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The *Postilla* series, which ceased publication with Number 232 (2004), was incorporated into the journal *Bulletin of the Peabody Museum of Natural History*, available from BioOne Complete at <https://bioone.org/>.

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Postilla

PEABODY MUSEUM OF NATURAL HISTORY
YALE UNIVERSITY
NEW HAVEN, CONNECTICUT, U.S.A.

Number 102

September 23, 1966

TWO PREHISTORIC ARCHEOLOGICAL SITES IN EGYPTIAN NUBIA

BY

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INTRODUCTION

The Yale University Prehistoric Expedition to Nubia was part of UNESCO'S international program to salvage the monuments of Nubia, with the direct aid of the Department of Antiquities of the United Arab Republic. The Yale Prehistoric Expedition worked in Upper Egypt and Egyptian Nubia for three field seasons during 1962-1965 inclusive (Reed, 1966).

My own participation was limited to the last season, 1964-1965, during which time I was responsible for excavation and study of two of the archeological sites on the east bank of the Nile River, DI-21B ("Catfish Cave") and WO-2A (fig. 1). The results of these studies are presented here.

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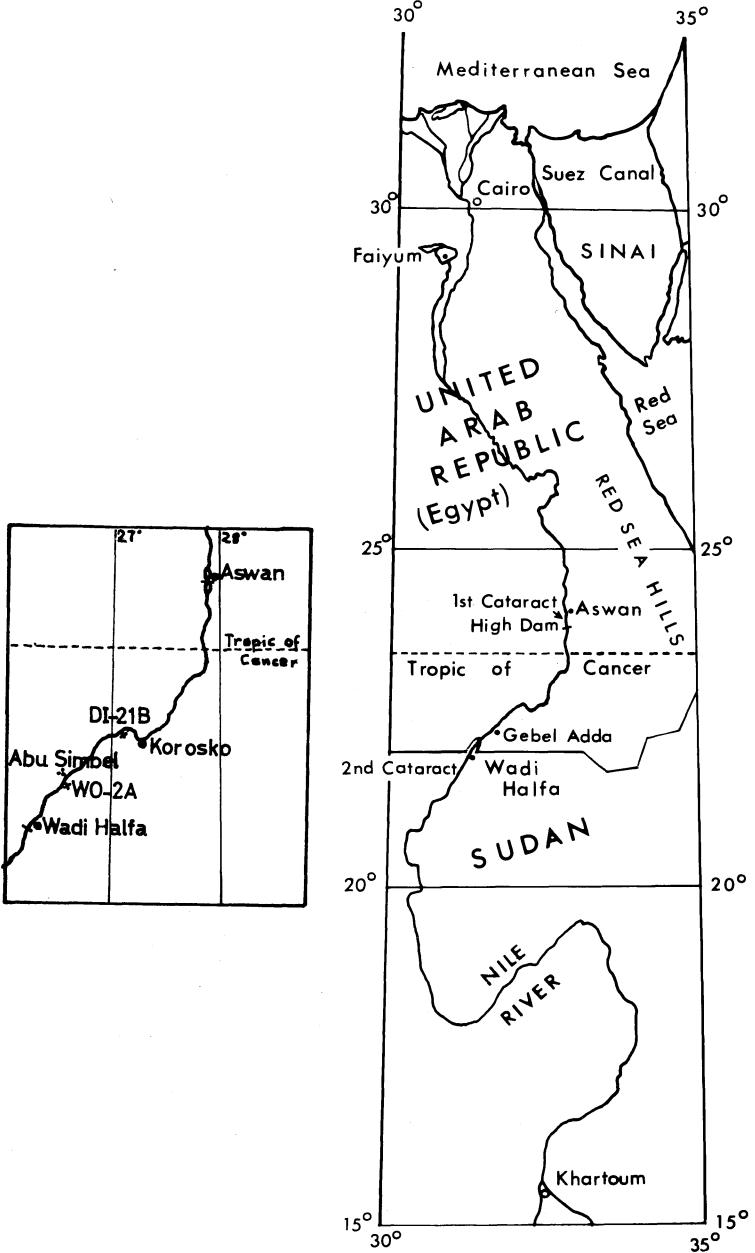


Fig. 1. Map of northeastern Africa, to show the location of the Nubian prehistoric sites DI-21B (Catfish Cave) and WO-2A.

CATFISH CAVE

This 'cave' is really no more than a cliff-side overhang, or abri, cut several meters deep into the rock; such shelters are not uncommon on eroded vertical faces of the Nubian Sandstone, a Cretaceous formation underlying most of Egyptian Nubia. Most of these rock-shelters are empty or serve only as temporary lairs for hyenas. Site DI-21B, however, was filled with sediments, as I noted when I first saw the site from the top of the opposite side of the wadi in which it lay.

The south-facing cave (fig. 2) is on the north side of the main wadi emptying into the Khor el Aquiba, in the El Dirr region, at 22° 43'N, 32° 07'E (UNESCO 1:10,000 map series on the Nubian Nile in Egypt, Minute 12, coordinates 727.95/0.021).

Catfish Cave is 800 m up the wadi from the Nile, very advantageously situated in a near-vertical rock-face of a gebel-ridge on the northern side of the wadi, thus opening almost directly south. Nevertheless, the interior is nearly always in the shade, and is shaded during the hottest hours of the day. From the cave one can view a wide expanse of the wadi, as well as the mouth of a smaller side-wadi; the Nile, however, is not visible, being hidden by a bend in the main wadi. The wadi floor has some scattered vegetation, mostly thorny shrubs, and about 3 km inland a single tree is growing.

When first seen, in early February, 1965, the wadi was already partially flooded due to the raising of the level of the Nile in Nubia by the building of the cofferdam of the High Dam at Aswan. Access to the shelter therefore was solely by boat, for which the expedition's small outboard proved invaluable. A first visit, the day after discovery, was made by myself with Peter Banks, another member of the expedition during 1964-1965, and preliminary exploration resulted in a decision to excavate. A temporary camp was established for the period February 16 — March 8, 1965, for Mr. Banks and myself, aided by five workmen (Khufitis), while the other members of the expedition continued their research elsewhere. The limited time did not permit a complete excavation of Catfish Cave.

As the excavation proceeded we discovered barbed bone fish spears and bones of catfish; catfish a meter or more in length were numerous in the waters of the wadi at the time of our excavations,

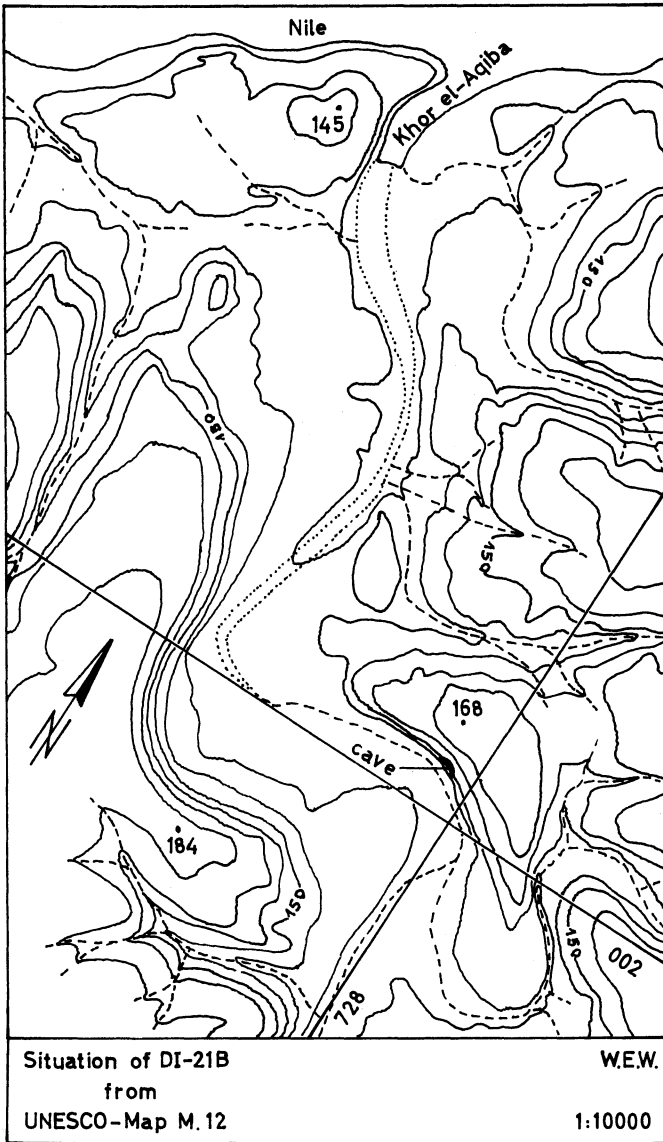


Fig. 2. Map of area of DI-21B (Catfish Cave), at 1:10,000. (Elevations are in meters).

so that the name "Catfish Cave" seemed most appropriate to us, and the site acquired that name in addition to its official catalogue number of DI-21B.

Numerous petroglyphs are present in the wadi, as is generally true for much of Nubia. Directly east of the cave two boats are pecked into the steep rock-face, and to the west, at a distance of 30-100 m, petroglyphs have been discovered at four different spots. The nearest is a single giraffe; the other groups are also four-legged animals, although not so clearly identifiable—some are seemingly giraffes, and the remainder probably gazelles. About 1.5 km further inland in this wadi a second group of petroglyphs (site DI-20P) was discovered on another steep rock-face opposite a junction with a side-wadi. These and other petroglyphs will be described in a future publication.

The excavation of the rock-shelter, DI-21B, began with a trench from back to front, 1.5 m wide and 4.5 m long, in the center of the cave, the rear of the trench being 1.0 m from the visible back wall (approximately from 2 to 6.5 m on the section, fig. 4). Its direction was very nearly north to south.

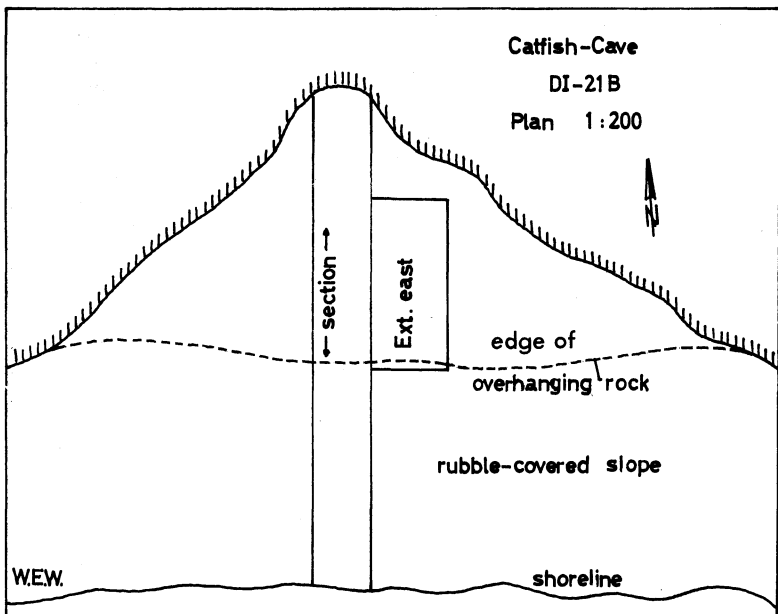


Fig. 3. The plan of DI-21B (Catfish Cave), as seen from above.

