



Mudpans: A Review into The Prehistory of the Abu Ballas Area (Western Desert of Egypt)

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ABSTRACT

Excavations close to the Abu Ballas hill, around 200 km southwest of the Dakhla Oasis, have produced proof that the area of "Mudpans" was occupied continuously between approximately 7500 and 5500 cal BC. Three phases of occupation during the Holocene are described by the archaeological sequence of the area in terms of cultural traditions and climatic change. Site Mudpans 83/39, in which the material culture may be dated to the Early Holocene/ Epipalaeolithic, represents the earliest phase of the Mudpans sequence, while the other two phases are Mid-Holocene in age. The Mid-Holocene A is represented by one site, Mudpans 85/56, while the other two sites, Mudpans 85/50 and 85/51 represent the Mid-Holocene B. If we take human occupation as an indicator of climatic development, Mudpans results show how the environment has impacted the economy there.

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INTRODUCTION

The Abu Ballas escarpment is a 250 km long sandstone escarpment that runs from southwest Egypt's Gilf Kebir Plateau to the Abu Tartur Plateau, which is located between the oases of Dakhla and Kharga (Fig. 1). In few places distinct escarpment is formed, and only in its western portion does it reach heights of more than 100 m due to the comparatively low density of the outcropping Tertiary sandstone and the underlying mudstone of the "lingula shales". For the

rest, the terrain slopes towards the South is defined by outcrops and hills, which strikingly depict the state of a plateau environment as it is undergoing erosion (Pachur and Braun 1980: 352).

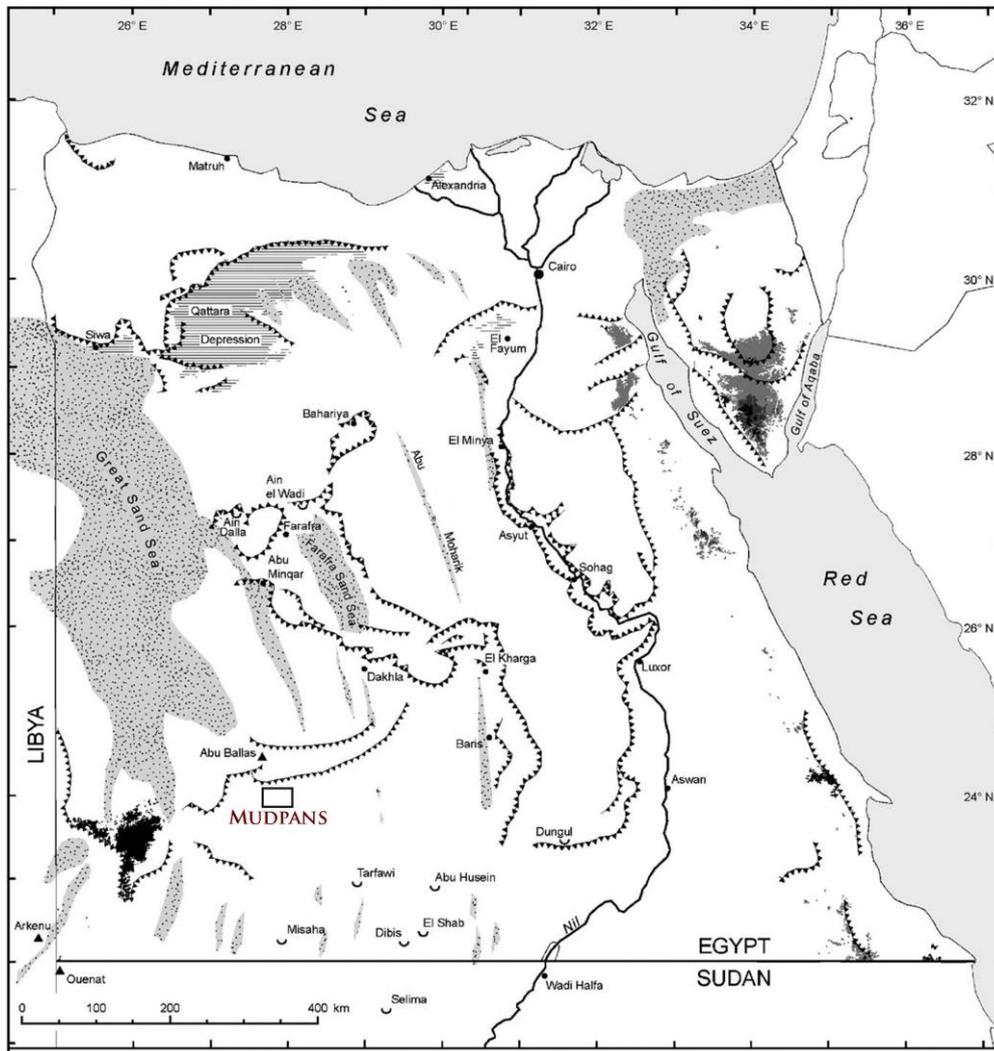


Fig. 1: Map showing the escarpments of Egypt’s Western Desert, where the Mudpans area is located south of the Abu Ballas ridge (after Kindermann et al. 2006, 1620).

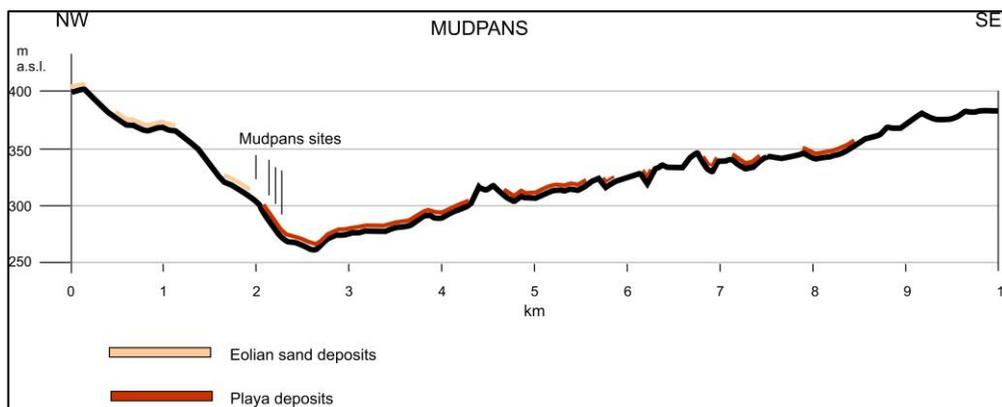


Fig. 2: NW-SE Elevation profile through the Abu Ballas Escarpment at Mudpans (Graph by Riemer, H. Elevation data: Google Earth “c” CNES/Aoirbus and Maxar Technologies; recording data 12/28/2005)

To the South, a chain of clearly outlined deflation basins can be seen in the satellite image, interrupted only in a few places. These basins owe their formation - as in many places in the Eastern Sahara - to the downdrafts blowing steadily from the plateau in a southerly direction

and were apparently already preformed in the hyper-arid period of the Late Pleistocene. During the Holocene wet phases, rainwater runoff from the slopes obviously led to the temporary formation of lakes and the development of semi-lacustrine playa sediments (s. elevation profile Fig. 2).

