by Tahir 2015).

The sites were sampled from different discovered parts of the depression. According to the general plan of the project the area was divided into sections. The main sections containing Paleolithic stone tools are Habaja, Ga'ab ElMwalih, ElSarara Oasis, Um Hilal and El Hamra (Fig. 1).

The assemblages collected from 30 Paleolithic sites were about 300 lithic specimen. Our classification conducts the general description of separate site collections and 201 stone tools selected for the advanced classification.

The stone tools selection considers the variations of raw material, technology and typology. The classification is based on stone tools measuring (size and weight), technology description of striking platform and faces reduction; and retouched and sharp edges. The stone tools ends, butt, edges and tang position were described too.

Sites setting

Most of Paleolithic sites in the Sudan have been found clustered near a bend of the River, either in northern Sudan or in central Sudan (Arkell 1949, Chmielewski 1968, Marks 1970), little discovered so far in the desert, i.e. Western Desert, Bayuda, and Eastern Desert (Wendorf 1968, Masojć 2010, Osypiński 2012, Nassr 2014). Early Paleolithic sites are normally found close to the Nile or on the Paleolake, Khor Abu Anga, Arkin-8 and Jebel ElGrain, most of the Middle Paleolithic sites discovered little far from the Nile on the base of a mountain or banks of deeper water channels, such as PB-177 in the Bayuda and Affad-23 in Affad district (Masojć 2010, Osypiński 2012).The Upper Paleolithic sites found on the small mounds clustered on the River banks and water channels, such as Upper Paleolithic sites in the Western Desert and Preceramic sites in the Upper Atbara river (Wendorf 1968, Marks et al. 1987).The benefit of seven seasons' archaeological survey in El-Ga'ab depression revealed the general distribution map of archaeological sites in the area (see Tahir 2013, 2014). The Paleolithic sites discovered around El-Ga'ab cluster near a bend of the depression, on small flat mounds and inset into probably middle Pleistocene deposits (Tahir 2012:107).

The surface of the sites between the plateau and the earlier oasis banks has a minor depression-like topography, with small deeper channel following the oasis from the mountain and from the high depression branches to the center.

Fig. 2: In situ arrow head within a large workshop of projectile stone tools from the site of HBJ-04-003. (Photo Tahir 2014).

The surface is formed by extensive quartz and chert sheets and sand stone outcrops. The depression is quite marked on the inland sides, being a recognizable deeper channel, about 292 - 285 m above the sea level (Tahir 2012:105).

The surface sites were eroded and parts of it covered by sand dunes. The Paleolithic stone tools are spread on the surface within the outcrops of sand stone and extensively on the flat gravel and accumulated on the oasis banks. The sites mayor workshop and some stone tools found in the middle of the oasis and depression center like the hinterland.

Here we try to describe the sites which have been sampled by dividing the area into sections to find the general distribution of the Paleolithic sites in the area (Fig. 1).

Ga'ab Abu Namel: Oasis located in the eastern side of the depression, covered by sand dunes in most parts, one of these oases revealed extensive small stone chip tools on a small mound (AN-3-05) (Fig.3). Backed blades with sharp edges and single ends and elongated arrow head, which indicates a large workshop of Upper Paleolithic.

Habaja: Gradual sloping plateau on the western side of the depression. The main features of this section from Jebal ElGrianat are small oval mounds and flat plains in between. Archaeological survey revealed seven sites containing Paleolithic stone tools, consisting of large stone tools closely to late Acheulean and Lanceolate point, Levallois point and other elements of Middle Paleolithic. The small point, tanged spear and arrow head, too, indicate many Upper Paleolithic sites in the section. The sites sampled and selected for this study are HBJ-4-016, HBJ-4-020, HBJ-4-023, HBJ-4-026, HBJ-4-027, HBJ-4-029 (Fig.3). The elongated hand axes, big bifacial points, point with tang, spear and arrow head show different technology, size and edges finishing. Stone tools are collected from the sand stone outcrops located on the foot of mountains and besides, which are generally workshops of projectile stone tools (Fig. 2).

The complex extensive finished stone tools were scattered, and debitage indicate a projectile workshop at Habaja HBJ-4-002, HBJ-4-003, HBJ-4-006 (Fig. 3). The last three sites found on the hillside toe.

ElHamra: is one of the main depression branches located in parallel line to Habaja section to the south, today covered by sand and palm trees, and compassed by a series of mountains and sand dunes. Bifacial Lanceolate tanged point and utilized flakes collected from single spot on the ridges of the mountain.

Ga'ab ElMwalih: Located in the center of the depression south to ElHamra section, generally the large oasis lies in an area, where underground water is available near the surface. The stone tools were collected from mounds, outcrops and flat channel traces, extremely close to the main traces of the oasis. Two main principal artifacts were collected, firstly Middle Paleolithic represented by small hand axes, rounded scraper and bifacial oval hand axes closely to the Sangoan stone tools (McBreaty 1988). The second one shows the Upper Paleolithic elements such as tanged spear point and arrow head with different size and end point.

The Paleolithic stone tools here are GMO-4-010, GMO-4-034, GMO-4-040, GMO-4-042, GMO-4-043, GMO-4-046, GMO-4-047, GMO-4-048, GMO-4-049, GMO-4-053, GMO-4-055 (Fig. 3).