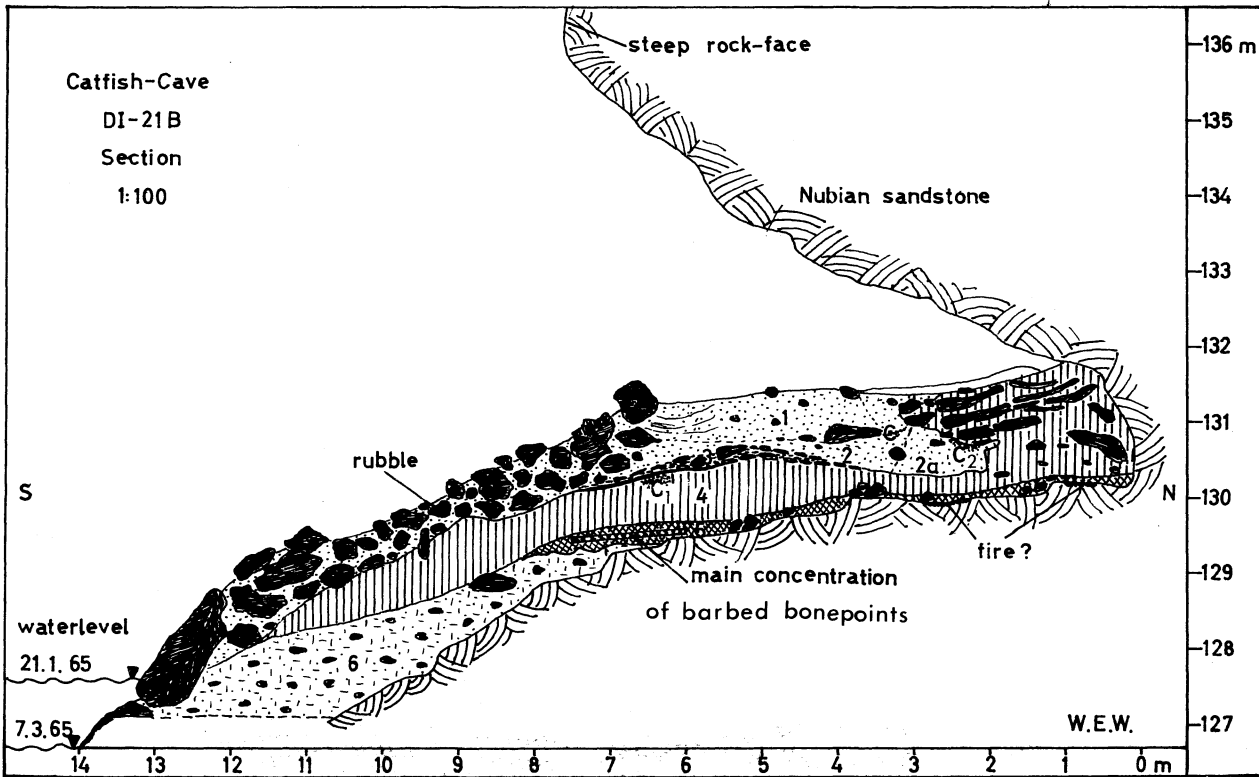


Fig. 4. Section through DI-21B (Catfish Cave), showing stratification (Layers 1-6), and the region from which the barbed bone points (harpoons) were recovered. C₁ = location of charcoal sample Y-1646; C₂ = location of charcoal sample Y-1680. The vertical scale records the elevation above mean sea level. The horizontal scale records the distance from the rear wall of the cave.

After bedrock had been reached in this trench, with productive and interesting results, the trench was extended back to the rock in the interior and down the slope to the water level, its final length being 13 m with an average depth of 1.5 to 2 m to bedrock. Later, an extension measuring 4.5 x 2 m was excavated on the eastern side to obtain a larger number of artifacts. (For details compare plan, fig. 3, and section, fig. 4, and the photographs, figs. 8-11). The cave was found to reach 7.5 m deep into the rock, its maximal width as measured under the overhanging rock being 17.5 m. The height varies between 7 m near the mouth to 1.0-1.5 m in the niche-like rear part.

The floor is rather even for the innermost 7 m; there is only a height-difference of 80 cm, which is caused by several small steps, between which the floor is nearly horizontal. From 7 m outwards the rock slopes down at an angle of 40°-45°, but this slope is also interrupted by several irregular steps. Toward both sides of the cave the slope becomes steeper, nearly vertical.

At the time of the excavation the water level was 126.5 m above mean sea level; the highest level during this season had been 127.6 m on January 21, according to a river gauge at Amada Temple. This high level was caused by the raising of the water behind the cofferdam of the High Dam being built south of Aswan. The cave supposedly will be permanently flooded sometime in 1966. The level of the flood-plain of the Nile in this part of Nubia, as it occurred under natural conditions prior to 1930 and the raising of the present dam at Aswan, was 113 m.

The ceiling of the cave is inclined outward and upward between 30° and 50°, interrupted by some inverted steps and short horizontal surfaces. The niche in the rear can have had an original height of only 1.0-1.2 m before accumulation of silt began, during which time there fell from the ceiling several slabs which are now embedded in silt.

On the floor in the interior several irregular but generally rounded sandstone boulders were found. Additionally, there were two spots where the bedrock was brittle and of a reddish color; these possibly represent traces of hearths, though neither charcoal nor stone-setting were found.

From the deepest point reached during excavation (the water level at the time) to a point near 6.5 m of the section (measured

from 0.0 at the back of the cave; see fig. 4), the bedrock was covered by a brown, sandy layer containing sandstone rubble up to 30 cm in diameter and by traces of gray silt, but the brown, sandy component dominated. The lower part was soft and loose, possibly caused by the infiltration of rising water, but toward the top this layer became much harder. Except for some catfish bones this layer was sterile; it was labeled Layer 6. On the lower part of the slope it was directly covered by loose sandstone rubble, some of it of considerable size, and a fill of yellow sand. However, from 11.5 m of the section, a rapidly thickening layer of gray silt was interposed between the brown, sandy layer and the sandstone rubble. From 6.5 m inward this silt rested directly on bedrock.

Between 8 m and the rear wall of the cave, a lower layer (5-25 cm thick) of slightly harder, browner and sometimes sandier silt was recognizable, but there was no abrupt change between this lower silt, which was labeled Layer 5, and the upper gray silt, which was labeled Layer 4. There was no clear demarcation of Layer 5 at its slope end, but in a few pockets it reached deeper into Layer 6.

In this Layer 5, several barbed bone points ("harpoons") were found between 1 m and 8 m of the section, with a concentration between 6 and 7.5 m. In addition to the 21 specimens illustrated (figs. 5 and 6), 15 small fragments, of which seven are basal ends, were found. Two more of the complete bone points were kept by the Department of Antiquities of the United Arab Republic and have not been illustrated here. Altogether parts of at least 38 specimens were recovered; most came from the original trench and only a few from the eastern extension of the excavation.

Except for their concentration between 6 and 7.5 m there was no specific pattern of distribution of bone points; the highest in the section was found near 1 m. The bones from which the barbed points were made were probably the split long bones of mammals living in the area at the time, but no diagnostic features remain by which either the bones or the animals can be identified.

Except for the one specimen which has no barbs (fig. 6.1), the bone points have a single row of barbs, but the number of these varies from 3 (fig. 5.4) to 9 (fig. 5.1) to at least 11 (specimens in the U.A.R., Department of Antiquities). The factor of a variable number of barbs for specimens of comparable length also

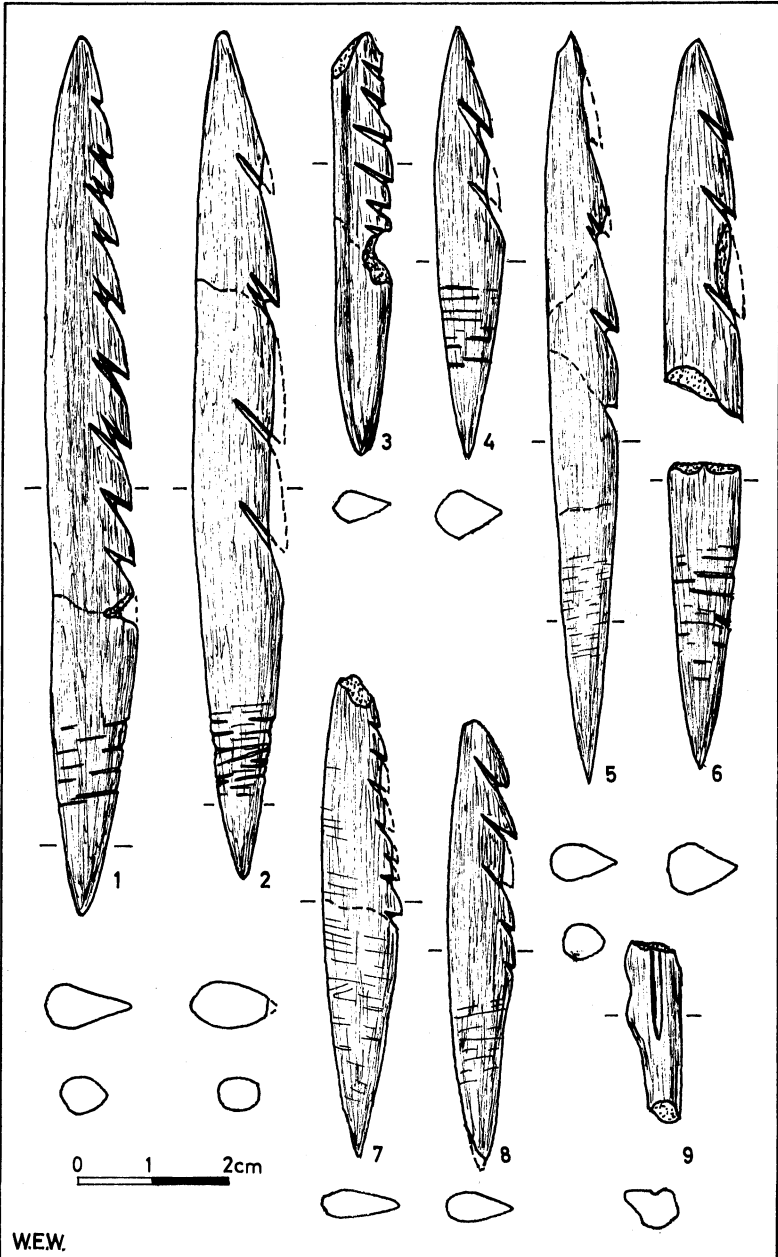


Fig. 5. Barbed bone points from DI-21B (Catfish Cave).

