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THE PREHISTORIC CULTURAL ECOLOGY OF CAPSIAN ESCARGOTIERES,

Part II : Report on investigations conducted during 1976 in the Bahiret Télidjène, Tebessa Wilaya, Algeria. *

by

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INTRODUCTION

In 1976, excavations were undertaken at three escargotières in the Télidjène Basin. At Ain Misteheyia (7° 45' 54" E, 35° 11'39" N) the excavations begun in 1973 and reported in Libyca (1), were extended in order to obtain a larger sample of cultural materials from the lower portion of the deposits and to examine further the stratigraphy of the site. At Oued Télidjène A (7°47'48" E, 35°8'34" N) which is Site 61 in Grébénart's list (2), we excavated two 1 m x 1 m test pits to obtain samples of snail shell, stone tools and animal bones, as well as radiocarbon samples, for comparison with Ain Misteheyia. At Kef Zoura D (7°40'38" E, 35°2'26" N) which is Site 201 in Grebenart's list, we excavated a 1 m x 1,5 m test trench within the shelter, again for the purpose of obtaining materials which could be compared with Ain Misteheyia. In the remainder of this report, these three sites will be referred to as AM, OT and KZ.

This will be the final report on AM and OT. Excavations at KZ were continued in 1978 and additional excavations are planned for 1981. These will be reported in full at a later date. While it would have been useful to continue work at AM, this is no longer possible ; the site was destroyed in the course of reforestation operations during 1977. Because excavations at OT were very limited, and only a small amount of material was recovered, they will not be reported extensively here. We shall refer to the data obtained from OT as well as KZ when required, and will concentrate instead on AM.

EXCAVATION METHODS

I was our intention originally to excavate AM by stripping off sucessive, observable stratigraphic horizons. We were convinced, on the basis of our 1973 excavations, that this could be done. However, early in the 1976 season it became apparent that this was impossible. Is such occupational horizons were preserved they were almost impossible to locate or to follow and were of very limited extent. We shall discuss why this was the case shortly. Faced with these difficulties, and pressures of time, we decided instead to excavate alternate 1 m x 1 m squares by 5 cm levels, and to profile the walls of each square so as to provide a series of continuous sections through the site.

(*) The manuscript for this monograph was completed in 1980. Since then additional analyses of the material have modified some of the conclusions presented here. Those interested should see the following :

LUBELL, D., 1984, Paleoenvironments and Epi-Paleolithic Economies in the Maghreb, in, J.D. Clark and S. Brandt (eds.), *From Hunters to Farmers : Observations on the Causes and Consequences of Food Production in Africa.* Berkeley : University of California Press.

LUBELL, D., P. SHEPPARD and M. JACKES, 1984, Continuities in the Epipalaeolithic of northern Africa with emphasis on the Maghreb. *Advances in World Archaeology,* v. 3. New York : Academic Press.

(1) LUBELL (D.) et al., — The prehistoric cultural ecology of Capsian escargotières. *Libyca,* t. XXIII, 1975, pp. 43-121.

(2) GREBENART (D.). — *Le capsien des régions de Tébessa et d'Ouled Djellal, Algérie.* Etudes méditerranéennes, n° 1, Université de Provence, 1975.

We opened twelve new squares in 1976. Ten of these were within the main excavation area, and eight were excavated to sterile substrate (squares K8, K9, K10, K12, L9, L11, M8 and M10). With the exception of K10, which was excavated after the surrounding squares had been completed, we have detailed profiles of the four walls of each of these as well as new profiles of J9 which was excavated in 1973. The total volume of deposits excavated at AM is now 19.10 m^3, and the 1976 excavations increased our sample of artifacts by over 50,000 pieces and provided additional data on faunal remains and stratigraphy.

As in 1973, all excavated deposits were sieved through either 3 mm or 5 mm mesh. In addition, some items observed during excavation (e.g. larger bone fragments, stone tools, concentrations of snail shell, etc.) were measured by three-dimensional coordinates, and a plan was drawn for the base of each 5 cm level in each square. One quarter of each level was taken as a bulk sample for determination of land snail species frequencies. Bulk samples for granulometric and geochemical analyses were taken at continuous 5 cm intervals from the exposed walls of three squares (L11, M8, M10) at the end of the excavations and during excavation in one square (K9). The same procedures, as applicable, were followed at OT and KZ.

STRATIGRAPHIC SEQUENCES AND CHRONOLOGICAL RELATIONSHIPS

In this section we will discuss the lithostratigraphy of AM, OT and KZ, the radiocarbon dates from each of these, and the cultural stratigraphy at AM.

LITHOSTRATIGRAPHY

AIN MISTEHEYIA

In figure 1, a series of profiles through the AM deposits are shown. These must be considered as best approximations only ; the loose and ashy nature

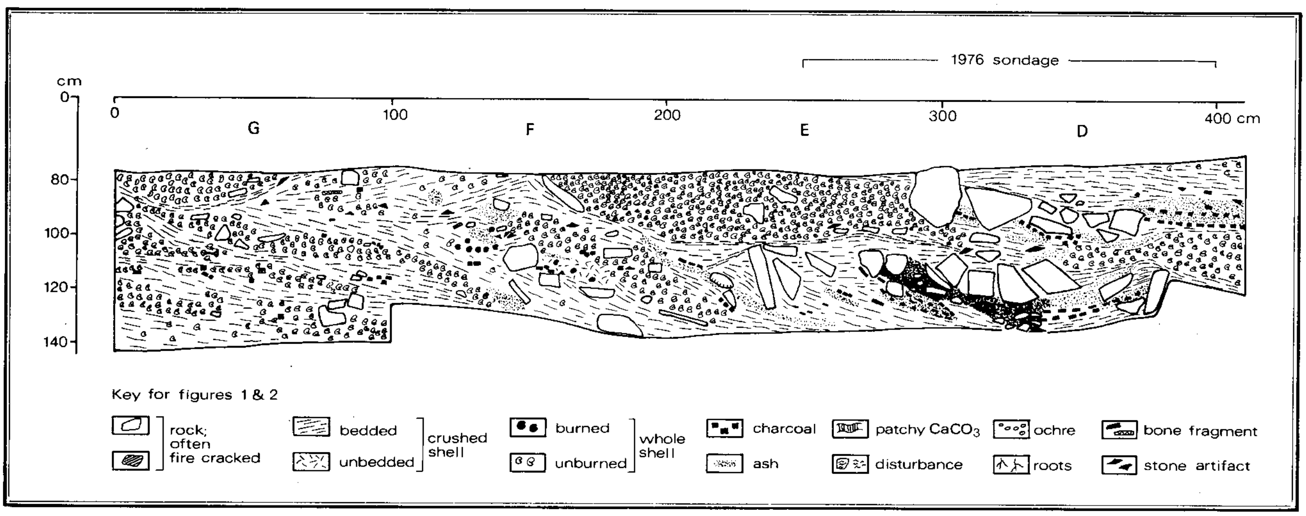

Figure 1. — East-west (top) and north-south (bottom) profiles for Ain Misteheyia. The lack of stratigraphy and degree of rodent burrowing are apparent. The position of the human burial can be seen in K8.

The captions of Figs 1 & 2 are reversed.

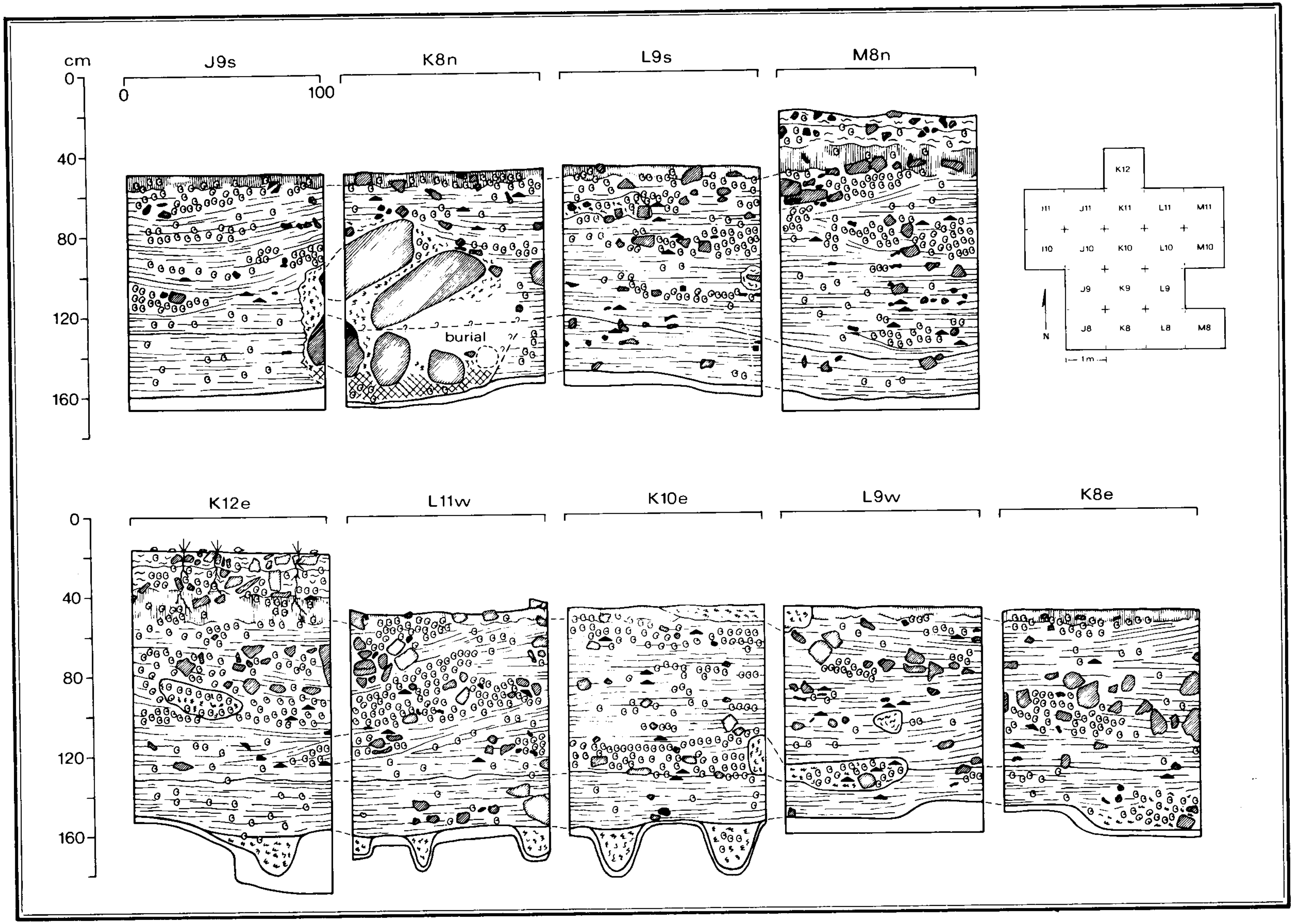

Figure 2. — Profile of the east of the main (1978) excavations at Kef Zoura D. The area excavated as a test in 1976 is indicated by vertical arrows.

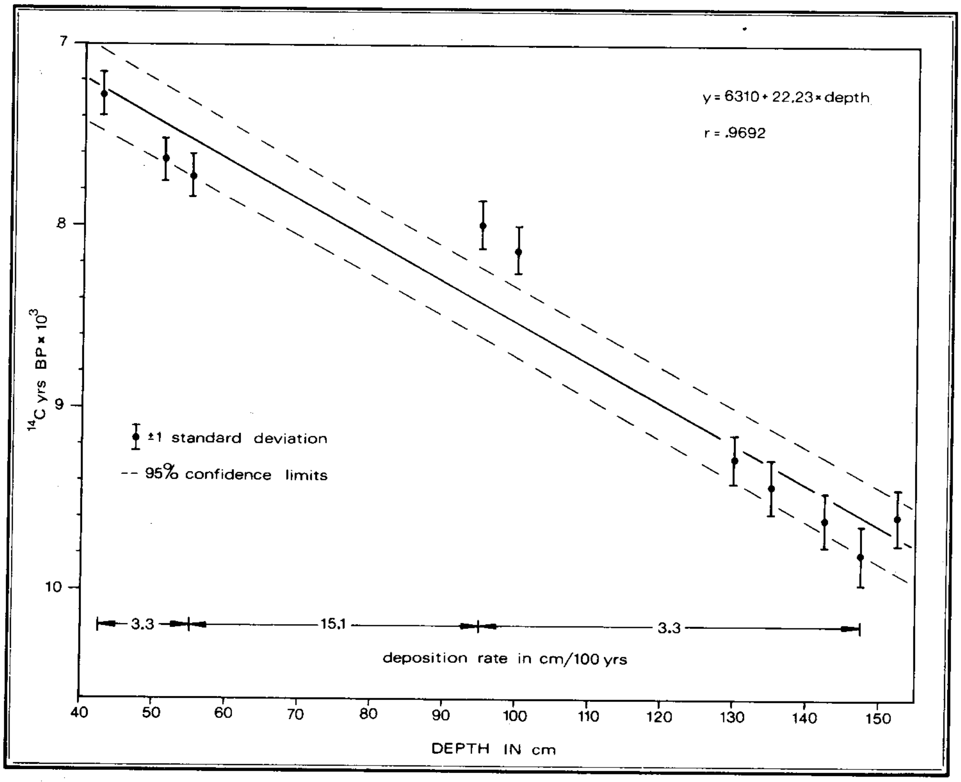

Figure 3. — Radiocarbon dates for undisturbed deposits at Ain Misteheyia plotted on a regression line.

of the deposits, the absence of clear-cut interfaces and color changes, local and not always well defined disturbances by rodents, and artificial stratification produced during attemps to clean the walls, all combined to make it extremely difficult to map the profiles with the accuracy one might wish. Furthermore, the lack of lateral continuity between profiles from adjacent squares rendered both the making and the interpretation of the profiles all the more difficult.

The sequence, as we interpret it, is basically comparable to that suggested on the basis of our single deep excavation (J9) in 1973 (3). However, several changes must be noted. First, the interface between levels 4 and 3b does not exist ; it appears to have been an artifact of excavation, produced by the horizontal extension of the 1973 excavations at the 50 cm level. Second, the pebble layer at the base of level 3a does not exist ; poorly drawn shells were apparently mistaken for pebbles when the profile was drawn in ink. At this level in J9, in 1976, we observed only a loose concentration of shell. Since this supposed pebble lens was used (at least partially) as the stratigraphic marker to distinguish levels 2 and 3 we have abandonned the distinction between them. Finally, we were unable to observe any characteristics sufficient to distinguish levels 3a and 3b and have abandonned this division as well.

(3) LUBELL (D.) et al., — l.l., pp. 64-65

We accept the interfaces between other levels as defined in 1973, although it is often difficult to see them in the field. Most of them seem to fade together without a distinct boundary. In table 1, we compare the revised lithostratigraphy to the originally proposed sequence.

As we have noted previously (4), the upper levels have been affected by pedogenesis and an orthic durothid aridisol with an A2/Ca (calcic) horizon has formed in level 3. Moreover, levels 4 and 5 should be considered a sort of lag deposit, formed by the partial removal, by sheet wash and deflation, of fine clastics mainly during post-Roman times. This has produced a lag cap of gravelly material on the surface of the site protecting it from further destruction. This appears to be the general process by which most open-air escargotières are preserved, although often their upper deposits are disturbed.

(4) Ibid., p. 68.

The revised lithostratigraphic sequence can be described as follows and this superseeds all previous descriptions :

— Level 5 : friable greyish brown (7. 5YR 4/2, dry) deposits (mainly silt) with abundant limestone gravel of variable size, roots, artifacts, some shell and bone ; thickness 10 - 15 cm.

— Level 4 : friable greyish yellow brown (10YR 4/2, dry) fine deposit (mainly silt) with less abundant limestone gravel of variable size, roots, artifacts, shell and bone ; thickness 10 - 15 cm.

— Level 3 : brownish grey (7. 5YR 4/1, dry) fine deposits (mainly silt) hardened and cemented in patches by calcium carbonate ; lifestone gravel, artifacts, bone, crushed and whole shell present ; thickness 15 - 20 cm.

— Level 2 : friable brownish grey (10YR 4/1, dry) fine deposit (mainly silt) with limestone gravel of variable size, artifacts, bones, crushed shells, whole shells dispersed or in small pockets and small or large lenses ; thickness 75 - 90 cm.

— Level 1 : friable greyish yellow brown (10YR 4/2, dry) fine deposits (mainly silt) comparable with level 2 but with less abundant cultural materials ; thickness 15 - 40 cm.

— pre-Capsian : bright yellowish brown (7. 5YR 7/6) silty sand with limestone gravel and cemented by calcium carbonate ; Pleistocene deposit ascribed to the « Soltanian ».

It should be emphasized that this is a general description. While there are minor differences among the profiles as regards colour changes, depth of levels, granulometry and the like, we are not able to identify major horizontal variations, or microstratigraphic changes. The taphonomic history of the AM deposits (see below) is such that one would not expect to be able to definie such variability. Furthermore, we are no longer convinced that the level indicated at ± 130 cm in the profiles should actually be believed. True, we did see it in the field, but it does not show up in subsequent analyses.

Oued Telidjene A

Two 1 m x 1 m test pits were excavated at OT. One of these (OT2) was abandonned when very marked rodent disturbance was encountered. The other (OT1), located at the high point of the site, was excavated to sterile substrate ; a glacis which appears to be equivalent to the pre-Capsian deposit at AM.

As at AM, the surface of OT is dotted with openings to rodent burrows. Furthermore, the Capsian deposits have been truncated (and to some extent protected) by one or more Roman buildings of which the remains are still visible on the surface. In general, the deposits revealed in OT1 are comparable to those of AM. We do not reproduce the profile here ; instead the following description is taken from field notes made by one of us (D.L.).

— Surface to 40 cm : light brown (7.5YR 6/4, dry) grading downwards to very pale brown (10YR 8/4, dry) with small round gravel and root penetration in the first 30 cm ; these deposits represent Roman disturbance and the base of this level is sharp and horizontal.

— 40 to 60 cm : this level marks the top of the remaining escargotière deposits ; brown (10YR 5/3, dry) with scattered whole shells and artifacts and occasional limestone fragments ; heavily disturbed by rodent burrows one of which penetrates into the underlying level to a maximum depth of 80 cm and so the base of this level is very uneven.

— 60 to 80 cm : a very dark greyish brown (10YR 3/2, dry) lens of crushed shell with a few whole shells and limestone fragments.

— 80 to 110 cm : a level of whole shell with very little matrix (no colour taken) and a few scattered artifacts and limestone fragments ; a lens of crushed shell between 90 and 105 cm intrudes across one half of the profile ; radiocarbon sample taken from whole shell portion at 100 - 105 cm dated at 7280 ± 120 yrs B.P.

— 110 to 140 - 155 cm : dark grey (10YR 4/1, dry) deposit with several large limestone blocks and smaller fragments, scattered whole shell and crushed shell ; contact with reddish yellow (7.5YR 6/8, dry) sterile substrate is uneven and disturbed by a rodent burrow.

In view of the radiocarbon date, it seems logical to conclude that OT is partially contemporaneous with AM. The artifact sample is too small for reliable comparison, but the faunal sample is large sample is large enough and will be discussed later.

KEF ZOURA D

In figure 2, the profile of the east wall of the main (1978) excavations is shown ; the part of these which encompasses the 1976 test trench is indicated as well. The deposits shown here differ markedly from those found in AM, OT and all other open-air escargotières we have examined (KZ is a rockshelter). They are loose and uncompacted ; so much so that it is nearly impossible to maintain vertical walls more than 1 m in depth. There are small hollows beneath some of the rocks, charcoal is abundant and well preserved, and microstratigraphy is present. There are rocks which have been completely calcined as a result of burning, burned snail shell is preserved, and bone is neither as corroded nor as root-etched as at AM and OT. The deposits are brownish black (10YR 3/1, dry, for layers with whole shells), probably because more carbonized material is preserved than at AM or OT. In sum, the deposits at KZ show very little evidence of alteration since or during the occupation of the site. The effects of precipitation, percolating water, pedogenesis and bioturbation (e.g. growing plants, burrowing rodents, trampling by animals, agriculture) appear to be absent or minimal. As a result, the preservation of fragile artifacts and cultural microstratigraphy is much better at KZ than at either AM or OT. Furthermore, our interpretation of the history of site formation in addition to the radiocarbon dates obtained for all three sites (but especially for KZ), suggest that compaction ther without a distinct boundary. In table 1, we compare the revised lithostratigraphy to the originally proposed sequence.

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HISTORY OF SITE FORMATION

There is a series of geological and palaeontological observations which permit a tentative reconstruction of the processes which led to the formation of the AM deposits as they exist at the present time.

Examination of the detailed profiles (fig. 1) indicates extensive rodent burrowing in the deposits. These burrows were undoubtedly produced by jerboa (*Jaculus orientalis*) and by gerbil (*Meriones shawi*), skeletal remains of which occur throughout the sequence. Furthermore, we have recovered a number of pellets throughout the deposits, which are clearly fecal pellets (coprolites) of these rodents. No doubt, burrowing rodents were attracted to the site by the loose, organic rich deposits and apparently utilized larger stones in these deposits as « architectural » components of their burrows. *Jaculus* is said to excavate burrows to average depths of 100 cm (5), but local informants estimated the depth of nests at only 70 cm. *Meriones* spp. generally construct burrows with two floors and nest chambers are usually at depths of less than 75 cm (6). Karimi found that burrows of *Meriones libycus* and *M. persicus* in Iranian Kurdistan reach depths of 70 and 120 cm respectively. Plaster casts of these burrows illustrate their very complex double-floor architecture and their marked destructive effect on original stratification (7). The deposits at AM have an average depth of 150 cm, but burrows occur throughout and are also present in the underlying substrate. Thus, it appears likely that rodents burrowed into the deposits are various times during their formation. We suspect that since these rodents generally avoid human beings (and for good cause !) that occupation of AM by rodents coincided with those periods when the site wase not inhabited by Capsian populations.

The high frequency of rodent remains and traces suggests that the stratigraphic sequence at AM may have suffered so much bioturbation that it cannot be trusted. However, at various depths, bones were found in anatomical position (e.g. a hartebeest naviculo-cuboid with the fitting cuneiform adjacent to it). Moreover, since the radiocarbon dates form a reasonably consistent series (see below), we conclude that the effects of bioturbation by rodents should not be overestimated. It is probably marked in and around rodent holes, but elsewhere the general sequence can be trusted.

A special form of bioturbation is evidenced by a few bones which look somewhat like pseudo-tools described by Brain (8) and bones from European caves fashioned by « charriage-à-sec » (9). Apparently these bones were buried at shallow depths and were then moved around when Capsian groups reoccupied the site.

All bones, both artifactual and non-artifactual, have been grooved and etched by plantroots (vermiculations). As this phenomenon can be observed at any depth, we conclude the periods of human occupation alternated with periods of non-occupation during which the site was colonized by vegetation (probably grasses). Because the deposits would have been very fertile and could probably even attract plants with special requirements (e.g. nitrophilous species) (10) this vegetation was undoubtedly lush and dense. This sequence of events probably also answers the question posed by Morel (11) : how could Capsian groups have lived on these sites if they consisted primarily of unconsolidated ash which was

(5) PETTER (F.). — *Répartition géographique et écologie des rongeurs désertiques de la région paléarctique.* Thèse, Fac. Sci., Univ. Paris, Mammalia, 1961, p. 136.

(6) Ibid.

(7) KARIMI (Y.). — La technique d'étude par moulage des terriers de Meriones au Kurdistan iranien. *Mammalia*, t. 33, 1969, pp. 495-498.

(8) BRAIN (C.K.S.). — Bone weathering and the problem of bone pseudo-tools. *South African Journ. Sci.*, t. 63, 1967, pp. 97-99.

(9) KOBY (F.E.). — Le « charriage-à-sec » des ossements dans les cavernes. *Ecologae Geol. Heb.*, t. 34, 1941, pp. 319-320.

(10) LUTZ (H.J.). — The concentration of certain chemical elements in the soils of Alaskan archaeological sites *Amer. Journ. Sci.*, t. 249, 1951, pp. 925-928.

(11) MOREL (J.). — In litt.

easily disturbed by wind or people tramping over it ? If the open-air escargotières were colonized by dense, deep-rooted vegetation when not occupied by Capsian groups, they may have been ideal places to come back to until, presumably after a short time, the vegetation cover was destroyed by burning, over-«harvesting» (?) or simply trampling.

If we accept that the unconsolidated character of the KZ deposits is an accurate reflection of the original situation at most open-air escargotières, the following sequence of recurring events seems plausible : (1) occupation by a Capsian group with accumulation of very loose ashy deposits ; (2) first phase of compaction and deflation of these deposits by precipitation and wind ; (3) colonization of the site by vegetation and rodents ; (4) re-occupation by a Capsian group. The length of time between (1) and (4) may have been as short as one year, but was probably longer.