This peculiar characteristic created suitable living conditions and a possible refuge for the populations fleeing the deteriorating conditions of the surrounding desert during the Holocene. However, these have already suffered greatly from the recent dry season's wind erosion and are frequently hardly recognizable from reworked Lingula Shale materials. Only in the western section of this chain, preserved yardangs up to more than 5 m high give evidence of the former thickness of the deposits, in which remains of hearths, encountered at different levels, attest to the presence of humans during their formation (Pachur and Braun 1980: 352; Pachur *et al.* 1984: 241; Pachur *et al.* 1987: 340).

These fossil lake basins had already attracted the attention of explorers in the 1930s and led to the inclusion of the term "mud pans" in the official English maps of the Western Desert (Kuper 1993: 214). Due to the lack of other geographic names in this region, it was also used to name the excavation area "Mudpans", which is discussed in more detail below. The B.O.S. (*Besiedlungsgeschichte der Ost-Sahara*) project's expeditions of the University of Cologne between 1985 and 1987 focused on archaeological sites in the Abu Ballas region, with the Mudpans sites, some 50 kilometers southeast of Abu Ballas, being one of the most comprehensive prehistoric research investigations during this fieldwork (Kuper 1993: 214; Kuper 1989:18).

Mudpans



Fig. 3: View from North-West over the research area "Mudpans" with its main excavated sites (after Kuper 1989, 21).

In 1932 Ralph Bagnold and the Sir Robert Mond Expedition travelled through the area below the mentioned escarpment as they made their way from Dakhla to the Gilf Kebir. The escarpment was not yet mapped and had not been thoroughly investigated. He reports "one practically continuous Neolithic site" at a "chain of ancient lakes" or "mud pans" along the southern edge of the escarpment (Bagnold *et al.* 1939: 283). In 1983 on their way back from the Gilf Kebir to Kharga, members of the B.O.S. expedition accidentally rediscovered Bagnold's site, which they named "Mudpans" in accordance with the only name given on the old British maps (Kuper 1993: 214). Due to the good preservation of organic remains, the Mudpans excavation area is now of central importance for linking the history of settlement and climate in the southwestern desert of Egypt (Kuper 1989:18).

At "Mudpans," the primary excavation was located at the playa's northern edge - which apparently carried water at times during earlier wet phases and thus offered favourable

conditions for settlement. It is there that most of the sites are located between or on top of the inselbergs on the escarpment's slope. Four distinct settlement areas covering a period of more than 2000 years have been explored within the mapped area of 800 to 350 meters as follows, site 83/39, 85/50, 85/51(1-4) and 85/56 (Kuper 1993: 214; Kuper 1989: 20) (Fig. 3,4).

During the first survey, attention was attracted by a notable hill in the Northwest of the area, on which, besides numerous stone circles, several rock engravings, among others of giraffes, were discovered (Site Mudpan 85/50). In addition, about 800 meters south of this, on a playa surface, a larger bone was found within a loose scatter of artefacts, which was later determined to be of a giraffe, accompanied by a few bones of hare and gazelle (Van Neer 1989: 328) and could be dated by associated charcoal to 7500 cal BC (8150±100 bp, site Mudpan 83/39). Based on these observations 1985, a three-week investigation took place here, which led to the discovery of site Mudpan 85/56, which turned out to be rich in organic remains. A further eight-day stay in 1987 was mainly devoted to a post-examination of this site, as well as to geomorphological observations and the completion of the topographic survey of the entire area.

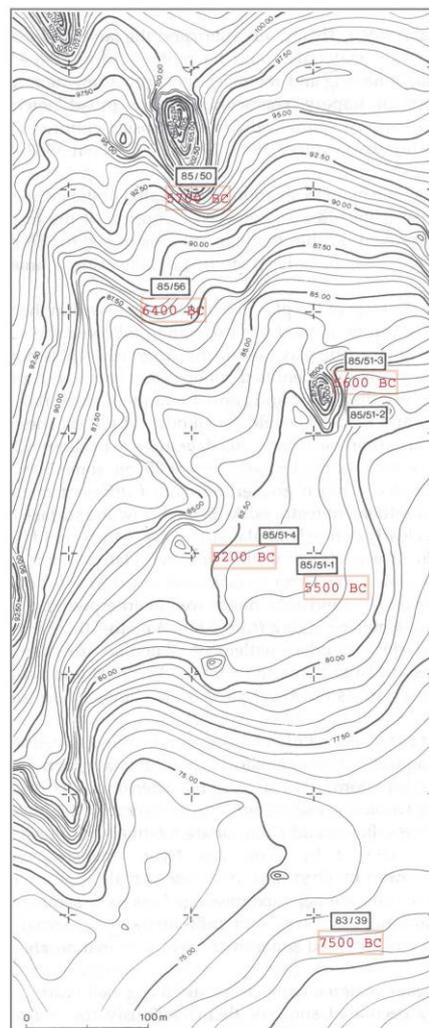


Fig. 4: Topographic map of the Mudpan area showing the excavated sites with their average radiocarbon dates (after Kuper 1993, 216, modified).

Site Mudpans 83/39

Within the entire excavation area, Site Mudpans 83/39, which lies on the edge of the playa, is the oldest (Fig. 3,4). A very small test excavation of 16 square meters and up to 20 cm deep followed the surface layer of artefacts into the playa sediment. Among the faunal remains gazelle (*Gazella dorcas*) dominates. Furthermore, as mentioned, giraffe, hare (*Lepus capensis*) and a tortoise are represented (Van Neer 1989: 328). The stone artefacts are mostly made up of small flakes and are not particularly diagnostic. There were just two triangles among the few retouched blades and bladelets that were found (Fig. 5: 18-20). Pottery was not present.