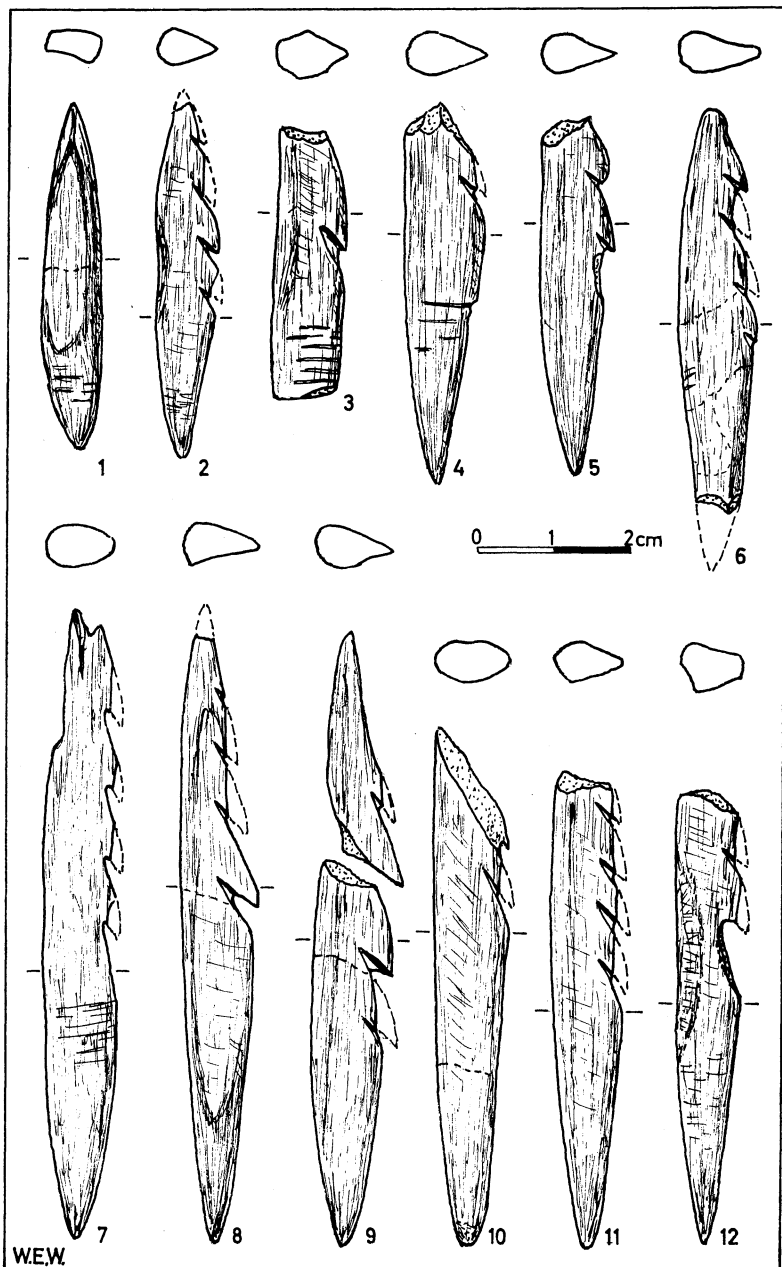


Fig. 6. Barbed bone points from DI-21B (Catfish Cave).

occurs at other localities in Africa, so these differences seem to be of no significance for typological separation of such bone points at different sites.

The barbs were originally created by incisions made into the sharp edge of a piece of dense bone ground flat; figs. 5.1 and 5.2 show especially well the traces of two crossed notches which cut the bone so that barbs would be produced.

About half of the points have incisions around the basal end, but only a few of these would provide an efficient haft for any means of attachment to a shaft. The pointed basal ends and the lack of efficient means to attach a cord to them, as well as the small size of the barbs, would make improbable the use of these bone points as harpoons; it is more likely that they were attached to shafts, either of spears or arrows, in which case they should more correctly be termed "barbed bone points" and not "harpoons."

The lengths of these bone points vary from 45 mm (fig. 6.1) to 115 mm (fig. 5.1); one specimen retained by the U.A.R. Department of Antiquities had a length of at least 120 mm. Perhaps the smaller ones may have been used as arrow points and the larger ones fastened to spears, but these ideas must remain speculative. A distinctive feature of one (fig. 5.9) is the groove in its side.

Each section (figs. 5, 6) is drawn as if the bone point were standing on its basal end and viewed from the tip.

Many of the points were broken and thus a number were necessarily reconstructed; for figs. 5.6 and 6.9, I am not absolutely certain that the parts originally belonged to the same point. The preservation varies; some are in excellent condition while others are brittle.

Other artifacts were scarce in Layer 5. There was less than a handful of small flakes, made from pebbles of brown chert, and even fewer made of chipped white quartz. Only one small bladelet shows oblique retouch (fig. 7.27); some other blades are truncated (fig. 7.25, 26, 28). A fragment of a larger flake has a faceted butt, and one flake (fig. 7.29) shows traces of use on the left edge. The terminal end of this latter is thick white cortex. One small irregular core, derived from a pebble, was found. The stone artifacts thus are not diagnostic and do not permit an identification of the assemblage. Layer 5 also contained a quantity of fish bones,

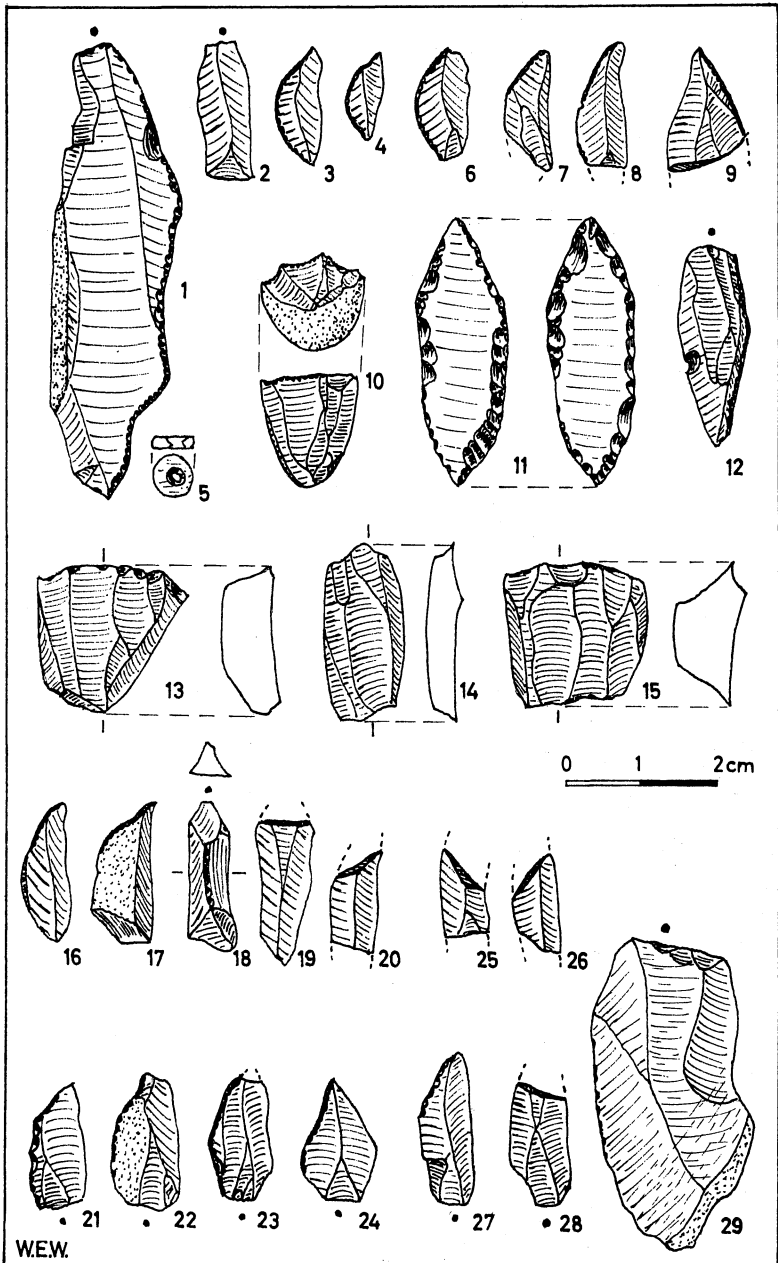


Fig. 7. Artifacts from DI-21B (Catfish Cave).

mostly skull plates and jaws of catfish. Some of this material was collected as a sample for radiocarbon dating, but unfortunately the quantity proved to be insufficient for this purpose, and so Layer 5, the one containing the bone points, cannot be dated.

The possible hearths mentioned above, as perhaps being present on the bedrock, would also belong in this Layer 5.

The upper gray silt of Layer 4 had a thickness of 40-80 cm; in the niche in the rear the silt was preserved to a depth of 1.5 m. This condition proves that the accumulation of silt had reached at least up to +132 m, of which a part had later been eroded, undercutting the silt, between 2 and 3 m from the top of the section. The embedded sandstone slabs in the niche which had fallen from the roof have already been mentioned; additionally, a little sandstone rubble was found in this silt. Remains of fish, especially of catfish, were also abundant in this Layer 4.

Between 8 m and the sloping end of the layer, a number of small land snails, *Zootecus insularis*, were found in the upper part



Fig. 8. General view of DI-21B from the wadi; the trench down the slope from the rear of the cave has been completed.

of the silt; the shells of these snails are not uncommon in wadi deposits and deposits of surface wash in the late Pleistocene and early post-Pleistocene of Nubia. A mixture with remains of the following Layer 3 cannot be excluded for this zone under the rubble.

Artifacts were present in this Layer 4, but they were neither numerous nor very diagnostic; mostly they were irregular chips and flakes of ironstone. The best of these flakes are illustrated in fig. 7.16-24; retouching is visible on nos. 16-18 and 21-24. Number 16 is not a real lunate; the back is only partly retouched, partly cortex. Some of these artifacts are truncated like nos. 19 and 20. Number 18 is of special interest, as a similar specimen was illustrated by Waechter (1965, p. 136, fig. 12.8) from his "Qadan" assemblage. Most of artifacts do not reach the size of the one shown in fig. 7.29; some of the larger flakes show signs of use along one edge. There are also some very small cores (fig. 7.10, 13, 14) in this collection from Layer 4. This assemblage is certainly microlithic, but the tools are too few to permit an identification with any known group.

The whole volume of material excavated from Layers 4 and 5 was washed through screens with water, so even the smallest fragments were recovered.

Between 4.5 and 7.5 m the silt of Layer 4 was overlain by a



Fig. 9. A view of the sediments inside DI-21B (Catfish Cave) at the beginning of the excavation.

well-developed hard sandy crust. Farther down the slope this crust disappeared gradually without clear limitation. At 6.5 m in and under this crust and extending in places a few centimeters deep into the silt of Layer 4, some charcoal was found in an area 30-40 cm across, but the area was not a definite hearth. (The coordinates of the sample in the section are: 130.3 m/6.4 m, fig. 4, C₁). Sometime after the partial erosion of the silt some people apparently entered the cave and lit a fire on top of the silt. The resulting charcoal was partly mixed with the upper two or three cm of the silt, and partly covered by a thin (?windblown) sandy layer, on which the crust was developed. This charcoal was taken as a sample for radiocarbon determination, on which the Yale Radiocarbon Laboratory reports as follows:

Y-1646: 7060 ± 120 B.P. (before 1950 A.D.) (See appendix for discussion).

Anything which happened in the cave prior to the formation of the charcoal, preceding it in time and below it in stratigraphic sequence, is older than the date given of 7060 ± 120 B.P. We refer particularly to the period of the erosion of the silt and before that to the deposition of Layer 5 containing the bone points. Unfortunately, there is no way to determine how much earlier the bone points are than the charcoal on top of Layer 4.

On the crust on top of Layer 4, and extending from 3.5 m to 7.5 m of the section, a thin layer of small (cobble-sized) sandstone rubble accumulated, over which was deposited a sandy, lens-like layer, dark brown in color and 10-15 cm thick, which still showed slight traces of silt. This stratum was labeled Layer 3; it was topped again by a layer of small sandstone rubble. Layer 3 contained numerous bones, catfish remains and a few shells of the land snail *Zootecus insularis*.

In addition to flakes and chips of ironstone and some of chert, agate, and quartz pebbles, the artifacts included a microlithic core (fig. 7.15), some retouched small bladelets and truncated fragments (fig. 7.7-9, 12), and, more important, a point with retouching on both sides nearly all around its edges (fig. 7.11). This point is of brown flint, and differs in typology and raw material from the rest of the assemblage. Certain points from Caton-Thompson's "Bedouin microlithic" of Kharga Oasis, as illustrated

by her (1952) on Pls. 95.14, 97.18, 99.20 or 100.7 represent the closest resemblance to this artifact.

No pottery was found in Layer 3, or in any of the strata below it.

From 6.5 m down the slope and successively on top of Layers 3, 4, and 6, coarse boulder rubble with sandy fill was piled up to the present surface. Between the innermost rubble near 6.5 m and the remaining hard silt near 3 m, loose yellow sand had accumulated, including some irregular sandstone debris of different sizes which also filled the undercut hollow in the silt between 2 and 3 m of the section. This sandy deposit contained pottery throughout and sherds were also found within the rubble.