CHRONOLOGY

The radiocarbon dates obtained from samples collected at AM, OT and KZ during 1973 and 1976 are given in table 2. From these, it is clear that the three sites form a sequence, with AM the earliest, followed by OT which is partially contemporaneous to the upper part of the AM sequence, followed by KZ. The 1978 excavations at KZ revealed a possible stratigraphic break at this site ; the deposits shown in Figure 2, may be underlain by other deposits which are contemporary with the lower part of the AM sequence.

Although the radiocarbon dates for AM do, in general, form an internally consistent series, there are several which require discussion.

The sample used for 1-8378 for the 80-90 cm level in J9, was collected in 1973, when our knowledge of the stratigraphy was still incomplete. It is now clear that this sample was collected from an area of rodent disturbance which can be seen in the north profile of J9 and the west profile of K10 (Fig. 1). There is no other reasonable explanation for the age of this sample ; it is out of sequence with those above (1-9871) and below (1-9873) it.

The dates for the 145-150 cm level in K12 (1-9824) and the 150-155 cm level in K10 (1-9825) are also not in sequence. This can be due to two factors : (a) either one or both of the samples came from areas affected by rodent disturbance which were neither recognized in the field nor recorded on the profile drawings ; or (b) early occupations of the site were discontinuous on the uneven surface of the pre-Capsian deposit and there has been some mixing at the base of the AM sequence. Either explanation seems equally likely to us. In any event, we consider the 1-9824 date to be reliable, and it is thus the earliest date presently known for a Capsian site.

The date on the human burial (1-9826) is inevitably out of sequence as this individual was interred from a higher level. The date confirms our interpretation from examination of the stratigraphy in the field (and see fig. 1) that a burial pit was dug from approximately the 125 cm level.

In figure 3, we have plotted those dates for AM which we consider to be the most reliable on a regression line. It is clear that 1-9873 and 1-9874 fall outside the 95 % confidence limits for the regression line. These two dates mark the appearance of more snail in the deposits as well as increased amounts of gravel at about 95 cm (fig. 5, and see discussion to follow). We shall argue later that this was a period of increased aridity and that Capsian groups living at AM responded to these conditions by collecting more land snails. The increased amounts of uncrushed shell which occur between 95 cm and 55 cm appear to have lessened compaction of the deposits and thus the rate of deposition seems to be higher than either above 55 cm or below 95 cm : 15.1 cm/100 yr. as opposed to 3.3 cm/100 yr. below.

This conclusion is based on our observation that uncrushed snail shells stabilize the deposits of escargotières ; the greater the amount of uncrushed shell originally incorporated into the deposits, the less marked will be the results of compaction. We demonstrated this inadvertently at the close of the 1976 excavations when we drove our Land Rover over the large pile of shells which had been discarded after the species frequencies had been noted. There was astonishingly little crushing of the shells. Unless Capsian populations intentionally crushed shell, or treated it in a manner we have not yet discovered which would destroy its ability to withstand crushing, we can only assume that our interpretation is correct ; single shells can be crushed easily with a bare foot, but piles of shells cannot.

The equivalence of deposition rates above 55 cm and below 95 cm can be explained in the following manner. The top of AM has been exposed for a least 5000 years, and the surface is now a lag deposit. The upper 50 to 60 cm of the deposits have been strongly affected by deflation and pedogenesis which have resulted in considerable destruction of both shell and bone. The end result is that these upper deposits appear (coincidentally) to have the same rate of deposition as those below 95 cm in which shell is less frequent.

The point we wish to stress here is the apparent difference in the deposition rates at AM and KZ. At AM, approximately 2500 radiocarbon years are represented by about 150 cm of deposit ; at KZ, no more than 600 radiocarbon years (and perhaps only a fraction of that) are represented by about 100 cm of deposit. Thus, we shall argue throughout this report, that the deposits which remain at AM are only a fraction (perhaps as little as one-third) of those which were originally present. The remainder have been removed by various processes (e.g. erosion, deflation), and, furthermore, have been disturbed by these and other processes (e.g. compaction, bioturbation). Thus, while the sequence of radiocarbon dates for AM appears reliable, deposition rates calculated on the basis of the amount of deposit remaining between radiocarbon samples may be unreliable. The much more rapid deposition rates which can be calculated from the KZ data are probably a more reliable indication of the original situation and the processes of accumulation involved in the development of an escargotière. We shall return to this point in our later discussion about the evidence in favor a non-sedentary pattern of occupation for Capsian sites. It is important to note here, that given the information discussed above, it is no at all surprising that we were unable to excavate AM by visible archaeological strata. Such strata are simply not preserved except in the most unusual circumstances. Any interpretation of he cultural stratigraphy must take this into account.

CULTURAL STRATIGRAPHY OF AIN MISTEHEYIA

In ligh of the preceeding statements, it should come as no surprise that we were unable, in 1976, to trace further the occupation surface exposed in 1973 (12), despite our conviction that it was present. Such a surface can only be identified in a site like AM by the presence of structures, and these are either absent or have been obscured by episodes of pedogenesis, compaction and by rodent burrowing. Examination of the profiles (fig. 1) will show

(12) LUBELL (D.) et al., — l.l., fig. 20.

that although there are occasional features which we have interpreted as hearths or shell lenses, and we have attempted to give an indication (however imperfect) of the dip of some of the beds of crushed shell, there is little actual indication of stratification. The only exception is the increased quantity of shell in levels above 95 cm which does show clearly in the profiles.

Thus, we have had to reconstruct the cultural stratigraphy by detailed analyses of the fauna, the stone artifact assemblage, and the granulometry and geochemistry of the deposits. Detailed results of each of these will be presented in the appropriate section, but we will summarize our conclusions here.

Using the data from the fauna, granulometry and geochemistry, (figs, 6, 9, 10, 13) we initially thought a three-part division of the sequence was appropriate : an upper part from the surface to 65 cm, a middle part from 65 to 95 cm, and a lower part comprising all deposits below 95 cm. We dated these, on the basis of the radiocarbon dates (table 2) as : 7700 to at least 7300 B.P. ; 8100 to 7700 B.P. ; and 9800 to 8100 B.P. respectively.

However, as stratigraphic analysis of the artifact assemblage progressed, it became increasingly clear that the artifacts from the lower and middle parts

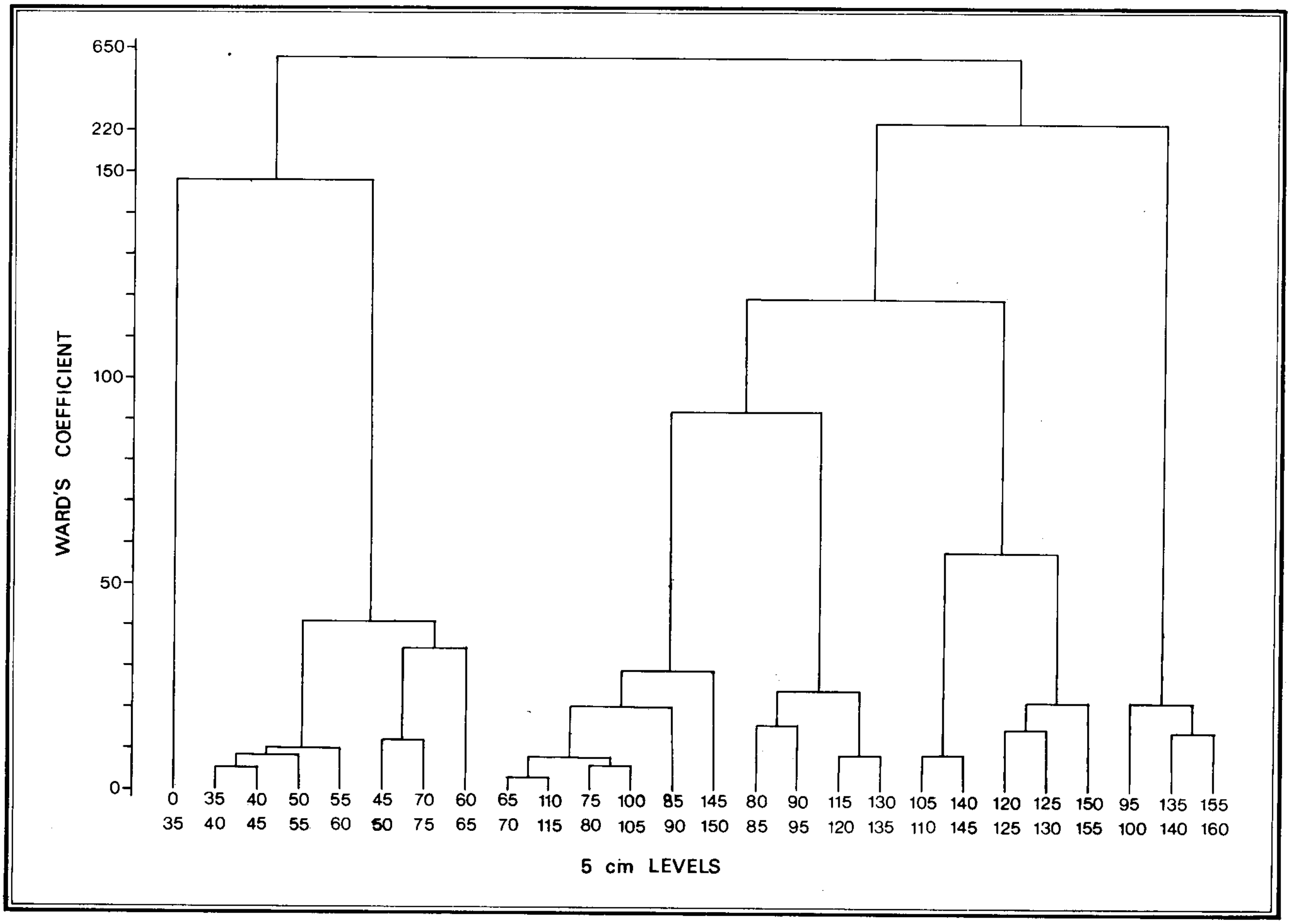

Figure 4. — Dendrogram produced by the CLUSTAN program showing clustering of 5 cm levels at Ain Misteheyia (1973 and 1976 collections) based on the percentage frequencies of eight tool groups.

of the deposit were far more similar to each other than they were to the assemblage from the upper part of the deposits. A number of analyses were undertaken to determine if a two part division was more accurate than a three part one. These analyses used SPSS and CLUSTAN computer programs (13) and involved a series of statistical tests (X^2, t, analysis of variance, etc) and cluster analysis (Ward's method, average linkage) for both metric and non-metric typological and technological characteristics. All these test confirmed our impression that differences within the assemblage below 65 cm were not significant, while differences between the assemblages below and above 65 cm were significant. Thus, we have chosen to divide the AM sequence into two parts, the Upper Levels (UL) and the Lower Levels (LL), and these can be characterised as follows :

— Upper Levels :

From surface to about 65 cm ; high frequencies of shell with *Helicella sitifensis* most abundant ; less bone with more smaller mammals (especially lagomorphs) ; decreased size of tools and debitage ; blades twice as numerous as flakes ; major retouched tool groups are notches and denticulates (30.81%), backed bladelets (24.07%) miscellaneous including pieces with continuous retouch (18.78%) and geometric microliths (8.09%) ; approximate dates of 7700 to at least 7300 B.P.

— Lower Levels :

From about 65 cm to sterile substrate at between 150 and 175 cm ; low frequencies of shell with *Helix melanostoma* most abundant ; more abundant bone with a predominance of larger mammals (*Alcelaphus, Bos, Equus*) ; larger tools and debitage ; equivalent frequencies of flakes and blades ; major retouched tool groups are backed bladelets (32.93%), notches and denticulates (14.75%), miscellaneous including pieces with continuous retouch (15.13%), and burins (13.38%) ; approximate dates of 9800 to 7700 B.P.

Figure 4 is a dendrogram constructed using the Ward's Method of correlation and the CLUSTAN program. The data used were the percentage frequencies for eight major tool groups (endscrapers, perforators, burins, backed flakes and blades, backed bladelets, notches and denticulate, truncations and geometric microliths) calculated on the total number of artifacts in those groups for each 5 cm level. Two clusters are evident : one comprising levels above 65 cm and one comprising levels below 65 cm. There is, it is true, a slight overlap because level 70 - 75 occurs with the upper cluster. However, this is not surprising in that we cannot expect the original stratigraphy to have been exactly horizontal and thus there may well be some slight mixing of levels. All in all, however, this dendrogram appears to confirm our division of the sequence into two major levels.

We shall see, in the pages to follow, how well the data from other analyses agree with this proposed division. We shall argue that the data do agree, and that the best explanation for the changes observed is, in large part, an environmental one ; i.e., that changes in the cultural sequence reflect adjustments made by groups living at AM (and elsewhere) to take best advantage of changing environmental conditions during the Holocene.

(13) NIE (N.H.) et *al.*, — *Statistical package for the social sciences*, 2e edition Mc Graw-Hill, New York, 1975.

WISHART (D.). —. *CLUSTAN user manual.* Inter-University/Research Councils Series, Report n° 47, Edinburgh, 1978.

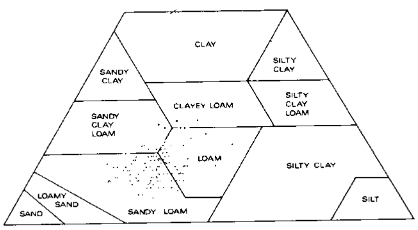

Figure 5. — Sedimentology of Ain Misteheyia (1976).

GEOARCHAEOLOGY OF AIN MISTEHEYIA

INTRODUCTION

At the end of the excavations, bulk soil samples of approximately 1 kg each were taken at 5 cm intervals continuously in columns from the south wall of M8, the south wall of M10, and the north wall of L11. In addition, a series of samples was collected during the excavation of K9, but because these did not provide a column through the entire depth of the deposits (and the other three did) we have decided to present only the results from M8, M10 and L11.

(14) LUBELL (D.) *et al.* — l.l., p. 67.

The samples were processed in the same manner as before (14), with the exception that this time a 2 mm mesh was used instead of 1 mm. From the greater-than-2 mm fraction, a 200 gr sample was hand sorted for shell and bone fragments, flint chips and gravel. Each of these components was weighed. Of the less-than-2 mm fraction, 50 gr were used for granulometric analyses (sand, silt, clay), and 5 gr were used for geochemical analyses (Ca, Na, Mg, Fe, Mn, K, P) of which only the results for Ca, Fe and P are useful. Granulometric analyses were done by the hydrometer method ; geochemical analyses by atomic absorption spectrophotometry with the exception of P which was determinated by the stannous chloride colorimetric method.

SEDIMENTOLOGY

(15) Ibid., fig. 15.

Most of the sample can be classified as sandy loam, and the remainder are loam, sandy clay loam or clayed loam (fig. 5). These results amplify those obtained from the single series of samples analyzed in 1973 (15).

The middle of the deposits (ca. 60 to 110 cm) contain more sandsized (2 mm to 0.63 mm) particles than those above or below. The frequency of particles in the silt-size fraction (0.63 mm to 0.39 mm) tends to increase from top to bottom, and is most abundant between 65 and 75 cm and between 125 and 145 cm. Materials within the clay-size fraction (0.039 mm to 0.0023 mm) are most abundant above 55 cm and least abundant between 90 and 110 cm (fig. 9 and table 3). These data can be summarized as follows : the upper part of the deposit contains less sand-size and silt-size particles but more clay-size particles than the lower part of the deposit.

(16) Ibid., pp. 67-70.

Following on our previous statements (16) one might interpret these data as indicating increased precipitation during the later part of the occupation of AM, although the conditions during the earlier part of the occupation are not all that clear. However, other factors urge caution.

During the analyses we became concerned that a considerable portion of the less-than-2 mm fraction was composed of snail shell fragments. If this were so, it would invalidate palaeoenvironmental interpretations made on the basis of the relative frequencies of sand, silt and clay, and might seriously bias those made on the basis of geochemical analyses as well.

Five samples from the L11 column were submitted to Professor Henry Schwarcz (Dept. of Geology, McMaster University) to determine the percentage of the less-than-2 mm fraction over the depth of the deposit.

« On the average about 9% of the total $CaCO_3$ in the —100, +200 mesh fractions appears to be shell fragments. Presumably other size fractions, particularly in the coarser size range, are more strongly dominated by this component.

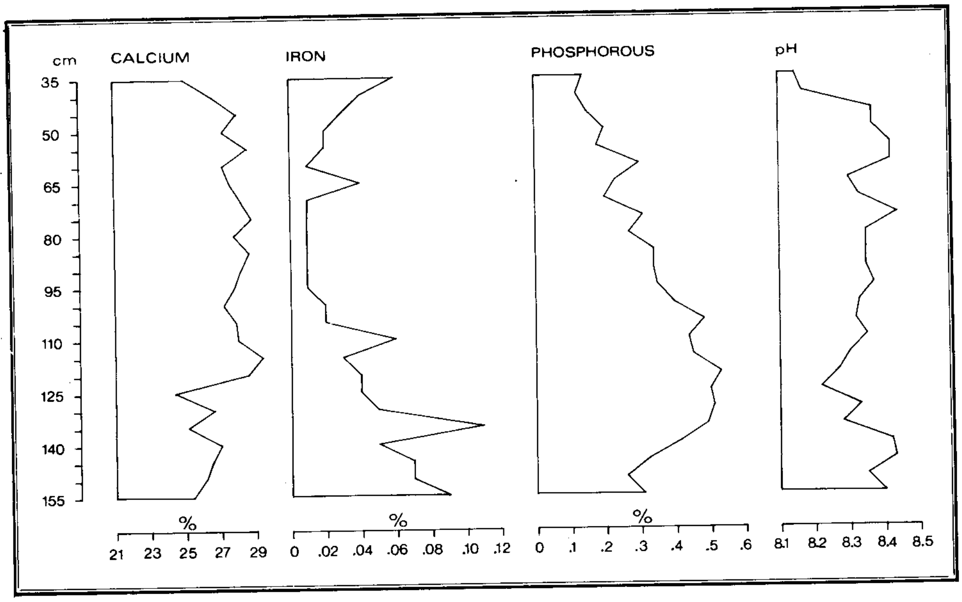

Figure 6. — Geochemistry of Ain Misteheyia (1976). The curves plot the values for X for each 5 cm level in table 4.

I would judge however that the sand and silt fractions contain relatively little shell debris and that volumetrically this component makes up less than 20% of the sediment as a whole, in the less-than-2 mm size range at least ». (17)

(17) SCHWARCZ (H.). — in litt., 7.04. 78.

No satisfactory method was found to segregate the shell fragments from the remainder of the less-than-2 mm fraction of the matrix. Thus, we must accept an error of at least 9% in the granulometric data. In view of this, we will not rely heavily on the frequencies of sand, silt and clay for palaeoenvironmental interpretations in this report.

Nonetheless, variation in the greater-than-2 mm fraction, suggests that our earlier interpretations are largely confirmed by additional data. From figure 6, it is clear that gravel and shell fragments vary inversely in the greater-than-2 mm fraction. The marked decrease in shell fragments and increase in gravel between 80 and 95 cm requires explanation, and two possibilities seem most likely : either non-occupation of the site, or environmental change (or perhaps both).

If the first were true, one would expect to find some change in the cultural stratigraphy : either an increase in the density of heavier materials (flint, bone, rock) not carried away by erosion or deflation, or a decrease in cultural materials *per se*. Neither of these is the case.

If the second were true, and the increased amount of gravel is a reflection of increased aridity and greater slope wash from the Garat El- Misteheyia, confirmation should be forthcoming from, e.g., the faunal remains and other geomorphogical and palaeobotanical data. This appears to be the case. The former are discussed in the section of archaezoology, the latter in the conclusions.

GEOCHEMISTRY

The geochemical model proposed in our first report (18) is, for the most part, confirmed by analyses of samples collected during the 1976 excavations. Above 50 cm and below 135 cm the following relationship seems to occur : decreased calcium and phosphorus, increased iron and higher pH (fig. 6 and table 4).

(18) LUBELL (D.) *et al.*, — l.l., pp. 68-69.

However, these relationships, which are based on much more data than before, are no longer so clear as they were. Nonetheless, in combination with the data from sedimentological analyses (see above) and archaeozoological studies (see below), they do seem to confirm our previous assessment of the palaeoecological history of AM and environs. Thus, we suggest that the earliest and latest phases of occupation took place under more humid conditions while the period represented by the middle of the deposits was drier. We emphasize that these are relative estimates and we are not now prepared to give figures for either rainfall or temperature.

In the analyses conducted this time, we have attempted to distinguish between the organic carbon and the inorganic carbon in the deposits at AM. The 1973 analyses were for total carbon. We have done this in order to try and estimate the amount of carbon which might reasonably be said to come from snail shell, wood, bone and flesh, as distinct from that derived from the limestone bedrock and calcareous soil of the region.

A series of soil samples and several modern *Helix melanostoma* shells were submitted to E.T. Leventhal (Department of Chemistry, University of Toronto) for analysis by X-ray Photoelectron Spectroscopy (19). Using this method she was able to distinguish between organic and inorganic carbon (fig. 8) and thus the ratio of organic to inorganic carbon in the various samples could be plotted (fig. 7). In addition, Leventhal determinated that the Cinorg/Corg ratio in modern *H. melanostoma* shell is 0.26 for the inner surface, and 0.44 for gross crushed shell (the latter is probably higher due to more organic carbon in the periostrakum). Leventhal suggests, that while experimental error cannot be excluded, it seems reasonable to conclude that crushed shell contributed 60 - 70% of the organic carbon in the deposits (20). Thus, all things being equal, increased amounts of crused shell (and perhaps whole shell as well) should be correlated with increased quantities of organic carbon in the deposits but is not apparent in the upper portion. In figure 9, low values indicate high organic carbon while high values indicate low organic carbon. Thus, in M8 and L11 (and perhaps K9) there is more organic carbon in the lower part of the deposits than in the upper. Yet, it is precisely in the lower part of the deposits that there is less shell but more bone. Thus, higher amounts of organic carbon seem more likely to result from increased decay of bone and flesh than from snail shell.

(19) Cf. Leventhal (E.T.) and Thompson (M.). — X-ray photoelectron spectroscopy as an analytical tool in archaeological chemistry. *Journ. Intern. Instit. for Conservation - Canadian Group*, t. 3, 1978, pp. 16-20.

(20) Leventhal (E.T.). — in litt., 27.03.80.

Other factors may, of course be important here (e.g. rodent activity, slope, the human burial in K8) ; on present evidence it is not possible to isolate these. Nonetheless, it does appear that increased amounts of snail shell can be correlated with increased quantities of inorganic carbon, especially in the upper portion of the deposits. It is of course, possible that pedogenic processes are in part responsible for these correlations ; e.g. the low percentage of calcium above 45 cm could be the result of increased leaching near the surface (see fig. 7).

BIOARCHAEOLOGY

MOLLUSKS

INTRODUCTION

To avoid unnecessary repetition the reader is referred to previous papers (21) for information on the accepted systematics, the variability, the ecology, the ethology, the food value, the frequencies and etc., of the snail species encoun-

(21) Lubell (D.) *et al.* — 1.1.
Id., The Capsian escargotières. *Science*, t. 191, 1976, pp. 910-920.

tered in the various escargotières. The 1976 field season provided new data on a few topics only, and these are discussed here.

MARINE SHELLS

Special mention should be made of the presence of a marine gastropod fragment in test pit 1 at OT ; the fragment is very small and cannot be identified. At AM there is a worked elongate and polished plate cut from the outer shell wall of a large unidentified marine gastropod (described in the section on Non-Lithic Artifacts). A polished *Columbella rustica* from the same site has a perforated spire and was apparently used as a bead (also described under Non-Lithic Artifacts).

Marine shells (*Columbella rustica, Nassa gibbosula, Pectunculus pilosus, Cypraea lucida*) have been found in various Capsian sites (22). They were used for several purposes and probably point to trade with human groups living near the sea.

(22) VAUFREY (R.). — *Préhistoire de l'Afrique, I, le Maghreb.* Publ. Instit. Hautes Etudes, Tunis, t. IV, Paris, 1955. MOREL (J.). — La faune de l'escargotière de Dra-Mta-El-Ma-El-Abiod (Sud-Algérien). *L'Anthropologie,* t. 78, 1974, pp. 299-320.

BURNED SHELLS

Various suggestions have been made concerning the manner used by Capsians to prepare snails for consumption. Exposure of the animals either during boiling or roasting will loosen the muscles so that the animals can de extracted easily from the shell. In 1973, we studied the various traces left by fire on land snaill shells. These are, in order of increasing intensity : (1) brown coloration resulting from incomplete burning of organic matter ; (2) more or less complete burning with formation of blackish and blueish-grey zones ; (3) complete oxidation of organic material and formation of calcium oxide (very white and powdery) ; (4) distortion, fissuration and desquamation of the shell. We argued that such signs could not disappear completely. Indeed they are said to have been observed in a Palaeolithic site in Germany (23). Hence their absence in the escargotières sampled by us until 1973 would indicate that the shells were heated in such a way that there was no direct contact with fire, heated rocks or coals.

(23) FALKNER (G.). — Die bearbeltung ur-und fruhgeschichtlicher mollusken-funde. In, BOESSNECK (J.), (ed.), *Archaeologie und Biologie, Archaologisch-Biologische Zusammenarbeit in der Vorund Frühgeschichtsforschung, Münchener Kolloquium* 1967, Deutsche Forschunggemeinschaft, Forschungberichte 15, Wiesbaden, 1969, pp. 112-140.