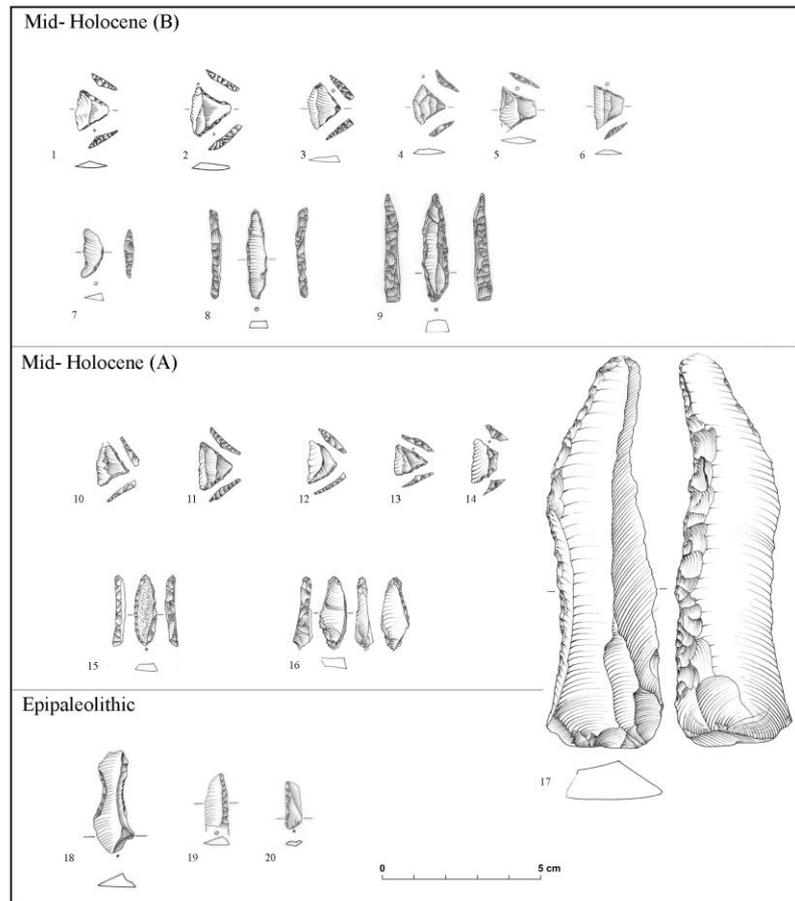


Fig. 5: Mudpans lithic material

Mudpans 85/50, 85/52 (Mid- Holocene B): 1-3 triangles; 4-6 trapezes; 7 Segment; 8-9 perforator.

Mudpans 85/56 (Mid- Holocene A): 10-13 triangles; 14 trapez; 15-16 perforators; 17 retouched blade.

Mudpans 83/39 (Epipalaeolithic): 18 notched blade; 19-20 backed bladelets.

Radiocarbon dates place this site to the Epipalaeolithic from 7500 – 6700 cal BC (8200 - 7730 bp), with four samples older than 8000 14C years (Table 1), identifying this site as the oldest in the entire area. Within a range of 20 to 170 meters from the excavation. A total of 21 fireplaces (*Steinplätze*) were surveyed, whose belonging to the recorded settlement site, cannot, however, be proved. From four of these sites came relatively well-preserved charcoal, which was predominantly determined as *Tamarix* and *Acacia*. Small amounts of *Leptadenia pyrotechnica*, *Maerua crassifolia*, and *Chenopodiaceae* also occur (Neumann 1989: 328).

Site Mudpans 85/56

The test area at site 85/56, about 500 meters further north, was only slightly bigger, but it shows a much greater amount of unique material and even some unexpected settlement features (Fig. 3,4). It is around 700 years younger than the Epipalaeolithic site of 83/39 (Kuper 1993: 215;

Kuper 1989: 20). The 5x8 meters excavation area revealed rather clearly defined circular structures at a depth of 20 cm, which could be followed in a 4th layer to a depth of 1 meter. Four holes carved through the rock were discovered at these locations over the length of the excavation, three of which were relatively trough-shaped and only partially within the limits of the excavation while the fourth was entirely examined. The walls of these holes, which range in diameter from 2.5 to 3 meters, are sloped vertically. Interestingly, no larger sandstone of a size that even approaches the volume of the exposed rock holes has been discovered in the excavation area. The dimensions of these holes, closely match those of other prehistoric settlements, such as the deliberately organized features at Nabta Playa Site E 75-6 (Wendorf and Schild 1980: 131). Both may have been the foundations of houses whose superstructures made of organic material have disappeared (Kuper 1993: 215).

In the Site Mudpans 85/56, among the find material, pottery is unusually well represented compared to other settlement sites in the working area. To apply the surface decoration on the pottery, a square-toothed comb tool was implemented using a rocker stamp technique (Fig. 6; 8-11). The decoration is always covering the entire surface. One unusually well-preserved vessel fragment may serve as an example of the decorative designs (Fig. 7). This exhibits a circular, high wavy band as its major motif, produced rather irregularly and with breaks. The remaining space is filled using the same technique with short, roughly horizontal lines. Around the base of the vessel, which is only partially preserved, runs a flat wavy line, which corresponds to the type of "Dotted Wavy Line" decoration. The rim, on the other hand, is covered by a partially sloping horizontal line, which is accompanied by a series of small, triangular stitches just below the mouth.

This presence of Khartoum pottery is another expression of a large-scale phenomenon. Since the middle of the seventh millennium cal BC, pottery has been found in the Egyptian Western Desert (See Riemer 2006; 2007), except for the Nabta Playa/Bir Kiseiba region, where it only emerges at the start of the Holocene (see Wendorf and Schild 2013; Jórdeczka *et al.* 2011; Jórdeczka *et al.* 2012). It belongs to the Khartoum-style tradition mainly characterised by impressed decoration (see Riemer and Jesse 2006). The distribution pattern of this ceramic is denser in Sudan and the southernmost areas of Egypt. For the time being, the ceramic material of site Mudpans 85/56 appears to be the most northern example of this Khartoum-related style of design, which is also found in the Nile Valley, for example, at the Dongola Reach and on several Nabta-Playa sites E75-7 and E75-8 -sourced potsherds (see Wendorf and Schild 1980).