The other Paleolithic stone tools used for this study are collected from single sites located close to the main section mentioned above: ElSarara Oasis, site SAR-05-002, Sar-05-003.South of ElSarara there is a small oasis called ElGamra, there are some assemblage collected from site GAM-05-011. In the southern part of El-Ga'ab depression, stone tools were collected from large workshop (Fig. 3). Extension

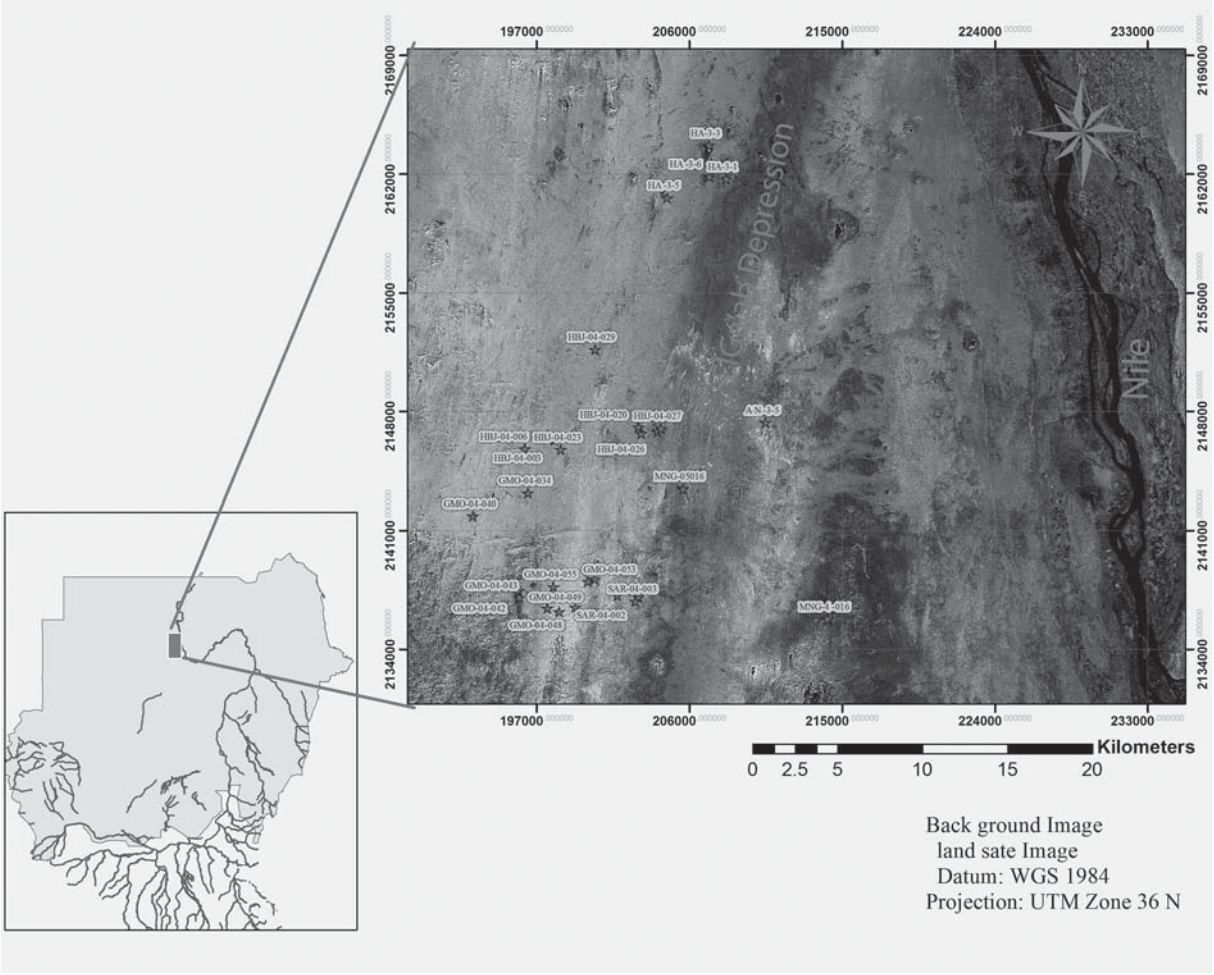

Fig. 3: Paleolithic sites distribution of El-Ga'ab depression (Illustration by Nassr 2015).

stone tools found in Um Hilal in a flat area close to the main depression, three sites have been discovered UH-05-002, UH-05-007 and Uh-05-008 (Fig 3). In the south west at Ga'ab ElThowani, projectile tip and Lanceolate have been collected from site THO-05-011 (Fig 3).

General view of stone tools

The primary classification of stone tools start with separate site assemblages, by description of raw materials and stone tools industries, and selecting samples of the techno-typological study. The samples are selected from the diversities of stone tools and sites locations.

The raw materials of the stone tools are mainly local rocks, from quartz, quartzite, chert, agate, rhyolite and sandstone. Quartz and chert are the common rocks of the stone tools and agate and rhyolite are secondary.

Within the assemblage, there is a big difference in technology and typology. The result of primary classification divides the assemblage into the large flaking technology which contains small hand axes, Lanceolate with different shapes, tang and end point and some Sangoan and Levallois stone tools (point and knifes), that are indicate of developed late Acheulean and early MSA technology of the area.

The cores were the common technology of stone tools, which are represented in some Sangoan point, spear, and there are some cores with conjoining flakes appearing in bifacial spear and arrow head.

The projectile stone tools were the main technology of the assemblages, which consist of spear and arrow head, and each types includes different subtypes, such as Aterian spear, triangular spear and tanged spear. Also the arrow heads show differences from diamond to small triangular arrow heads. That indicates the complexity Upper Paleolithic technology of the area.

The detailed classification of stone tools carried out by measuring each types of stone tools (size and weight) and numbers to classify the outline of stone tools variations (Table. 1).