However, appreciable quantities of snails (5 - 60 %) with the various stigmata of fire described above were collected in certain levels at KZ. These snails are often in very bad condition and frequently it is possible to crush them into between thumb and index without effort. There can hence be little doubt that in open-air sites most burned shells are completely destroyed by various post-depositional agents and that only a few slightly burned shells may eventually survive as, for example, at Dra-Mta-el-Ma-el-Abiod, where Morel (24) records that less than 3 % of the shells are burned.

(24) MOREL (J.). — Sur certains aspects de la vie des populations capsiennes (épipaléolithique nord-africain). Comm. *9è Congrès U.I.S.P.P.*, Nice, 1976.

Therefore, the absence of burned shells at AM, OT and other unprotected sites can not be used as proof that shells were not exposed directly to fire or heated objects. However, the fact that in better preserved sites such as KZ shells are burned only in certain levels, indicates clearly that Capsian groups did not regularly prepase snails by roasting. It seems more likely that shells were burned after consumption, when they were already part of the cultural deposits in which or on which hearths were built. The almost complete destruction of burned shells in open-air sites furthermore poses the problem how far estimates of shell numbers for those sites are reliable.

ABSOLUTE AND RELATIVE FREQUENCIES OF SNAILS PER LEVEL

At AM snails were counted in each square and level in a known volume of sediment. When results for each square were plotted they showed comparable

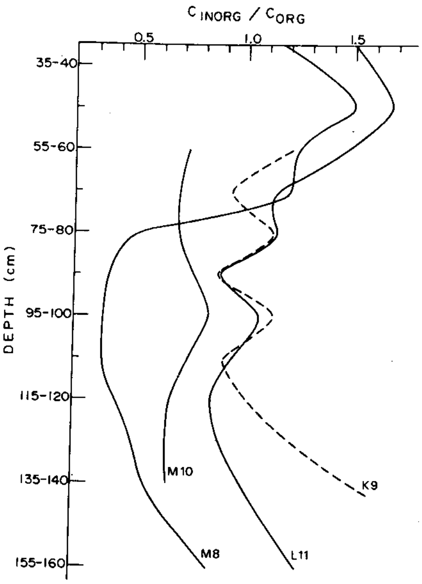

Figure 7. — The ratio of the amount of inorganic carbon (as carbonate) to organic carbon (as hydrocarbon) *vs* depth for four soil columns at Ain Misteheyia.

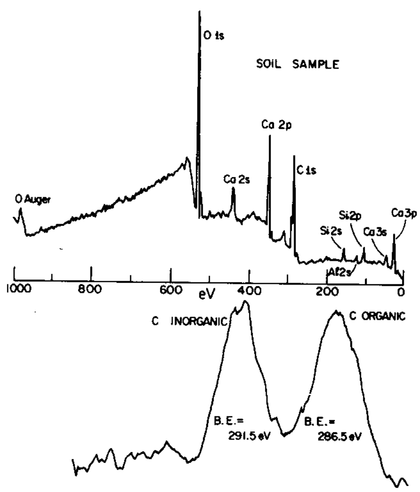

Figure 8. — XPS (X-ray photoelectron spectroscopy) spectra of a sample from Ain Misteheyia deposits.

trends. Therefore, the data were pooled and the average results calculated and plotted. These are illustrated in fig. 10, which gives the average number of snails per quadrant (= one fourth or a square per 5 cm level), as well as the average percentage of *Helix melanostoma* with respect to the total of edible snails (*H. melanostoma, Helicella sitifensis, Leucochroa candidissima, Otala* spp.). The graphs illustrate clearly : (1) a steady increase in the number of snails per 5 cm level ; and (2) a steady decrease in the importance of *Helix melanostoma,* which corresponds to an increase in the less productive (i.e. having less food value) and small species (*H. sitifensis, L. candissima, Otala* spp.). The most plausible explanation for the inverse correlation of the amount of snails to the percentage of *Helix melanostoma* is that this particular species was, during the period represented at AM, not easily obtained by the Capsian collectors, who therefore included other frequent species in their diet. The pattern in levels above 40 cm may however be less reliable because of taphonomic bias (pedogenic change, lag deposit formation).

These graphs do not reflect changes in apparent rates of deposition (see figure 3). If we were to adjust the curves in accordance with these apparent rates, we would have to combine at least four levels into one between 95 cm and 65 cm. To do this would produce a marked rise in the frequency of whole snail shell in these levels. However, the curve for *Helix melanostoma* would show little change since the percentage of this species is quite consistent among adjacent levels, as are the number of shells of all species. Another way to visualize the changes over time would be to divide frequencies for number of shells below 95 cm by four.

The results from the 1976 excavations at AM are basically comparable with those obtained in 1973 for square J9. In this square a steady decrease of *H. melanostoma* towards the top was seen. At the same time *Helicella sitifensis* showed a steady increase, while *L. candidissima* showed no clear trend. As snails at AM were collected mainly in the plain, a decrease in *H. melanostoma* should be inversely correlated with an increase in *Helicella sitifensis* ; but *L. candidissima,* as a snail more often collected on the slope, would be less affected.

According to the radiocarbon dates (table 2), the sequence at OT can be correlated with the upper part of AM. As the uppermost levels at AM are probably biased, the evidence from OT, which appears less biased, is very welcome. It indicates (fig. 11) that : (1) snail collecting became a still more important activity ; but that (2) the importance of *Helix melanostoma* increased again from ca. 7600 BP to percentages comparable with those in the LL at AM.

KZ represents a still younger phase of Capsian occupation, overlapping and following OT. Here again (fig. 12) the amounts of shells are high, as are the percentages of *H. melanostoma.* Moreover, if we adjust the counts below 130 cm to accord with a 67 % compaction rate as per the upper levels at AM, the frequency of snails rises to between 200 and 1000 per compacted level ! Above 120 cm at KZ, the apparent deposition rate is 6.7 cm/100 yrs. This is one half that at AM between 95 and 65 cm. Therefore, to adjust the quantity of shells for these at KZ we would have to divide by two. This conversion would reduce the number of snails per level to between 20 and 340. This is a marked decrease over the levels below 130 cm.

Examination of the *Helix* curve for OT (fig. 11) above 135 cm shows a somewhat higher frequency of this species than below 130 cm at KZ (fig. 12). We think these deposits are at least partially contemporary. This differential

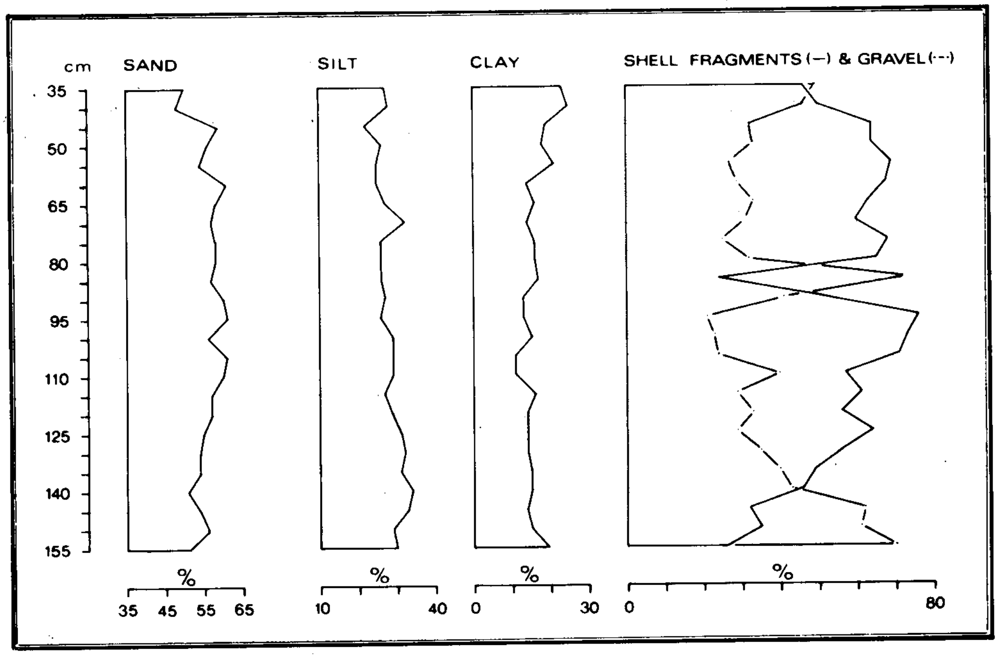

Figure 9. — Granulometry of Ain Misteheyia (1976). The curves plot the values for X for each 5 cm level in table 3.

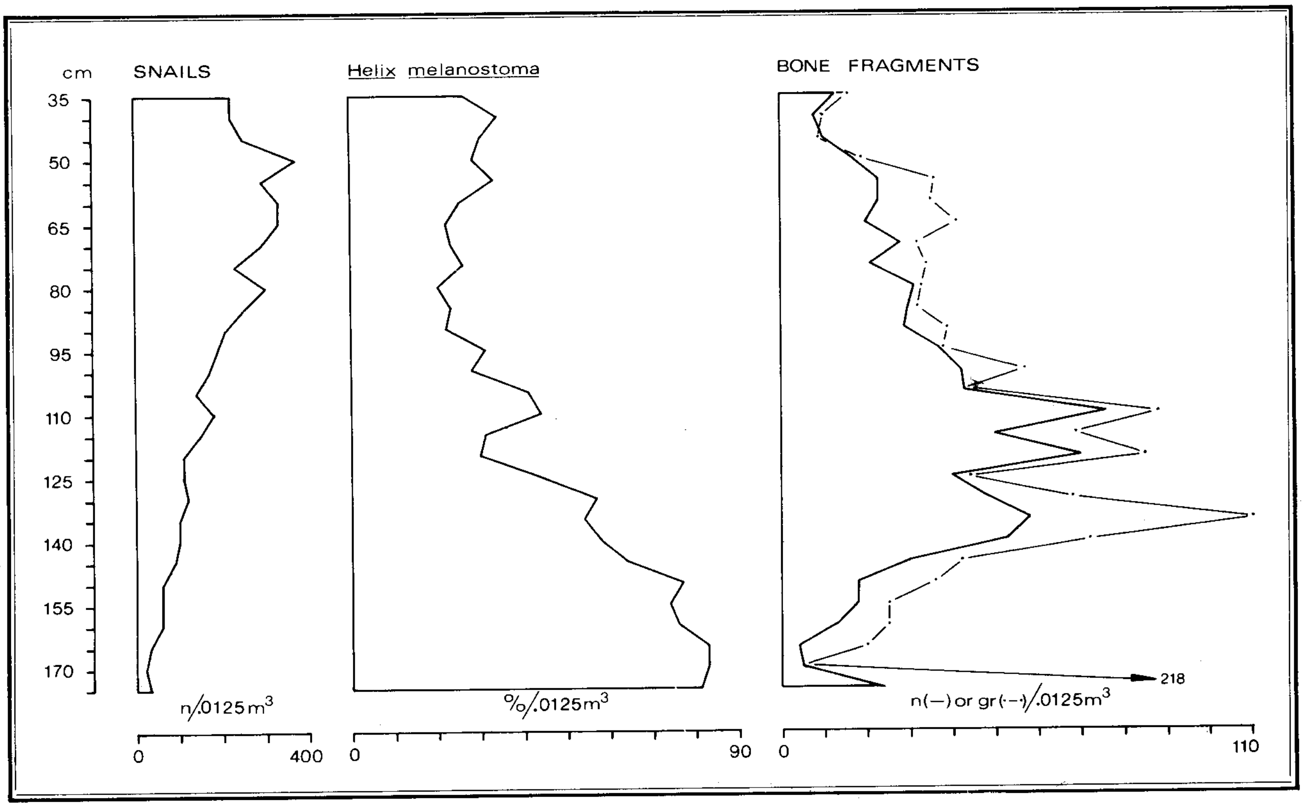

Figure 10. — Frequencies of whole shell, *Helix melanostoma* in reference to other land snail species, and bone fragments in the Ain Misteheyia (1976) deposits. Curves plot the means per quadrant (25 cm x 25 cm x 5 cm) for all excavated squares.

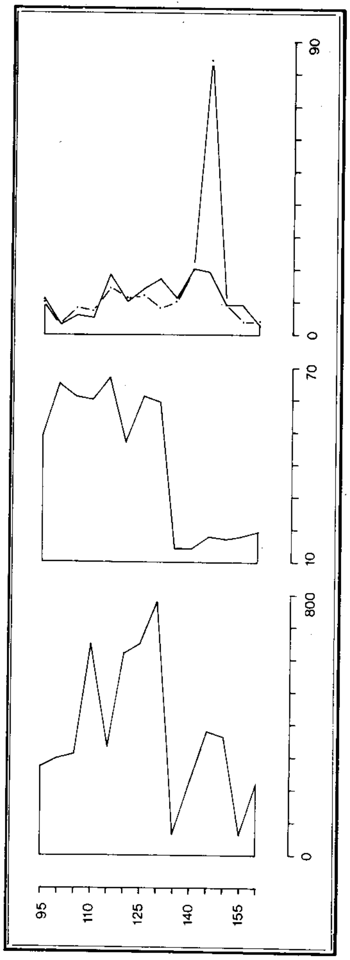

Figure 11. — Frequencies of whole shell, *Helix melanostoma* in reference to other land snail species, and bone fragments in test pit 2 at Oued Télidjène A (1976). For key see figure 10.

decrease in snails per time unit above 130 cm at KZ corresponds to a marked increase in the frequency of *H. melanostoma* (up to 84 %). This suggests a decrease in snail collection with an emphasis on larger specimens. This implies a pattern of preferential collection towards the end of the Capsian occupation in the region.

However, because compaction at KZ appears to be less marked than at AM or OT, it is possible that the fluctuations in the KZ curves reflect the vagaries of sampling during a test excavation. Further work at this sire in 1968 (to be reported separately, but see fig. 2) suggests this is, indeed, true.

In sum, the evidence from these sites suggests the following sequence of events : (1) initially snail collection was a minor activity for Capsian groups, and *H. melanostoma* was the preferred species ; (2) with the onset of more arid climate at ca. 8200 BP, snail collection increased, and since the abundance of *H. melanostoma* apparently declined due to reduced grassland habitat, preference shifted to smaller species (e.g. *Helicella sitifensis* and *Leucochroa candidissima*) which lived either in more humid but very localized habitats or at higher elevations ; (3) as climate improved, *H. melanostoma* became more abundant again and re-appears in the archaeological record as the most frequent species ; (4) a final decrease in snail collection may be evidenced in the upper part of the KZ deposits but this is far from definite.

VERTEBRATES

INTRODUCTION

Bones were either hand picked during excavation or retrieved through sieving. As the deposits were very loose, wet sieving was unecessary. The mesh size of the screens varied between 1.5 and 3 mm. According to recent research on sampling bias (25) such mesh sizes give a better than 95 % recovery rate for animals weighing more than 25 kg (i.e. larger than smaller carnivores, lagomorphs, rodents, insectivores, lizards, etc.). Since we consider lizards and rodents to be mostly intrusive in Capsian sites, and as smaller carnivores are generally not frequent game, any sampling bias would concern mainly the lagomorphs which are well represented in the Capsian fauna.

The osseous material from all the sites sampled is very fragmentary and identification rates (% of identified bone) is low, as illustrated in table 5 which summarizes the weight and number of osseous fragments recovered from the three sites as well as some of their relations. For OT1 it is preferable to use the data between brackets because marked sample bias is caused by the presence of a large bovid astragalus in an assemblage otherwise composed of small remains. If this correction is accepted, we note the following distinct trends : (1) a marked decrease in average weight (and hence size) of the identified fragments at OT and KZ ; (2) a correlative marked increase in the percentage of the number of identified fragments. These phenomena probably reflect the increased importance of small game (lagomorphs, gazelle) as well as better preservation, especially at KZ. While the low percentage of identified remains may cast doubt on the representativity of the identified assemblages, it is indicative of good recovery rates for fragmentary material.

(25) CASTEELS (R.W.). — Some biases in the recovery of archaeological faunal remains. *Proc. Prehist. Soc.*, t. 38, 1972, pp. 382-388.

TAPHONOMY

The marked fragmentation is due to cultural factors (butchering ; breaking of bones for marrow extraction), and to the various taphonomic processes which affect open-air sites. Indeed, bone preservation at AM and OT is far worse than at KZ. Marked fissuration of the bone into splinters is the characteristic result of insolation and precipitation, both of which produce intermittent desiccation and leaching of bone exposed on the surface. Subsurface leaching is due mainly to percolating water but also to pedogenic processes, especially in the upper levels at AM and OT.

The effect of plant roots on the surface of practically all the bones at AM and OT (vermiculations) has already been discussed. No doubt bioturbation by plants roots also contribued to the fragmentation of bone. Gerboas and pseudo-artifacts, which could be unintentionally produced by man, also suggest a destructive influence.

CHANGES IN BONE FREQUENCIES

The marked differences in the « productivity » of bones remains from AM, OT and KZ summarized in table 6 are due to changes in the amount of bone incorporated into the deposits as well as the lower compaction rate at KZ. Furthermore, the 1976 excavations at AM produced approximately three times the amount of bone recovered were in the upper 40 cm of the site in which bone concentration is low. Thus, our previous calculations which estimate the importance of game in the diet at AM, underestimate mammals as a protein source when compared to land snails (26).

(26) LUBELL (D.) *et al.* — l.l., 1975. pp. 95-96.

Vertical changes in the frequency of bone at AM, OT and KZ are illustrated in figs. 10, 11 and 12, in which both average number of fragments and average weight per quadrant for each 5 cm level are given. It is not surprising that the graphs show comparable trends, because the number of fragments and their total weight are directly related. At AM following subdivisions can be observed :

(1) 0 to 45 cm : low bone productivity, as a continuation of (2) but probably affected by destruction of bone due to pedogenic and related processes ;

(2) 45 to 100 cm : low bone productivity ;

(3) 100 to 145 cm : high bone productivity ;

(4) 145 to 175 cm : low bone productivity near the base of the site with much re-working of pre-Capsian deposits.

Thus, (1) and part of (2) correspond to the UL as previously defined, while most of (2) and all of (3) and (4) are equivalent to the LL. We caution that there is marked taphonomic bias in (1) and (4).

The apparent deposition rate in the upper AM sequence (45 to 100 cm) is at least four times higher than in the lower part (fig. 3). If we correct bone frequencies to take this change into account, it appears that the absolute amount of bone per volume and time unit does not decrease ; and in fact, may even increase slightly in the upper levels ! The significance of the constant amount of bone incorporated into the deposits per time unit, or its slight increase towards the top, is difficult to gauge. No doubt, a marked increase in deposition rate increases the chances of bone preservation. But the quantitative relation between rates of deposition and preservation cannot be measured with the available evidence. Hawever, we feel that, roughly speaking, preservation rates and deposition rates may well be related on a one-to-one basis ; i.e. that any increase in deposition rates will produce a comparable increase in preservation rates. If this intuitive assumption is correct, it would seem that the amount of bone per time unit at AM decreased markedly in the upper levels rather than increased, but that this decrease is masked by an appreciable increase in the amount of bone preserved.

At OT, where the deposits correspond in part to the top of the AM sequence, bone productivity is lower (fig. 11). At KZ (within the shelter only), bone productivity is lower still, although is may be useful to distinguish between an upper level (down to 125-130 cm) and a lower level (fig. 12). In the latter, where compaction appears to be slight, bone density can be re-estimated to accord with the upper AM sequence (65 to 95 cm). In this case, bone density would increase to levels comparable with OT. While compaction did occur to some extent in the upper levels at KZ, bone density is still very low.

These data suggest that we can observe a trend over time towards lower frequency of bone per time unit in the AM-OT-KZ sequence (see tables 55 and 56). This trend appears to corroborate our assumption that a marked change in bone preservation rates in the upper AM sequence accounts for the high number of bone fragments per time unit. Moreover, the increase in snails which has already been discussed, suggests a change in subsistence pattern : i.e., an increased consumption of snails and, hence, at least a change in the specific ratios of animals represented in the samples (see table 56). Support for this hypothesis is forthcoming from data on the species represented in the sequence.

However, a note of caution should be added. Accumulation rates are rough estimates only, and the variations of bone frequences in the sequences at OT1 and KZ are slight. Furthermore, if we take into account that accumulation rates may be directly related to the increased collection of snails, changes in bone frequencies may only reflect the increasing importance of snail collecting. However, theoretically, the adoption of snails as a regular protein source should bring about a decline of game as a protein source. Hence we think the increase in snails is related to a real, but possibly slight, decrease in the importance of bone (i.e. game). This is also suggested by changes in the game assemblages.

DESCRIPTION OF SPECIES (27)

FISH

A small fish vertebra (L. body ± 2.9 mm) was found during processing of the bulk sample from M8, 110 to 115 cm at AM. This is the first time fish remains have been reported from a Capsian site. Small freshwater fish are present today in wadis with a perennial water supply, and may have been occasional elements in the Capsian diet. However, this vertebra could be intrusive. It could, e.g., have been brought to the site in the stomach contents of an animal such as either wild cat or jackal.

TURTLE (*Testudo graeca*)

Turtle is represented mainly by carapace fragments at the three sites. The common turtle of Algeria was described as *T. mauritanica,* but according to Wermuth and Mertens (28) this form belongs to *T. graeca*. Turtle was not found at AM in 1973, but is common in the escargotières.

(27) Former studies on Capsian faunal assemblages referred to in this section are listed here and will not be repeated.

BOUCHUD (J.). — La faune, In, CAMPS-FABRER (H.), *Un gisement capsien de faciès sétifien, Medjez II, El-Eulma (Algérie)*, Paris, C.N.R.S., 1975, pp. 377-391.

LUBELL (D.) *et al.* — 1.1., 1975.

MOREL (J.). — 1.1., 1974.

ROMER (A.S.). — Pleistocene mammals of Algeria : fauna of the paleolithic station of Mechta-el-Arbi. *Bull. Logan Museum*, n° 1, 1928, pp. 80-163.

Id., Mammalian remains from some paleolithic stations in Algeria. *Bull. Logan Museum*, n° 5, 1938, pp. 163-184.

VAUFREY (R.). — op. 1.

(28) WERMUTH (H.). and MERTENS (R.). — *Schildkröten, Krokodile, Brückenechsen*. Fischer, Jena, 1961, p. 209.

LIZARD (*Laterca* sp.)

Some fragments of pleurodont mandibles from AM and OT2 can be ascribed to larger lizards of the genus *Lacerta,* but a definite identification is impossible as we lack comparative material. From the Capsian, *L. ocellata, L. tepida ?* and *Lacerta* sp. have been recorded. These lizards do not necessarily represent food debris, but are probably penecontemporaneous or post-Capsian intrusives.

SMALLS BIRDS

Birds are represented at AM my a vertebra, a fragment of carpometacarpus, an incomplete humerus and a third phalanx. The carpo-metacarpal and the phalanx pertain to birds about the size of the Eurepean woodpigeon. The humerus is derived from a smaller bird species (size of thrushes). Hence the material represents two species, but no identifications were attempted, because we lack comparative material. A list of birds found in the Capsian is given elsewhere

OSTRICH (*Struthio camelus*)

Osrich is represented only by eggshell fragments, some of which have been worked (into beads or decorated). Ostrich eggshell fragments are frequent in many Capsian sites, but bones of this species are almost never found. Camps-Fabrer (29) records ostrich bones from only one Iberomaurusian and six Neolithic sites. In a later publication she refers to finds of ostrich feathers and bones in the Capsien typique of Abri Clariond and ostrich bones in the Capsien supérieur at Lala (30).

HEDGEHOG (*Aetechinus algirus*)

An incomplete left lower jaw from AM represents a hedgehog slightly smaller than the European *Erinaceus europaeus.* An incomplete tibia compares well with its homologue in the same species, but appears to be more slender. No doubt this material represents *A. algirus,* which is slightly smaller than *E. europaeus* (31). Hedgehogs are a common element in Capsian faunas where they appear under names *Erinaceus algirus, Aetechinus* sp. and *Aetechinus algirus.*

GOLDEN JACKAL (*Canis aureus*)

A canid is represented at AM by an upper third incisor, a poorly preserved incomplete metapodial and a first phalanx, which can be ascribed to a canid of about 45 cm at the withers. At OT, an M2 with canid morphology measures 18.2 mm. No doubt these specimens pertain to a jackal. Jackal has already been found at AM and identified as *Canis aureus.* Former records of canid finds refer to *Canis lupaster, C. anthus* and *Canis* sp. Very probably most of these records can be grouped as *C. aureus.* This species can be divided into several geographical races but probably also exhibits much phenotypical variability as to body size.

WILD CAT ? (*Felis libyca ?*)

A small felid is represented by a canine in OT2, which can be tentatively asigned to wild cat. This species has been recorded from the Capsian as *Felis ocreata* and *F. libyca,* but not frequently.