During the excavation this sandy deposit was divided into three different layers, as follows: Layer 1, extends down to 60-80 cm where sandstone chunks were increasing; this layer is subdivided into upper and lower units at 50 cm. below the surface; Layer 2, the sediment down to the sandstone material topping Layer 3; and Layer 2a, the sand filling the undercut hollow within the silt. After subsequent study, however, no significant differences in the artifacts could be noted; therefore a summarized description will suffice.

Pottery is most frequent in the lower part of Layer 1; here some hard, wheel-made sherds were found together with some thick, poorly made ones. The frequency decreased in Layer 2. Of special interest are the following sherds:

Layer 1, upper: 1 rim sherd of thin gray ware with oblique fine notches on top of the rim and a small hole pecked 1 cm under the rim; 1 sherd of brown-black burnished ware.

Layer 1, lower: rim sherds of a bowl of light brown ware, 16 cm in diameter and almost certainly not deeper than 10 cm; rim sherds of another bowl of light brown, black-topped ware, 17-18 cm in diameter.

Layer 2a, sand within silt: a sherd of red-slipped ware which was used as a polishing or smoothing tool; all edges are rounded and the inner face shows striations from use. Another rim sherd with finely notched rim, thin (5 mm) red-brown ware, slightly gray mottled. Further, there are a few brittle fragments of an unfired vessel, 5 mm thick.

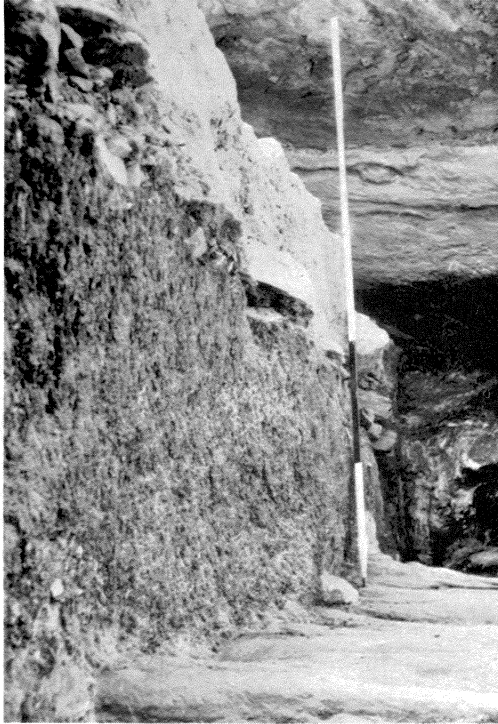


Fig. 10. A view of the back of the trench at the end of the excavation of DI-21B (Catfish Cave). The vertical section to the left has silt at its base, on the nearly horizontal bedrock of Nubian Sandstone.

Stone artifacts had been made from ironstone, from gray flint, and from pebbles of quartz and agate. These latter are mostly irregular flakes and chips; those from ironstone are rather thick with plain striking platforms and an angle of 120° - 130° . Ironstone flakes are more frequent in the lower part of Layer 1. Only a few real tools were found: a big retouched blade of gray flint (fig. 7.1), a small bladelet and two tiny lunates of agate (fig. 7.2, 3, 4) from Layer 1; one tiny lunate from Layer 2; one lunate (fig. 7.6) from Layer 2a. A small ostrich eggshell bead (fig. 7.5) was found in Layer 1; in Layer 2 there was a crude side scraper of ironstone.

Additionally, four grinding stones (three querns and a handstone) were excavated from Layer 1; the largest quern was roughly rectangular, 41x33 cm, and 6-14 cm thick, with a shallow trough-shaped upper face. Another was a roughly oval ironstone slab,

29x19x2 cm, which was smeared with some black substance, possibly soot. A third was a flat slab with several grooves; unfortunately, it was accidentally discarded by the workmen during the excavation. The handstone was an unevenly ovoid pebble (12x8x4 cm) of Nubian sandstone, worn flat by use on one side. The handstone was collected, but the querns were left at the site.

Organic remains from these sandy layers included various mammalian bones, catfish bones, a few land snails (*Zootecus insularis*) and several fragments of shells of a small egg. Several ashy spots were also found in Layers 1 and 2.

On top of the sand within the silt (Layer 2a), and directly under the overhanging hard silt, a collection of small twigs and charcoal was made for radiocarbon age determination. (Coordinates of the sample in the section are: 130.8 m/2.3 m, fig. 4, C₂). Although this is not a homogeneous sample like charcoal from a hearth, it certainly came to this protected spot within a short time. The age determination was made by the Yale Radiocarbon Laboratory, as follows:

Y-1680: 4830 ± 80 B.P. (before 1950 A.D.) (See appendix for discussion).

Since the level from which the material was taken for the radiocarbon determination is more recent than the point similar to those from the 'Bedouin microlithic' and more recent than the first pottery which was brought into the cave, these two events must have occurred between approximately 7000 and 4800 B.P. Later a small pit had been dug from the surface, at the bottom of which some charcoal was found (fig. 4, C). Since this sample is of no chronological significance it has not been dated. Finally some fine, loose yellow dust accumulated in the rear of the cave; except for some bones of a rodent this dust was sterile.

The history of Catfish Cave has been reconstructed as follows: The cave itself is an overhang due to erosion of the vertical slope in the bend of the wadi. During a phase of accumulation of sediments, a sandy deposit (Layer 6) containing rounded sandstone rubble covered the bedrock. The dominance of sand in this Layer 6 indicates that it is due mainly to accumulation of material from the wadi, but the presence of small amounts of silt indicates some deposit during a high stage of the Nile. Some catfish bones were

also present. The influence of the Nile, as indicated by the deposits of fluviatile silts, increased throughout the period of deposition of Layer 5 and became dominant in Layer 4. During this latter period, the Nile rose to a level of at least 132 m, some 19 m higher than the level of the modern flood plain in this part of the Nile Valley.

At the time when Layer 5 was deposited, there must have been a short period—perhaps only a few days during the seasonal rising and falling of the Nile—when the rear part of the cave was still dry, whereas the zone from 4 m outwards was under shallow water. This spot must have been a favorable one in the sheltered, sunny bend under the rock, where fish may have preferred to stay at certain times. Indeed, catfish in the Nile can still be observed behaving in this same way. So people could come to the cave, either by swimming or by boat, and use the shelter from which to fish. They could rest on the dry floor in the rear, light a fire there, and easily reach the fish in the shallow water with their spears, arrows or harpoons. A certain number of bone points were lost or broken, which situation explains the concentration of them in a limited zone. The scarcity of other artifacts makes it probable that this shelter was a temporary place of occupation for fishing only and was not a permanent living site.

During the period of the later accumulation of silt the floor was built up until the roof at the rear became too low for human comfort and the area of occupation was moved forward. The stone artifacts throughout Layer 4 prove that the place was not completely abandoned; but, since no more bone points were found in this layer, one may think that the fishing zone was farther out, too, and has been destroyed by later erosion.

Silt accumulation continued at least to a height of +132 m. This height could really be the maximal attained during this phase of Nile alluviation, since at several other places there is an upper limit of silt deposition near this elevation, as for instance at Wadi Or (compare with fig. 13), or with the "Arkin Unit" further upstream in Sudanese Nubia, where the maximum elevation of silt is +134 m (Wendorf *et al.*, 1965, p. xv).

Following the deposition of the silt, most of it was removed by erosion, which excavated the undercut hollow in the rear part and left only a small patch in this sheltered cave. Then some char-



Fig. 11. A view from the back of DI-21B (Catfish Cave), looking south across the water-filled wadi; the excavation of the trench has been completed.

coal was embedded in the silt under a sandy crust which developed upon this erosional surface. The 'date' (radiocarbon determination) of this charcoal is around 7000 B.P. Later the cave was briefly occupied by people who used artifacts similar to those termed "Bedouin microlithic." By that time sandstone debris had already crumbled from the ceiling and is found at the base of and on top of Layer 3. After this, the accumulation of rubble, partly of considerable size, increased, producing the cover under the steep rock-face and down the slope (Layers 2 and 1). Much of the rubble on the slope in front of the cave opening fell into the wadi bed from the cliff above the cave; that which accumulated under the overhang may have fallen from the roof itself, and may have destroyed the continuity of Layer 3 in this zone.

During this period people possessing pottery entered the cave;

the rubble and their pottery were subsequently covered with loose sand. The eroded space between the silt was filled at the latest around 4800 B.P.¹ after which sand and rubble continued to accumulate for some time.

To what period the petroglyphs in the neighborhood belong is not known.

Barbed bone points have not previously been known in the Nile Valley between Khartoum to the south and Fayum to the north (although copper harpoons are known from Nagada, in Upper Egypt). However, the inference has been made that such bone points were used the length of the Nile, since they are also present within this same general period at Ishango (de Heinzelin, 1962) on Lake Edward in the Congo, and at sites in East Africa. While naturally a coincidence, it is interesting that Catfish Cave lies approximately half way between Khartoum and Fayum, thus neatly filling the above mentioned gap.

Typological considerations as to possible relationships with the barbed bone points from Central and Northeastern Africa are not possible at present, because these artifacts are different at every site known. The closest resemblance to specimens excavated at Catfish Cave is with one of those from Ishango (de Heinzelin, 1962, p. 110, no. 7) but no conclusions as to possible closeness of cultural relationship should be inferred from such similarity.

Insofar as radiocarbon age determinations are available, the barbed bone points from Catfish Cave are older than 7060 ± 120 B.P., and thus older than those previously dated in Africa. The age determinations hitherto known, as given by Huard and Massip (1964) are:

Fayum A, 4400 ± 180 B.C. (= 5950 ± 180 B.P.)

4200 ± 250 B.C. (= 5750 ± 250 B.P.)

Shaheinab, 3490 ± 380 B.C. (= 5440 ± 380 B.P.)

(The true dates are undoubtedly somewhat older than these published ones, as is discussed in the appendix).

Unfortunately, local conditions at Ishango made radiocarbon determinations impossible, so that de Heinzelin (1962) was forced to guess at the time and duration of the occupancy of the site. He stated, "The best archeological and geological evidence date the

¹ See appendix for discussion.

site from some time between 9000 B.C. and 6500 B.C." He did not, however, present either archeological or geological evidence for such guess dates. Lacking such knowledge, one cannot find evidence to agree or disagree with his conclusions that Ishango was the oldest African site for such barbed bone points or was the center from which their use spread. Until far more sites and radio-carbon determinations are known, such knowledge would seem to be unobtainable, except that one can say that the use of such barbed points did persist for millenia, as for instance around Lake Chad, where they are known from the First century A.D. (Courtin, 1965), and even as late as the Tenth to Fifteenth centuries A.D. (Treinen, 1965).

Bone points from the Natufian culture of Palestine are probably older than those from Catfish Cave, but this fact does not necessarily indicate a Natufian influence in the Nile Valley, particularly since the bone points from the Fayum, geographically intermediate between Palestine and Nubia, are younger again. As already stated, typological comparison is impossible, since the bone points are different at each known site.

In the sequence of physical events as reconstructed at Catfish Cave, I see no contradiction in radiocarbon determinations and in level of deposition of Nile sediments with the reconstruction of events accompanying the deposition of the "Arkin Unit" as determined by Wendorf *et al.*, (1965) in the area around Wadi Halfa and the Second Cataract, in Sudanese Nubia. However, Mr. Robert Giegengack, geologist for the Yale Prehistoric Expedition, is making a thorough study of the problems in Nubia of the correlations between chronology, stratigraphic sections, and sequences of geological events, as determined from his own work and that of others. These studies, when published by him, will include a final summary of his geological researches at Catfish Cave, as correlated with events elsewhere in the Nile Valley in Nubia.