Stone tools type	Sites section	Numbers	Percentage	Big size mm	Small size mm	Weight G
Small hand axes	Ga'ab El Mwalih	3	2%	185x88x48	162x79x34	727-588
Sangoan	El Gamra	6	3%	122x78x26	113x80x25	504-335
Lanceolate spear point with stemmed tang	Ga'ab El Mwalih	6	3%	190x64x15	160x42x14	266-155
Bifacial spear	Habaja	12	6%	153x54 x18	117x55x24	221-192
Knifes	El Sarara	7	3%	132x60x16	125x51x11	197-124
Triangular spear point	Habaja	9	4.5%	128x55x17	71x45x19	134-82
Clovis spear	Habaja	4	2.5%	97x52x25	67x38x16	105-48
Levallois point	Habaja, Ga'ab El Mwalih	7	3%	86x45x20	73x35x14	94-52
Tanged spear point	Habaja, El Hamra	9	4.5%	123x43x12	43x16x17	129-34
Backed Crescent	Habaja	6	3%	68x32x9	72x30x12	51-36
Burin	Um Hilal	5	2.5%	77x16x7	43x25x5	19-14
Denticulate	Ga'ab Abu Namel	9	4.5%	86x29x5	55x27x9	32-24
Chips	Ga'ab Abu Namel	7	3.5%	81x21x4	43x10x2	14-4
Arrow head	Habaja, Ga'ab El Mwalih, El Sarara, El Gamra, Um Hilal	111	55%	66x21x4	36x10x3	25-2

Table 1: The variability of Paleolithic stone tools of El-Ga'ab depression.

This let us suggest that there are different technologies of stone tools, different in bifacial faces finishing and edges and dorsal layout, which are attributes to late Acheulean and early MSA technologies in the northern and western sections of El-Ga'ab depression. The projectile tip points were concentrated on the middle sections of the depression and the western ridges of mountains and the western side of the main channel and oasis.

That indicates that the later occupations of El-Ga'ab depression in Stone Age are dominated by MSA projectile technology (Levallois, Mousterian, Aterian and Upper Paleolithic and Microlithic technology).

Indeed, that is the main concentrations of stone tools, although there are single stone tools recorded also in the other parts of the depression.

Stone tools technology

The general classification of the stone tools collected from the selected sites of El-Ga'ab depression revealed large variations of the Paleolithic stone tools technology from the production view, mainly the MSA technology. We detect Middle and Upper Paleolithic assemblages with the Lanceolate and projectile tip point technology.

The sites collection shows also some contrast among the concentrations and the typologies of the collections, some of them revealed a huge concentration and other showed a single sample. Also there are some sites showing big and large Lanceolate stone tools and other contain small tip points. The differentiation of the stone tools forms are observed by the shape and size and the finishing process. The stone tools show mostly a tip point from Lanceolate tip point and projectile tip point with large variation of surface abrasion and retouched edges.

The bifacial stone tools are common, with working dorsal and sharp edges. The tip end working from the dorsal and the edges are retouched with the negative percussion. The big stone tools are made by rounded conjoining flaking with large scars extension from the butt to the end point. Some side tools like a knife show the flaking extension from the dorsal to the edges with vertical percussion to product sharp edges ends. These big tools are mainly made by bifacial on large cutting flakes, such as the small hand axes (Fig. 4), little made on flake unifacial.

This indicates that El-Ga'ab area contains some Middle Paleolithic sites, which are closely to the late Acheulean and early MSA technology. The large Lanceolate bifacial stone tools made on flakes are quite similar to the late Acheulean stone tools known in the Nile Valley, such as Amygdaloidal hand axes have been discovered in Western Desert (Dakhla) (Schild & Wendorf 1977: 72), and late Acheulean hand axes in the northern Sudan, Arkin-8 collection (Chmielewski 1968).

There are some hand axes showing the elongated end and flaking sides similar to the Levallois point with a big size and rounded a butt.

Although the Lanceolate tip point stone tools are similar to the Levallois point in the tip point, which are MSA technology (Van Peer 1991:108), the largest size and flaking bifacial shapes of these stone tools here are typical late Upper Acheulean hand axes. That shows two technological elements combined from late Acheulean and MSA period within one technology. This indicates the developed technology in the area, with simple changes in the size with liaised of the tip end point, might be affected by the environment changes.

Tanged Lanceolate tip points are the main stone technology of the assemblage, which end appears as a point neck width, which has proven to be a valuable proxy measurement of the width of the shaft to which a point was attached. The base of the tools show a part of a butt like tanged usage with dihedral shape (Fig. 5). This tanged and elongated axis with dart tip point end is very clearly in late Acheulean and MSA technology (Sangoan, Lupemban, Aterian and Levallois point) (see McBreaty 1988, Van Peer 1992, Howkins 2001).

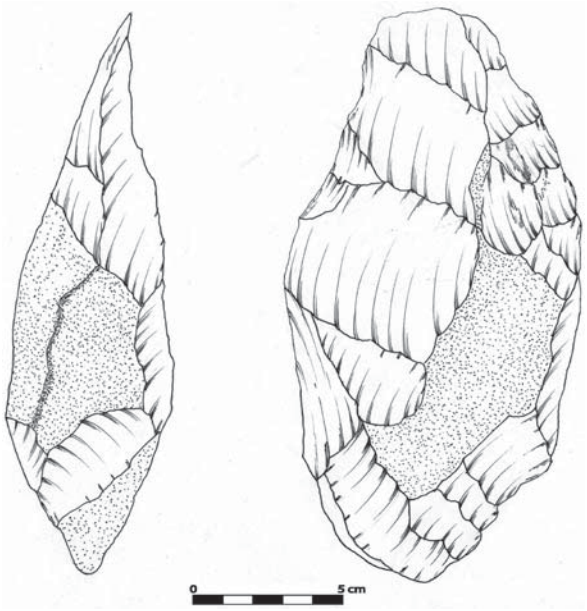

Fig. 4: Bifacial Lanceolate hand axes made on cutting flakes. (drawing Nassr 2015).