ZEBRA (*Equus mauritanicus*)

An equid is represented mainly by most fragmentary teeth, tooth fragments and some postcranial remains at AM and OT. Measurements follow :

(29) CAMPS-FABRER (H.). — *La disparition de l'autruche en A⁺ique du Nord.* Trav. C.R.A.P.E., Paris, A.M.G., 1963.

(30) Id., *Matière et art mobilier dans la préhistoire nord-africaine et saharienne.* Mém. C.R.A.P.E., nº 5, Paris, A.M.G., 1966.

(31) MALEC (F.) and STORCH (G.). — Der wanderigel *Erinaceus algirus* Duvernoy and Lereboullet, 1942, von Malta und seine beziebungen zum ordafrikanischen herkunftsgebiet. *Saugetierk. Mitteil.*, t. 20, 1972, pp. 146-151.

Upper jugal teeth (not P2 or M3), L.	: 29	28	26	25.5	25	24	22
lower id., L.	: 25	24					
P2, L.	: 28.5						
M3, L.	: 27.5	27.5	27.2				
scapula, max. D. articular surface	: 50						
min. D id.	: 39						
mc/mt, TR.D. dist.	: 38	44					

The teeth exhibit some sebrid characteristics such as concave to flat interstyllar valleys (upper teeth), less rounded to pointed metastylids and deep lingual sinuses (lower teeth). Thus it is probable that all the material can be ascribed to *Equus mauritanicus.* This zebrid equid is a typical Capsian game animal and has already been recorded at AM. Romer cites *Equus burchelli mauretanicus,* as well as *Equus asinus africanus* at a few sites, but Vaufrey states that most of the records in North Africa of *Asinus africanus* are invalid and that they refer to *E. mauritanicus.*

HARTEBEEST (*Alcelaphus buselaphus*)

The most frequent game animal in the collection is certainly hartebeest, of which teeth, jaw fragments, one horn-core, and various postcranial elements (mainly metapodials, wrist and knuckle bones, metapodials, phalanges) were found. Measurements are given below :

Ps-P4, L	:± 32									
M3 L.	: 30.5									
radius TR.D. prox.	: 55									
TR.D. dist.	: 48									
humerus TR.D. dist.	: 53	53	51.5	± 51	50	47				
mc, TR.D. prox.	: 42									
TR.D. dist.	: 42									
tibia, TR.D. dist.	: 48	46.5	46	45	42	52				
calcaneum, TR.D. prox.	: 18									
astragalus, H.	: 51	52.5	50	49	46					
TR.D.	: 34	34.5	35	34	21					
naviculo-cuboid, TR.D.	: 44	43	41.5	38	37,5					
mt, TR.D. prox.	: 38	± 36	35.5	35	35					
TR.D. dist.	: 41.5	40	38.5	38						
Ph I, L.	: 61	58								
TR.D. prox.	: 21	20.5	20	19						
TR.D. dist.	: 19.5	19	19	18.5	17					
Ph. II, L.	: 39.0	36.5								
TR.D. prox.	: 19.5	18	20.5	19.5	19	19	18.5	18	17.5	17.2
TR.D. dist.	: 17.0		16.5							
Ph. III L.	:	52	50	48	47	45.5				
TR.D. articular surface	:	16.5	17.8	15,5						

The measurements can be compared with those given hartebeest from Uupper Paleolithic sites in the Northern Sudan and in Egypt (32). Hartebeest has been recorded from the Capsian as *Bubalis boselaphus, Alcelaphus bubalis* and *Alcelaphus buselaphus.*

(32) GAUTIER (A.). — Mammalian remains of the northern Sudan and southern Egypt. In, WENDORF (F.) et al. — *The prehistory of Nubia, vol. I,* Dallas, Southern Methodist Univ. Press, 1968, pp. 80-99.

Id., Freshwater mollusks and mammals from Upper Palaeolithic sites near Idfu and Isna. In, WENDORF (F.) and SCHILD (R.). — *Prehistory of the Nile Valley.* New York, Academic Press, 1976, pp. 349-364.

LARGE BOVID (*Bos primigenius* and *Homoïoceras antiquus ?*)

Big bovides are rather well represented at AM. The remains found include isolated teeth and postcranial (mainly distal) leg elements. Measurements on a few specimens follow.

M1/2 L.	:	29.3	28.2	
P4 L.	:	25.5	± 23.5	
mt, TR.D. prox.	:	67		
TR.D. dist.	:	82	81	79
astragalus, H. max.	:	95	90	
H. med.	:	87	81	
TR.D. dist.	:	63	58	
naviculo-cuboid, TR.D.		68		

Two heavily worn upper molars are characterized by (1) the absence of interfossettes, (2) the absence of a pli prefossette as well as pli protoloph, (3) a well defined pli hypoloph, (4) narrow endostyles attached mose towards the protocone side than the metaconule, (5) not very prominent para-and metacones. Two P4 are characterized by anterior cavities completely opened medially. Following Gentry and Churcher (33) this set of diagnostic features is indicative of *Bos*, but not *Homoïoceras*. Another upper molar is comparable with those already described but has no pli hypoloph.

The other are very fragmentary and cannot be assigned definitely to *Bos* sp. or *Homoïoceras* sp., but as the teeth are attributed to *Bos primigenius*, most other remains probably also represent this species.

From the Capsian, *Bos primigenius mauretanicus*, *Bos taurus ibericus*, *Bos primigenius* and *Homoïceras antiquus* have been cited. *Homoïoceras antiquus* is very rare, as it was only reported at Relilai and at Medjez II ; Moreover the record at Medjez II is not substantiated by a description of diagnostic features. The *Bos* records indubitably all refer to *Bos primigenius*. In Neolithic times the giant buffalo would become more frequent, but the identifications have been questioned.

DORCAS GAZELLE (*Gazella dorcas*) AND ATLAS GAZELLE (*G. cuvieri*)

Gazella is represented at the three sites by a small number of specimens only. They include a horncore, two isolated teeth, and various postcranial remains (mainly distal leg elements : astragali, metapodial fragments, phalanges). These remains have been compared with those of recent *G. dorcas* (Egypt) and can be separated without too much difficulty into a group comparable in size with *G. dorcas* and a second group containing remains attributable to a gazelle about 1.2 to 1.3 times larger than *G. dorcas*. No doubt these groups correspond to *G. dorcas* (height at the withers 53-56 cm) and *G. cuvieri* (66-71 cm) also known as the Atlas or the Edmi gazelle (34). Measurements for both forms are tabulated below.

(33) GENTRY (A.W.). — *Pelorovis oldowayensis*. Reck, an extinct bovid from east Africa. *Fossil Mammals of Africa*, n° 22, Bull. Brit. Mus. (Nat. Hist.), *Geology*, t. 14, n° 7, London, 1967.
CHURCHER (C.S.), *Late Pleistocene vertebrates from archaeological sites in the plain of Kom Ombo, Upper Egypt*. Life Sciences Contributions, n° 82, Toronto, Royal Ontario Museum, 1972.

(34) For *G. dorcas* and *G. cuvieri* cf. SCLATER (P.L.) and OLDFIELD (T.), *The book of antelopes, Vol. I. to IV*. London, Porter, 1894-1900. For the Edmi gazelle, cf. HARPER (F.), *Extinct and vanishing animals of the old World*. Spec. Publ., Amer, Comm. Intern. Wild Life Protection, no. 12, New York, 1945.

female horncore TO.D. base	: 13.8	—			
astragalus, H.	: 32.8	23.8 (c)			
D.	: 19.9	14.2 (c)			
mc, TR.D. prox	: 24.1				
TR.D. dist.	: 22.4 (a)	20.7	21.2 (a)		
mc/mt, idem	: 22.3 (b)				
mt, TR.D. prox.	: 19.9				
ph. I, L.	: 44.2	39.3	—		
TR.D. diaph.	: 9.3	—	±8.4		
ph. II, L.	: 26.4	24.3	23.3	22.8	
TR.D. diaph.	: 7.8	7.4	7.1	6.3	
ph. III, L.	: 29.4	28.6	—	26.5 (c)	25.3 (c)
	9.3	9.3	9.7	7.6 (c)	7.4 (c)

(a) worked bone
(b) subadult
(c) dorcas gazelle

The material from the AM 1974 excavations in which no Atlas gazelle was thought to occur was reinvestigated in the light of the 1976 collections. It appears that the material described as *Gazella* belongs to *G. dorcas*. Moreover some of the specimens identified as *Ammotragus lervia* represent *G. cuvieri*. It includes the second phalanx listed separately in table 11 of our earlier report because of its slender form, as well as a first phalanx with a transverse distal diameter of 11.0 (second column of same table) (35). In all three sites remains of the Atlas gazelle seem to predominate ; this is due either to differential preservation or to ecological factors, which will be discussed later. Both *G. dorcas* and *G. cuvieri* have already been recorded from the Capsian by various authors ; according to these sources *G. dorcas* is at least as frequent as, or even more frequent than, *G. cuvieri*.

(35) cf. LUBELL (D.) *et al.*, 1.1., 1975. A.G. would like to ascribe the misi dentification to the fact that at the time of the study he was still recovering from viral hepatitis contracted during the 1973 field season in Algeria.

BARBARY SHEEP (*Ammotragus lervia*)

Some miscellaneous fragments (tooth, axis, humerus, calcaneum, metatarsus, phalanges) have sizes varying from approximately small hartebeest to mostly somewhat larger than *Gazella cuvieri*. These remains are thought to represent *Ammotragus lervia* in which we include the remains attributed to *Ovis* sp. by former authors, which in our opinion represent small females of Barbary sheep. This collection includes five unfused phalanges, which may pertain to young hartebeest ; their general proportions, however, are similar to Barbary sheep. Measurements could be made on only a few specimens.

horncore, base diameters	: 78	x 75
humerus, TR.D. dist.	: 47	
astragalus, H.	: 43.5	
TR.D.	: 29	
mt, TR.D. prox.	: 26.5	
Ph. II, L.	: 44	

The horncore fragment is probably derived from a robust male ; the diameters of the horncore of a 4 year old male from the Antwerp Zoo are 69 mm x 64 mm. Barbary sheep is a common, although apparently not very frequent, Capsian game animal. It has been recorded as *Ammotragus lervia, Ovis tragelaphus, Ovis* sp. and *Ovis africana*. The species had aleady been recorded at AM, but as stated in the section on gazelles, remains of Atlas gazelle were erroneously described as pertaining to Barbary sheep.

GERBIL (*Meriones shawi*)

A gerbillid is represented by a skull, several lower jaws and some postcranial remains at AM. This material is conspecific with *Meriones shawi* found in recent owl pellets collected in the valley of Wadi Mezeraa and identified by Dr. J.J. Jaeger (36) ; it is also comparable with skeletal material in the I.R.S.N.B. (Brussels).

Meriones shawi is a common rodent of the region and no doubt most of the collected remains pertain to animals which made their burrows in the site during Capsian or post-Capsian times. It has been recorded from the Capsian as *Meriones shawi* or *Gerbillus shawi* by various authors. However, none of these authors refer to the high probability that in most cases this rodent is intrusive.

(36) JAEGER (J.J.), Montpellier, personal communication

JERBOA (*Jaculus orientalis*)

A jerboa species is represented at AM by a skull, some jaws and postcranial material. The upper cheek teeth row measures 7.0 mm, the lower 6.9 mm (alveolar measurements). In Algeria two jerboas occur : *J. orientalis* and the smaller *J. jaculus*, which according to Petter is confined to desertic regions. Measurements of both forms (Upper cheekteeth rows : 5 and 6.5 mm) in Egypt given by Anderson indicate that the size of *J. orientalis* would be about 1.3 times that of *J. jaculus*. The range of the upper molar series length given by Petter is 5.0 to 5.5. mm (37).

No doubt the jerboas of AM can be assigned to the form *J. orientalis*, which is still very common in the region. Former records refer to *Jaculus* sp., *J. jaculus*, and *Dipumauritanicus*. As with the gerbil, most of the jerboa remains are probably intrusive.

(37) PETTER (F.), op. 1.
ANDERSON (J.), *Zoology of Egypt*. Mammalia, London, 1902.

RODENT PELLETS

Small, greyish-brown, short tubiform pellets with slightly convex ends, averaging 2.1 mm in diameter and 5.3 mm in length, occur throughout the sequence at AM. They appear to be slightly more frequent in areas of rodent disturbance. They are composed of mixed fine clastics and organic matter. They are comparable to fecal pellets of pet hamsters (*Cricetus* sp.) but are considerably. smaller. No doubt they represent coprolites of either jerboa (*Jaculus orientalis*) or gerbil (*Meriones shawi*), the two rodent species occuring frequently in escargotières and recorded as intrusives at AM. Rodent pellets were observed at other sites during the first field season but were not reported.

LAGOMORPHS (*Lepus caepnsis* AND/OR *Oryctolagus cuniculus*)

Lagomorphs are represented by various remains including teeth, skull fragments and postcranial elements. Measurements on a few specimens follow.

humerus, TR.D. dist.	:	10.2	10.2	10.0	9.6	9.2
radius, TR.D. dist.	:	8.2	7,6	7.5		
calcaneum, L.	:	28.3	26.5			

These remains are somewhat larger than small European wild rabbit, but smaller than European hare in our collections. *Lepus capensis* (*Lepus kabylicus*) as well as *Oryctolagus cuniculus* have been recorded from the Capsian. As in the case of the AM 1973 material, it is impossible to decide whether the material described here represents both hare and rabbit or only one of those two lagomorphs.

PALEOECOLOGY AND PALEOECONOMY

GENERAL EVALUATION OF THE AIN MISTEHEYIA ASSEMBLAGE

Table 7 summarizes the composition of the vertebrate fauna per 5 cm level at AM. The major game animals are the hartebeest (*Alcelaphus buselaphus*) followed by the zebra (*Equus mauritanicus*), large bovids (*Bos primigenius* and *Homoïoceras antiquus ?*) and lagomorphs (*Lepus capensis* and/or *Oryctolagus cuniculus*). The Barbary sheep (*Ammotragus lervia*), *Gazella* spp. and turtle are infrequent, while hedgehog (*Aetechinus algirus*), golden jackal (*Canis aureus*) and small birds are rare. Ostrich egg shells are frequent. The rodents and the lizards do not, in our opinion, form part of the anthropogenic fauna. They are probably intrusives, and their significance has been discussed in connection with the taphonomic history of the deposits.

This faunal assemblage reflects a semi-arid grassland steppe with dispersed parkland in the plains (large bovids, hartebeest, zebrid). The slopes were probably wooded and inhabited by Atlas gazelle (lower slopes) and Barbary sheep (higher slopes and ridges). The grassland probably included dispersed stands of trees because hartebeests like shade during the heat of the day (38).

(38) MALBRANT (R.). — *Faune du centre africain français (mammifères et oiseaux)*. Paris, Lechevallier, 1952, p. 64.

The predominance of hartebeest may indicate that very large herds of this animal were present. It is known that hartebeests formerly congregated in herds of more than one hundred individuals. Moreover, Malbrant insists that the species is easily approached and killed, and that herds will not flee even after repeated firing. One of us (A.G.) has had personal experience in East Africa which confirms this observation. Neither zebra nor the aurochs (or for that matter the giant buffalo *Homoïoceras antiquus*) would have been similarly easy prey for Capsian hunters.

(39) SCLATER (P.L.) and OLDFIELD (T.), op. 1.

Gazella cuvieri no doubt inhabited the region, but was confined to mountainous areas, although probably at lower elevations than *Ammotragus lervia* (39). Both species were no doubt infrequent game owing to their preferences for mountainous (and therefore difficult hunting) habitats .*Gazella dorcas* is less frequent than *G. cuvieri* and was probably a rare visitor to the region in very dry seasons.

In table 8 the relative frequencies of the various animals at AM trapped or hunted by Capsian groups are given, together with the recalculated relative frequencies of the fauna excavated in 1973. A few misidentifications of AM 1973 material have been revised with the result that the number of *Ammotragus lervia* for AM 1973 drops to 13 (8.2%), while *Gazella cuvieri* is added with 17 fragments (10.8%). In the larger sample from AM 1976, hartebeest is more prominent than in the AM 1973 sample. Moreover, some species have been added. Inevitably percentages of most other species found in 1973 have dropped. Lagomorphs, on the contrary, have become more important. As a whole, however, we do not consider these differences significant. They probably reflect improved sampling (much more material from the lower deposits).

When average weights per head are calculated (table 8), hartebeest remains the most important source of meat, but large bovids take second place over equids and smaller game such as gazelle and the lagomorphs.

In this section we have used the sample from AM to characterize generally the paleocology and paleoeconomy of Capsian occupation. In the following paragraphs we will discuss the evidence for faunal changes at AM and also discuss the evidence from the much smaller OT and KZ samples.

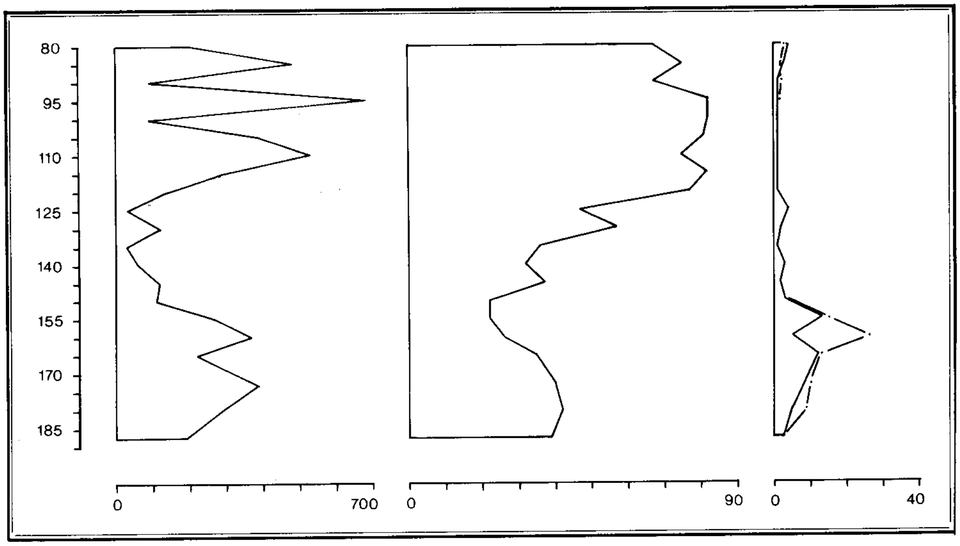

Figure 12. — Frequencies of whole shell, *Helix melanostoma* in reference to other land snail species, and bone fragments in 1976 test trench at Kef Zoura D. For key see figure 10.

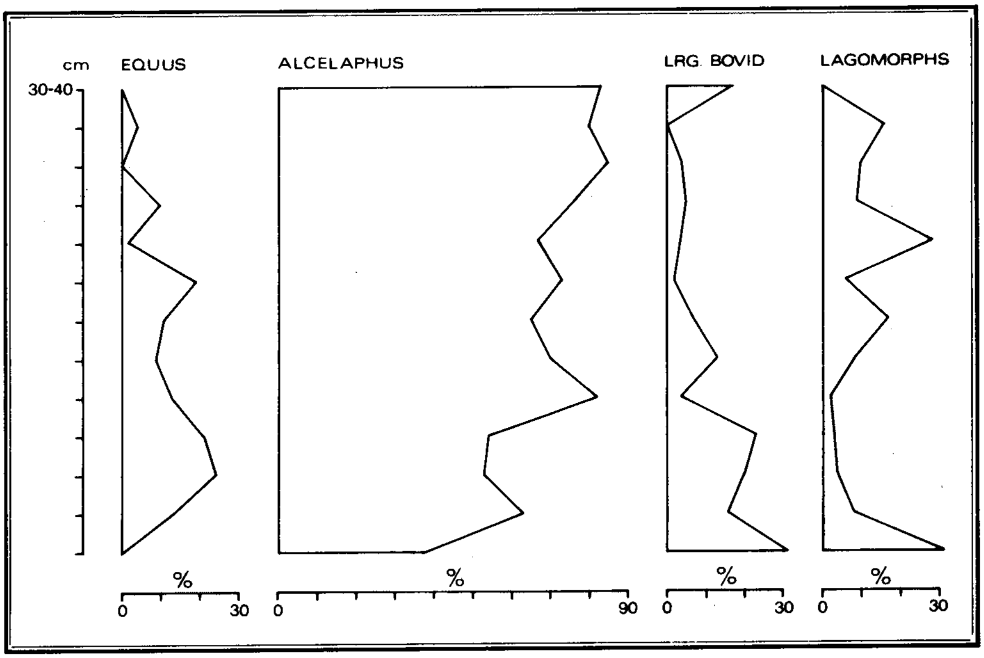

Figure 13. — Changes over time in the mammal fauna at Ain Misteheyia. Curves plot the percentages in table 9.

FAUNAL CHANGES

Table 9 and figure 11 illustrate changes through time in the composition of the AM vertebrate assemblage for the main game animals. While these changes are not striking, the decrease in equids and large bovids and the increase

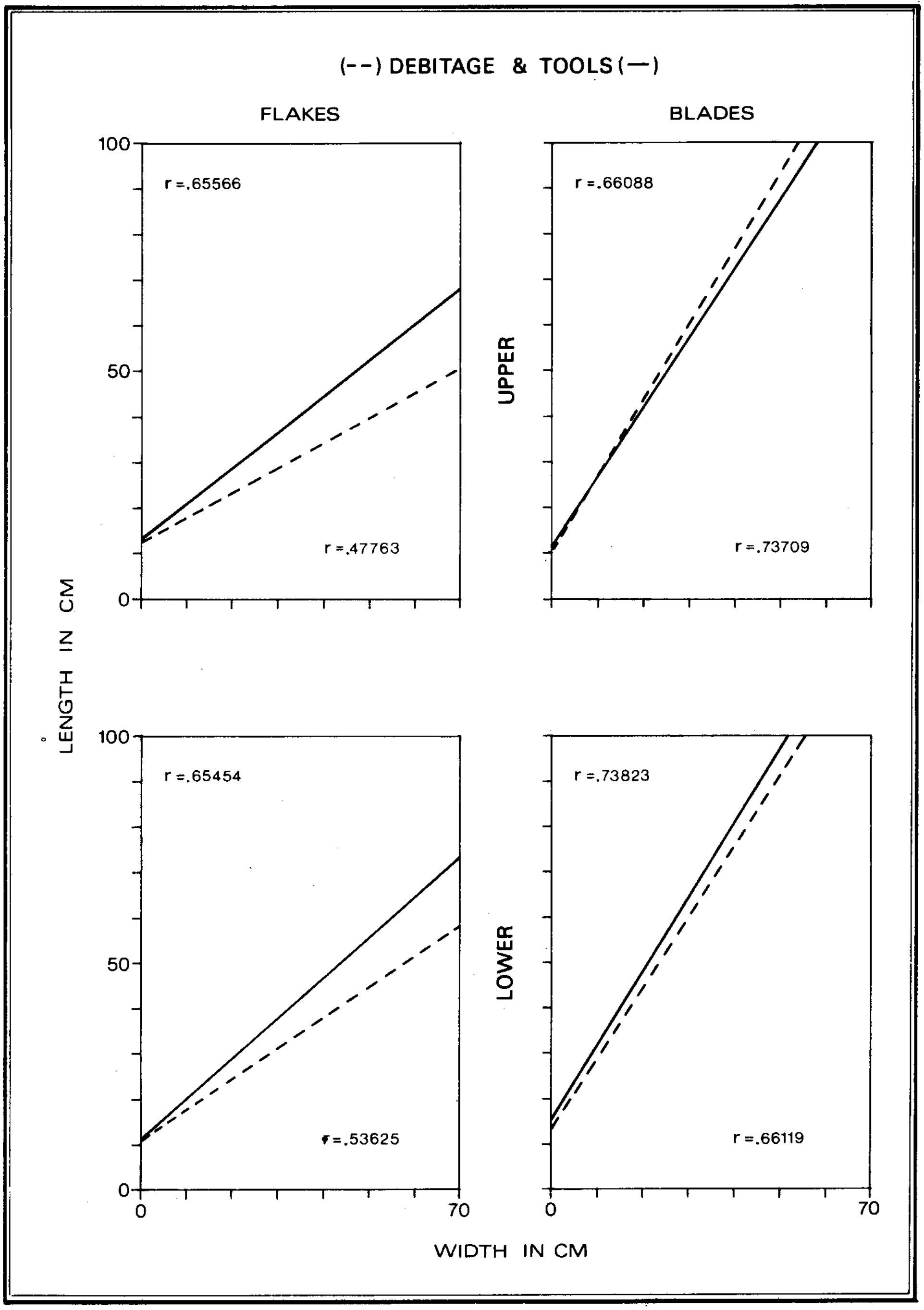

Figure 14. — Comparison of length/width ratios for unbroken debitage and tools in the upper and lower levels at Ain Misteheyia (1976).