It is interesting that at the site DIW-1 near Wadi Halfa, "Fishbones were very numerous, especially those of catfish" (Chmielewski, 1965, p. 160). This might indicate a similar economic base of a dependence on fish, especially catfish. While at first glance the barbed bone points from Catfish Cave do not seem large enough to have held catfish the size of those in the Nile, the fact that all of the identifiable fish bones from the cave were

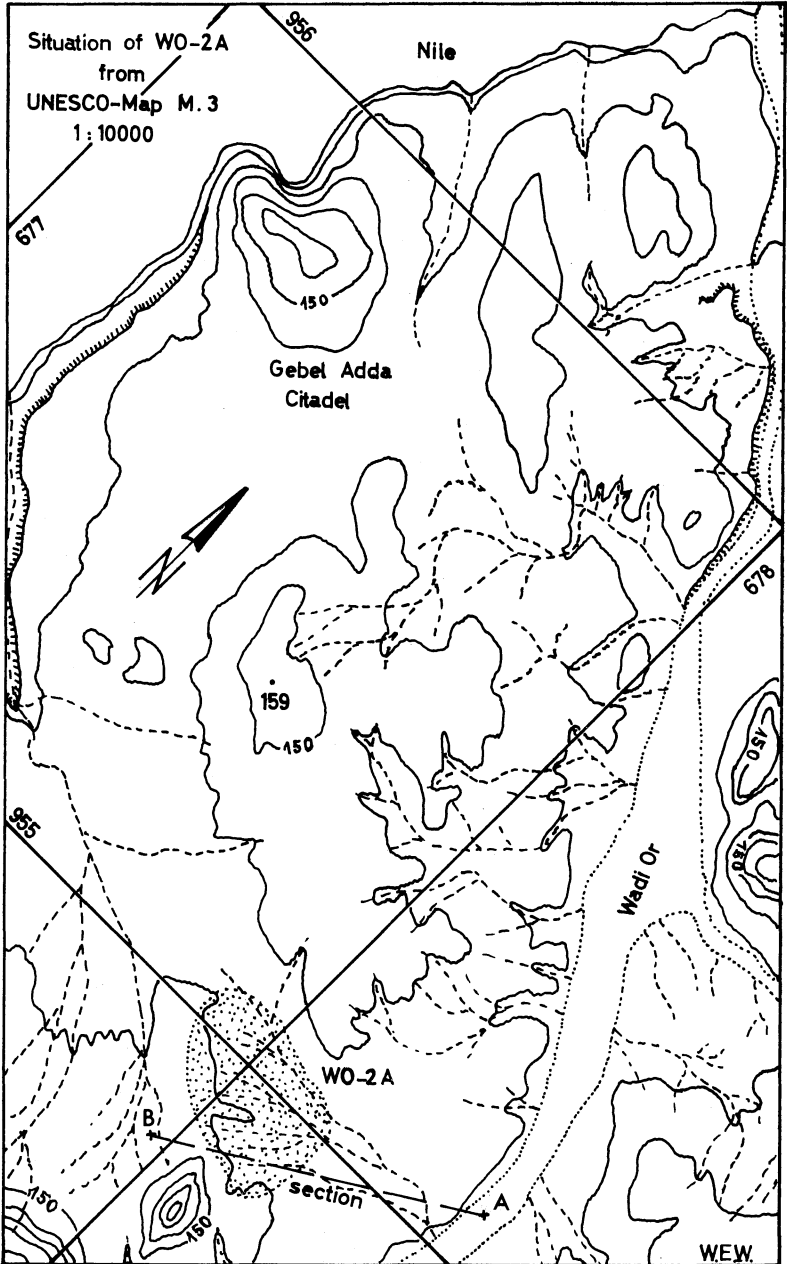


Fig. 12. Map of the area of WO-2A, at 1:10,000. (Elevations are in meters).

of catfish would indicate that these bone points were indeed being used primarily to spear these large fish.

THE NEW PALEOLITHIC ASSEMBLAGE AT WO-2A

During January, 1965, at the time of the end of the feast of Ramadan, a holiday for all Muslims, the members of the Yale University Prehistoric Expedition to Nubia spent a few days at Gebel Adda to give our workmen (Khuftis) and crew the chance to participate in the festivities of the larger group of Khuftis working at the excavation of the American Research Center at the Citadel of Gebel Adda. During those days we did some additional surveying in this region, although it had already been partly studied early in 1964. As a result I discovered a site with Paleolithic artifacts which are of special interest, since they represent a new assemblage hitherto unknown in Egypt. The site was registered as no. WO-2A.

This site is 350 m south of the Wadi Or (on some maps, 'Wadi Mor') and about 1200 m inland from the Nile and the Citadel of Gebel Adda, on a slightly sloping area, covered by sand and gravel, between silt deposits along the wadi and isolated sandstone hillocks toward the southeast (see the map, fig. 12, and the section, fig. 13). This terrain is cut by a number of small branches of a drainage system which ran in a northeasterly direction toward the wadi, cutting partly through a small barrier of silt and caliche (see the section, fig. 13). Southwest of WO-2A there is another small drainage system, which runs directly toward the Nile.

The area of site WO-2A measured about 300 m SE-NW and between 100 and 170 m in an opposite, SW-NE, direction (dotted area on the map, fig. 12). Some artifacts, however, were scattered beyond those boundaries. Within the area of the site, artifacts were strewn in remarkable profusion. At a first glance there seemed to be a mixture of two different series, one of ironstone artifacts of medium to large size, and another of artifacts of small to medium size made from various forms of amorphous silica, petrified wood, and quartz. Altogether, these smaller tools made a most colorful series, in contrast to the brown to brown-black color of the ironstone, which is a ferrocrete sandstone, here sometimes banded.

The first impression of a mixture of at least two independent assemblages was supported by the numerous drainage channels,

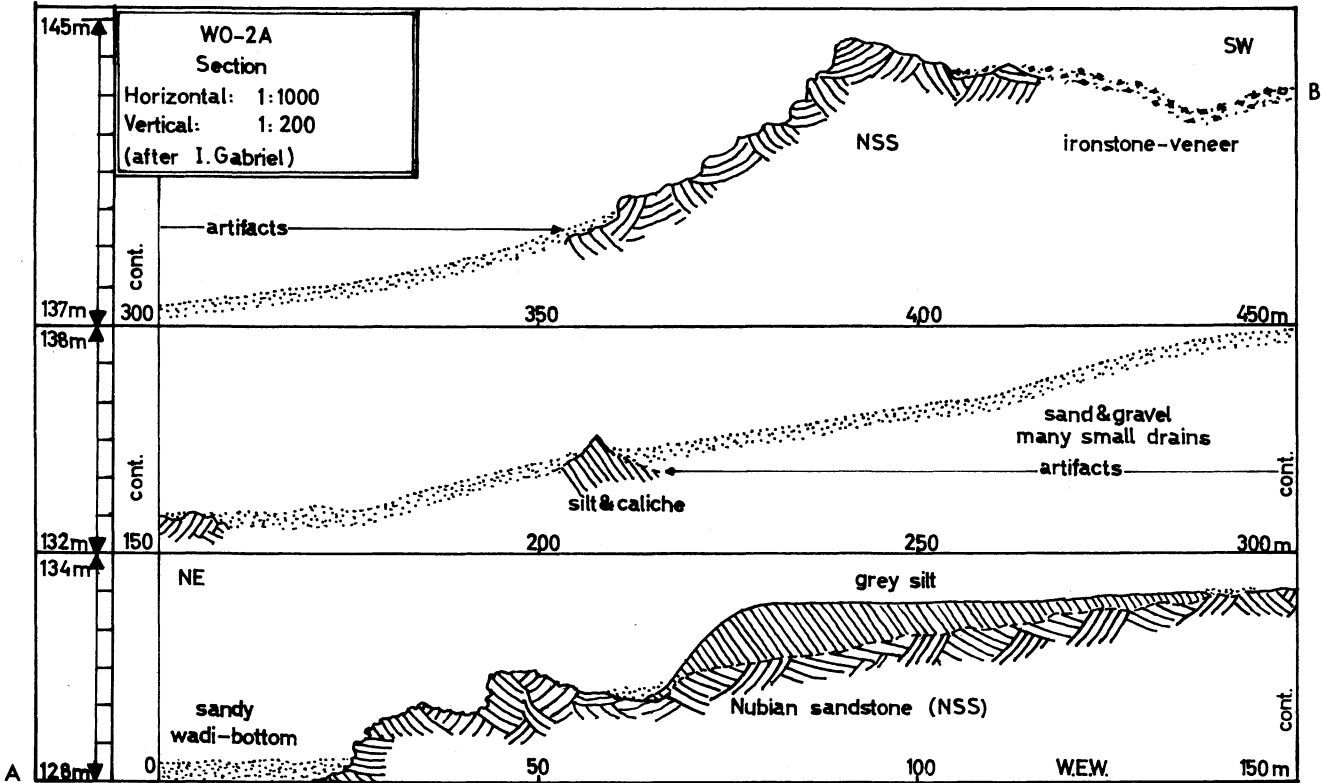


Fig. 13. Section across WO-2A along the line A — B of Fig. 12.

which seemingly could have allowed the transport of one or the other supposed assemblage by periodical runoff from anywhere in the neighboring hillocks. Indeed, it was surprising that there was only a minimum of clearly younger materials, such as fragments of pottery and a few broken blue glass beads, in spite of the relatively short distance between the site and the long occupied, densely inhabited Citadel of Gebel Adda.

After a certain number of artifacts had been collected and given preliminary study, the suspected differences between two presumed series were found not to exist. The types of the cores and the corresponding flakes are completely identical; the only difference is in the size range of the artifacts made from ironstone compared to those from other raw materials. The same situation has been noticed at ANW-3, near Wadi Halfa in northern Sudan (Waechter, 1965:126).

In the medium sized range, with artifacts of approximately 4 to 6 cm in length, both types of materials were used but in the range over approximately 6 cm, cores and flakes of ironstone are exclusively present, and in the range under approximately 4 cm, artifacts are mostly from the other materials. Obviously, in part the raw material influenced the size of the artifacts. Ironstone can be obtained in any size desired, while the other raw materials occur in the Nile gravels only as pebbles of limited size. Also, if delicate tools are made, materials like chert and agate are superior to the grainy ironstone. Thus it was impossible to obtain tools of certain sizes from materials other than ironstone, but for fine, delicate tools of small size the other materials were preferable.

Another argument for the unity of these two series is the presence of some special types of tools which, although rare in ironstone, were made from both types of materials.

It was impossible to collect all of the artifacts over the whole area of the site. I estimate that I collected from the site 20-25% of the ironstone artifacts and 70-75% of the smaller tools made from other materials. This estimate is valid only for cores, prepared flakes and other tools; for irregular chips and debris a lesser percentage was collected. Altogether the collection includes between 8,000 and 10,000 specimens.