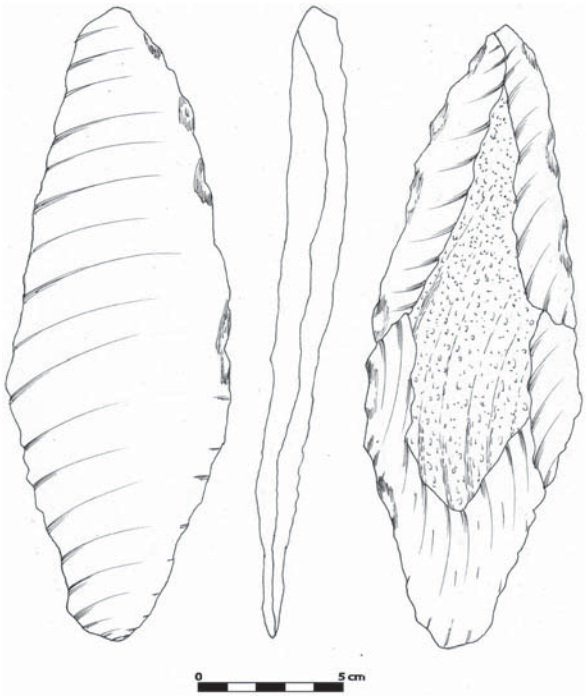

Fig. 5: Lanceolate spear point with stemmed tang (drawing Nassr 2015).

The flake is the particular technology of the stone tools, which represent some connecting elements of Middle and Upper Paleolithic. Some stone tools technology also show local features, which are similar to the MSA in North-East Africa in the tang size

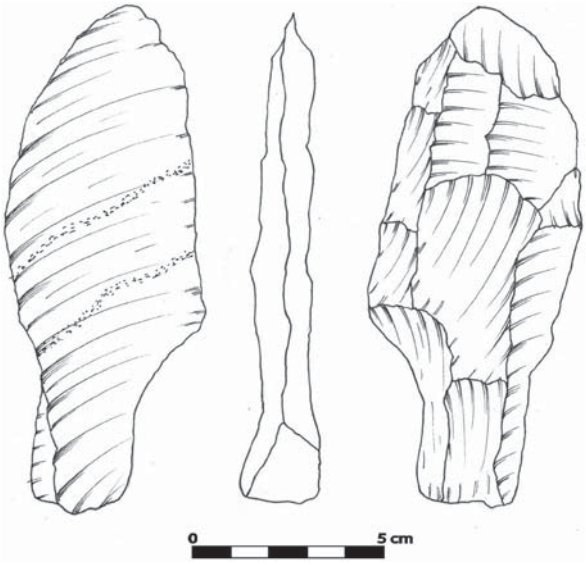

Fig. 6: Big knife with sharp one side and stemmed tang (drawing Nassr 2015).

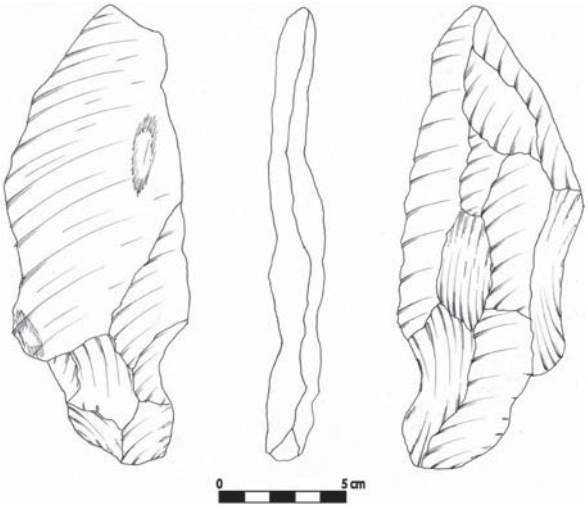

Fig. 7: Aterian tanged Spear point (drawing Nassr 2015).

(Wendorf & Schild 1980), as well as to the MSA stone tools in South-East Africa in elongated shape and sharp edges (McBreaty 1988). One of these examples is observed in a big knife with sharp one side and stemmed tang (Fig 6).

The small stone tools show regular bifacial technology on bipolar shape and fine foreword extension percussion, with tip point. Some stone tools show a defined tang different in length and width. Some triangular flakes, foliate bifacial and unifacial points which are described here are typical of late Acheulean and early MSA stone tools in North Africa (Wendorf & Marks 1975).

The Aterian spear with tanged and tip end point (Fig 7), are closely similar to the Aterian of the Western Desert (Caton-Thompson 1946:32).

The arrow head was the common stone tool made on blade and bifacial, recognized by the tip point and different tang and size (Fig 8). These stone tools are the projectile technology, which have a point that attached to a weapon such as an arrow, dart, lance and spear. These are usually made on blade with small size in arrow head, dart and spear should be quite large. It is similar to the Upper Paleolithic projectile tip point of North-East Africa (Shea 2006:823).

This complex cluster of Upper Paleolithic industries are mixed with Middle Paleolithic technology and showed large techno-complex variations among developed Levallois point and foliate Mousterian to Microlithic arrow head, which are quite acceptable in the northern Sudan and Western Desert (Wendorf 1968, Marks 1970, Elamin 1981).