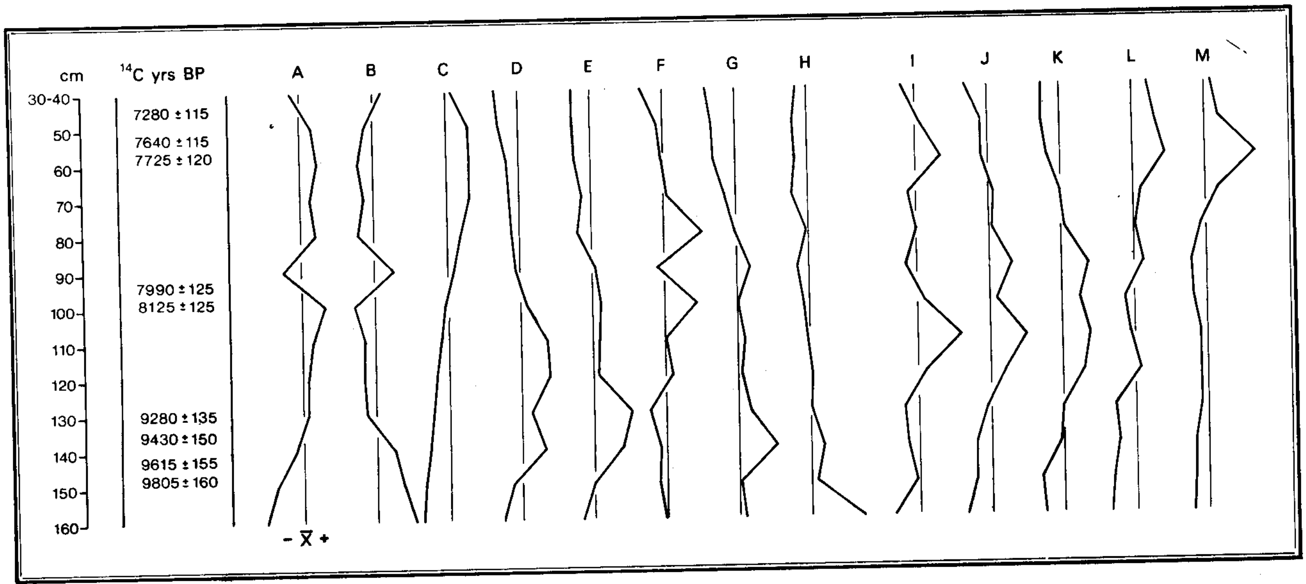

Figure 15. — Summary diagram of the Ain Misteheyia sequence. A - shell fragments ; B - gravel ; C - whole snail shell ; D - bone fragments ; E - *Equus* + *Bos* ; F - *Gazella* + lagomorphs ; G - tool length ; H - tool width ; I - end-scarpers ; J - burins ; K - backed flakes and blades ; L - notches and denticulates ; M - geometric microliths. The thin vertical line represents the mean for each curve, and the curve itself plots the deviation around that mean. For this diagram, two 5 cm levels have been grouped as one (i.e. 40-45 and 45-50) are plotted as one level colled 40-50).

in lagomorphs above 100 cm may reflect a decrease in general game biomass resulting from biotope deterioration which was caused by an episode of more arid climate begining about 8100 BP (see figures 6 and 7). This could have increased dependecy of Capsian groups on the most abundant game animal (hartebeest) as well as increased their hunting of smaller game such as the lagomorphs. The frequencies of other game animals in our sample are too small for similar calculations (table 8).

The composition of the fauna at OT and KZ is summarized in table 10. While the sample sizes are rather small, they do suggest change. At OT the most frequent species are lagomorphs (51.2%), *Alcelaphus* (27.9%) and *Gazella* spp. (9.3%, mainly *G. cuvieri*). At KZ the most common elements are lagomorphs (50%), *Gazella cuvieri* (25%) and *Alcelaphus* (20.8%). Since these assemblages appear to represent a succession in time, with OT the earliest, they suggest a further decrease in the importance of large game ; a trend which seems to begin at AM. The difference in the frequency of *Gazella vs Alcelaphus* probably also reflets the distinction in site locations and, therefore, catchment areas. OT (more *Alcelaphus*) is situation in the plain, while KZ (more *Gazella*) is near the top of the escarpment with easy access to the higher terrain preferred by *Gazella cuvieri*. The lagomorph remains at OT are concentrated in the upper part of the deposits (21 of 22 fragments found above 11 5cm) ; i.e. those which probably post-date AM. This may well be a reflection of the changing character of the catchment area as a function of changing environmental conditions.

If we take into account the weight of the various species involved, the shift from larger game to small game looks much less impressive, especially in the OT-AK sequence, where lagomorphs weighing only 2 kg replace *Alcelaphus* weighing 175 kg as the most important game. At AK the weight percentage of lagomorphs is about 2%, while *Alcelaphus* attains 81% (Cf. weight percentages at AM in table 8).

FAUNAL CHANGES AT MEDJEZ II

(40) Bouchud (J.), l.l.

Sequential changes of fauna in the Capsian have also been studied at Medjez II (40). A detailed comparison of the data obtained at AM with those of Medjez II is, however, impossible because of marked differences in sampling procedures and the conflicting sets of radiocarbon dates obtained for the latter site. Nonetheless, Medjez II probably spans the period from ca. 9000 B.P. (8500 B.P. ?) to ca. 6500 B.P. This site therefore appears to correspond to the upper two-thirds of the AM sequence.

The molluscan fauna collected at Medjez II comprises : *Helix melanostoma* (= *Helicella melanostoma major* and var. *albina* according to Bouchud) ; *Helicella cespitum* (*H. sitifensis ?*) ; *Leucochroa candidissima ; Otala* sp. (= *Eobania constantinae* according to Bouchud) ; *Rumina decollata.* The quantitative changes of this fauna are not well documented. We have recalculated the percentages based on data from Bouchud.

Depht in cm	% *Helix melanostoma*
87 - 100	53.0
200 - 212	30.1
287 - 300	70.0
325 - 337	35.0

(41) Camps-Fabrer (H.). — op. l., 1975, p. 418.

These percentages do not show a very clear trend. Moreover, they are rather high in comparison with AM. However, it should be noted that Camps-Fabrer says that snails are more abundant in the upper layers of Medjez II (41).

(42) Bouchud (J.), l.l., p. 391, fig. 156.

The vertebrate fauna contains basically the same set of animals found at AM. The distribution of game species is summarized in table II which is based on the information given by Bouchud (42).

Striking differences between the Medjez II and AM faunas are the virtual absence of *Equus mauritanicus* in the former assemblage (only an incisor present in the older Medjez samples) and the high percentage of *Ammotragus lervia* in several levels at Medjez. These differences probably reflect distinctions in site territories and catchment areas. We are unable to evaluate the significance of these differences in the absence of a detailed description of the environmental setting of Medjez II.

Faunal changes observed at Medjez are : (1) an appreciable decline of *Alcelaphus* above 250 cm ; (2) a comparable decline in large bovids ; (3) a marked increase of *Lepus ;* (4) possibly some increase in the frequency of *Ammotragus.* Bouchud recognizes some of these changes and suggests they are related to climatic deterioration. According to the radiocarbon dates this change took place at about 8300 B.P., which is very close to the date for similar changes in the fauna at AM.

In conclusion, we can say that although no detailed comparison of the faunal assemblages from the two sites is possible, it seems that comparable and isochronic changes in the fauna are visible at both sites. This corroborates the hypothesis that a supra-regional climatic deterioration is involved.

HARTEBEEST HERDING

Morel says that according to his sample of hartebeest teeth from Dra-Mta-El-Ma-El-Abiod most of the hartebeest killed were juveniles and young animals (43). From this he deduced that a very strict hunting code was observed or that hartebeest were herded (« parcage »). Higgs includes hartebeest in his tabulation of animals for which historical evidence is available for some form of domestication in Egypt and refers to the Capsians as possibly practising incipient domestication (44). Morel does not explain exactly how he was able to age the teeth and does not provide his source of information concerning dental ages in hartebeest (45). However through the courtesy of the same investigator, we were able to examine most of the hartebeest teeth from Dra-Mta. In our opinion, they do not warrant the conclusion that most animals were juveniles or young. The teeth are derived from animals of various age and the collection contains a fair number of upper third molars (N = 15) most of which are well worn.

(43) MOREL (J.), l.l., 1974 and 1976.

(44) HIGGS (E.S.). Les origines de la domestication. *La recherche*, t. 7, 1976, pp. 308-315.

(45) MOREL (J.),l.l., 1974, p. 309.

Our own sample (all sites studied here) contains five rather well preserved upper third molars forming a series with increasing evidence of wear, in which the most worn specimen is ground down to about half its original height. Among five well preserved M3, one does show almost no wear, a second shows very slight wear, while the other three are well worn (only half of the original height left). The other teeth pertain mainly to the permanent dentition and show very variable wear. The sample is in fact very comparable to a collection of hartebeest teeth of Upper Paleolithic age from the Sudan (46). Both seem to contain animals of all ages. Even if « younger » animals predominated this could reflect the effect of non-selective cropping of well balanced hartebeest herds, in which « younger » animals predominate.

(46) GAUTIER (A.), l.l., 1968.

As a conclusion we want to insist on the fact that there is no clear evidence for herding or incipient domestication of hartebeest in the Capsian, nor does it seem that selective hunting implying a strict hunting code was practised. Moreover, the high frequency of hartebeest can be explained as a result of the predominance of this antelope, which forms large herds and appears to be an easy prey.

SEASONAL EXPLOITATION OF THE VERTEBRATE FAUNA

In our previous papers it was pointed out that snails can be collected successfully in spring and fall ; in winter most of the edible species are not easily availabble. Hence snail gathering can probably be considered as a seasonal activity. This in turn may imply annual transhumance cycles by Capsian groups. The analysis of vertebrate finds (birds, hartebeest, gazelle) of various escargotières provides some further data reported on below suggesting seasonality of occupation.

Avian species identified at Relilai, Medjez II and Dra-Mta-El-Ma-El-Abiod (47) are : *Tadorna ferruginea, Gypaetus barbatus, Milvus* sp., *Falco pereginus, Alectoris b. barbara, Otis tarda, O. tetrax, Cursorius gallicus, C. cursor, Pterocles alclata, Columba palumba, Columba* sp., *Asio otus.* According to Tchecopar and Hue, these species live and breed in the Maghreb or seem to have done so before they were exterminated through ruthless hunting (48). *Otis tarda* may be an exception because this bustard is restricted to Tangier, Northern Morocco. Nevertheless, typical migratory birds are absent from the Capsian avifauna. Capsian groups seem to have exploited the various resources of their

(47) VAUFREY (R.), op. l.
BOUCHUD (J.), l.l.
MOREL (J.), l.l., 1974.

(48) ETCHECOPAR (R.D.) and HUE (F.) *The birds of North Africa*, Edinburgh, Olivier and Boyd, 1967.

environment without too much selection. Therefore the absence of migratory birds may indicate that the sites were not occupied in winter when migratory birds visited the regions in which Capsian site are found. The foregoing should be regarded as a suggestion only, as our knowledge of the Capsian avifauna is still restricted.

Many herd animals (e.g., zebras, many bovids) in Africa are migratory, their movements being triggered mostly by forage problems during the dry season. However, it is difficult to know how these animals may have reacted to the seasonal cycles of the Maghreb. According to Malbrant (49), *Alcelaphus lelwel* in the Tchad and the Central African Republique migrate north as soon as the rains start to transform their habitat into marshes but the amplitude of the movement is restricted (500 km maximum). Possibly we may postulate comparable movements south for hartebeest in the Capsian region during the cooler and more humid season (winter ; with snow and temperatures below zero). Capsian groups may even have followed the hartebeest trek, as this antelope appears to be a main vertebrate protein source. *Gazella dorcas,* on the other hand, is not an animal normally found in the Capsian region, as it prefers sub-desertic (to desertic ?) conditions. But it may have moved in from the south especially in very hot summers. Therefore, it would have been a summer game animal as already suggested by Morel (50), although stragglers could have been killed in autumn.

(49) MALBRANT (R.), op l

(50) MOREL (J.), l.l., 1974.

None of the foregoing comments solves definitely the problems of whether or not the Capsian way of life was based on transhumance, and, if it was, at what season Capsian groups occupied the Télidjène region (spring and summer ?). We have only a reasonable assumption ; one which becomes more reasonable in light of what is know about many surviving hunter-gatherer groups.

GAME NOT FOUND IN THE ESCARGOTIERES

Morel (51) has drawn attention to some of the animals which were probably present in the Capsian territory but which are almost never found in the escargotières. This group would include storks (*Circonia spp.*) the ostrich (*Struthio camelus*) and wild boar (*Sus scrofa*). It is not clear to us why storks are included in this group. As we have already said, the avifauna of the escargotières is not yet well know and the absence of storks may be accidental. Ostrich eggshell fragments, however, are a frequent item in inventories of Capsian materials, but almost no osseous remains of the species have been recorded from Capsian sites. Wild boar, which is still an inhabitant of forested areas around Tébessa and Chéria, is recorded only at Redeyef, Mechta-el-Arbi and Medjez II (52). Morel suggests that the ostrich and boar may have been protected by a taboo. In the case of the ostrich, this may have been related to the fact that Capsian groups used ostrich eggshells for various purposes and did not want to disturb the provider of these useful items (53). For boar, we suggest that this species is relatively difficult game (forested terrain ; very suspicious), on which Capsian hunters did not concentrate because open terrain herbivores were much more easily obtainable.

(51) Ibid.

(52) VAUFREY (R.), op. l. BOUCHUD (J.), l.l.

(53) cf. LEE (R.B.), The : Kung *San : men, women and work in a foraging society*. London, Cambridge University Press, 1979, for data on and discussion of the modern use of ostrich egg shells.

DIETARY ITEMS OTHER THAN SNAILS AND GAME

All calculations of diet in archaeological sites are generally very gross approximations not only because we do not know the exact original quantities of foodstuffs brought to the site, but also because many foodstuffs do not leave behind recognisable traces. As we have noted in previous reports the Capsian diet very probably included insects, small vertebrates (lizards, etc.) and plants (fruits, roots, seeds). Morel (54) includes honey in the list of perishable foods leaving no traces. Indeed the importance of bee hunting in many pre-industrial groups is often underestimated (55) and according to local informants, it is still practised in the region around Chéria. Tixier (56) recently pointed out the appreciable food value of ostrich eggs, which may contain the equivalent of about two dozen chickn eggs. Moreover, ostrich egg nests frequently contain 10 to 12 eggs. If Capsian groups exploited this ressource in a reasonable way, they had a regular though seasonal supply of eggs. Unfortunately the many preserved egg fragments in Capsian sites do not tell us whether they come from consumed eggs or not ; moreover we do not know how to relate the counts of these fragments to complete eggs either as artifacts or as food.

(54) MOREL (J.), l.l., 1974, p. 172 (footnote).

(55) cf. PAGER (H.), Rock paintings in southern Africa showing bees and honey hunting. *Bee World*, t. 54, 1973, pp. 61-68 ; and GAUTIER (A.), A bee hunling scene on a rock painting from the Mahadeo Hills, India. *Amer. Bee Journ.*, t. 114, 1974, pp. 258-259.

(56) TIXIER (J.), *Le campement préhistorique de Bordj Mellala*. Paris, Editions du Cercle de Recherches et d'Etudes Préhistoriques, 1976.

LITHIC ARTIFACTS

A total of 50,272 lithic artifacts were recovered during the 1976 excavations, bringing the total assemblage for AM to 72,954 pieces. The frequencies of major artifact classes for both the 1973 and 1976 excavations are given in table 12.

The differences in percentage frequencies between the 1973 and 1976 collections are not statistically significant ; variation is due to the much larger sample from the lower levels recovered during 1976. Nonetheless, it is clear that revision of previously published figures (57) is required because the larger sample changes the stratigraphic sequence. In this report only the 1976 assemblage will be presented and discussed.

(57) LUBELL (D.), *et al.*, l.l., 1975.

As we have already shown, the AM sequence can be divided into two parts. Thus, observations for lithic artifacts have been grouped and will be presented as belonging to either the UL or the LL.

The distribution of major artifact classes in these two levels is given in table 13. The only classes used for the manufacture of retouched tools are flakes, blades and, occasionally, burin spalls.

In the following sections only cores, flakes, blades, and coretrimming pieces will be discussed. No measurements were recorded for core-trimming pieces, burin spalls, microburins or debitage.

CORES

INTRODUCTION

The 1976 assemblage contains 164 cores and 26 core fragments. Of the cores, 72 (43.9 %) occur in the UL and 92 (56.1 %) in the LL. Overall, the size of cores is small and they appear to have been heavily worked. The mean length for all cores in the UL is 38.16 mm while in the LL the mean length is 38.10 mm. Single platform and opposed platform cores are always the most numerous, and flake cores are more frequent than blade cores. In that blade tools out number flake tools, it seems reasonable to conclude that most of the cores are exhausted and that the final stages of core reduction produced a rather large number of small flakes.

The cores have been classified according to the system developed for the Nile Valley Late Palaeolithic (58). The general breakdown of the major core classes present is given in table 14.

(58) LUBELL (D.), *The Fakhurian : a late palaeolithic industry from Upper Egypt. Cairo, Geological Survey of Egypt*, Paper n° 58, 1974.

The value of Chi-square for table 14 is 6.17 (df = 3, P. 05 7.82) which we interpret as indicating no significant difference between the two deposits.

The distribution of flake cores, blade cores, or those cores from which both flakes and blades appear to have been removed is summarized in table 15.

There is, clearly, no significant difference in this distribution and we can conclude that the kinds of cores do not reflect a marked technological difference between the two deposits.

STRIKING PLATFORMS ANGLES

Because many cores in this assemblage have more than one platform from which flakes or blades were struck, each platform on a core has been recorded separately as a type (lisse, faceted, cortex, shattered) as well as the angle at the intersection of he platform and the surface from which flakes or blades were removed. Thus, the number of observations is greater than the actual number of individual cores. Furthermore, not all platform angles could be measured.

In some North African assemblages blade core platform angles are smaller than flake core platform angles — the mean of the latter in the Fakhurian approaches ninety degrees (59). This does not appear to be the case for AM. Instead, there is little difference between the platform angles of blade and flake cores and, furthermore, blade cores tend to have slightly larger platform angles. These data are summarized in table 16.

(59) Ibid.

The differences are not statistically significant. The values for Chi-square are 1.063 (flake cores) and 0.959 (blade cores). To indicate significant differences at P = 0.05 Chi-square would have to be greater than 5.99. Furthermore, there is no significant difference when flake cores and blade cores in the UL, or those in the LL, are compared.

Of the platforms, only two were cortex and two shattered. The remainder were either lisse or faceted. Among the flake cores, the majority of platforms are lisse and there is no significant difference between those in the UL and LL. The value of Chi-square in table 17 is 0.780 (df = 1, P. 05 3.84).

There are, however, significant differences in the kinds of platforms found on blade cores. In the UL the majority of blade core platforms are faceted, while lisse platforms are more common in the LL. In table 19, the value of Chi-square is 5.62 (df = 1, P. 05 3.84).

This distinction may be indicative of different methods of removing flakes and blades from the cores. Faceted platforms in certain Capsien supérieur assemblages suggest the use of pressure or indirect percussion for blade removal (60).

(60) cf. TIXIER (J.). L'industrie lithique caspienne de l'Ain Dokkara, région de Tébessa, Algérie. *Libyca*, t. XXIV, 1976, pp. 21-54.

SINGLE PLAFORM CORES

These tend to be small, and there are slightly more lake cores than blade cores. The blade cores are consistently larger than the flake cores but there is no difference in platform angles. Flake cores tend to have a larger diameter than blade cores. Some pieces have battering at the distal end (opposite the platform), suggesting the occasional use of an anvil or support. A few are made on flakes, and one piece has traces of red ochre on both the platform and the flaked surface. The data for single platform cores is summarized in tables 18, 20 and 21.

It is clear that all cores in the UL have larger platform angles than those in the LL and tend to have larger diameters. The pattern of lisse and faceted blade core platforms already noted for the UL and LL is repeated for the single platform blade cores.

Chi-square for table 20 is 3.74 (df = 1, P. 05 3.84) and thus there is a possibility that both samples could have come from the same population. In other words, there are weak statistical grounds to reject an hypothesis of similarity.

The complete range of data on platform angles, length and diameter are given in table 21.

OPPOSED PLATFORM CORES

Most opposed platform cores bear scars resulting from blade removals (51.6 %). The remainder show either flake scars (32.3 %) or both flake and blade scars (16.1 %). The stratigraphic distribution is given in table 22. rIcshm.)

Opposed platform cores can be classified by the position of the two platforms into the following varieties : same side, adjacent side, opposite side, twisted (61). The great majority in both the UL and the LL are same side (5 supper, 10 lower), followed by opposite side (3 upper, 6 lower). One piece in each level is twisted and the remainder are too fragmentary for accurate classification. Among the same side group are two pieces in the LL which have a single platform pyramidal core at one end with a second « wedge » platform at the distal end formed by what amounts to bifacial removals.

(61) LUBELL (D.), op. l.

Data for opposed platform cores is summarized in table 23.

NINETY DEGREE

These are cores which have at least two, and sometimes three, platforms which are positioned at right angles on the same side, adjacent sides, or opposite sides of the piece (62). They are interpreted as cores on which secondary platforms were created after the first (or second) no longer provided a good surface from which to remove flakes or blades. Most of these cores were used for flake removals, and they all tend to be small, giving one the impression that they have been worked down to the maximum extent possible. The stratigraphic distribution is as follows.

(62) Ibid.

While there seems to be no significant difference in this distribution, there is a difference in the stratigraphic distribution according to type.

The full range of observations for ninety degree cores is given in table 26.

GOBULAR CORES

These are irregular cores on which no patterned series of platforms or removals can be seen but which are, nonetheless, not merely core fragments.

MULTIPLE PLATFORM CORES

These are cores on which there are three or more platforms but which cannot be classified as ninety degree, due to the lack of patterning in the position of the platforms.

WEDGE CORES

On these cores the platform tends to be a ridge from which flakes or blades are removed bifacially. There are only three examples present here.

MISCELLANEOUS

The collection includes three initially struck cores, two in the UL and one in the LL. These are pieces from which one or two exploratory flakes have been removed. In addition, there is one blade core in the LL which appears to have been worked using bipolar technique, but is definitly not a scaled piece. Finally, there are a series of core fragments (17 in the UL and 9 in the LL) which cannot be classified into any of the categories discussed above.

DEBITAGE

FLAKES

The 1976 assemblage contains 6544 flakes of which 2196 (33.6 %) occur in the UL and 4348 (66.4%) occur in the LL. Of those in the UL, 270 (12.3%) were used for retouched tools. The equivalent figure for the LL is 326 (7.5 %). Thus, there are actually 1926 debitage flakes in the UL and 4022 in the LL. Of these, 342 (17.8 %) in the UL and 2259 (56.2 %) in the LL are broken. Thus, the total number of complete debitage flakes on which measurements were taken is 3347 (total flakes less broken flakes less flake tools). These were measured for length and width and the characteristics of the striking platform were recorded. The data are summarized in the tables 2 and 54.

Because of the large sample size, any value of t greater than 3.69 is considered significant. However, the very similar means for width suggest that it might be better to interpret this particular statistic with caution. It is clear, however, that complete flakes are larger in the LL than in the UL and this pattern is repeated in complete flake tools.

The differences beween deposits expressed in this table are significant. The value of Chi-square is 136.912 (on a 25 % sample it is 34.085 which is equally significant). Thus the higher number of faceted platforms in the UL, and increased frequency of punctiform and shattered platforms in the LL suggest significant differences in the method by which cores were prepared and flakes removed. This is not entirely in agreement with the interpretation of flake core platform type (table 17), and we suspect the small sample of cores may not present a full picture. There are, of course, other possible explanations.

Evidence of burning is present on 269 (17.0 %) of the flakes in the UL and on 283 (16.0 %) of those in the LL.

BLADES

The 1976 assemblage contains 8776 blades of which 4321 (49.2 %) occur in the UL and 4455 (50.8 %) in the LL. Of those in the UL 771 (17.8 %) were used for retouched tools, while in the LL 1037 (23.3 %) were used in this manner. Thus, there are actually 3550 debitage blades in the UL and 3418 in the LL. Of these, 3159 (89.0 %) in the UL and 2864 (83.8 %) in the LL are broken. Thus, the total number of complete debitage blades on which measurements were taken is 920 (total blades less broken blades less blade tools). These were measured for length and width, the characteristics of the striking platform were recorded, and the morphology of the distal end was recorded as well.

It is clear from table 31 that complete debitage blades in the LL are both longer and wider than those in he UL. Furthermore, in both the UL and the LL, debitage blades have a less variable distribution for width than for length. This suggests either that : (1) width was more tightly controlled by those making blades ; or (2) that the technique used to make blades invariably produces pieces with less variability in width than in length (or both).

The differences between levels in this table are significant. The value of Chi-square for a table without cortex platforms is 25.102 (df = 3). The higher frequency of faceted platforms in the UL, and increased frequency of punctiform and shattered platforms in the LL appears to confirm the distribution of faceted platforms on blade cores (table 18) and suggests different methods of blade production in the two levels at AM.

The shape of the distal end of all complete blades was recorded to see if those which had not been retouched showed some pattern which might have rendered them unsuitable for modification. Four categories were used.