Together with this, some undecorated sherds with carved rims are found (Fig. 6; 12-13), unknown from "classical" Khartoum assemblages but well represented at the same time around 6600 cal BC (7700 bp) by the vessel from Wadi el Akhdar 80/7-1 in the Gilf Kebir (Schön and Cziesla 1996: 85). Pottery without or with scarce decoration, that is restricted to the rim, occurs further north at Willmann's Camp (Glass Area 81/61) together with Khartoum related decorations, though its chronological position is not clear (Kuper 1995: 129). All the decorated sherds are of extremely high quality. Their surface looks to have been finely smoothed both, inside and outside. Unlike decorated pottery, which is found throughout the sediment, undecorated is only found in the top strata. We may be able to date it – as at site 85/51 – to a later period around 5900 cal BC (6800 bp) because of its fabric and notched rim, which also seems likely for a small portion of the stone artefacts.

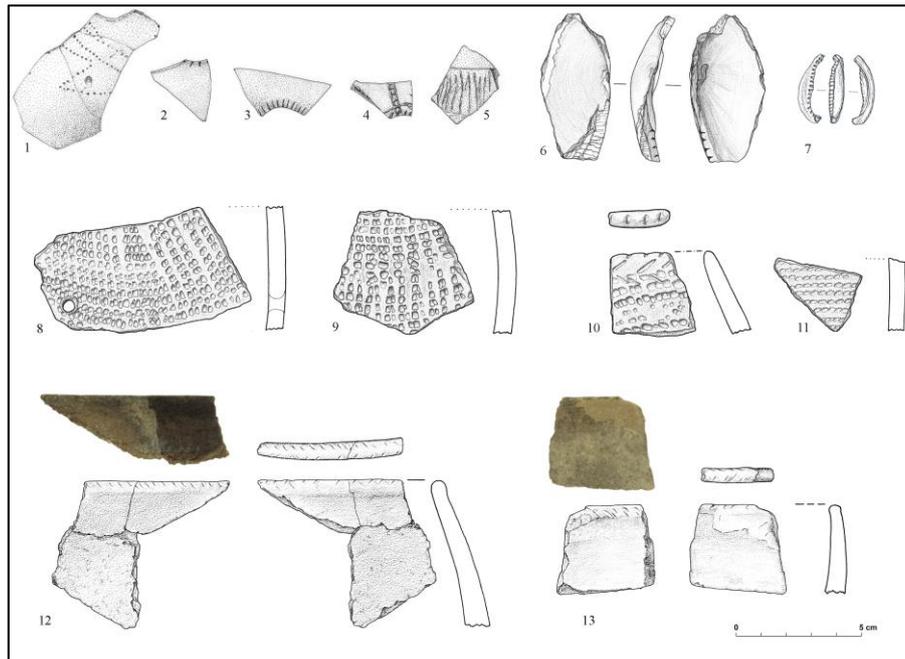


Fig. 6: Mudpans 85/56. 1-5 Decorated ostrich eggshell; 6. Nile Aspatharia shells; 7. Red Sea modified Cowrie shell; 8-11. Decorated pottery in rocker stamp design (Khartoum type); 12-13 Undecorated pottery with carved rim.



Fig. 7: Mudpans 85/56. Decorated pot with dotted wavy line motif of “Khartoum type”.

The extensive lithic material contains 1043 tools and artefacts with lateral retouch. There are in addition 103 pieces with secondary modifications (85 scaled pieces ‘*piece esquillee*’, 17 burin spalls and 1 microburin). Most of this material – roughly 65 % – came from lower layers and were connected to the majority of the decorated ceramics, while the remaining elements were discovered on the surface or in shallow deposits. The material consists of triangles and trapezes as well as of drills (*meches de foret*), lateral retouched blades (Fig. 5; 10-17), and a significant amount of scaled pieces (Kuper 1993: 219).

The raw material used for the tools was predominantly quartzite of various varieties (N=374: 35.8 %) to differentiate as follows: yellow N=137: 13.1%; red N=21: 2.0%; orange N=3: 0.3%; black N=213: 20.4%). Also present are flint (N=314: 30.1 %), quartz (N=175: 16.8 %), silt (N=112: 10.7 %) and fossil wood (N=67: 6.4 %). The inventory is determined by flakes

(N=471: 45.2 %), lateral retouched blades (N=405: 38.8 %), microliths (N=113: 10.8 %) and scaled pieces (N=54: 5 %) (Figure 5, 8).

The spectrum of microliths (N=113: 10.8%) includes 22 segments, 20 isosceles triangles, 3 scalene triangles, 18 trapezes, 2 backed bladelets, 1 backed point, 1 micro-point, 1 facially retouched point and 45 typical microliths. There is a distinct raw material preference, but with only one exception all segments are made of flint, while in the other forms also silt and quartzite were used.

The percentage of flakes is with 471 pieces (45,2%) remarkably high. The two main materials used to make them were flint and quartz (85,7 % of all quartz tools are made up of flakes). The pieces showed a remarkable range in size. Among the 40 drills, 36 are of the *meche de foret* type. Fossil wood was preferred for the manufacture of these frequently quite small bilaterally prepared tools. Three typical burins, seven side-scrapers, and four small end-scrapers complete the inventory. Almost all the 405 modified blades (38,8%) have a continuous, often bilateral edge retouch that may be alternately dorsal-ventral and occasionally appear toothed. The grindstones from the find context all belong to the roundish relatively flat variety with working surfaces on both sides, suggesting that the processing of wild cereals is highly probable.

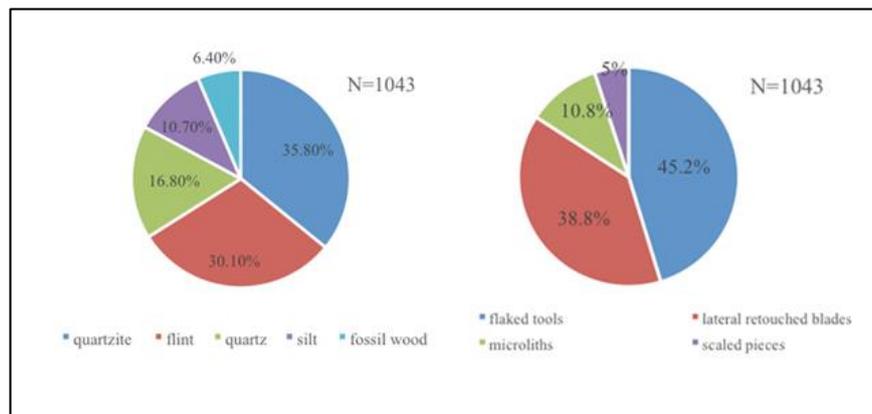


Fig. 8: Mudpan 85/56. Left: The percentages of the main raw material types in the flaked lithics. Right: The percentages of tool types.