From the technological point of view the flake technology is the common feature of the stone tools and the core technology is rare, the flaking process appears different as spot of striking platform on the butt, dorsal and sides, such as point platform, two striking platforms on the dorsal, side striking platform and cortical striking platform.

The finishing observed at the small tools, bifacial with abrasion surface by continuing detachment and conjoining flaking scars, the end tip point and the tang recognized are main elements.

The stone tools made on blade technology, shows continuing percussion on two faces, with abrasion surface and working sides and tip end point. Also there are some stone tools unifacial technology with one sharp edge and cortical striking platform detected.

The debitage technology appeared from the small stone tools with a few processing and sharp edges.

These different techniques with the form and shape of the stone tools indicate that the Paleolithic sites of El-Ga'ab show early MSA and late Upper Paleolithic stone tools, similar in the tip end point and different in shape and size. The small stone tools are mainly made of flake, blade and a few stone tools made of core and debitage. The stone tools are corresponding in the tip end point and different in flaking and simple reduction on the dorsal and sharp edges, which are projectile tip point in general with deve-loped elements and changes independent of the chronological variations and sub-regional diversities.

The stone tools form are mainly from spear and arrow head, with a large differentiation in the size and tang and tip point design, mostly contain Levallois and Mousterian spear point and Middle and Upper

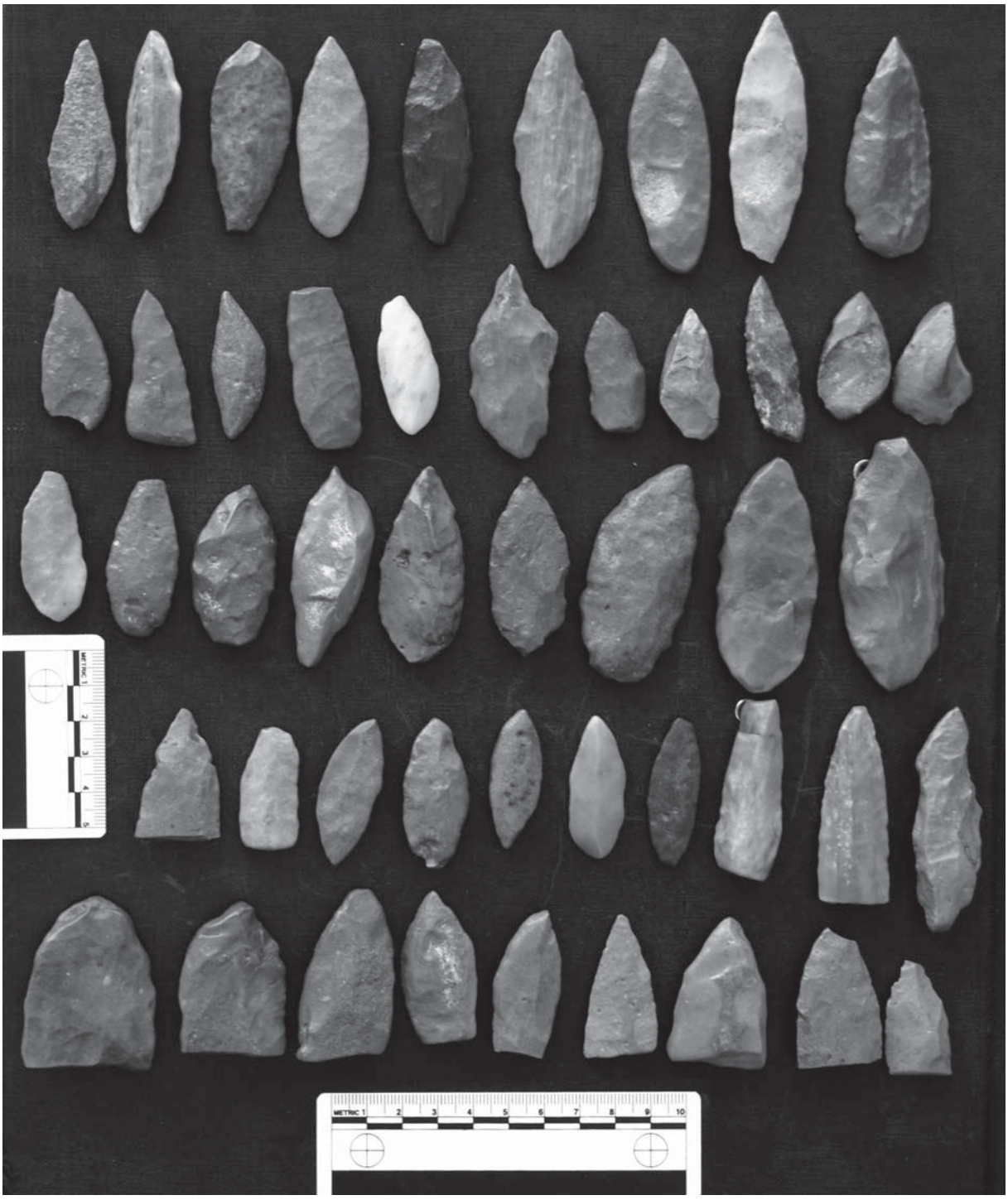

Fig. 8: Sample of Arrow head, projectile stone tool technology (photo Nassr 2015).

Paleolithic arrow head, which are similar to the MSA and Upper Paleolithic Lanceolate and projectile technology in North-East Africa (Shea 1997:83, Wendorf 1968 and Van Peer 1991). In the same time the small stone tools technology revealed a new face of the Middle and Upper Sudan Paleolithic from El-Ga'ab depression, which are combined between the technology in the desert and the Nile in hunting stone tools traditions.