The higher frequency of pointed blades in the UL and blunt ended blades in the LL is statistically significant. The Chi-square value for a 2 x 2 table (pointed and blunt, UL and LL) is 15.04 (df = 1, P. 05 3.84). Why this difference occurs is not immediately apparent.

Evidence of burning is present on 34 (8.7 %) of the blades in the UL and on 45 (8.1 %) of those in the LL.

CORE-TRIMMING PIECES

These have been classified into three categories : crested blades, platform rejuvenation flakes, and surface rejuvenation flakes. The first are blades with a bifacially flaked central ridge and are generally thought to have been preparation for the removal of blades (63). The second are flakes which, in effect, truncate the core by removing the striking platform, apparently in order to renew it for further use. The third are generally thick wide flakes which, more often than not, bear numerous flake or blade scars on their dorsal surface. Hinge fractures are frequent on these surfaces and such flakes are interpreted as attempts to renew an otherwise intractable core.

(63) Tixier (J.). l.l.

Surface rejuvenation flakes are always the most common, and are more frequent in the LL. The greater number of platform rejuvenation flakes in the UL may relate to increased use of pressure flaking and the consequent need to remove platforms on which a pressure tool could no longer be placed accurately.

The Chi-square value for this table is 29.95 (df = 2, P. 05 5.99). Thus the differences must be considered significant and we can conclude that both levels do not represent the same population.

RETOUCHED TOOLS

INTRODUCTION

The frequencies of major retouched tool classes and the frequencies of the major artifact classes on which they are made are given in table 36. It is clear that the LL contains higher frequencies of endscrapers, burins, backed flakes and blades and backed bladelets ; the UL contains more notches and denticulates and geometric microlihs. Blade and bladelet tools predominante in both levels : 75.62 % in the UL and 77.57 % in the LL.

Dimensions for retouched tools are given in table 37, where the significance of the differences between the two levels is also compared using the t statistic. In general, retouched tools in the UL tend to be smaller than those in the LL, but these differences are not always significant. Thus, while flake tools in both levels are much the same size in terms of length and width, those in the LL are significantly thicker. Blade tools in the LL are significantly longer, wider and thicker than blade tools in the UL. These distinctions more or less parallel those already discussed for flake and blade debitage.

In figure 14, the length/width ratios for complete debitage and retouched tools in he UL and LL are compared using regression lines. It is evident that in both the UL and LL flake tools are more « blade-like » in their dimensions than flake debitage. Whether this is due to conscious selection of longer, narrower flakes for the manufacture of retouched tools, or simply the modification of the original blank, is not known. There is clearly no distinction of this sort for blade tools and blade debitage in either level.

There seens little doubt that the assemblage from the UL can be assigned to the Capsien supérieur, although for the moment it is not clear to which of the various « facies » it may belong. The assemblage from the LL is more problematical. Some of the indices (especially for burins, backed bladelets, backed blades, geometrics and endscrapers) are rather similar to certain Capsian typique assemblages such as Redeyef Table Sud couche inférieur and El Mekta « bas » (64). Other indices, especially for notches and denticulates, suggest a Capsien supérieur assemblage. The larger overall size of the artifacts in the LL may be indicative of the Capsien typique.

(64) Id., Notes sur le Capsien typique. *La Préhistoire : problèmes et tendances*, Paris, C.N.R.S., 1968 pp. 439-451.

Thus, on present evidence, AM seems to contain both Capsien typique and Capsien supérieur in chronological and stratigraphic sequence. We shall return to this hypothesis in our conclusions. Type lists for the 1976 assemblage only and the combined 1973 and 1976 assemblages are found in tables 57 and 58 respectively.

I ENDSCRAPERS

More endscarpers are made on flakes than on blades, but this is more pronounced in the UL where 72.0 % are flake tools whereas only 57.3 % of those in the LL are flake tools.

Endscrapers in the LL are consistently larger than those in the UL, but the difference is only signifiant for the length of flake endscrapers (table 37).

The majority of endscrapers have retouch in addition to the scraper retouch on the distal or proximal end. Most are retouched bilaterally, and the frequency of those with retouch only on the left or right edges is the same in both LL and UL deposits (table 38).

The angle of retouch at the scraper end, as well as the width at that end were also recorded. There are no significant differences in the angle or the width of either flake or blade endscrapers when UL and LL are compared (table 37). In fact, the only significant difference, and one which could have been predicted, is that blade endscrapers are always significantly narrower than flake endscrapers in both the UL and LL.

II PERFORATORS

In both levels, perforators tend to be made on blades rather than flakes (88.9 % in the UL and 81.3 % in the LL). The number of complete pieces is insufficient for statistical tests of dimensions, but the data are given in table 37.

There does not seem to be any pattern to the distribution of retouch or backing by side in either the UL or the LL. The data for these characteristics are given in table 39.

III BURINS

These are almost always blade tools : 75 % in the UL and 70.9 % in the LL. One burin in the LL is made on a burin spall. Burins on truncation, as would be expected in a Capsian assemblage, are the most frequent kind : 90.7 % in the UL and 93.7 % in the LL.

The dimensions of complete burins are different in the two levels. Flake burins are larger in the LL, but the differences are not significant. Blade burins are smaller in the LL but the difference is significant only for width : in other words, blade burins in the LL are significantly narrower than those in the UP (table 37).

In an attempt to see if there are consistent patterns in the way endscrapers are broken, and thus perhaps determine how they were used or hafted, an analysis was done of the dimensions of all distal fragments (« distal » here refers to the end on which the scraper is formed ; it could be proximal). The results (table 37) show that all distal fragments are thinner than complete pieces, thus suggesting that breakage is due primarily to the strength of the actual tool. Those distal fragments in the UL are both wider and thinner than complete pieces, while those in the LL are both narrower and thinner than complete pieces. This is probably due in large part to the greater emphasis on flake endscrapers in the UL and blade endscrapers in the LL.

In both the UL and LL the majority of burins occur on the distal end of the flake or blade. In addition, more burins occur on the left side of the tool than on the right side. Thus, the most frequent pattern is for left side distal burins. There are no significant differences between the UL and LL for these characteristics which are summarized in table 40.

Truncations are almost invariably formed by obverse retouch. Only four cases (all in the LL) have inverse truncations : one each on Types 21, 22, 24 and 27.

IV BACKED FLAKES AND BLADES

Far too many pieces are broken to permit a statistical analysis. The available rata on dimensions of complete pieces are given in table 37.

The position of retouch and backing is summarized in table 41. Two points are of particular interest. Obverse backing is always the most frequent : 88.9 %

of backed pieces in the UL, and 75 % of those in the LL. Of greater interest is the position of backing, for there is no difference between the UL and LL. In each one, 55.6 % are backed on the left, and 38.9 % are backed on the right. Thus, despite the higher frequency of backed flakes and blades in the LL, they were apparently treated in the same way as those in the UL. In other words, those attributes which appear to have stylistic importance in some Maghreb epipalaeolithic assemblages (65) do not permit us to distinguish between the backed flakes and blades in the two deposits at AM. One piece, an example of Type 41, has traces of ochre.

(65) Close (A.E.), *The identification of style in lithic artefacts from north east Africa.* Mém. l'Institut d'Egypte, n° 61, Cairo, S.O.P. Press, 1977.

V Composite tools

Samples of complete pieces are tools small for statistical tests. The data on dimensions of complete pieces are given in table 37.

All composite tools in the UL are burin-endscrapers (Type 44) while 17 (70.85%) of those in the LL are burin-endscrapers. The remaining 7 pieces are Type 43, backed blade-endscrapers. Of these, 5 have obverse retouch and 2 have sur enclume retouch ; 4 are backed on the left side and 3 are backed on the right side.

VI Backed bladelets

This is the most numerous class of retouched tools in the LL and the second most numerous in the UL. However, very few pieces are complete, and thus measurements of length are only of limited value. Width and thickness are of more interest as width especially appears to be an important variable.

As can be seen in table 37, complete specimens in the LL are longer, narrower and thicker than those in the UL but the differences are not significant.

All fragments in the LL are narrower and thicker than those in the UL, although the differences are not always significant (table 37). These data suggest that (a) the dimensions of complete pieces are not anomalous, and (b) that since the length of fragments is never significantly different between the two levels, it is likely that backed bladelets were used (and therefore broken) in much the same way during both the earlier and later occupations at AM.

The position of the different types of retouch and backing for backed bladelets is given in table 42. Several points are of interest.

The side on which backing occurs is said to have possible stylistic import (66). Of those backed bladelets for which orientation could be determined, the pattern at AM (1976) is as follows :

(66) Ibid.

	Right		Left		Total
	N	%	N	%	
Upper	94	51.6	78	42.9	172
Lower	148	42.3	179	51.1	327
Total	242		257		499

Clearly, the distribution is reversed between the UL and LL. The Chisquare value for this table is 3.98 which is significant at the 0.05 level of probability. Thus, it seems reasonable to conclude that backed bladelets were treated somewhat differently in the two deposits as to the side preferred for backing. Among the fragments (almost entirely Type 66) which could not be oriented, the occurence of unilateral backing is 100% in the UL, and 98.5% in the LL.

	Obverse backing		Sur enclume backing		Total
	N	%	N	%	
Upper	118	57.0	89	43.0	207
Lower	171	43.8	219	56.2	390
Total	289		308		597

Once again, the frequencies in the UL and LL are reversed, and the Chisquare value of 9.375 is significant at a probability of 0.05. It seems that for kind of backing, as well, the backed bladelets in the LL were treated differently from those in the UL.

A final point of interest is the degree of difference in width and thickness for bladelets with obverse backing and those with sur enclume backing. Since few pieces are backed bilaterally and the majority do not have retouch opposed to the backed edge, it was thought that width and especially thickness might be important factors in the presence of one kind of backing rather than another. This is certainly not the case for thickness, as can be seen in table 37, where the means for obverse backed and sur enclume backed bladelets are the same within each level. The important point seems to be that sur enclume backed bladelets are always significantly narrower than obverse backed bladelets. Thus, sur enclume backing appears to have been used when a narrow bladelet tool was desired, and may have been employed because it is easier to work a bladelet towards its thicker mis-line using the sur enclume technique.

There are only ten pieces with Ouchtata retouch, and with the exception of one made on a flake in the UL, all are made on blades. The flake in the UL, all are made on blades. The flake is the only complete piece and the sample is far too small for any valid statistics.

VII Notches and denticulates

These tend to be blade tools rather than flake tools in both the UL (67.3%) and LL (59.8%). Most are broken fragments. The dimensions of complete flake tools show that those in the LL are longer, narrower and thinner than those in the UL, but the differences are not significant (table 37). No figures are given for broken flake tools as there are no easily identifiable patterns within them.

The dimensions of complete and broken blade tools are also given in table 37. Complete blades in the LL are longer, wider and thicker than those in the UL, but the differences are not significant. Proximal fragments are also longer, wider and thicker but, again, not significantly. The main differences come in distal and medial fragments. The former are significantly wider and thicker in the LL, and the latter are significantly wider and thicker. Taken together, these data suggest that notched and denticulad blades in the LL are larger overall than those in the UL, and that notched and denticulated flakes in the LL tend more towards blade-like dimensions in terms of length and width.

Data on the position and kind of retouch for flakes are given in tables 43 and 44. Those pieces under "none left" and "none right" have retouch at the distal or basal end, or both. It is clear that obverse retouch is the most common.

The data from table 44 is summarized below ; those pieces with only distal or basal retouch are not included.

	Upper		Lower		Total	
	N	%	N	%	N	%
Right	25	14.0	22	20.4	47	16.4
Left	31	17.4	31	28.7	62	21.7
Bilateral	122	68.5	55	50.9	177	61.9
Total N	178		108		286	

The differences between the UL and LL are significant. The Chi-square value for this table is 8.960.

Data on blades with bilateral notches, bilateral denticulation and notches or denticulation combined with retouch are given in table 45. Bilateral denticulation is the most common variety in both levels, but retouch combined with denticulation on an apposing adge is almost as common in the LL. Despite the differences, the Chi-square value for this table is 8.029 which is below the value (9.488) necessary to reject an hypothesis of similarity.

One blade in the UL (a Type 77) has traces of ochre adhering.

VIII Truncations

Most truncations are made on blades (98.5% in the UL and 75.0% in the LL). One piece in the LL is made on a burin spall.

Dimensions are given in table 37. No comparisons are possible for flakes between the upper and lower levels. Complete truncations on blades in the LL are shorter, narrower and thinner than those in the UL, but the difference is only significant for thickness although the difference for width approaches significance.

Position and kind of truncation are given in table 46. These data show that distal truncations are more frequent than basal truncations and oblique truncations more frequent than straight truncations in both levels. The differences between them are not significant and we must conclude that truncations were not treated differently during the earlier and later occupations.

In the UL, inverse truncations are present on three of the distal and one of the basal examples. One piece is a double truncation. Six have additional retouch on the right edge, six on the left, and three have additional bilateral retouch.

In the LL, inverse truncations are present on one distal, two basal, and one lateral. Both lateral truncations are on flakes. As well, there is one distal truncation formed by alternating retouch, and four of the pieces are double truncations. Additional retouch is present on the right side in nine examples, on the left side in six, and seven have additional bilateral retouch.

IX Geometric microliths

Geometric are almost three times more frequent in the UL than in the LL, and those in the UL are longer, wider and thinner (table 37). These differences are significant only for length and thickness.

The frequencies of the four major groups within the geometrics are given in table 47. There are clear distinctions between the UL and LL and these distinctions are significant ; the Chi-square value for table 47 is 22.49.

Included within the geometrics are thirteen artifacts (10 in the UL and 3 in the LL) which have been classified as either Type 85 or Type 88 but which do not, *sensu stricto.* conform to the descriptions for either of these types (67). These are geometrics with one straight or concave oblique truncation opposed by a convex truncation which is perpendicular to the long axis of the piece. Some examples resemble what might be called a tiny endscraper on a truncated bladelet. In the UL, the oblique truncation is proximal on two Type 85 and two Type 88, two pieces are indeterminate, and the remainder have oblique distal truncations (one 85 and three 88). Of the three examples in the LL, one 85 has an oblique basal truncation, one an oblique distal truncation, and the single 88 has an oblique basal truncation. We have been unable to determine if this variety of geometric is found in other Capsian assemblages or if it is unique to AM.

(67) Tixier (J.), *Typologie de l'épipaléolithique du Magbreb.* Mém. C.R.A.P.E., n° II, Paris, A.M.G., 1963.

Tixier (68) has shown that there is a distinct patterning for the position of the short side on elongated scalene triangles and scalene perforators in the Ain Dokkara assemblage and we have observed a similar pattern in the assemblage from KZ. Unfortunately, the AM geometrics were not observed for these characteristics, and the collections were returned to Algiers before this reports was written. We hope to restudy the material in future.

(68) Id., I.I., 1976.

X Microburin technique

In accordance with current usage, microburins have been removed from the tool category and are treated as a by-product of tool manufacture. Only types 102 and 103 are present in the AM assemblage, and their distribution is a follows.

The Chi-square value for this table is 3.92 and the differences between the UL and LL are thus considered to be significant. In other words, it is unlikely that both represent the same population.

XI Miscellaneous

Included within group XI are those pieces with continuous retouch which are classified as Type 105. They comprise 98.4% of the artifacts classified as Types 104 to 111. The majority of pieces classified as Type 105 are blades : 61.5% UL and 65.1% LL.

Flakes with continuous retouch in the LL are slightly longer, wider and thicker than those in the UL but the differences are not significant (table 37). Blades with continuous retouch in the LL are longer, wider and thicker than those in the UL, and these distinctions are highly significant for length and widthe but not significant for thickness (table 37).

The majority of flakes and blades in both levels have obverse retouch on one or both lateral edges (tables 49 and 50). In the UL, bilateral retouch is the most common form on both flakes and blades, while in the LL retouch on the left side is the most common on flakes and retouch on the right side is most common on blades (table 51). There is no significant difference among the upper and lower flakes for side retouched, but there is a significant difference for blades. Right side retouch is far more common in the LL and bilateral retouch is more frequent in the UL (table 51).

A number of flakes in both the UL and LL have retouch on the distal end (table 52), frequently in combination with retouch on the right or left edge. Distal end retouch is rare on blades in both levels, and is almost always obverse on both flakes and blades.

Also included in group XI are two sidescrapers (Type 106) in the UL (1 on a flake and 1 on a blade) and three sidescrapers in the LL (2 on flakes and 1 on a blade). There is, as well, a single example of Type 109 in the LL.

Finally, there are fourteen artifacts classified as varia (Type 112) which do not fit within the descriptions for any of the other types. They are described below.

Upper Level

1. An arch backed blade with a basal truncation and Ouchtata retouch on the right edge.

2. A proximal fragment of a blade with converging sur enclume backing on the left and right edges.

3. A Type 62 combined with a Type 68, showing traces of a Krukowski microburin facet at the distal end.

4. A proximal fragment of a blade with bilateral obverse retouch grading into obverse backing.

5. A bifacial lanceolate, found on the surface of the site. It is 67 mm long and 34 mm wide.

Lower Level

1. A blade with a notch on the left edge, abrupt retouch (backing ?) on the distal end, and a bifacial truncation on the proximal end.

2. A blade with bilateral alternate denticulation, a normal endscraper on the distal end, and a nosed endscraper on the proximal end.

3. A fragment of a bladelet with an alternating distal truncation.

4. A transverse proximal burin on a blade.

5. A distal endscraper on a bilaterally denticulated blade.

6. A double endscraper on a blade formed by sur enclume retouch with backing on the left edge and o notch on the right edge.

7. A flake which appears to be a re-worked Aterian piece. There is a broken bifacial tang on the proximal end.

8. A possible burin plan on a flake. The burin facet (?) is on the ventral surface and was struck from a distal truncation.

9. A fragment of a bladelet with sur enclume retouch grading into bifacial retouch along one edge.

NON-LITHIC ARTIFACTS

The assemblage of non-lithic artifacts from the 1976 excavations includes items made of bone (N = 21), ostrich egg shell (N = 5), marine shell (N = 2), and some extremely small fragments of shell-tempered ceramics. The last were found only in L8 between 30 and 45 cm. They appear identical to those found previously but are too rare and fragmentary for further discussion here.

BONE ARTIFACTS

The most common variety here is the poinçon (N = 18). Most are fragmentary, but four can be identified as falling within the characteristics of poinçon type 4 as defined by Camps-Fabrer (69). A single, extremely small medial fragment seems best placed in the alène category (70). In those cases for which identification of the original animal is possible, these tools are always made of gazelle bone. In addition, there are two bones identifiable to Atlas gazelle (a distal metatarsal and a distal metacarpal) which retain traces of groove and splinter technique.

(69) Camps-Fabrer (H.), op. 1., 1966, p. 109.

(70) Ibid., p. 123.

In general, bone artifacts are poorly preserved, with considerable root etching of the surface and destruction of the original polish.

POINÇON TYPE 4

— (M8/60-65) : The proximal portion is present, the distal end is missing. Made on a splinter of gazelle metapodial. L = 42.2 ; prox. D = 11.6 ; dist. D = 4.2.
— (L11/65-70) : Burned, proximal fragment made on a splinter of gazelle metapodial. L = 14.9 ; prox. D = 10.4.
— (M8/75-80) : Elongate splinter from the proximal end of a gazelle metapodial (complete). L = 66.2 ; prox. D = 10.9 ; medial D = 5.6 ; dist. D = 2.2.
— (L11/155-160) : Elongate splinter with a missing distal end. Probably made from a gazelle metapodial. L = 28 ; prox. D = 8.2 ; dist. D = 3.6.

POINÇON FRAGMENTS

— (M8/0-30 & 35-40) : Originally found as four medial fragments (two from each level), these were reconstructed to form a single medial fragment of a poinçon. L = 80.5 ; D = 5.0 to 3.9.
— (M11/40-45) : Medial fragment, heavily encrusted with carbonate and very poorly preserved. L = 35.2 ; D = 5.8.
— (K12/45-50) : Distal fragment. Badly preserved. L = 39.3 ; D = 3.5.
— (K10/60-65) : Medial fragment, light weathering, no root etching, some polish preserved. L = 34.6 ; D = 4.1.
— (M8/70-75) : Distal fragment, light weathering. L = 33.6 ; D = 2.7.
— (M8/75-80) : Medial fragment with rather flat cross-section, heavy root etching and some longitudinal cracks. L = 33.7 ; D = 5.8.
— (L11/75-80) : Medial fragment with some, but not severe, root etching and retaining traces of red ochre. L = 24.1 ; D = 4.7.
— (K10/80-85) : Medial fragment in very poor condition with heavy root etching. L = 20.2 ; D = 3.6.

— (K10/80-85) : Distal part (consists of two reconstructed fragments) both badly weathered and heavily etched. L = 65.5 ; medial D — 4.5 ; distal D = 3.5.

— (K9/100-105) : Medial fragment of a very small poinçon. L = 29.9 ; D = 2.9.

— (K8/110-115) : Medial fragment with moderate root etching. L = 19.2; D = 3.8.

— (L9/120-125) : Medial fragment with root etching. L = 30.0 ; D = 5.4.

— (L9/130-135) : Medial fragment with heavy root etching and in poor condition. L = 28.9 ; D = 4.2.

— (L9/135-140) : Distal portion composed of two fragments ; the distal end and a medial section. This specimen is very heavily weathered, and only the distal fragment can be measured. L = 63.0 ; D = 4.1.

ALENE (OR EPINGLE ?)

— (L9/95-100) : A very small medial fragment. L = 21.1 ; D = 1.5.

POINTE DE SAGAIE

— (J9/1973 test) : This specimen was discovered during a re-study of the faunal remains from the 1973 excavations. It is an elongate pointed splinter with a bevelled base and the dimensions suggest an animal larger than gazelle. L = 62.0 ; D = 10.8.

WORKED BONE

Two bone artifacts from AM can still be recognized directly as derived from *Gazella cuvieri* metacarpals. The first specimen shows traces of transverse grooving due to repreated cuts at about 20 mm above its distal end going around almost its complete periphery and was broken following this groove. The second specimen carries a comparable transverse groove at about 33 mm from its distal end on its dorsal surface ; three other grooves parallel to the longitudinal axis of the bone occur in the middle of the plantar side, on one of the lateral sides and on the dorsal surface in the middle above one of the condyles. Snapping of this bone was also attempted but apparently without success. Both specimens, which are apparently discarded waste, illustrate nicely the grooving-and-snapping technique, used to produce elongate bone splinters, which were worked into needles, an item frequently found in the Capsian. A preliminary examination of most bone needles (thickness of bone, size) from AM suggests that many of them may also be derived from long bones and possibly predominantly from metapodials of *Gazella* spp. or comparable herbivores. Needles collected at Dra-Mta-el-Ma-el-Abiod also seem to have been made predominantly from *Gazella* metapodials (71). Larger needles are much less frequent could be derived from bone of hartebeest, the most common species in Capsian sites.

(71) MOREL (J.), I.I., 1974.

SHELL ARTIFACTS

These are rare at AM, consisting of four ostrich egg shell beads, a fragment of decorated ostrich egg shell, a perforated *Columbella rustica* shell, and a fragment of marine gastropod shell which appears to have formed part of a bracelet (?).

EGG SHELL BEADS

— (K12/55-60) : An incomplete (or possibly broken) specimen. Outer D = 10.5 ; Perforation D = 3.0.

— (L9/105-110) : Two complete specimens ; one large and one small. Outer D = 13.9 and 5.2 ; Perforation D = 4.1 and 2.0.

— (K9/105-110) : A complete specimen. Outer D = 13.2 ; Perforation D = 4.8.

DECORATED EGG SHELL

— (K9/60-65) : This specimen is decorated with one line of short, parallel grooves about 1 mm long each, in Style IB1 (72). It is subrectangularin shape : 20.5 x 20.5.

(72) CAMPS-FABRER (H.). op. 1.. 1966, p. 336.

BRACELET FRAGMENT

— (K9/50-55) : This specimen is an elongate curved strip of shell cut from the shell wall (probably the last whorl) of a large marine gastropod. Dimensions : L = 37. 9; W = 9.5 ; T = 2.5.

MARINE SHELL BEAD

— (K10/120-125) : A *Columbella rustica* shell has been perforated by the removal of the apex. Dimensions : L = 12.4 ; D = 10.0.

HUMAN SKELETAL REMAINS

Two human skeletons were excavated at AM during 1976. The first, an adult male, was found primarily in K8. The body had been buried in a shallow pit beneath two large boulders and several smaller ones. A full description of this skeleton and the manner of its burial has been published elsewhere (73). A section drawing of the burial can be found in figure 1.

(73) MEIKLEJOHN (C.), PARDOE (C.), and LUBELL (D.), The adult skeleton from the Capsian site of Ain Misteheyia, Algeria. *Journal of Human Evolution*, t. 8, 1979, 411-426.

The second human skeleton belongs to a child who apparently died at birth. The remains were excavated in L11 between 95 and 100 cm. A radiocarbon sample from the same level, but taken from the north wall of L11, has been dated at 8125 ± 125 years. B.P. (Table 2 : I-9784).

No artifactual materials were found which could be related directly with the skeleton. The bones appeared to be simply included within the normal matrix of the deposits without any evidence for a burial pit.