Bones are comparatively well preserved. Wim van Neer examined 1600 bones, among which *Gazella dorcas* and *dama* are predominating with 79% (*Gazella dorcas* with 872 pieces, *Gazella dama* with 399), followed by *Oryx (oryx dammah)* with only 10%, and then, to a much lesser amount, ostrich (*Struthio camelus*), turtle, hare (*Lepus capensis*), and fox each with about 5% of the bones. In only a few examples do predators appear, such as hyena (*Hyaena hyaena*), jackal (*Canis aureus*), wild fox (*Vulpes rippelli*), fennec (*Fennecus zerda*), and wildcat (*Felis cf silvestris*) as well as some smaller rodents. The elephant is represented by a piece of ivory, which, however, is more likely to have reached the settlement from far away for ornamental purposes. Domestic animals are absent (Van Neer and Uerpman 1989: 328).

Charcoal is abundant and partly preserved in larger pieces. It is all the more remarkable that only three species could be found: As on all sites *Acacia* and *Tamarisk* as well as to a lesser extent *Maerua*. The ¹⁴C data obtained from this, as well as the corrected ostrich data originating from the same find context, cover the time between 6500 and 6300 cal BC. The remaining organic material consists of particularly ostrich egg material. Besides 173 beads, there are also numerous preparatory works for these as well as decorated neck parts and wall fragments of ostrich egg bottles (Fig. 6; 1-5). They prove the exploiting of ostrich eggs as a food source as

well as for the use as containers and raw material for ornaments. The 2,200 unworked fragments reveal strong wind cutting only in the uppermost stratum. In the deeper strata their appearance is almost "fresh", which underlines the rapid embedding of the fragments that can be deduced from the ceramics position. About 10% of all ostrich egg artefacts are burnt; the total weight is 2604 grams. Surprisingly some Nile *Aspatharia* shells and three specimens of modified Cowrie shells from the Red Sea were found that indicate linkages extending more than 700 kilometres to the East (Kuper 1993: 215) (Figure 6; 6-7).

Site Mudpans 85/50

Similar material appears to be present at the nearby site Mudpans 85/50, which is located on the lower slope of a prominent, roughly 50x20 meters large, boat-shaped hill, which raises about 10 meters. There were documented twenty-two largely circular stone structures made of slabs, which spread out over an area of roughly 15 x 30 meters. They ranged in their inner diameter from 2.0 to 2.5 meters and their outer diameter ranges from 2.5 to 4.5 meters. The slabs were partially still standing. Complete excavation of one of the stone circles revealed up to 60 cm standing walls. After the stones were taken out, a shallow trough resembling the dwellings at the nearby site 85/56 and clearly carved out of the base rock appeared in the centre. Some circles seem to belong together to a complex, at others a small terrace has been worked into the hillside, so that only the lower side had to be delimited by slabs.

In addition to these stone settings, at a total of 28 locations rock engravings are remarkable, in some cases close to the area of the stone circles. A direct connection, however, is not to be proved. The drawings include mainly schematic representations such as concentric circles and serpentine lines as well as very simply executed animal images, among which gazelles and giraffes can be determined. Additionally, at some nearby hills, also engravings have been discovered (sites 85/60 and 85/63), which fill the gap in the distribution of rock art between Dakhla and the Gilf Kebir and the Ouenat area in the distribution of rock art, in addition to the two engravings of Abu Ballas.

Between the stone circles as well as on the slopes of the hill, numerous bones were found, which were measured individually. Due to their location between the large debris on the slope, they were apparently protected from wind erosion and thus preserved. The principal species included are the oryx antelope (*Oryx dammah*) and gazelle (*Gazella dama* and *Gazella dorcas*), together with hares (*Lepus capensis*), foxes (*Vulpes sp.* and *Vulpes rüppelli*), jackals (*Canis aureus*), a tiny rodent (*Canis sp.*), ostriches, and a land tortoise (Van Neer 1989: 328).

Identifiable charcoals were recovered during the excavation in large numbers and in a good state of preservation. Katharina Neumann was able to attribute a substantial number of charcoal samples to ten different tree species of trees, all of which are currently found in the Sahel region such as *Salvadora*, *Leptadenia*, *Cassia*, and *Ziziphua*. The 6-radiocarbon dates that are now available are concentrated around 5900 cal BC (6800 bp). This is consistent with the few carved rim fragments of undecorated pottery found during the excavation of one of the stone circles, whose fabric matches that of the top level of 85/56. Decorated pottery is only available from the wider area of the settlement with two single finds in rocker comb technique. Besides some retouched flakes and a small tanged point, the stone tools mainly consist of triangles (Fig. 5; 1-4).

Site Mudpans 85/51

Four test excavations conducted at the nearby site Mudpans 85/51 revealed a knapping site representing two distinct periods and a few eroding pits with more bones. The range of stone artefacts roughly resembles that of site 85/56. This excavation obtained the youngest dates for the Mudpans area. They come from the area southwest of the hill where almost 300 grinding stones, most of which are fragmentary, have also been mapped. Along with this, numerous large milling stones were discovered, some of which had regular notches at the rim that may have been used to hold them up during transportation. These slabs with notches are also documented from a later context in the Northern Sudanese regions of Gilf Kebir and Laqiya (Kuper 1993: 221).

In the South of the site, about 100 meters separated from this small hill, the 7.5 meters excavation area 85/51-1 records a find concentration consisting of bones, stone artefacts, milling and grinding stones, and ostrich fragments and beads. The 365 stone artefacts contain the remains of both primary form production and secondary flaking. They were made of flint, quartz, silt, fossil wood, and different varieties of quartzite. In addition to splintered pieces and final retouches, the small concentration includes trapezoids, isosceles triangles. The faunal identification suggests the presence of dama and dorcas gazelle, a large wild bovid and hare. The largest of the four excavation areas, is area 85/51-2. There were -along with ostrich bone fragments and beads, and countless broken milling and grinding stones, and bones- 2506 stone artefacts discovered. These were made of the usual raw materials like flint, fossil wood, quartz, silt and quartzite, with the latter predominating in a black variety. Investigations into the find material indicated a site's temporal depth, which cannot, however, be more exactly described: The Stone artefacts were placed on the site during an earlier phase, whereas objects composed of a distinctive red, platy quartzite indicate an impact site from a younger period. The range of tools (4.8%) consists of segments, dorsal knives, isosceles and asymmetrical triangles. Additionally, there are notch remnants, "meshes" and end-retouched artefacts.