The variability of the stone tools indicate complex Paleolithic industries developed in El-Ga'ab area from late Upper Acheulean, Levallois point, classical Levallois, Mousterian, Sangoan, Tumbian, Aterian to small Upper Paleolithic stone tools with the local technological elements convicted by the function of the stone tools, which is the hunting.

Stone tools typology

The classification of the assemblages, looking on the quality and quantity, yielded a new face of Middle and Upper Sudan Paleolithic. Lanceolate tip point and projectile tip point are the common technology of the assemblage which is quite similar to the Middle and Upper Paleolithic in northern Sudan and Western Desert of Egypt and Sudan. Moreover there are additional characteristics of the assemblage regarded as the local traditions.

In general, the early Paleolithic sites in El-Ga'ab are lacking, a few Lanceolate hand axes are known and collected from single sites in the center and north of the depression. The main types of stone tools are closely to the early MSA stone tools, which are represented in oval small hand axes similar to the Sangoan, large unifacial points similar to the Levallois and there are elongated Lanceolate spear points with stemmed tang (Fig 9), which are rare in the Sahara and northern Sudan, a few similarities with Lupemban and Tumbian in the shape and Aterian in tang. These multiple attributes of MSA stone tools of El-Ga'ab depression are very informative regarding the regional diversity of Middle and Upper Paleolithic in North-East Africa in general, which are similar to the stone tools found in Dakhla Oasis and Wadi Halfa reach, those two different landscape areas show the main model of Middle and Upper Paleolithic stone tools in the Nile Valley (Schild & Wendorf 1977, Wendorf 1986). The stone tools from El-Ga'ab depression confirm the importance of the area in North-Eastern Africa for the Paleolithic study. When the denticulate Mousterian and Nubian Levallois point regarded as common tools of Middle and Upper Paleolithic in Sudan and Egypt (the Nile and the desert), in El-Ga'ab depression, the Lanceolate and projectile tip point were the main tools, they could be from late Acheulean to the late Upper Paleolithic.

Fig. 9: Lanceolate spear point with stemmed tang (photo Nassr 2015).

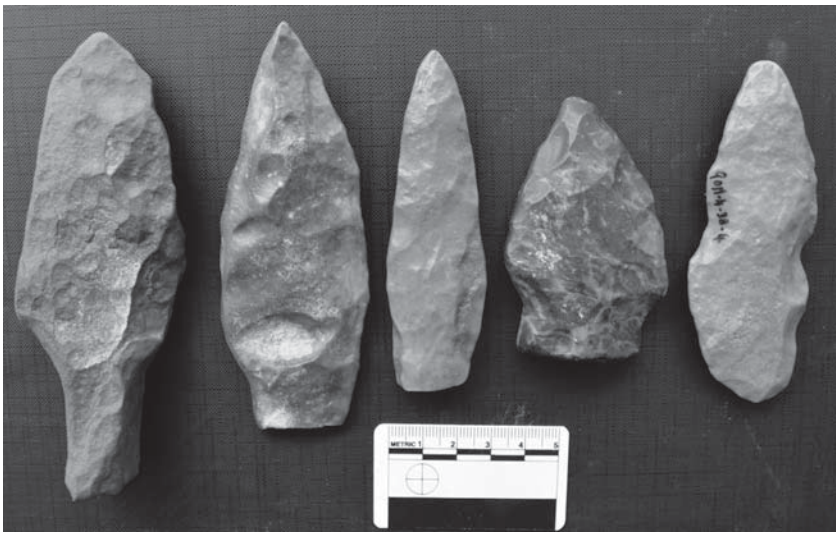

Fig. 10: Spear point with different tang and notch (photo Nassr 2015).

On the other hand the variation of stone tools in size and raw material and the similarities in tip end point indicates the local developed technology in El-Ga'ab. This gives the area its importance and offers resources for the people adaptations for long period occupations.

Spear points with different shapes and sizes are found, which show gradual changes in the technology from Levallois point to projectile point, some of them have tanged close to Aterian stone tools and other with notch on the bottom and tip end point (Fig 10).

Denticulate stone tools are observed, containing serrated bifacial denticulate, backed crescent, burins and knifes, which are similar to the Mousterian denticulate and Upper Paleolithic stone tools in northern Sudan (Wendorf 1968).

The classification of arrow head revealed different subtypes of arrow heads, mostly

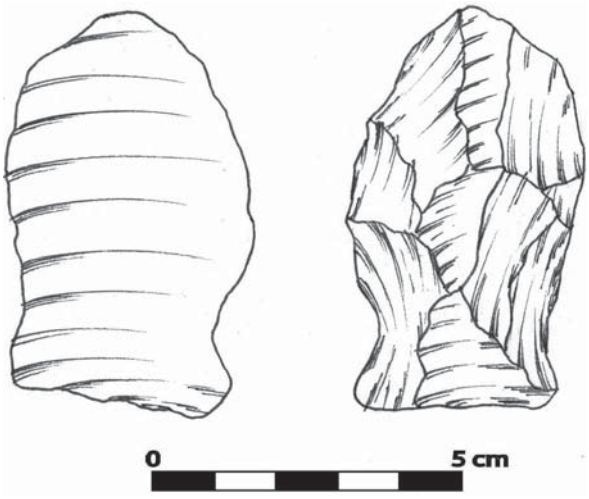

Fig. 11: Choice tanged arrow head (drawing Nassr 2015).

made on blade on the projectile tip point industry, and containing different shape diamond, rounded and serrated arrow head. The tanged arrow head shows different tang, flat tang, strait tang, side strait tang, flute tang, shouldered tang and choice tang (Fig 11).