All artifacts were found on the surface; a few test pits did not reveal anything deeper in the sand. Additionally, a small trench

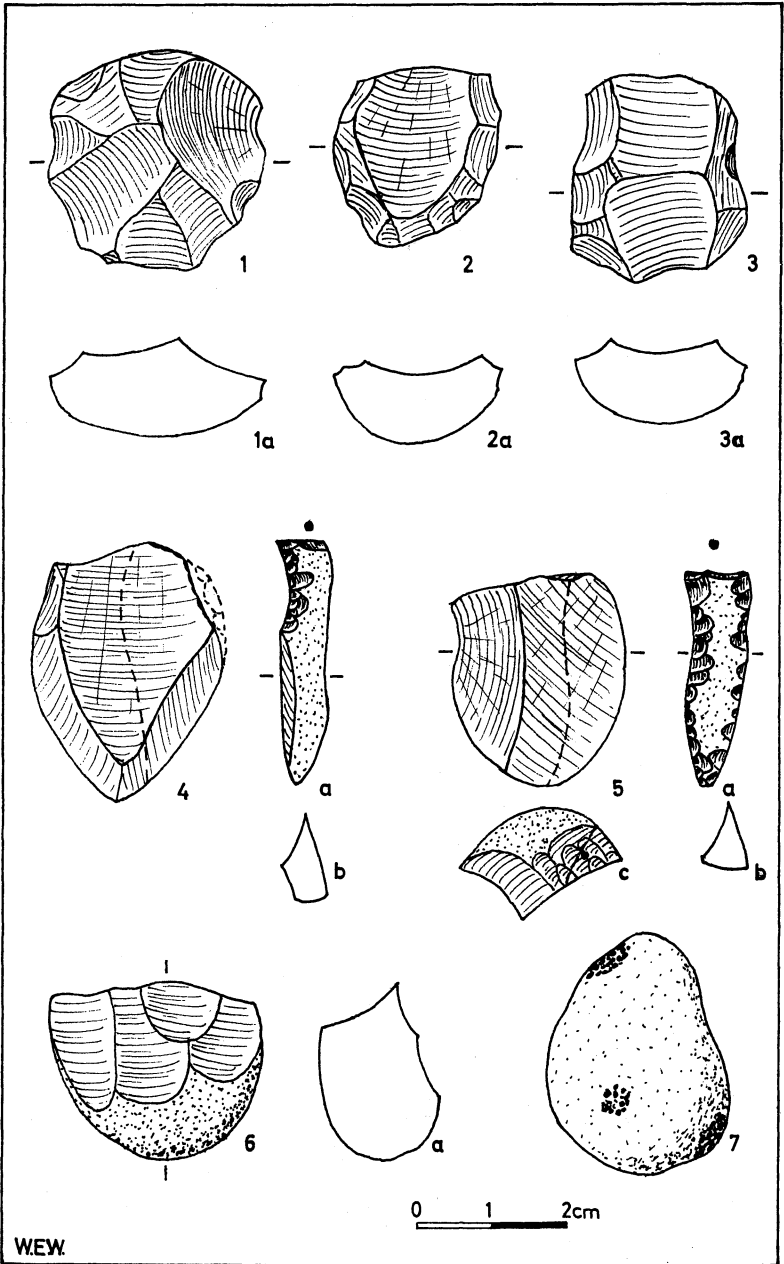


Fig. 14. Artifacts from WO-2A.

was excavated to a depth of 70 cm directly southwest of the silt and caliche barrier, but nothing was found in it. Here the sand covered the silty deposit, but its relation to bedrock has not been established. Since the whole collection was shipped to Yale University for later detailed studies, my descriptions of the types of this assemblage are preliminary, based on notes and sketches made in the field-laboratory aboard the Expedition's houseboat, the HATHOR. The accompanying illustrations, therefore, do not represent any particular individual artifacts, but are composite as to types and average as to size. Therefore no details on numbers and exact dimensions can be given in this paper; for these facts, a later publication is anticipated. However, since to my knowledge no Paleolithic assemblage like this one has been described, while at least one type of artifact seems to have been hitherto completely unknown, I feel justified in presenting this preliminary description.

There are several types of cores: A. The most frequent is the discoid core from which small chips have been struck all around the edge. These discoid cores can be quite flat (fig. 14.1), but may sometimes also be thicker and steeper. B. Closely related are ovoid cores, but they are infrequent. C. Another important type of core is one which is often slightly pointed with a central negative of a prepared point or flake already struck (fig. 14.2); if these points or flakes had not yet been struck, these cores might resemble some of the discoid ones, but it seems unlikely that the large number of discoid cores were abandoned before striking the central prepared flake. The discoid cores are a unique form, probably with a purpose of their own. D. Cores with flakes struck from both ends (fig. 14.3). E. Another rare type is the core which looks like a chopping tool, is made from a small pebble, and therefore is never found in ironstone (fig. 14.6). F. Cores for the production of the crescent-like flakes which are characteristic of this assemblage.

To make these crescent-like flakes, some of the pointed cores with a central negative were used (fig. 14.4; the section is similar to no. 2). From such a core a flake was struck. (The dotted line, fig. 14.4, indicates where the flake separated from the core. The part to the right gives the outline of the crescent, and at the top right, part of the original core-preparation, later removed by retouching, is indicated.) The resulting flake is crescent-like or like

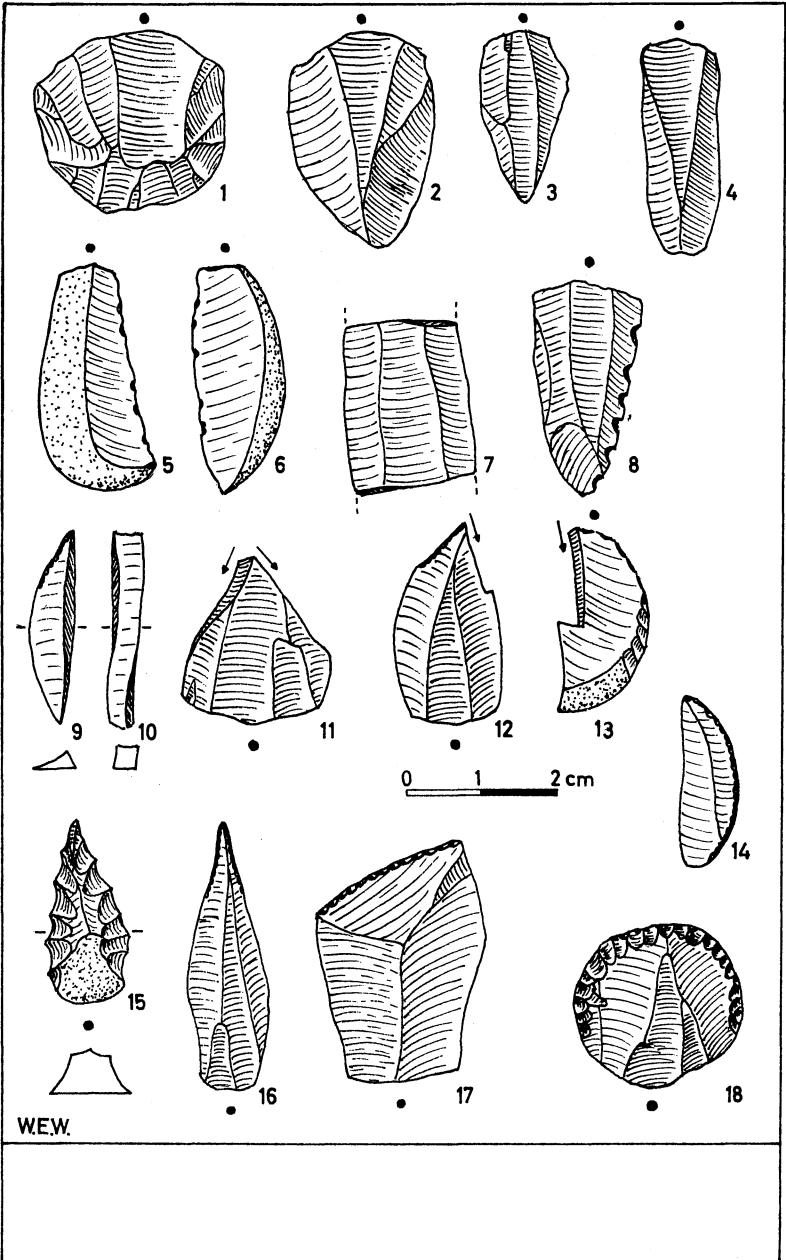


Fig. 15. Artifacts from WO-2A.

an orange slice and shows on its upper face an oblique portion of the central negative surface of the core (fig. 14.4), separated by a ridge from a part of the marginal preparation of the core near its terminal end.

Obviously, however, other cores were especially prepared to obtain a similar flake (fig. 14.5). Here, by using only a few strokes, part of the cortex was removed from a small pebble, a striking platform was prepared (fig. 14.5c), and the crescent-shaped flake struck off. In this case the upper face is a single oblique negative portion, lacking the ridge found on a flake made from a prepared pointed core. The resulting crescent-shaped flakes, whether made from one type of core or the other, show a slight twist when seen from their back (fig. 14.4a and 5a). Characteristic and nearly always present is the twist at the basal end, resulting from the oblique negative on the upper face. In section, such flakes are wedge shaped (fig. 14.4b and 5b).

Both edges of the back may be modified by retouching, but normally at least the edge along the 'twist' is retouched, while the remaining parts of the back are covered by cortex. It was interesting to notice that of the 389 crescents collected, all but 9 were struck from the right edge of the core, as illustrated; the others were struck from the left. In size and quality these crescents vary; some are large and crude, but there are also small ones with carefully retouched backs. A few were made from ironstone. A considerable number (48) of crescents have an additional burin-blow along the inner edge (fig. 15.13). This blow can have been struck from either end; there are even a few with blows from both ends (double-burins).

These numerous crescent-like flakes with the characteristic oblique negative on the upper face are the most distinctive artifacts in this assemblage. Since I have never seen or heard of anything similar, I recommend calling them "Wadi Or crescents."

Excellently prepared flakes and points, mostly with faceted butts, are very frequent; these flakes were struck from the cores with a central negative. They occur in all sizes and were made from all materials; mostly they are rather thin, but the majority have never been systematically retouched. Some show short retouched edges, but no special types have been recognized. These flakes vary in shape, from circular to oblong to pointed; blade-

like flakes are less frequent (fig. 15.1-4; a dot always indicates the basal end). From these flakes a number of other tool types were fashioned. Cortex-backed flakes are frequent (fig. 15.5-6); the edges often show traces of use, as is true for many of the "Wadi Or crescents." Many are snapped, mutilated flakes or blades, with only the middle parts remaining for use, but necessarily the basal and terminal fragments are also found. These snapped flakes occur in all materials, sizes, and proportions (short and broad to long and narrow), but are never retouched (fig. 15.7). Several flakes, mainly pointed ones, show one notched edge (fig. 15.8); they are rare in ironstone.

A few flakes were fashioned into quite regular small round scrapers, they are rare, but occur both in ironstone and other materials (fig. 15.18).

Burins represent another important component of the assemblage. These exist in a variety of forms, but most important are the rather short triangular ones, which had been prepared by blows along both edges (fig. 15.11). According to Wendorf *et al.*, (1965, p. xxvi, fig. 6.3) this form is present in the 'Kormusan' assemblage of site ANW 3 near Wadi Halfa. Other typical burins from WO-2A are those with a retouched edge opposite the burin-blow (fig. 15.12). The burins on the "Wadi Or crescents" have already been mentioned (fig. 15.13). Of interest are a number of burin-spalls, which are of two different forms; some have a triangular section (fig. 15.9), while others are quadrangular (fig. 15.10). The first type represents the edges of flakes, resulting from a first blow, while the latter are the result of a second blow, either to resharpen a burin or, more likely, to reduce the flakes into the short, triangular burins already described. I have noticed that a number of the triangular spalls show some retouching along the edge. Since there are only a few flakes with retouched edges, it would be surprising if these few were later selected for the production of burins. Although these retouches are not necessary to strike the spalls, the possibility must be considered that the retouches were secondarily made on the spalls, which may then represent a special tool.

A borer-like pointed flake with a rather steep, crude, notch-like retouch (fig. 15.15) was collected in limited quantity. Several

of this type have their butts still covered with cortex. Additionally, there are a few small lunates (fig. 15.14).

Of some types, only one or two specimens were collected, such as a pointed flake-blade, with both edges retouched at the tip (fig. 15.16), or a broad flake with oblique terminal retouch (fig. 15.17).