Only Area 85/51-3 on 17 m yielded a feature that extended 40 cm below the surface. An unstratified find zone with numerous bone fragments, charcoal fragments, and sandstone was located in the reddish sediment. These may be the remains of two pits, the upper parts of which have been blown out, as to conclude from the distribution of bigger bone pieces and stone objects, as well as the stone artefact assemblages. Pottery was found in the form of some undecorated, quite fragile sherds. Only 44 tools (2.8 %) of the 1580 stone artefacts, which were primarily made of light or black quartzite, were identified. Trapezoids make up the majority of the microlith spectrum, although there are also equilateral and unequal triangles, dorsal knives, and one segment. Aside from a few borers, including two *meches de foret*, it's important to note the extremely high percentage of flakes.

The oryx antelope (*Oryx dammah*) dominates with 96 % of the 620 determinable bones. Along with the gazelle (*Gazella dorcas* and *Gazella dama*), other species include, hare (*Lepus capensis*), jackal (*Canis aureus*), hyena (*Hyaena hyaena*), the land tortoise and desert fox (*Vulpes rüppelli*). It's possible that the smaller animals' worse preservation circumstances contributed to these species' relatively low prevalence, but it seems more likely that Oryx antelope were slaughtered at this location. It's possible that the remaining ruins attracted the local wild animals, and thus became the prey of man.

From the surface of area 85/51-4, 12 kg of grinding stones were collected. Among the numerous grinding stones a nearly circular form with one and more rarely with two opposite

working surfaces prevails. Four undecorated and severely wind-eroded ceramic sherds, 14 ostrich egg shells, and 850 stone artefacts, the most of which are made of light quartzite, were found when this small excavation area was sifted. This surface has with 100 (9.1 %) specimen a higher proportion of tools than the other surface. In addition to multiple isosceles triangles, trapezoids, and a micropoint, the inventory is almost entirely made up of flakes. In addition, there are end retouched artefacts, as well as some simple borers and meches. The fauna includes, besides *Gazella dorcas* and a large wild bovid, hare (*Lepus capensis*) and fox (*Vulpes rüPELLI*).

Mudpans occupational sequence

In the Mudpans area evidence of early settlement has been preserved that covered more than two millennia, from roughly 7500 to 5500 cal BC (8500 to ca. 6500 bp). In terms of cultural traditions and climate change, the archaeological sequence of Mudpans provides us with three phases of occupation during the Holocene. Site Mudpans 83/39, in which the material culture may be dated to the Early Holocene/Epipaleolithic, represents the earliest phase of the Mudpans sequence, while the other two phases are Mid-Holocene in age. The Mid-Holocene (A) is represented by one site, Mudpans 85/56, while the other two sites, Mudpans 85/50 and 85/51 represent the Mid-Holocene (B) (Fig. 9). The earliest Holocene phase can be simply passed because there are so few data from the Western Desert for that time period. We start our overview of the Holocene sequence at site Mudpans 83/39 on the edge of the playa, which dates to the Epipaleolithic/Early Holocene 7500 - 6700 cal BC (8200 - 7730 bp). The environmental data for this period provide some climatically significant evidence. Thus, on the one hand, the occurrence of the giraffe proves its distribution more than 1000 km to the north of its present location, but the lack of desert-loving species among the charcoal, on the other hand, can probably be taken as an indication that, although sufficient precipitation was available in addition to the limited data we do have about the vegetation, the temperatures were still somewhat too cool for the immigration of the complete Sahelian flora (see Neumann 1989). Epipaleolithic assemblages with geometrics and backed bladelets make up the majority of the material culture; ceramic technology has not yet been demonstrated.

Similar conditions may have prevailed later at the time of the settlement of Mudpans site in 85/56, when the second phase have started during mid- Holocene (A)/ Middle Neolithic 6500 – 6300 cal BC (7500 - 7300 bp). The absolute dominance of the gazelle among the numerous animal bones could rather be interpreted as an indication for a somewhat drier environment. Only the oryx antelope represents larger bovids, and domesticated species are completely absent. On the other hand, the occurrence of *Aspitharia* shells and Cowrie snails prove far-reaching contacts to the Nile Valley and the Red Sea, respectively. The rock dwelling at site 85/56 provides a clearer understanding of the next period. As far as the botanical remains are concerned, it appears to demonstrate an increasing influence from the South, but it also represents the ceramics that connect this site to the Khartoum complex. It seems to be the most northern example of this Khartoum-related style of design, which is also found in the Nile Valley, for example, at Dongola Reach and on several Nabta-Playa sites as E75-7 and E75-8. The undecorated pottery date back to a later period around 5900 cal BC (6800 bp). Also the lithic materials find its parallels in the South. The material consists of triangles, segments, and trapezes as well as drills (*meches de foret*), lateral retouched blades.

The two neighbouring sites Mudpans 85/50 and Mudpans 85/51 represent the following phase of the mid-Holocene (B). What was the reason to later establish the settlement 85/50 on the narrow and sloping mountain plateau, can only be guessed. Since all the dated charcoal samples come only from the excavation of the stone structure, nothing can be said about the

contemporaneity with the other findings. The six radiocarbon dates so far available cluster around 5900 cal BC (6800 bp) what is in correspondence with the undecorated pottery from the excavation whose fabric is the same as that from the upper strata of site Mudpans 85/56. Besides some retouched flakes the lithic material mainly consists of triangles, which are well in accordance with the proposed mid-Holocene/Middle Neolithic age of the site. Mudpans 85/51, which prolongs the third phase of the occupational sequence to the very end of the mid-Holocene, contains a knapping site from two separate time periods. This site obtained the youngest dates for the Mudpans area. The variety of lithic material is similar to that of site 85/56 in general.

The favourable water conditions that formed the basins are in line with the vegetation reconstruction made mostly from the charcoals of the Mudpans sites for this occupational phase. Ten different tree species of trees, all of which are currently found in the Sahel region such as *Salvadora*, *Leptadenia*, *Cassia*, and *Ziziphus* could be identified from the charcoal remains. This relative climate optimum seems to be reflected also in the bone material, among which not gazelle, but oryx antelope make up the largest part. The various southern species evidently are a result of a warmer climate with sufficient rainfall. Climate data from other regions and a general absence of dates in the radiocarbon list suggest that this may have been preceded by a period of decreased precipitation just before 5800 cal BC (6800 bp). According to Katharina Neumann's reconstruction of the environment around 5800 cal BC (6800 bp), the Acacia desert scrub, which today represents the usual vegetation for Khartoum's latitude, should have extended into southern Egypt during the final phase of the Mudpans Sequence (see Neumann 1989).