These variations of arrow head subtypes indicate different activities of projectile stone tools in the area, which are quite similar to the projectile stone tools in North Africa (Shea 2006) and Upper Paleolithic tip point in the Sahara (Wendorf & Schild 1980).

Finally the surface collection is not enough to make a clear decision about the dating and the chronology. From the general observation from the stone tools accumulations and situation on the surface with the landscape of the sites and the techno-typological classification, we can understand the general time lines of the stone tools period, which might be from late Acheulean to the late Upper Paleolithic Stone Age.

The area is still promising and need more focusing research by the excavation and samplings with laboratory analysis and absolutes dating and more elaborated classification of stone tools and environment remains.

Conclusion

The study of the Paleolithic stone tools of El-Ga'ab depression shows a large variability of the stone tools technology in the Sudan, Lanceolate and projectile tip points are the main elements of the technology. Spear point and arrow heads are the common tools types. That indicates a gradual development of MSA and Upper Paleolithic stone tools in the area, which are quite similar to the eastern Sahara assemblages (Wendorf & Schild 1998, Howkins 2001, Shea 2006) with some variations such as long tip point and tang shapes, which might be local characteristics.

The classification of the stone tools shows different types of the stone tools with multiples technologies, and there are subtypes of stone tools. The differences in size, weight and shape of the spear and arrow head stone tools indicate that these are the common stone tools and it is developed over long multiple periods, this might be affected by the climate changes and sub-regional variability.

The comparative study of the stone tools shows clear contact of the area with the Western Desert and the northern Sudan in their similarities of the technology and typology. This also revealed that hunters groups occupied the area from late Acheulean, MSA and Upper Paleolithic agreeing with findings of Wendorf 1968, Marks 1970, Elamin 1981, Becker & Wendorf & Schild 1998, Howkins 2001, Nassr 2014.

The Lanceolate stone tool similar to which were found in late Acheulean and MSA level in Africa, which are used as a term encompassing a wide range of elongated pointed tools, that have been shaped by invasive thinning retouch over both their dorsal and ventral surfaces. Most of these Lanceolate stone tools shaped found in Ethiopia, central and eastern Sudan and the Western Desert of Egypt (Arkell 1949, Schild & Wendorf 1981, Semaw 2000, Beyin 2013 and Nassr 2014).

The spear and arrow head are the projectile stone tools, which indicate the emergence of features of Upper Paleolithic, however some authors noted a projectile in MSA stone tools, such as Levallois point, Mousterian points and various bifacial point types (Holdaway 1990, Howskins 2001).

In North-East Africa there is less clear knowledge about the complex regional diversities with some gaps converging. Many studies placed this gaps reflecting the fact that the stone tipped projectile weapons developed from bifacial points. That is clear from the CPE discoveries in the Western Desert of Egypt and Northern Sudan (Wendorf 1986).

From the initiation of early studies and the result of recent field work in the Sudan with the result of this study classification, it is widely accepted that the north/west Sudan was occupied during the Middle and Upper Paleolithic by conservative groups with an essentially Lanceolate tanged and projectile point technology. The result of the collection classification from different sites have demonstrated the presence of bladelet pointed with retouched tips industries as early as Upper Paleolithic, might be suitable to fill some of the general gaps geographically (Wendorf and Schild 1980, Carcea 2003, Van Peer et al 2003).

The archaeological discoveries of the Western Desert of the Nile in Egypt and Sudan indicates that the northern Sudan and adjacent desert to the west should represent an early manifestation of the development of industries characterizing by bifacial Lanceolate and projectile tip points, which probably indicates a link between the desert and the Nile in Late Stone Age. The suitable area to test these hypotheses is El-Ga'ab depression from the first notes of this study.

What was said concerning stone tools, shows a different chronology with similar technological attributes, from bifacial Lanceolate point of Late Acheulean, Sangoan, Lupemban, Levallois, Mousterian and the Projectile tip point of foliate, spear and arrow head, which might be an indication of technological development or economic changes. The main elements of the stone tools features in El-Ga'ab area are the tip point, which indicates the local techniques of the stone tools in the area.

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Zusammenfassung

Die Untersuchungen zur Vorgeschichte in Nordostafrika zeigt eine weite Verbreitung von paläolithischen Fundplätzen im Niltal und in der Wüste. Dabei sind einerseits Unterschiede, aber auch Gemeinsamkeiten in der Steinwerkzeug-Technologie und -Typologie zu erkennen. Während die Steinwerkzeuge der Westwüste Südägyptens Interaktion mit dem Niltal anzeigen, ist aus dem Nordsudan bisher wenig bekannt. Dies legt nahe, das Gebiet zwischen Nil und Wüste unter verschiedenen Gesichtspunkten anhand der paläolithischen Steinwerkzeuge zu erforschen. Die Ablösung des Acheuléen-Faustkeils durch die Levallois-Spitze ist ein wesentlicher Punkt, ebenso die Veränderung von der MSA-Spitze zur Geschossspitze im Jungpaläolithikum.

Die El-Ga'ab Depression ist ein ausgedehnter Paläosee in der Westwüste, der sich etwas südlich des Dritten Kataraktes westlich entlang des Nils befindet. Dieses Gebiet hat sich als aufschlussreich für die genannten Forschungsfragen gezeigt. Seit 2007 wird dort archäologische Feldarbeit von der Khartoum-University durchgeführt. Zahlreiche paläolithische Fundstellen wurden untersucht. Der Artikel präsentiert die Ergebnisse der Untersuchung von paläolithischen Steinwerkzeugen, die in den Kampagnen 2009-2015 gesammelt wurden. Die Fundstellen liegen in unterschiedlichen Landschaftsbereichen, vor allem an den Rändern der Senke nahe des Paläosees. Die Dichte der Artefakte variiert unabhängig von den Fundplatzkontexten.