The skeleton was studied by Dr. Mark Skinner (Department of Archaeology, Simon Fraser University) who reported as follows (74).

(74) SKINNER (M.), in litt., 18.08 77.

« Nothing below the lumber vertebrae was recovered ; i.e. no pelvis or lower limb elements (see table 53).

In my opinion two individuals are represented ; all but one item came from a single individual to be discussed below. The odd item is a deciduous molar cusp (AM/051) probably from a child of 1-2 months of age (post partum). It is too large to be any of the missing cusps from the molars found. Were it to be from this individual it could only be a protoconid from the missing RDP 4 (= m 2) but a detailed microscopic examination of shape and size differences from the protoconid of the left DR 4 rule out this possibility.

There is absolutely no evidence recorded in the recovered remains of any kind of abnormal development or environmental stress.

From attained formation levels of the deciduous molar crowns using normative data from Kraus and Jordan (75), I can age the individual accuratelf to 37 ± 1 weeks (probably 36) intrauterine (38 - 40 weeks is modal full term gestation).

(75) KRAUS (B.S.) and JORDAN (R. E.), *The human dentition before birth*. Philadelphia, Lea and Febiger, 1965.

From the previously mentioned lack of evidence for physiological stress in this individual and the slightly premature gestational age (though certainly potentially viable), I conclude that this individual died at birth. While the cause of death is unknown, death may have been made more likely by the slight physiological immaturity of this individual at birth ».

While we cannot dispute Skinner's interpretation, we stress that there was no evidence of a second individual found during excavation. If specimen AM/051 does in fact belong to another individual we can only suggest that the inclusion of that tooth was placed there intentionally for unknown reasons.

CONCLUSIONS

THE AIN MISTEHEYIA SEQUENCE

Data on the AM sequence are summarized in figure 15, where the values given in previous tables and figures have been transformed to Z values which show the deviation around the mean (X).

Examination of figures 15 shows that a number of changes occur beginning at about 100 cm or 8125±125 BP. These may be summarized as follows :

— shell fragments decrease and gravel increases ;
— the frequency of whole snail shells increases ;
— the frequency of bone fragments decreases ;
— larger herbivores (*Equus* and *Bos*) decrease in abundance while smaller mammals (*Gazella* and lagomorphs) become more ambundant.

These data suggest that at about 8200 BP the environment exploited by groups living at AM became more arid and that these people turned to smaller (more arid adapted) animals for food.

It seems that these conditions eventually resulted in (at least in part) changes in the lithic artifact assemblage. However, these changes appear to have taken several hundred years (until ca. 7700 BP ?) before they are really apparent. These may be summarized as follows :

— the size of tools decreases ;
— endscrapers, burins and backed flakes or blades decrease ;
— notches and denticulates and geometric microliths increase.

Taken together, these data suggest that the larger tools found in AM lower were used as weapons and implements for the hunting and butchering of larger animals than were the smaller tools in AM upper. Furthermore, a major factor in this equation seems to have been changing environmental conditions. Somewhat similar patterns appear to be present at OT and KZ and Medjez II. The question we must now ask is : do these sites represent a general (i.e. wide spread) phenomenon, and where does AM fit within the Capsian.

THE PLACE OF AIN MISTEHEYIA IN THE CAPSIAN

There seems little doubt that two major occupations are represented at AM, each composed of a number of shorter episodes. But how do these two major occupations compare with other Capsian sites ? Lubell (76) has used cluster analysis to compare 81 Capsian assemblages in the same way that the different levels of AM have been studied (cf. fig. 4). This analysis confirmed the distinction between AM Upper Level and AM Lower Level. Furthermore, the UL and the LL each clusters with a different set of assemblages : AM Upper with R'Fana inférieur, Medjez II Phase II and Ain Cherita ; AM Lower with El Mekta, Dakhlat es-Saâdane inférieur, Cubitus inférieur, Columnata sous abri, and Dra-Mta-El-Ma-El-Abiod (77).

Each of these clusters is compared visually in figure 16, based on the data in table 54. The following points should be emphasized.

(1) The cluster associated with AM Upper is characterized chiefly by high frequencies of notches and denticulates and backed bladelets. With the exception of burins at Medjez II, all other tools groups have frequencies of less than 10%. The published radiocarbon dates for these assemblages are all later than c. 7800 B.P. These assemblages have been assigned by Camps (78) to the Tébessa (R'Fana), Sétif (Medjez II) and Tiaret (Aïn Cherita) facies of the Capsien supérieur.

(2) The cluster associated with AM Lower is characterized by quite high frequencies of burins, endscarpers and geometrics in addition to the ubiquitous backed bladelets and notches and denticulates. With the exception of Dra-Mta-El-Ma-El-Abiod, the published radiocarbon dates are all older than ca. 7800 B.P. In that the dates for Dra-Mta do not sample the lower levels of the site, and there seems to have been some change in the assemblage over time (79), it is possible that the diagram published here represents a mixed assemblage. The assemblages in this cluster have been assigned by Camps (80) to the Tébessa (El Mekta) and Meridional (Dakhlat es-Saâdane) facies of the Capsien supérieur and to the Columnatian (Cubitus, Columnata). Morel (81) is equivocal on assigning Dra-Mta to one of the facies of the Capsien supérieur.

Thus, our suggestion earlier in this report that AM Lower might possibly be considered Capsien typique, does not seem to be substantiated. Nonetheless, a chronogical distinction is clear, and some explanation (other than geographic location of the sites) must be adduced for this patterning. The data from AM and Medjez II are helpful here.

At both AM and Medjez II, at about 8000 B.P., there are changes in the vertebrate fauna : the frequencies of larger vertebrates decline while those of smaller, more arid adapted animals, increase. Furthermore, at AM, this is the approximate date at which the number of snail shells in the deposits begin to increase, the frequency of *Helix melanostoma* (grassland habitat) decreases and the frequencies of *Helicella sitifensis* and *Leucochroa candidissima* (more arid adapted) begin to increase. In addition this is the approximate time at which our geoarchaeological data indicate the onset of more arid conditions. Couvert (82) dates this arid episode to ca. 8250 B.P. which is in good agreement with our estimate from AM of ca. 8125 ± 125 B.P. He suggests a drop in mean annual precipitation of about 150 mm.

(76) LUBELL (D.), Paleoenvironments and epipaloelithic economies in the Maghreb (20 000 to 5 000 B.P.). In, CLARK (J.D.), (ed.), *The causes and consequences of food production in Africa*, Berkeley, University of California Press, 1980.

(77) Data for R'Fana, Medjez II, Ain Cherita, El Mekta, Dakhlat es-Saâdane, Cubitus and Columnata are taken from CAMPS (G.), *Les civilisations préhistoriques de l'Afrique du nord et du Sahara*, Paris, Doin, 1974. Data for Dra-Mta-El-Ma-El-Abiod are from MOREL (J.), L'industrie lithique de l'escargotière de Dra-Mta-El-Ma-El-Abiod dans le sud-est algérien : sa composition, son évolution. *L'Anthropologie*, t. 82, 1978, pp. 335-372.

(78) CAMPS (G.), op. 1.

(79) MOREL (J.), 1.1., 1978.

(80) CAMPS (G.), op. 1.

(81) MOREL (J.), 1.1., 1978.

(82) COUVERT (M.), Variations paléoclimatiques en Algérie. *Libyca*, t. 20, 1972, pp. 45-48.

The evidence from the land snail shell assemblages is also informative. Snail collecting seems to have become more important over time to judge from the AM-OT-KZ sequence. However, the species collected changed with time. *Helix melanostoma,* which is frequent in the lower part of AM, decreases staldily until the lower levels at OT and then increases again. We suspect the later increase occured about 7600 B.P., at or near the time when Couvert (83) postulates an increase in precipitation (his date is 7850 B.P.). The initial decrease in *Helix* is probably related to the combined deleterious effects of increased collection and aridification. The later increase in *Helix* may reflect increase in population density for this species following the onset of more humid conditions after ca. 7800 B.P. The evidence from KZ suggests that *Helix* frequencies may have declined again after about 6500 B.P., and while we cannot be positive, this may be related to a pluviometric minimum postulated by Couvert (84) at ca. 6300 B.P.

(83) Ibid.

(84) Ibid.

These data, in combination with other North African data on Holocene climate and environment (85), suggest a wide-spread episode of aridity in the Maghreb beginning at about 8000 ± 200 years ago and lasting for perhaps 500 years. While we lack sufficient detailed studies of the fauna from Capsian sites to be absolutely sure, it appears on present evidence that this change in climate is reflected in changes in lithic and faunal assemblages from Capsian sites. This is certainly the case at AM, Medjez II and at KZ. At KZ, data excavated in 1978 (which will be the subject of a separate report) confirm the presence of two, chronologically and typologically distinctive lithic assemblages in association with different vertebrate faunal assemblages : the later levels have characteristics with suggest Capsien typique even more strongly than AM Lower and the fauna is composed almost exclusively of large herbivores.

(85) Reviewed by Rognon (P.), Essai d'interprétation des variations climatiques au Sahara depuis 40.000 ans. *Rec. Géog. Phys. et Géol. Dyn.,* t. XVIII, 1976, pp. 251-282 ; and by Lubell (D.), l.l. 1980.

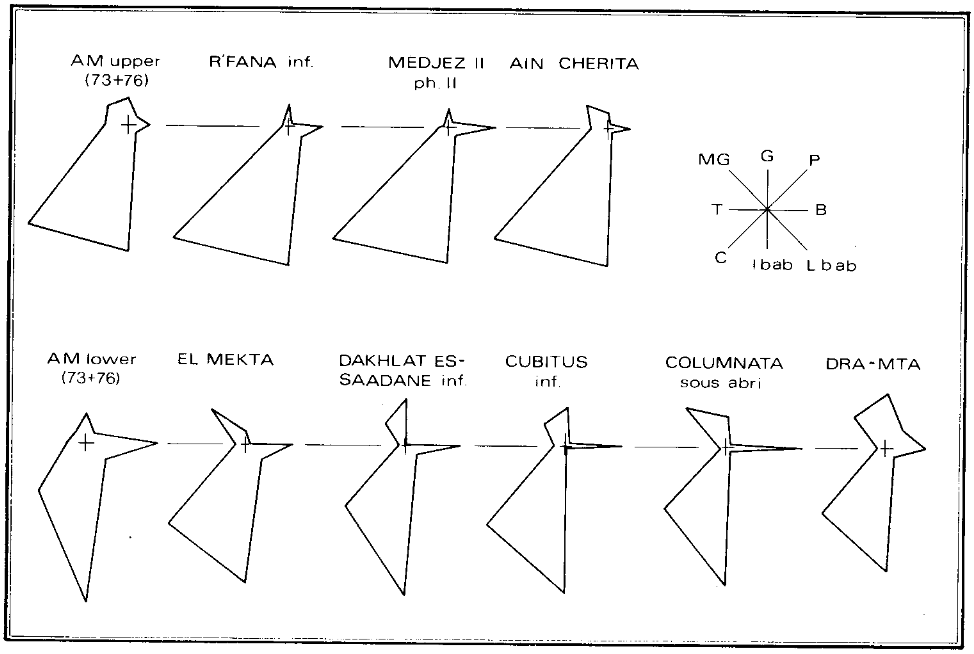

Figure 16. — Comparison of Ain Misteheyia with other Capsian assemblages. Data are taken from table 54, and each star diagram represents the percentage frequencies.

Thus, we argue that the data indicate concomitant changes in climate, environment, artifact assemblages and faunal assemblages. But the question remains as to just what this means in terms of subsistence strategies or, in other words, the Capsian palaeoeconomy.

THE CAPSIAN PALAEOECONOMY

All our data suggest that changes in subsistence strategies occurred over the time period represented by the AM-OT-KZ sequence. But were these changes fundamental ones, or were they merely adjustments which permitted Capsian groups to take better advantage of local conditions without having to change their basic way of life ?

In general terms, we see a change from an earlier pattern in which large herbivores (*Bos, Equus, Alcelaphus*) and large land snails (*Helix melanostoma*) provided the bulk of the meat in the diet of Capsian groups, to a later pattern in which smaller animals (*Gazella* and lagomorphs but also *Alcelaphus*) and smaller land snails (*Helicella sitifensis, Leucochroa candidissima*) became more important. We can explain this change as due to increasingly arid conditions which caused changes in the biotope (e.g. overgrazing of poor grassland) that were, it appears, irreversible to a certain extent. Thus, it seems that Capsian groups increased their collection of land snails as the larger mammals and land snails became less frequent.

In order to understand this patterning more clearly, we have computed two indices and two ratios for the faunal data from AM. The indices for bone density and shell density show clearly that bone density declines in relation to shell density from lower to upper levels (table 55). The very high figure for SDI between 30 and 65 cm may be a result of compaction in the UL as we BDI have already discussed. Nonetheless, the trend is clear.

In table 56, we have compared the specific ratio to the dietary ratio. The former refers to the frequency of individual specimens per species or supra-specific category (e.g. vertebrates *vs.* intervertebrates) ; the latter refers to the inferred dietary contribution of each species or supra-specific category.

Here, as well, the trend through time is clear ; shell or meat from snails is at least five as abundant between 30 and 65 cm as between 125 and 155 cm.

Thus, unless differencial preservation factors are involved (and this must be considered a possibility given the apparent difference in deposition rates), one can only conclude that snails became more important as a source of food during the later periods of occupation at AM.

However, we emphasize that this does not imply any fundamental change in the subsistence strategy of the people who lived at AM. What we see, instead, is a continuing series of adjustments to a basic way of life which, so far as we can tell, did not occasion major changes. As with modern hunter-gatherers (86), flexibility appears to have been the key to success for Capsian groups.

Part of this flexibility undoubtedly included frequent movement among sites and regions. In our opinion, the case for seasonal occupation of the escargotières is very strong, although we agree that the evidence necessary to prove such and hypothesis has not yet been found (87). We have provided some data here but more is required. If, as seems to be the case, there are strong continuities between the Capsien supérieur and the Neolithic of Capsian Tradition, the recent model proposed by Roubet for transhumance during the NCT (88) should also be applicable to the preceeding Capsian supérieur (at least). One of us has discussed these matters in greater detail elsewhere (89).

(86) cf. LEE (R.B.), op. l.

(87) Contra GREBENART (D.). — Une civilisation d'Afrique du Nord : le capsien. *La Recberche*, t. 9, 1978, pp. 138-145. See also discussions by LUBELL (D.), 1.1., 1980 ; and by MOREL (J.), Les capsiens de la région de Tébessa : sédentaires ou nomades. *Libyca*, t. XXV, 1977, pp. 157-161.

(88) ROUBET (C.). — Une économie pastorale, pré-agricole en Algérie orientale : le néolithique de tradition capsienne. *L'Anthropologie*, t 82, 1978, pp. 583-586.

(89) LUBELL (D.). — 1.1., 1980

Original (Square J9: 1973)	Revised (All squares: 1976)
Level 6	Level 5
Level 5	Level 4
Level 4	Level 3
Levels 3a, 3b & 2	Level 2
Level 1	Level 1

Table 1. — Original and revised lithostratigraphy for Ain Misteheyia.

Site	Lab. No.	Provenience[a]	Material	^{14}C yrs BP ($T\frac{1}{2}$=5568)
Kef Zoura D				
	I-9835	90-95 cm	charcoal	5965±115
	I-9836	125-130 cm	charcoal	6485±125
	I-9837	145-150 cm	charcoal	6505±125
	I-9838	165-170 cm	charcoal	6575±170
Oued Télidjène A				
	I-9832	120-125 cm	shell	7280±120
Ain Misteheyia				
	I-7690	J9: 40-45 cm	shell	7280±115
	I-9782	L9: 48-55 cm	shell	7640±115
	I-9781	K10: 50-60 cm	shell	7725±120
	I-8378(*b*)	J9: 80-90 cm	shell	8835±140
	I-9783	M8: 90-100 cm	shell	7990±125
	I-9784	L11: 95-105 cm	shell	8125±125
	I-7691	J9:125-135 cm	shell	9280±135
	I-9785	M10:130-140 cm	shell	9430±150
	I-9786	K9:140-145 cm	shell	9615±155
	I-9826(*c*)	K8:140-150 cm	shell	9130±150
	I-9824	K12:145-150 cm	shell	9805±160
	I-9825	K10:150-155 cm	shell	9590±155

(a) All depths are below datum for that site.
(b) Sample taken from disturbed area.
(c) Sample of snail shells from matrix surrounding human burial.

Table 2. — Radiocarbon dates for AM, OT and KZ.

Depth	Sand L11	Sand M8	Sand M10	Sand X̄	Silt L11	Silt M8	Silt M10	Silt X̄	Clay L11	Clay M8	Clay M10	Clay X̄	Shell Fragments L11	Shell Fragments M8	Shell Fragments M10	Shell Fragments X̄	Gravel L11	Gravel M8	Gravel M10	Gravel X̄
30-35	48	43	58	49.7	30	28	23	27.0	22	29	19	23.3	29	50	58	45.7	67	42	38	49.0
35-40	38	49	55	47.3	33	28	23	28.0	29	23	22	24.7	33	47	70	50.0	64	50	23	45.7
40-45	52	60	65	59.0	27	20	19	22.0	21	20	16	19.0	44	76	73	64.3	53	20	23	32.0
45-50	55	50	63	56.0	26	29	22	25.7	19	21	15	18.3	33	80	80	64.3	67	14	18	33.0
50-55	48	60	54	54.0	24	23	27	24.7	28	17	19	21.3	56	74	77	69.0	42	19	19	26.7
55-60	62	55	66	61.0	23	30	21	24.7	15	15	13	14.3	69	59	75	67.7	27	39	22	29.3
60-65	62	54	57	57.7	23	27	30	26.7	15	19	13	15.7	36	74	80	63.3	61	22	15	32.7
X̄ for Upper Level				55.0				25.5				19.5				60.6				35.5
65-70	51	54	66	57.0	30	36	31	32.3	19	10	13	14.0	66	66	48	60.0	21	26	47	31.3
70-75	55	56	63	58.0	23	31	25	26.3	22	13	12	15.7	47	66	88	67.7	41	24	9	24.7
75-80	63	53	59	58.3	26	29	23	26.0	11	18	18	15.7	52	68	76	65.3	46	28	21	31.7
80-85	54	59	59	57.3	25	30	23	26.0	21	11	18	16.7	3	48	22	24.3	97	49	73	73.0
85-90	52	59	68	59.7	31	30	20	27.0	17	11	12	13.3	14	73	81	56.0	84	22	17	41.0
90-95	60	54	68	60.7	30	28	20	26.0	10	18	12	13.3	64	80	83	75.7	31	18	15	21.3
95-100	51	60	57	56.0	28	33	27	29.3	21	7	16	14.7	65	72	81	72.7	32	24	14	23.3
100-105	63	58	61	60.7	29	30	27	28.7	8	12	12	10.7	62	71	79	70.7	32	22	17	23.7
105-110	62	58	61	60.3	30	31	26	29.0	8	11	13	10.7	50	67	54	57.0	47	30	43	40.0
110-115	52	53	66	57.0	31	33	17	27.0	17	14	17	16.0	44	68	72	61.3	40	25	21	28.7
115-120	49	53	68	56.7	37	30	20	29.0	14	17	12	14.3	54	64	51	56.3	40	24	34	32.7
120-125	50	59	56	55.0	34	31	29	31.3	16	10	15	13.7	46	72	74	64.0	48	19	20	29.0
125-130	51	57	55	54.3	32	33	31	32.0	17	10	14	13.7	36	68	63	55.7	56	26	23	35.0
130-135	53	48	61	54.0	29	36	27	30.7	18	16	12	15.3	33	57	61	50.3	54	39	28	40.3
135-140	54	50	50	51.3	30	36	35	33.7	16	14	15	15.0	46	55	38	46.3	50	37	41	42.7
140-145	46	53	62	53.7	36	38	24	32.7	18	9	14	13.7	28	28	39	31.7	69	66	52	62.3
145-150	55	50	64	56.3	29	38	20	29.0	16	12	16	14.7	32	39	35	35.3	66	56	62	61.3
150-155	47	56	50	51.0	26	34	30	30.0	27	10	20	19.0	10	38	31	26.3	87	58	65	70.0
X̄ for Lower Level				56.5				29.2				14.4				54.2				39.6

Table 3. — Granulometric percentage frequencies for Ain Misteheyia (1976 excavations).

NB. — Sand, silt and clay determined by hydrometer method. Shell fragments and gravel hand sorted and frequencies determined by weight (shell fragments + gravel + flint chips + bone fragments = 100 %).

Depth (cm)	Calcium L11	Calcium M8	Calcium M10	Calcium X̄	Iron L11	Iron M8	Iron M10	Iron X̄	Phosphorus L11	Phosphorus M8	Phosphorus M10	Phosphorus X̄	pH L11	pH M8	pH M10	pH X̄
30-35	25.1	23.4	26.5	25.0	.06	.10	.02	.06	.06	.17	.18	.14	8.00	8.45	8.00	8.15
35-40	23.4	27.7	28.3	26.5	.06	.05	.02	.04	.09	.12	.16	.12	8.15	8.25	8.10	8.17
40-45	26.5	28.8	28.7	28.0	.07	.02	.01	.03	.15	.12	.17	.15	8.05	8.55	8.50	8.37
45-50	26.0	28.2	27.1	27.1	.03	.03	.01	.02	.22	.15	.22	.20	8.15	8.40	8.55	8.37
50-55	27.3	28.7	29.6	28.5	.05	.02	.01	.02	.13	.13	.29	.18	8.35	8.30	8.60	8.42
55-60	27.6	26.2	27.8	27.2	.02	.003	.003	.01	.18	.14	.59	.30	8.30	8.50	8.45	8.42
60-65	27.5	26.2	29.3	27.7	.03	.10	.01	.04	.30	.22	.18	.23	8.30	8.15	8.45	8.30
X̄ for Upper Level				27.1				.03				.19				8.31
65-70	28.0	28.7	28.0	28.2	.01	.01	.01	.01	.18	.20	.22	.20	8.30	8.30	8.40	8.33
70-75	28.6	29.6	28.2	28.8	.01	.01	.02	.01	.26	.41	.27	.31	8.25	8.65	8.42	8.44
75-80	28.5	27.0	27.9	27.8	.02	.01	.01	.01	.26	.21	.34	.27	8.35	8.30	8.40	8.35
80-85	26.8	29.0	30.2	28.7	.01	.01	.02	.01	.31	.35	.35	.34	8.20	8.65	8.20	8.35
85-90	25.7	29.6	29.7	28.3	.03	.003	.01	.01	.29	.35	.39	.34	8.20	8.55	8.30	8.35
90-95	26.1	29.1	28.2	27.8	.03	.001	.01	.01	.28	.31	.46	.35	8.30	8.40	8.40	8.37
95-100	26.4	27.0	28.1	27.2	.02	.01	.01	.02	.31	.40	.48	.40	8.20	8.40	8.40	8.33
100-105	28.0	27.5	28.3	27.9	.01	.03	.04	.02	.38	.53	.54	.48	8.20	8.40	8.35	8.32
105-110	26.6	29.0	28.5	28.0	.04	.13	.01	.06	.28	.49	.53	.44	8.25	8.45	8.35	8.35
110-115	28.7	30.0	nd	29.4	.05	.01	nd	.03	.36	.54	nd	.45	8.20	8.50	8.20	8.30
115-120	27.5	30.3	28.1	28.6	.10	.00	.02	.04	.54	.48	.58	.53	8.20	8.45	8.15	8.27
120-125	26.4	19.2	27.2	24.3	.08	.00	.03	.04	.38	.62	.51	.50	8.15	8.20	8.30	8.22
125-130	25.1	25.8	28.8	26.6	.07	.05	.02	.05	.43	.54	.56	.51	8.35	8.25	8.40	8.33
130-135	26.9	19.8	28.7	25.1	.13	.17	.04	.11	.39	.47	.60	.49	8.35	8.20	8.30	8.28
135-140	27.0	26.2	27.8	27.0	.05	.06	.05	.05	.38	.52	.34	.41	8.45	8.40	8.40	8.42
140-145	25.2	26.8	27.5	26.5	.09	.07	.05	.07	.24	.45	.27	.32	8.40	8.50	8.40	8.43
145-150	25.6	26.4	26.3	26.1	.09	.08	.05	.07	.23	.37	.18	.26	8.35	8.30	8.40	8.35
150-155	23.7	27.0	25.8	25.5	.14	.08	.05	.09	.13	.51	.29	.31	8.40	8.40	8.40	8.40
X̄ for Lower Level				27.3				.04				.38				8.34

Table 4. — Percentage frequencies for Ca, Fe and P and pH values for Ain Misteheyia (1976 excavation).

NB. — Ca and Fe determined by atomic absorption spectrophotometry with a Perkin Elmer Model 496 ; P determined by stannous chloride colorimetric method with a Pye-Unicam spectrophotometer ; pH determined with à Corning (electronic) pH meter.