However, it doesn't seem that these favourable climatic conditions continued for very long. There is compelling evidence that they come to an end in a new dry period that begins around 4800 cal BC (6000 bp) Due to a lack of radiocarbon dates, it is assumed that from this point on, a break in occupation occurred from the Siwa area southwards to entirety of western Egypt. Wetter conditions did not return to this area of the Western Desert of Egypt, where the prehistoric settlement came to a definitive end, according to the vegetation map for the period approximately 4500 cal BC (5700 bp) (Neumann 1989: 116). This climatic deterioration and increasing aridity led to a regionalisation of the desert occupation (Kuper and Kröpelin 2006: 805). People started to withdraw from the desert retreating to refuge areas such as the Gifl Kebir and the Oases where intensive herding or even pastoral economies developed (see Riemer 2003), whilst Neolithic life began to flourish in Fayoum and the Nile Valley (Kuper and Kröpelin 2006: 806).

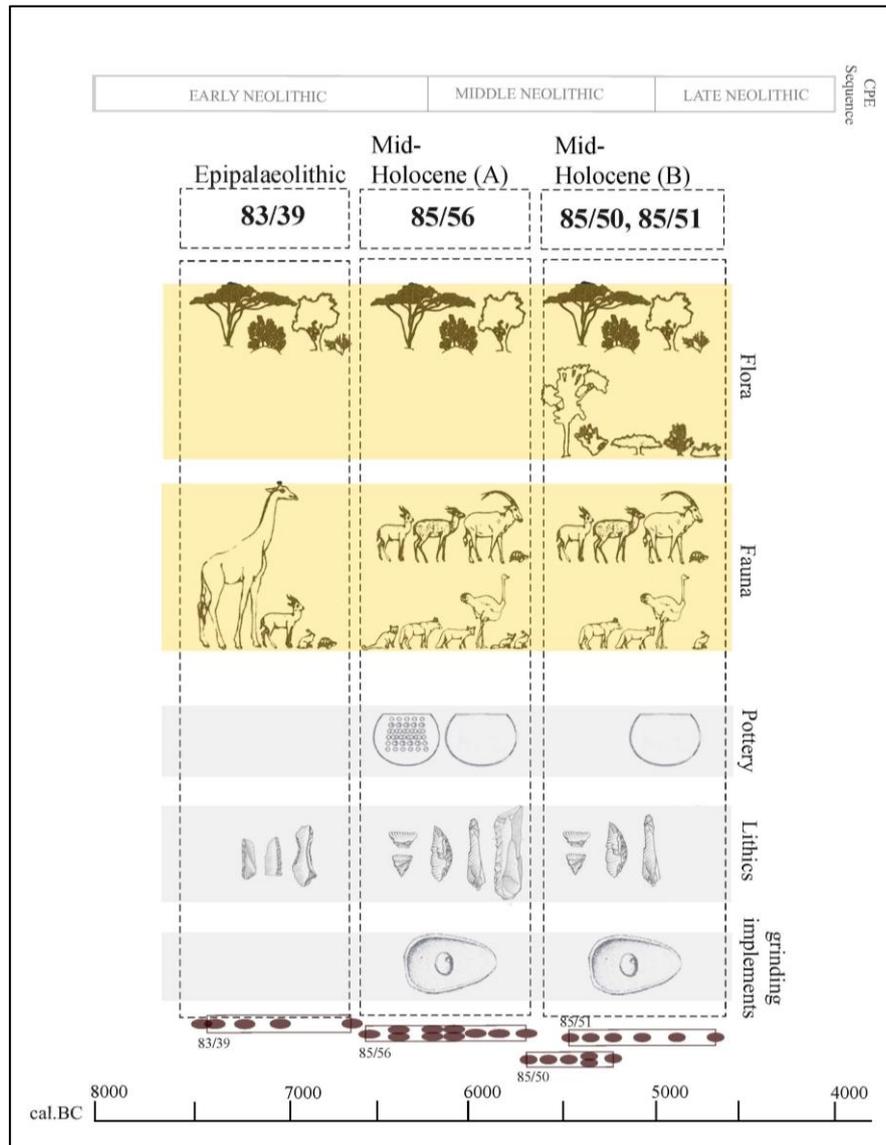


Fig. 9: The Mudpan Sequence based on environmental data (after Kuper 1993) and the archaeological material from 4 excavation sites arranged to their radiocarbon dates (graph by Nader El-Hassanin).

Summary and conclusion

Figure 9 is well informative regarding human occupation as an indicator of climatic development by using a summary of the Mudpan results to show how the economy in Egypt's Western Desert has been impacted by the environment. At Mudpan; the animal bones comprise mainly the typical prey of desert hunters like hare, antelope and gazelle, which can tell us about the environmental impact on the economic development in the Western desert of Egypt (Fig. 10).

Even without complete information on the species composition, it is clear that domesticated animals are absent and that the vast majority of faunal remnants correspond to typical wild dry land species. Evidently, neither poor preservation nor an insufficient collection is responsible for the lack of domesticated animals. This is significant because at the same time, cattle and/or other small livestock were brought to other parts of the Western Desert. Poor precipitation availability, a lack of groundwater, and the great distances between episodic water pools in the desert have all been assumed to be the main causes of the absence of domesticated animals in areas such as Mudpan.

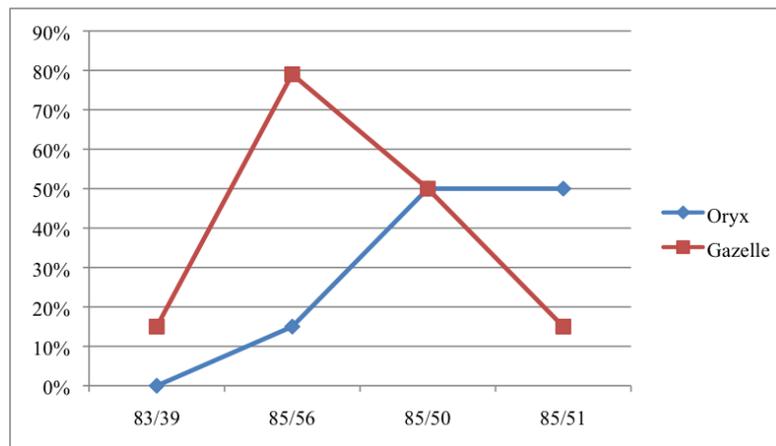


Fig. 10: Graph showing the varying frequency of gazelle and oryx in the settlements of the Mudpan area, indicating a remarkable change in the environment.