A number of quartz pebbles of different sizes and shapes, apparently used as hammerstones (fig. 14.7) were collected, as well as a few fragmentary slabs of coarse gray sandstone, each with one smoothed face, which were probably parts of broken querns. Fragments of broken bones of large mammals were found all over the site; mostly these are partly petrified and appear to be eroded (see appendix).

Circular stone settings of about 1 m diameter were observed within the area of the site. Three of them were excavated, but no charcoal was found; most probably these had been hearths (fig.

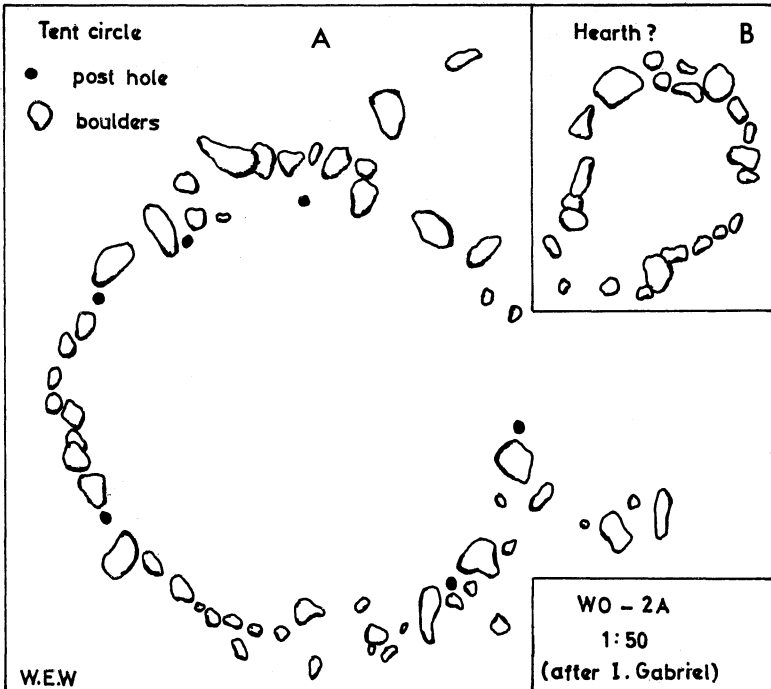


Fig. 16. A. Tent-circle. B. Possible hearth. Found at site WO-2A.

16, B), but their age is not determinable. A larger stone circle (3 m diameter) with an opening to the east, associated with 6 shallow post holes (fig. 16, A), was found near the northwestern border of the site; some artifacts and one pottery sherd were collected within this stone circle. Such a circle would presumably be a tent circle, but the age is unknown.

The exact position within the Paleolithic sequence of Nubia of this assemblage from Wadi Or is not clear. There is no doubt that it must belong in the series of epi-Levallois assemblages, as defined by Caton-Thompson (1946), such as are represented by the Sebilian in Upper Egypt and Nubia, and by the Kormusan in northern Sudan. With both it has some similarities, but it differs in other respects. However, the levalloisoid technique and the basic forms of cores and flakes seem to be common to all three groups mentioned. The assemblage at WO-2A may share with the Sebilian the character of the mutilated, snapped flakes, but it differs from the Sebilian by the complete lack of retouching of these snapped flakes, by the lack of the typical Sebilian feature of the removal of the bulb end of many flakes, and by the presence of burins and the distinct "Wadi Or crescents."

With the Kormusan it has in common the use of a wide variety of raw materials, the presence of burins, especially the short triangular form (though these seem to be rare in the Kormusan), of notched flakes and a few round scrapers, but it differs from it mainly by the presence of the distinctive "Wadi Or crescents" (nothing like these has been described from the Kormusan), by the frequency of burin-spalls and snapped flakes, and by the presence of steep, borer-like tools, some lunates and a few single types at Wadi Or. On the other hand, the Kormusan has a few different single tool types missing from Wadi Or.

It seems that there existed several more or less local or at best regional groups within the epi-Levalloisian phase of the Nubian Paleolithic, with the Sebilian dominating the Egyptian part of Nubia, and more differentiated groups occurring towards the Sudan, north of the Second Cataract.

The tent-circle and the hearths were studied by Mr. Ingo Gabriel, a fellow member of the Yale Prehistoric Expedition, who also helped in leveling the section.

All materials collected at DI-21B and WO-2A have been

deposited in the Peabody Museum, Yale University, except for some fragmentary human bones gathered from the surface of the southeastern portion of WO-2A in January, 1964. These human remains have been sent to the Division of Physical Anthropology, U.S. National Museum, Washington, D.C.

ACKNOWLEDGMENTS

The research of the Yale University Prehistoric Expedition to Nubia for 1964-1965, the year of my participation, was financed in large part by Grant no. SCC-29629, from the Department of State of the United States Government, under the program of Public Law 480 for release of local currencies for scientific research. Other funds were received from NSF grant no. GS-309. Additional finances for our work were derived from grants and donations made by the American Philosophical Society, The Wenner-Gren Foundation for Anthropological Research, the Smithsonian Institution, the Yale-Pennsylvania Archaeological Expedition to Nubia, and several private donors. Without the generous aid of each of these grants, the expedition could not have functioned.

To Dr. Minze Stuiver, director of the Yale Radiocarbon Laboratory, I am indebted for the age determinations on our samples Y-1646 and Y-1680.

Within the United Arab Republic the members of the Expedition received welcome cooperation, as was true also for the previous years of the Expedition's research, from Dr. Louis-A. Christophe at the UNESCO office in Cairo, and from all members of the Department of Antiquities, both in Cairo and Aswan. Particularly helpful were Dr. Mohammed Ma'adi (the Director-General), Mr. Abdin Siam (in charge of the Aswan office), and Mr. Ahmed Said Hindy, our most industrious, cheerful, and enthusiastic representative from the Department of Antiquities.

To all of these, to our foreman Abdullah Said Osman, to local laborers and boat crews, and to others too numerous to mention, I offer my thanks for their help, without which a successful season would not have been possible.

APPENDIX

ORGANIC REMAINS FROM YALE UNIVERSITY NUBIAN EXPEDITION'S ARCHEOLOGICAL SITES DI-21B AND WO-2A, WITH A DISCUSSION OF THE RADIOCARBON DETERMINATIONS BY CHARLES A. REED, PEABODY MUSEUM OF NATURAL HISTORY, YALE UNIVERSITY

ORGANIC REMAINS FROM DI-21B (CATFISH CAVE). Most of the organic remains from Catfish Cave consisted of broken bones, of which a considerable proportion were of fish; only a few remains of molluscs were present. All the bones were so thoroughly broken that identification of most pieces was impossible; after preliminary sorting and weighing aboard the Expedition's houseboat, the HATHOR, the pieces obviously not identifiable were discarded. Even so, study of the remaining pieces at the Peabody Museum proved that most of these could not be identified either.

The bones are too broken to allow a determination of the number of individuals present for any species. Some rough approximation of the relative importance of two different kinds of vertebrates, fish and non-fish (the latter mostly mammals), can be determined from the weight of bone of each group. Of course, a few broken pieces of bone from one large mammal, such as *Bos*, will outweigh the bones of several fish. Therefore when there is any considerable proportion of fish bones, the fish are assumed to have been important at the time in the life of the people who occupied the cave.

Not all bones of mammals and birds necessarily represent animals hunted and killed by man. Shady spots in Nubia, such as Catfish Cave, are used today as temporary lairs for cats, foxes, jackals, and hyenas; some broken bones remaining from meals of carnivores are often found in such spots today. Since a considerable part of a cow or other large mammal may be dragged to its lair by the local hyena, *Hyaena hyaena*, the broken bones of *Bos* or other medium-to-large mammals in a wadi side shelter do not necessarily indicate the activity of man. While occasionally a bone will bear the trace of marks made by human stone artifacts and occasionally a bone crushed by a hyena will show the marks of the latter's teeth, more often there is no evidence known to me at present whereby bone broken in Nubia by prehistoric man and that

broken by hyenas can be distinguished. Even though Catfish Cave was used by man as a seasonal fishing site and sometimes otherwise as a temporary human shelter, most of the bones of birds and mammals may represent remains of meals of carnivores. Rodents also use crevices at the back of such overhangs as living places, so one may find some rodent bones scattered on the surface or through the deposits; other rodent bones may be derived from disintegrated carnivore feces.

The bones from Catfish Cave are often blackened but are not mineralized; to the contrary, they lie light in the hand, as if relatively unchanged since being deposited.

In the following summary, Dr. Keith S. Thomson, Peabody Museum, Yale University, is responsible for the identifications of the fish. I am most appreciative of his efforts and consider any such identifications to be a minor miracle, considering the extremely fragmented nature of the materials proffered him. A few bird bones have been sent to Mr. E. Tchernov, of the Hebrew University, Jerusalem; he will report separately on these.

The identified organic remains are as follows:

LAYER 1: Fishbone, 20 g; other bone, 105 g; ratio = 19.2% fish.

A. Mammal:

1. Sheep or cow: small piece of broken horn, with one surface cut.
2. Cow or equid: 3 fragments of large long bone or bones.
3. *Gazella* sp.: Fragment of anterior cannon bone (metacarpal) and fragment of tibia. (The gazelle in the area today is *G. dorcas*).
4. *Lepus* sp.: distal end of humerus. (The hare at present in Nubia is *Lepus capensis*).
5. Rodent: A broken femur of a young, small rodent.

B. Fish: Not identifiable.

C. Mollusca:

1. Several fragments of shell from *Unio willcocksii*, a fresh-water clam found abundantly in the Nile. The broken pieces did not show any indication of use by man.

2. Two small fragments of *Etheria elliptica*, the Nile freshwater 'oyster', which always grows on a rocky substratum.
3. Two shells of *Zooteca insularis*, the shells of this small land snail are found commonly, sometimes in considerable numbers, in open desert sediments deposited under conditions of former rainfall, or deep in the cracks of bare rock surfaces (as at Kurkur Oasis; Leigh, 1964), or washed into wadi sediments. In some of these locations, these delicate little shells undoubtedly have persisted for ten thousand years or more. No living snails of this species were found in Egypt by any of the group from Yale.

E. Other: One pair of elytra from a beetle, showing no evidence of antiquity.

LAYER 2: Since the material from this layer was scant, it was not weighed.

- A. Mammal: Five fragments of unidentifiable long bone of a mammal the size of a cow or equid and one fragment from a long bone of a mammal the size of a gazelle or large dog.
- B. Fish: Two pieces only, not identifiable.
- C. Mollusca:
 1. A fragment of the shell of *Etheria elliptica*.
 2. The umbo region of a valve of *Unio willcocksii*. The external surface of this piece was highly polished, as if it had been used as a tool for smoothing.
 3. Two *Zooteca insularis*.

LAYER 3: Fishbone, 38 g; other bone, 189.5 g; ratio = 20% fish.

A. Mammal:

1. Six pieces of heavy long bone, probably *Bos* or *Equus*.
2. Broken premolar, probably deciduous, of a small bovid, possibly gazelle.

3. Broken vertebral pieces of a young mammal the size of a sheep or goat.
4. Cheek tooth of a hare, *Lepus cf. capensis*.
5. Portion of a shaft of a jackal or jackal-sized dog.

B. Fish: Not identifiable.

C. Mollusca: Seven shells of *Zootecus insularis*.

LAYER 4: Fishbone, 225 g; other bone, 41.5 g; ratio = 81.6% fish.

A. Mammal:

1. Carnivore: The root of a canine and part of the shaft of a tibia, each from an animal the size of a jackal. (The jackal in Nubia today is *Canis aureus lupaster*.) Otter: a fragment of the posterior end of the left mandible, consisting of little more than the condyle, angular process, and part of the coronoid process, is from an otter, probably of *Lutra maculicollis*. The otter is not now known in Egypt, but the present range of this species, which extends into the drainage of the White Nile in Sudan (Setzer, 1956:555), is the closest to Egypt of any of the African otters. Skeletal material of the other genera (*Paraonyx* and *Aonyx*) of African otters has not been available for comparison, but their present ranges are further to the south and west.
2. Broken distal end of a phalanx of a small bovid, somewhat larger than a gazelle.