Eine statistische Klassifikation und Beschreibung der Steinwerkzeuge wurde für 201 Sammlungen durchgeführt und zeigt hauptsächlich zwei kulturelle Einheiten: MSA-Steinwerkzeuge (repräsentiert durch kleine Faustkeile, Sangoan, Lanzettspitzen, Levallois- Spitzen und verschiedene Formen von Speerspitzen) und Jungpaläolithikum (charakterisiert durch Stielspitzen, Pfeilspitzen und Klingen mit Gebrauchsretusche). Lanzett- und Geschossspitzen sind die wichtigsten Elemente der Typologie. Speer- und Pfeilspitzen sind gebräuchliche Gerätetypen. Das lässt auf eine graduelle Entwicklung vom MSA zum Jungpaläolithikum in diesem Gebiet schließen, ähnlich wie in der weiteren Ostsahara.

Die typologische Klassifikation zeigt unterschiedliche Typen der Steinwerkzeuge mit multiplen Technologien, darüber hinaus gibt es Unterklassen von Steingeräten (kleine Faustkeile, Lanzettspitzen, Speere, Messer, gezähnte Stücke, rückengestumpfte Klingen und Pfeilspitzen). Es gibt Unterschiede in Größe, Gewicht und Form. Die Unterklassen der Speer- und Pfeilspitzen sind bekannt und lassen vermuten, dass diese die üblichen Steinwerkzeuge sind, die über eine lange Zeitspanne entwickelt wurden. Dies kann durch Klimaänderung und regionale Variabilität beeinflusst sein.

Auch wenn die Forschung zum Paläolithikum in der El-Ga'ab Depression noch im Anfangsstadium ist, hat vorliegende Studie gezeigt, dass dieses Gebiet großes Potential für eine zukünftige systematische Feldstudie hat.

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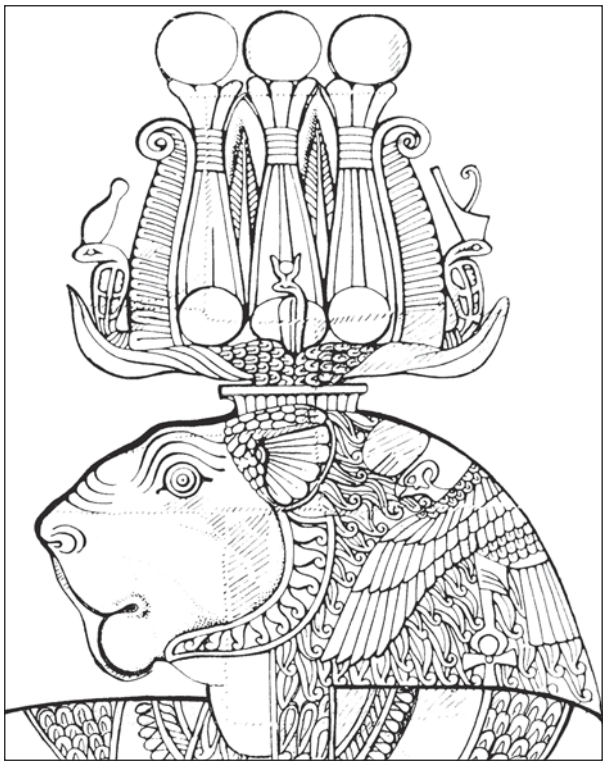

Heft 26
2015

Herausgeber: Sudanarchäologische Gesellschaft zu Berlin e.V.
c/o Humboldt-Universität zu Berlin
Institut für Archäologie – Lehrbereich Ägyptologie und Archäologie Nordostafrikas
Unter den Linden 6 • 10099 Berlin

Verantwortlich für die Herausgabe: Angelika Lohwasser

Layout & Satz: Frank Joachim

Erscheinungsort: Berlin

Internetpräsenz: www.sag-online.de

Bankverbindung der SAG: Deutsche Bank 24 AG
BLZ 100-700-24 BIC DEUTDEDBBER
Kto.-Nr. 055-55-08 IBAN DE36100700240055550800

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Angesichts der Tatsache, daß die globalen wirtschaftlichen, ökonomischen und politischen Probleme auch zu einer Gefährdung der kulturellen Hinterlassenschaften in aller Welt führen, ist es dringend geboten, gemeinsame Anstrengungen zu unternehmen, das der gesamten Menschheit gehörende Kulturerbe für künftige Generationen zu bewahren. Eine wesentliche Rolle bei dieser Aufgabe kommt der Archäologie zu. Ihre vornehmste Verpflichtung muß sie in der heutigen Zeit darin sehen, bedrohte Kulturdenkmäler zu pflegen und für ihre Erhaltung zu wirken.

Die Sudanarchäologische Gesellschaft zu Berlin e.V. setzt sich besonders für den Erhalt des Ensembles von Sakralbauten aus meroitischer Zeit in Musawwarat es Sufra/Sudan ein, indem sie konservatorische Arbeiten unterstützt, archäologische Ausgrabungen fördert sowie Dokumentation und Publikation der Altertümer von Musawwarat ermöglicht. Wenn die Arbeit der Sudanarchäologischen Gesellschaft zu Berlin Ihr Interesse geweckt hat und Sie bei uns mitarbeiten möchten, werden Sie Mitglied! Wir sind aber auch für jede andere Unterstützung dankbar. Wir freuen uns über Ihr Interesse!

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Der antike Sudan. Mitteilungen der Sudanarchäologischen Gesellschaft zu Berlin e.V.

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Heft 26 • 2015

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