In addition, the variety of wild animals and the numerous arrowheads among the lithic tools indicate the significance of hunting throughout the entire occupational sequence of Mudpan. Most sites in southwestern Egypt such as Mudpan feature arrowheads in the shapes of triangles and trapezes. They were probably utilized as transversal insets. One can say, pointed arrowheads are not associated to early Holocene material at Abu Ballas. They don't appear before 6500 cal BC and are typical of Mid-Holocene occupation up until the desert began to dry out around 5000 cal BC. The most reliable dating data come from Mudpan 85/56, where ^{14}C dates between 6500 and 6200 cal BC are connected to geometric shapes including triangles, trapezes, and segments as well as pottery made in the Khartoum style. Several sites with ^{14}C dates where transversal arrow heads have been discovered provide evidence from a later time period. These sites include Mudpan 85/51-3 (c. 5600 cal BC), 85/51-1 (c. 5400 cal BC), 85/51-4 (c. 5300 cal BC) (see Riemer 2002).

This is consistent with the correspondence between the abundance of arrowheads and the absence of domesticated animals at Mudpan sites, which led to the conclusion that during all phases of occupation, people in the Mudpan area relied on hunting and gathering for their food. This would mainly match the gazelle engraving that was discovered at one of Mudpan's sites (Kuper 1993: 222). A direct connection, however, need not be demonstrated. It's more likely that the playa basin has attracted the local wild animals, which thus became the prey of man. The latter may have incorporated them as an essential part into his diet, as several other results and ethnographic examples demonstrate.

If, based on our current knowledge, we assume that rivers and large permanent lakes were absent in Abu Ballas Region at this time, while the presence of some Nile *Aspatharia* shells and specimens of modified Red Sea Cowrie shells indicate linkages that extend more than 700 kilometres to the East. It shows, along with pottery and arrowheads, that Mudpan sites must be understood in the context of high intergroup exchange and mobility during the middle Holocene, when people were still roaming broad areas and forging local identities in Egypt's Western Desert.

Table 1: Radiocarbon dates with 2σ calibration by OxCal v.4.4, IntCal 13 (Bronk Ramsey 2021, Riemer et al. 2013) rounded

Site	LAB. Nr.	Age bp	cal.BC	Material
Mudpan 83/39	KN 3742	8.260±280	7965-6560	Charcoal

Mudpans 83/39	KN 3743	8.250±75	7500-7100	CharcoaL
Mudpans 83/39	KN 3401	8.150±100	7500-6800	CharcoaL
Mudpans 83/39	KN 3989	8.020±180	7450-6560	CharcoaL
Mudpans 83/39	KN 3989	7.990± 70	6800-6450	CharcoaL
Mudpans 83/39	KN 3986	7.860± 70	7000-6600	CharcoaL
Mudpans 83/39	KN 3961	7.730± 75	6700-6400	CharcoaL
Mudpans 83/39	KN 3988	7.710± 75	6660-6430	CharcoaL
Mudpans 83/39	KN 3987	7.360± 75	6400-6070	CharcoaL
Mudpans 85/56	KN 3723	7.660± 80	6650-6400	CharcoaL
Mudpans 85/56	KN 3693	7.660± 70	6640-6400	Ostrich egg
Mudpans 85/56	KN 3985	7.600± 75	6600-6350	CharcoaL
Mudpans 85/56	KN 3634	7.550± 75	6500-6250	CharcoaL
Mudpans 85/56	KN 3720	7.550± 160	6750-6050	CharcoaL
Mudpans 85/56	KN 3692	7.510± 70	6470-6230	Ostrich egg
Mudpans 85/56	KN 3635	7.500± 75	6470-6225	CharcoaL
Mudpans 85/56	KN 3721	7.370± 170	6570-5970	CharcoaL
Mudpans 85/56	KN 3984	7.300± 200	6500-5750	CharcoaL
Mudpans 85/50-1	KN 3629	7.000±150	6100-5600	CharcoaL
Mudpans 85/50-1	KN 3749	6.880±70	5900-5650	CharcoaL
Mudpans 85/50-1	KN 3627	6.830±70	5875-5600	CharcoaL
Mudpans 85/50-1	KN 3750	6.650± 65	5670-5500	CharcoaL
Mudpans 85/50-1	KN 3788	6.640±65	5660-5500	CharcoaL
Mudpans 85/50-1	KN 3630	6.530± 150	5750-5200	CharcoaL
Mudpans 85/50-1	KN 3631	8.200± 1100	10750-5300	CharcoaL
Mudpans 85/51-1	KN 3628	6.770± 90	5850-5500	CharcoaL
Mudpans 85/51-1	KN 3859	6.690±65	5700-5500	CharcoaL
Mudpans 85/51-1	KN 3887	6.530±150	5750-5200	CharcoaL
Mudpans 85/51-3	KN 3886	6.460±65	5500-5300	CharcoaL
Mudpans 85/51-3	KN 3858	6.320± 65	5470-5200	CharcoaL
Mudpans 85/51-4	KN 3965	6.270±150	5500-4850	CharcoaL

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مدبان: مراجعة لعصور ما قبل التاريخ في منطقة أبو بلاص (الصحراء الغربية في مصر)

المخلص

أظهرت الحفائر التي تمت بالقرب من منطقة أبو بلاص، والتي تقع على بعد حوالي ٢٠٠ كم جنوب غرب واحة الداخلة بالصحراء الغربية لمصر، دليلاً على أن منطقة "Mudpans" شهدت تواجد بشري بشكل مستمر في الفترة من ح. عام ٧٥٠٠ إلى ٥٥٠٠ ق.م. حيث أمكن التعرف على ثلاث مراحل للتواجد البشري أثناء مرحلة الهولوسين، وذلك من خلال تتبع التسلسل الأثري للمنطقة متمثلاً في البقايا الأثرية والتغير المناخي. يمثل موقع Mudpans 83/39 المرحلة الأولى من التواجد البشري في المنطقة حيث يمكن تأريخ الثقافه المادية به إلى عصر الهولوسين المبكر. في حين تمثل المرحلتين الأخريتين منتصف الهولوسين .

يتم تمثيل منتصف الهولوسين A بموقع واحد (Mudpans 85/56)، بينما يمثل الموقعان الآخران (85/50, 85/51) Mudpans منتصف الهولوسين B. إذا تم اعتبار التواجد البشري هو المؤشر على التغير المناخي، فإن النتائج تظهر كيف أثرت البيئة على الاقتصاد العام في المنطقة.

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الفخار.