B. Fish: Some fifty individual pieces, all that were identifiable, were from the catfish *Clarias* sp.

LAYER 5: Fishbone, 1362 g; other bone, 66 g; ratio = 95.2% fish.

A. Mammal: Fragment of a proximal part of a left posterior cannonbone (metatarsal) of a bovid slightly larger than a gazelle; it is not from a gazelle, but may have belonged to an immature ibex or Barbary sheep.

- B. Reptile: A crocodile is represented by the tip of one tooth. The absence of crocodile remains otherwise, and indeed of all bones of reptiles and amphibians, indicates that these animals were not important to the people who used the cave for a fishing site, at least not at the time they occupied the cave.
- C. Fish: The overwhelming proportion of fish remains from this layer, that in which the bone fish spears were also found, argues that fishing was the main occupation of the people at the time they occupied the cave. The fish bones are almost entirely those of catfish, and most of these are from *Clarias* sp., with a few pieces from *Synodontis* sp. and ?*Auchenoglanis* sp. Each of these genera is found in this part of the Nile at present (Boulenger, 1907). Three fish bones, only, of several thousand recovered from Layer 5, were identified as being other than from catfish; these are referred to an unknown percoid.

LAYER 6: Fishbone, 148 g; other bone, 13.5 g; ratio = 91% fish.

- A. Mammal: Ibex or Barbary sheep? Three unidentifiable pieces of long bone.
- B. Fish: None of the fragments of bone from fish were identifiable. Although no bone fish spears were found in this deepest level and the total amount of bone is small compared with the next layer above, yet the implication is strong that fishing was an important human occupation at the time of the deposition of this earliest layer in Catfish Cave.

PART 7. The North Extension Trench, from the sand between the silts: Fishbone, 11 g; other bone, 39.5 g; ratio = 28% fish.

A. Mammal:

1. *Procavia*: A partial left maxilla and a fragment of a right maxilla, with the cheek-teeth missing, were found of a hyrax, an animal living in the adjacent Red Sea Hills into the present century and one still found in small num-

bers in southeastern Egypt (Hoogstraal, 1964). This hyrax is called *Procavia ruficeps ruficeps* (Hemprich and Ehrenberg, 1832) by Hoogstraal but Bothma (1966) uses the name *Procavia habessinica bartoni* (Gray, 1868) for the hyrax of "southern Egypt" in the latest review of the group. The fragments of jaw recovered are not identifiable as to species.

2. Hare, *Lepus* cf. *capensis*: Partial right and left maxillae, with six separate cheek-teeth.
3. Ibex or Barbary sheep: Three fragments of long bones.
4. Gazelle: The proximal part of a tibia.
5. Spiny mouse, *Acomys* sp.: A femur and a tibia. These mice were ubiquitous along the Nile at the time of our research in Nubia, and were almost the only species of rodent which in 1965 had survived the killing of the waterside vegetation following the artificial raising of the water level in 1964.
6. Other rodents: Several broken bones of rodents the size of *Rattus* and smaller.
7. Carnivore: A rodent-chewed piece which could be part of the shaft of a radius of a jackal, *Canis aureus lupaster*.

B. Fish: None identified.

C. Mollusc: One *Zootecus insularis*.

ORGANIC REMAINS FROM SITE WO-2A. This collection was made by W. E. Wendt from within the area designated by him as archeological site WO-2A; the collection consisted of 92 fragments of heavily mineralized bone, mostly of limb bones from larger mammals. Of the original collection, 81 were not identifiable either as to bone or animal, which high proportion testifies both to the extremely broken condition of the remains and to the great erosion they have suffered since being broken.

Indeed, I have never seen a group of fossilized bones which definitely appeared to have been so thoroughly water-rolled. The first assumption, therefore, was that they had been carried to the site by the Nile of a former period; however, the great rarity otherwise of vertebrate fossils in Egyptian Nubia and their concentra-

tion within the confines of an archeological site would argue for their presence there as being due to man. They were presumably not carried in after mineralization; not only is this possibility a remote one, but the varied nature of the bones as to size and condition — from an intact astragalus of a large bovid to small flakes from teeth and long bones — also indicates that they were dropped in the area where found. Additionally, three pieces showed marks of having been cut, presumably during the process of butchering the carcass after a kill. The available evidence indicates, thus, that the bones were broken and dropped on the site by man.

To have become mineralized so thoroughly, the bones must have been buried in Nile sediments which were permeated by water. If the artifacts from WO-2A are of a general age of those of the Sebilian to the north and the Kormusan to the south, as Mr. Wendt thinks, then they are of a time when the Nile was depositing silt; indeed, the original site of WO-2A may have been on the flood plain of the period, the silts of which have been since eroded away, letting down both artifacts and bones onto the Cretaceous sandstone below.

If the bones were not water-rolled, then their present eroded condition must indicate considerable sandblasting after re-exposure. By comparison, the associated artifacts showed almost no indication of wind erosion.

The few bones which could be identified were as follows:

A. Bovidae:

1. The astragalus of a bovid of the size of a domestic cow; worn fragments of two other astragali are slightly larger.
2. Three fragments of long bone, from a bovid the size of a domestic cow.
3. Three fragments of lower molars, with only the selenodont portion of the enamel preserved; the shape and size of the preserved parts indicate they are most probably from a *Bos* the size of a domestic cow.

B. Equidae: The second phalanx of *Equus* sp. (probably *E. asinus*) showed distortion and a slight asymmetry; examination under the microscope proved that it had suf-

ferred an oblique fracture which had subsequently healed by the laying down of well-organized bone with no pathological involvement. (I am indebted to Priscilla Turnbull, at the Field Museum, Chicago, for confirmation of my original identification of this interesting specimen as being from an equid).

- C. Hippopotamidae: A small portion of a canine tooth is from a hippopotamus; these animals lived in the Egyptian portion of the Nile River well into Medieval times, and thus their presence in a prehistoric site might be expected.
- D. Trionychidae: One eroded piece of carapace is from *Trionyx* sp., the soft-shelled turtle. The species cannot be identified from the fragment recovered, but is probably *Trionyx triunguis*, which is still found in the Nile in Nubia (Anderson, 1898).

DISCUSSION. The number of identifiable specimens is too few for any ethno-historical conclusions. Cattle, wild ass, and hippopotamus are all known to have been present in Nile sediments of circa 13,000 years ago near Kom Ombo, Upper Egypt, where they were collected by me in association with artifacts of Middle Sebilian type. These animals have also been recovered from sediments of approximately the same age in Sudanese Nubia (Dexter Perkins, personal communication), so their presence in Egyptian Nubia was to be expected.

INTERPRETATION OF THE RADIOCARBON DETERMINATIONS.

In archeological reports in general, radiocarbon determinations have usually been published in terms of years B.C., as I have myself done in the past. Further, I have been at meetings of prehistorians where we were urged to do so, in preference to publishing in terms of radiocarbon 'units' or 'years' B.P. (Before Present, i.e., before 1950 A.D.; see Flint and Deevey, 1962). If the B.P. units ('years') were strictly equivalent to true years, as has generally been assumed, the policy of publication of dates in terms of years B.C. would be justified. Recent research, however, shows that such strict equivalence is not valid, so that a radiocarbon unit

or a sequence of them cannot necessarily be translated directly into years B.C. (Olson and Chatters, 1965).

As has been known for some time, radiocarbon determinations from Egyptian materials of known ages in historical context have often measured younger in radiocarbon 'years' than the number of years B.C. previously determined by historical and/or astronomical techniques (Ralph, 1959; Smith, 1964). The results of recent research, correlating tree-ring data for absolute chronology with radiocarbon determinations made on the same wood, indicate that this tendency for the 'date' expressed in radiocarbon units to be younger than the actual date was undoubtedly a worldwide phenomenon, beginning about 300 B.C. and continuing to at least 4000 B.C. (Damon, Long, and Gray, 1966), beyond which time tree-ring data do not now exist.

At other times, as between approximately 800 A.D. and 1250 A.D., the long-term fluctuations of atmospheric C^{14} have resulted in wood and other organic remains having a higher reading in radiocarbon units than their known age in years (Stuiver, 1961, 1965; Suess, 1965; Stuiver and Suess, 1966).

These various discrepancies are due to variations in the C^{14} content of the earth's atmosphere, with the result that a radiocarbon unit ('year') may for one period be larger than a true year, but during another period be less. The physical phenomena thought to be involved do not concern us here, but can be learned from other sources (Suess, 1965; Damon, *et al.*, 1966).

As one's research comes to lie on the chronological scale further back into the Pleistocene, such discrepancies become less important, for a possible error of a few hundred or even a thousand years in absolute years for a radiocarbon determination from thirty or forty thousand years ago is relatively meaningless. Even so, the wise course would seem to be to express such ages in radiocarbon 'years' and not in years B.C., for the latter implants in the mind of any reader a certainty which may be an illusion.

Some radiocarbon determinations do not necessarily define chronologic sequence, even on such a relative scale as discussed above (Suess, 1965; Stuiver and Suess, 1966). For instance, a radiocarbon determination of 300 B.P. could be (in terms of actual dates) either 1640 A.D., 1565 A.D., or 1510 A.D., each date being accompanied by the usual measure of indeterminacy as

expressed by a standard deviation. Or, to put the problem from the opposite point of view, organic materials which grew during each of the above years would all yield, within the standard deviation, a radiocarbon determination of 300 B.P., even though 130 calendar years separate the youngest and oldest samples. Similarly, organic materials which grew during the years 900 A.D., 790 A.D., and 690 A.D. would all have the same radiocarbon determination of 1200 B.P. (\pm a standard deviation derived from statistical considerations in the determination of the C^{14} activity of the particular material being tested and not upon the variation of atmospheric C^{14} which produced the differences listed above). Another such discrepancy is found with materials growing at approximately 1750 A.D., which yield a radiocarbon age of only 80 B.P., a difference of 120 'units' between radiocarbon years and true years. The conclusion must be that within a period of any adjacent two centuries radiocarbon determinations cannot at present be depended upon always to yield a strict chronological sequence.

As already mentioned, for the years between 300 B.C. and 4000 B.C. in absolute chronology, radiocarbon determinations made on wood dated dendrochronologically are consistently more recent than the true age of the wood (Damon, *et al.*, 1966). Within this period of three thousand seven hundred years, variations of atmospheric C^{14} capable of producing minor fluctuations of a century or more in one direction or the other probably occurred; as discussed above, this type of fluctuation is true for certain periods within the most recent millenium.

On the basis of present evidence, a working formula (Stuiver and Suess, 1966) for transferring radiocarbon 'years' between approximately 2300 B.P. and 6000 B.P. into calendric years is:

$$T \text{ (true age)} = 1.4 R \text{ (radiocarbon units or 'years')} - 1100.$$

From the figure thus derived a further subtraction of 1950 yields the approximate age in years B.C. On this basis, an approximate true age of the sample Y-1680 (see p. 18) of 4830 ± 80 B.P. would be 5660 calendar years (= 3710 B.C.), or more than 800 years older than one would have assumed if the radiocarbon determination had been transferred directly into years B.C. by direct equivalence of B.P. 'years' with calendar years.

The earlier radiocarbon sample from Catfish Cave, Y-1646 (see p. 15), 7060 B.P., lies too far beyond the earliest range of

dates at present controlled by dendrochronological evidence to attempt the transfer into strict calendar years. As yet we have no way of knowing whether a C^{14} determination in this range of years B.P. represents more or fewer actual years.

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