Site	weight in grams	number	% identified	mean weight in grams
AM, 1973	--	158	±4.3	--
	+3500	±3700	--	0.9
AM, 1976				
Identified	5924	750	2.9	7.9
Not identified	23538	25542	--	0.9
Total	29462	26292	--	1.1
AM, 1973 + 1976				
Totals	32962	29992	--	1.1
OT1				
Identified	352(127)	48(47)	8.5	7.3(2.7)
Not identified	511	514	--	1.0
Total	863(638)	562(568)	--	1.6(1.1)
OT2				
Identified	51	16	8.6	3.2
Not identified	148	170	--	0.9
Total	199	186	--	1.2
OT1 + OT2				
Identified	403(118)	64(63)	8.6	6.3(2.8)
Not identified	659	684	--	1.0
Total	1062(837)	748(747)	--	1.4(1.1)
KZ (1976)				
Identified	40	29	17.6	1.4
Not identified	380	237	--	1.6
Total	420	266	--	1.6

Table 5. — Comparison of weight and number of fragments at AM, OT and KZ.

Site & year	Excavated volume cm^3	Total number of fragments	$\overline{X}$ number per cubic meter	$\overline{X}$ weight per cubic meter gr
AM 1973	5.10^6	3700	740	± 700
AM 1976	14.10^6	26292	1878	2103
AM 1973+1976	19.10^6	29992	1579	1735
OT1 + OT2 1976	1.10^6	748	748	1062
KZ 1976	$1.5.10^6$	266	177	280

Table 6. — Bone productivity at AM, OT and KZ.

Depth (cm)	*Equus mauritanicus*	*Alcelaphus buselaphus*	large bovid	*Gazella* spp.	*Ammotragus lervia*	lagomorphs	*Aetechinus algirus*	*Canis aureus*	turtle	small bovids	*Struthio camelus* (eggshell)	*Jaculus orientalis*	*Meriones shawi*	lizard	totals
0-30	--	7	--	--	--	--	--	1	--	--	3	--	--	--	11
30-35	--	3	--	--	--	--	--	--	--	--	4	--	+	--	7
35-40	--	2	1	--	1	--	--	--	--	--	1	--	--	--	5
40-45	1	6	--	--	--	2	--	--	1	--	3	--	--	--	13
45-50	--	14	--	2	--	2	--	--	--	--	5	--	--	--	23
50-55	--	20	--	2	1	3	--	--	4	--	5	--	--	--	35
55-60	--	21	2	--	--	2	--	--	--	--	5	--	--	--	30
60-65	2	21	1	2	2	3	--	--	1	--	2	+	--	--	34
65-70	2	11	1	3	1	1	--	--	--	--	3	--	+	--	21
70-75	1	16	2	1	--	6	--	--	--	--	6	--	--	--	33
75-80	--	23	--	4	--	10	--	1	1	--	5	--	+	--	44
80-85	4	26	--	1	--	3	--	--	--	--	3	--	--	1	38
85-90	8	21	1	--	--	1	--	--	--	--	2	--	--	--	33
90-95	3	19	2	1	2	7	1	--	3	1	1	--	--	--	40
95-100	7	38	4	3	--	8	1	1	1	1	7	--	+	--	73
100-105	2	15	2	1	--	5	--	1	--	--	2	+	--	1	29
105-110	4	34	7	1	--	1	--	--	1	--	2	+	--	--	50
110-115	6	30	1	3	--	2	--	--	2	1	1	--	+	--	46
115-120	5	42	2	5	--	--	--	--	3	--	2	--	+	--	59
120-125	2	18	6	--	2	1	--	--	3	--	4	+	--	--	36
125-130	13	20	10	--	1	1	--	--	1	--	1	--	+	--	47
130-135	9	17	7	3	2	2	--	--	--	--	--	--	+	--	40
135-140	6	17	5	1	1	--	--	--	2	--	--	+	--	--	29
140-145	2	14	4	2	--	1	--	1	1	--	--	--	--	--	25
145-150	3	10	2	--	1	2	--	--	1	--	--	--	+	--	19
150-155	--	1	2	--	--	3	--	--	2	--	--	--	--	--	8
155-160	--	5	3	2	--	2	--	--	--	--	--	--	--	--	12
160-165	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
165-170	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
170-175	--	--	3	--	1	--	--	--	--	--	--	--	--	--	4
totals	80	442	68	37	15	68	2	5	28	3	67	+	+	2	817

Table 7. — Frequency of the various vertebrates per 5 cm level at AM 1976 (fragment counts).

471 27

	average weight(a)	number of fragments 1976	relative frequency 1976	relative frequency 1973	weight percentages 1976
Equus mauritanicus	175 kg	80	10.7%	19.0%	9.5%
Alcelaphus buselaphus	175	442	58.9	47.4	52.3
large bovid	800	68	9.0	8.2	36.8
Gazella cuvieri	25	22	2.9	10.8	0.5
G. dorcas	17	15	2.0	2.5	0.2
Ammotragus lervia	80	15	2.0	8.2	0.8
Aetechinus algirus	0.3	2	0.3	0.0	+
lagomorphs	2	68	9.0	3.2	+
Canis aureus	8	5	0.8	0.7	+
turtle	1	28	3.7	0.0	+
small birds	0.3	3	0.5	0.0	+
total		750			

Table 8. — Absolute and relative frequencies of game animals at Ain Misteheyia.

(a) Deduced from Malbrant (1952) and Oldfield (1894-1900).

Depth cm	*Equus* N	*Equus* %	*Alcelaphus* N	*Alcelaphus* %	*Bos* N	*Bos* %	Lagomorphs N	Lagomorphs %	Total
0-30	--	--	7	100.0	--	--	--	--	7
30-40	--	--	5	83.0	1	17.0	--	--	6
40-50	1	4.0	20	80.0	--	--	4	16.0	25
50-60	--	--	41	85.0	2	4.0	5	10.0	48
60-70	4	9.5	32	76.2	2	4.8	4	9.5	42
70-80	1	1.7	39	67.2	2	3.4	16	27.6	58
80-90	12	18.8	47	73.4	1	1.6	4	6.3	64
90-100	10	11.4	57	64.8	6	6.8	15	17.0	88
100-110	6	8.6	49	70.0	9	12.9	6	8.6	70
110-120	11	12.5	72	81.8	3	3.4	2	2.3	88
120-130	15	21.1	38	53.5	16	22.5	2	2.8	71
130-140	15	24.6	32	52.5	12	19.7	2	3.3	61
140-150	5	13.2	24	63.2	6	15.8	3	7.9	38
150-160	--	--	6	37.5	5	31.3	5	31.3	16
160-170	--	--	--	--	--	--	--	--	--
170-180	--	--	--	--	3	100.0	--	--	3
Total	80	11.7	469	68.5	68	9.9	68	9.9	685

Table 9. — Frequency changes of major game at AM 1976 (fragment counts).

Species	AM		OT1		OT2	OT1 + OT2		KZ	
	N	%	N	%	N	N	%	N	%
Equus mauritanicus	80	10.8	2	4.6	—	2	3.4	--	--
Alcelaphus buselaphus	469	63.6	12	27.9	3	15	25.9	5	20.8
large bovid	68	9.2	1	2.3	—	1	1.7	+	—
Gazella dorcas	15	2.0	--	--	1	1	1.7	--	--
Gazella cuvieri	22	3.0	4	9.3	2	6	10.3	6	25.0
Ammotragus lervia	15	2.0	2	4.6	—	2	3.4	1	4.2
lagomorphs	68	9.2	22	51.2	9	31	53.4	12	50.0
Aetechinus algirus	2		—		—	—		--	
Canis aureus	5		—		—	—		—	
Felis libyca	--		—		--	1		--	
turtle	28		3		—	4		3	
Struthio camelus (eggshell)	67		7		--	9		2	
small birds	3		--		—	—		--	
Jaculus orientalis	++		--		—	--		--	
Meriones shawi	++		1		--	1		--	
small rodent	—		--		—	--		—	
lizard	2		1		—	--		--	

Table 10. — Comparison of faunal assemblages at AM, OT and KZ (fragment counts).

Depth cm	*Alcelaphus*		Large Bovids		Gazelle		*Ammotragus*		*Lepus*	
	N	%	N	%	N	%	N	%	N	%
0-50	1	5.9	2	11.8	1	5.9	--	--	13	76.5
50-75	5	18.5	1	3.7	4	14.8	--	--	17	62.3
75-100	2	7.4	--	--	4	14.8	--	--	21	77.8
100-125	3	16.7	--	--	2	11.1	4	22.2	9	50.0
125-150	1	3.0	--	--	2	6.1	2	6.1	28	84.8
150-175	--	--	--	--	2	20.0	--	--	8	80.0
175-200	2	8.0	--	--	1	4.0	7	28.0	15	60.0
200-225	--	--	--	--	2	16.7	--	--	10	83.3
225-250	5	17.6	1	3.6	2	7.1	7	25.0	13	46.4
250-275	4	12.6	1	3.2	3	9.8	--	--	23	74.2
275-300	31	34.1	20	22.0	18	20.0	14	15.4	8	8.8
300-325	20	54.1	9	24.3	1	2.7	--	--	7	18.9
325-350	23	41.2	15	26.8	11	19.6	3	5.4	4	7.1

Table 11. — Absolute and relative frequencies of main game animals at Medjez II.

Class[a]	1973 No.	1973 %	1976 No.	1976 %	1973 + 1976 No.	1973 + 1976 %
Flakes	3295	14.53	6544	13.02	9839	13.49
Blades	5142	22.67	8776	17.46	13918	19.08
Cores & core fragments	139	0.61	190	0.38	329	0.45
Core-trimming pieces	100	0.44	931	1.85	1031	1.41
Burin spalls	150	0.66	978	1.94	1128	1.55
Microburins	214	0.94	348	0.69	562	0.77
Debitage	13642	60.14	32505	64.66	46147	63.25
	22682	99.99	50272	100.00	72954	100.00

Table 12. — Major artifact classes in the Ain Misteheyia assemblage.

(a) These include retouched tools.

Level	Flakes[a] N	Flakes[a] %	Blades[a] N	Blades[a] %	Cores & fragments N	Cores & fragments %	Core trimming N	Core trimming %	Burin spalls[a] N	Burin spalls[a] %	Micro-burins N	Micro-burins %	Debitage N	Debitage %	Total
Upper	2196	12.4 (29.3)[b]	4321	24.4 (57.7)	89	0.4 (1.2)	519	2.9 (6.9)	240	1.3 (3.2)	123	0.7 (1.6)	10235	57.7	17723
Lower	4348	13.4 (42.3)	4455	13.7 (43.3)	101	0.3 (1.0)	412	1.3 (4.0)	738	2.3 (7.2)	225	0.7 (2.2)	22270	68.4	32549
Total	6544		8776		190		931		978		348		32505		50272

Table 13. — Major artifact classes by level in the 1976 Ain Misteheyia assemblage.

(a) These include retouched tools.

(b) Figures in brackets are restricted percentages, calculated without debitage.

	Single platform N	Single platform %	Opposed platform N	Opposed platform %	Ninety degree N	Ninety degree %	Other N	Other %	Total
UL	34	47.2	9	12.5	13	18.1	16	22.2	72
LL	30	32.6	22	23.9	13	14.1	27	29.3	92
Total	64		31		26		43		164

Table 14. — Major core classes (AM 1976).

	Flake cores N	Flake cores %	Blade cores N	Blade cores %	Flake/blade cores N	Flake/blade cores %	Total
UL	46	63.9	21	29.2	5	6.9	72
LL	58	63.0	27	29.3	7	7.6	92
Total	103		49		12		164

Table 15. — Frequency of flake and blade cores (AM 1976).

	less than 70° N	%	70° to 80° N	%	80° to 90° N	%	Total
Flake cores							
UL	11	22.9	21	43.8	16	33.3	48
LL	12	23.1	18	34.6	22	42.3	52
Total	23		39		38		100
Blade cores							
UL	6	19.4	10	32.3	15	48.4	31
LL	11	28.2	13	33.3	15	38.5	39
Total	17		23		30		70

Table 16. — Core platform angles (AM 1976).

	Lisse N	%	Faceted N	%	Total
UL	27	57.4	20	42.6	47
LL	35	66.0	18	34.0	53
Total	62		38		100

Table 17. — Flake core platforms (AM 1976).

	Lisse N	%	Faceted N	%	Total
UL	12	37.5	20	62.5	32
LL	28	65.1	15	34.9	43
Total	40		35		75

Table 18. — Dimensions of single platform cores (AM 1976).

	$\bar{X}$ Angle degrees	$\bar{X}$ Length mm	$\bar{X}$ Diameter mm
Flake cores			
UL	77.4	34.5	38.5
LL	73.0	36.3	37.1
Blade cores			
UL	77.3	46.9	35.6
LL	73.5	40.6	31.4

Table 19. — Blade core platforms (AM 1976).

	Lisse		Faceted		Total
	N	%	N	%	
UL	3	21.4	11	78.6	14
LL	8	57.1	6	42.9	14
Total	11		17		28

Table 20. — Platform types for single platform blade cores (AM 1976).

Level	Kind	Platform	N(a)	Platform Angle degrees		Length mm		Diameter mm	
				$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
UL	Flake	Lisse	12	76.3	8.65	32.8	11.39	37.5	12.28
LL	Flake	Lisse	10	72.8	10.79	38.2	7.76	38.1	6.44
UL	Flake	Faceted	7	80.0	8.66	38.6	7.46	39.3	7.45
LL	Flake	Faceted	6	73.3	8.36	33.2	6.82	35.3	7.99
UL	Blade	Lisse	3	78.7	1.55	51.7	14.43	37.7	10.50
LL	Blade	Lisse	8	73.0	6.10	35.1	6.10	29.4	8.67
UL	Blade	Faceted	10	76.9	6.40	39.0	7.60	29.8	5.73
UL	Blade	Faceted(b)	11	76.9	6.40	45.5	22.90	35.1	18.40
LL	Blade	Faceted	6	74.4	9.66	47.8	13.30	34.0	11.00

Table 21. — Characteristics of single platform cores (AM 1976).

(a) N here equals the total number of cores since all are single platform.

(b) One core within this group is much larger than normal (Length = 111 mm, diameter = 88 mm). It is pyramidal, and appears to have been abandoned (lost ?) before it was exhausted. Because it is far outside the normal range, figures calculated both with and without this piece are given. The figures for platform angle do not change as one other piece has a shattered which could not be measured.

	Flake cores N	%	Blade cores N	%	Flake/Blade cores N	%	Total
UL	3	33.3	5	55.6	1	11.1	9
LL	7	31.8	11	50.0	4	18.2	22
Total	10		16		5		31

Table 22. — Frequency of opposed platform cores (AM 1976).

Level	Kind	Platform	N[(a)]	Platform Angle degrees $\bar{X}$	s	Length mm $\bar{X}$	s	Diameter mm $\bar{X}$	s
UL	Flake	Lisse	5	69.4	10.45	32.4	2.51	32.0	9.69
LL	Flake	Lisse	9	80.0	6.68	36.8	14.50	32.4	15.50
UL	Flake	Faceted	2	88.0	0.00	35.5	3.54	26.5	9.19
LL	Flake	Faceted	7	79.1	4.56	35.4	7.14	32.9	4.95
UL	Blade	Lisse	5	70.2	6.53	45.2	3.56	26.8	4.38
LL	Blade	Lisse	21	75.6	10.19	40.0	12.18	29.1	13.18
UL	Blade	Faceted	6	82.5	2.26	34.8	5.12	27.8	4.67
LL	Blade	Faceted	3	72.7	14.19	37.0	7.20	31.3	6.51

Table 23. — Characteristics of opposed platform cores (AM 1976).

(a) Each platform has been treated separately. Thus, N equals the total number of platform which could be measured and from which length and diameter could be measured as well. The total number of cores in 31.

	Flake cores N	%	Blade cores N	%	Flake/Blade cores N	%	Total
UL	1	7.7	9	69.2	3	23.1	13
LL	-	-	9	69.2	4	30.8	13
Total	1		18		7		26

Table 24. — Frequency of 90° cores (AM 1976).

	Same side N	%	Adjacent side N	%	Opposite side N	%	Total
Upper(a)	3	25.0	5	41.7	4	33.3	12
Lower	7	53.8	3	32.1	3	23.1	13
	10		8		7		25

Table 25. — Frequency of 90° cores by type (AM 1976).

(a) One cannot be classified as it is too fragmentary.

Level	Kind	Platform	N[(a)]	Platform Angle degrees		Length mm		Diameter mm	
				X̄	s	X̄	s	X̄	s
UL	Flake	Lisse	10	76.7	8.30	27.8	5.90	32.0	7.86
LL	Flake	Lisse	14	75.6	8.28	34.4	6.70	36.4	5.42
UL	Flake	Faceted	8	74.8	10.43	41.0	14.66	39.6	10.53
LL	Flake	Faceted	5	80.0	8.90	33.0	8.75	38.4	7.96
UL	Blade	Lisse	4	79.5	9.00	48.8	14.20	45.5	11.79
LL	Blade	Lisse	2	79.0	7.10	42.5	13.40	38.0	7.10
UL	Blade	Faceted	3	74.6	5.69	36.6	1.53	30.3	4.20
LL	Blade	Faceted	4	72.0	10.40	51.0	15.00	33.0	13.86

Table 26. — Characteristics of 90° cores (AM 1976).

(a) N equals the number of platforms, not the number of cores which is 26. In each of the deposits, 13 cores have 2 platforms and 2 cores have 3 platforms.

Level	Kind	N	Length mm		Diameter mm	
			X̄	s	X̄	s
UL	Flake	3	38.0	14.42	30.0	7.94
LL	Flake	11	37.7	19.49	35.0	11.86

Table 27. — Distribution and characteristics of globular cores (AM 1976).

Level	Kind	N	Length mm		Diameter mm	
			X̄	s	X̄	s
UL	Flake	8	39.5	5.13	38.4	7.48
	Blade	1	29.0	--	33.0	--
LL	Flake	13	37.9	9.57	35.3	6.24

Table 28. — Distribution and characteristics of multiple platform cores (AM 1976).

Level	Kind	N	Platform	Platform Angle degrees	Length mm	Diameter mm
UL	Flake	2	Faceted	59 & 85	31 & 19	37 & 31
LL	Flake	1	Faceted	73	27	27

Table 29. — Wedge cores (AM 1976).

	Upper Level N	Upper Level $\bar{X}$	Upper Level *s*	Lower Level N	Lower Level $\bar{X}$	Lower Level *s*	*t*	?
Length (mm)	1584	22.9	7.82	1763	24.3	8.31	5.00	S
Width (mm)	1584	20.4	6.82	1763	20.6	6.64	3.69	S?
L/W ratio	1584	1:1.2	--	1763	1:1.2	--	--	--

Table 30. — Dimensions of complete flake debitage (AM 1976) (for key to symbols see table 37).

	Lisse N	Lisse %	Faceted N	Faceted %	Punctiform N	Punctiform %	Shattered N	Shattered %	Cortex N	Cortex %	Total
UL	982	62.0	485	30.6	60	3.8	50	3.2	7	0.4	1584
LL	1082	61.4	337	19.1	156	8.8	177	10.0	11	0.6	1763
Total	2064		822		216		227		18		3347

Table 31. — Striking platforms for complete flake debitage (AM 1976).

	Upper Level N	Upper Level $\bar{X}$	Upper Level *s*	Lower Level N	Lower Level $\bar{X}$	Lower Level *s*	*t*	?
Length	391	29.5	10.77	554	34.0	13.13	5.58	S
Width	391	11.7	4.29	554	13.8	5.51	6.31	S
L/W ratio	391	1:2.6	--	554	1:2.6	--	--	--

Table 32. — Dimensions of complete blade debitage (AM 1976).

	Lisse N	Lisse %	Faceted N	Faceted %	Punctiform N	Punctiform %	Shattered N	Shattered %	Cortex N	Cortex %	Total
UL	221	56.5	105	26.9	41	10.5	24	6.1	--	--	391
LL	305	55.1	93	16.8	74	13.4	76	13.7	6	1.1	554
Total	526		198		115		100		6		945

Table 33. — Striking platforms for complete blade debitage (AM 1976).

	Pointed		Blunt		Hinged		Overpassed		Total[a]
	N	%	N	%	N	%	N	%	
UL	201	51.7	167	42.9	18	4.6	3	0.8	389
LL	200	37.7	285	53.7	34	6.4	12	2.3	531
Total	401		452		52		15		920

Table 34. — Distal end shape of complete debitage blades (AM 1976).

(a) Twenty-five blades were sufficiently complete to be measured for length but there was enough uncertainty regarding the shape of the distal end that this was not recorded.

	Crested blades		Platform rejuvenation		Surface rejuvenation		Total
	N	%	N	%	N	%	
Upper	46	8.9	174	33.5	299	57.6	519
Lower	30	7.3	76	18.4	306	74.3	412
Total	76		250		605		931

Table 35. — Frequency of core-trimming pieces (AM 1976).

		Groups after Tixier (1963)										Total		Unidentifiable
		I	II	III	IV	V	VI	VII	VIII	IX	XI	N	%	fragments
Upper Level														
Flakes		36	2	11	2	5	1	97	4	3	67	228	23.65	42
Blades		14	16	33	18	1	226	200	34	75	112	729	75.62	31
Burin spalls		-	-	-	-	-	5	-	-	-	1	6	0.62	-
Indeterminate		-	-	-	-	-	-	-	-	-	1	1	0.10	7
Total	N	50	18	44	20	6	232	297	38	78	181	964		80
	%	5.19	1.87	4.56	2.07	0.62	24.07	30.81	3.94	8.09	18.78			
Lower Level														
Flakes		51	5	50	6	7	3	78	13	1	68	282	21.44	35
Blades		38	26	125	69	17	421	116	42	36	130	1020	77.57	18
Burin spalls		-	1	1	-	-	9	-	1	-	1	13	0.99	-
Indeterminate		-	-	-	-	-	-	-	-	-	-	-	-	41
Total	N	89	32	176	75	24	433	194	56	37	199	1315		94
	%	6.77	2.43	13.38	5.70	1.82	32.93	14.75	4.26	2.81	15.13			

Table 36. — Major artifact classes used for retouched tools (AM 1976).

Table 37.—Key : L = length (mm) ; W = width (mm) ; T = thickness (mm) ; A = angle (degrees) ; N = number ; X̄ = mean (mm) ; S = standard deviation ; t = value of t test ; ? =relationship at P .05 ; S = significant ; NS = not significant.

		Upper Level			Lower Level				
		N	X̄	s	N	X̄	s	t	?
All unbroken flake tools									
	L	99	33.7	10.99	150	36.5	13.68	1.71	NS
	W	99	27.4	2.39	150	28.9	10.26	1.45	NS
	T	99	7.7	4.03	150	8.8	4.18	2.08	S
All unbroken blade tools									
	L	127	30.8	12.30	276	40.4	16.93	5.73	S
	W	127	12.8	5.86	276	15.3	7.58	3.26	S
	T	127	4.0	8.39	276	6.1	3.45	3.56	S
All broken flake tools									
	L	141	28.0	9.32	135	33.0	10.58	4.14	S
	W	141	24.5	9.88	135	27.9	9.40	2.88	S
	T	141	7.4	3.82	135	8.2	3.69	1.57	NS
All broken blade tools									
	L	623	22.6	9.64	749	25.2	12.31	4.25	S
	W	623	11.1	5.08	749	11.9	7.01	2.26	S
	T	623	3.45	2.07	749	4.4	2.70	6.97	S
I Endscrapers									
On flakes	L	21	36.0	16.15	26	49.4	19.30	2.54	S
	W	21	32.7	12.39	26	36.1	11.85	0.97	NS
	T	21	9.8	5.22	26	12.4	4.98	1.74	NS
Bit	A(a)	36	72.4	8.91	48	68.6	11.88	1.61	NS
Bit	W(a)	34	29.0	11.21	45	29.7	11.35	0.27	NS
On blades	L	4	41.5	7.33	11	50.4	22.68	0.77	NS
	W	4	21.2	5.19	11	24.2	7.11	0.77	NS
	T	4	7.5	3.42	11	9.6	4.13	0.91	NS
Bit	A	13	72.6	8.50	37	68.2	11.71	1.24	NS
Bit	W	13	16.6	6.78	37	17.9	6.80	0.59	NS
Distal fragments									
On flakes	L	12	32.8	12.92	17	31.2	13.44	0.31	NS
	W	12	37.2	14.58	17	34.0	9.64	0.70	NS
	T	12	12.6	4.96	17	9.7	3.70	1.78	NS
On blades	L	6	37.0	15.15	24	34.2	12.97	0.45	NS
	W	6	21.8	7.03	24	20.7	6.36	0.39	NS
	T	6	7.5	1.76	24	7.1	2.88	0.30	NS

(a) Angle measured at intersection of ventral surface and scraper edge ; width measured at widest part of scraper bit.

II Perforators									
On flakes	L	2	20.0	-	3	44.7	-	-	-
	W	2	13.5	-	3	27.7	-	-	-
	T	2	3.5	-	3	8.7	-	-	-
On blades	L	2	26.0	-	7	38.1	11.13	-	-
	W	2	10.0	-	7	14.1	4.41	-	-
	T	2	2.0	-	7	5.4	2.37	-	-
III Burins									
On flakes	L	4	31.7	3.20	33	38.0	10.81	1.16	NS
	W	4	21.0	7.62	33	30.4	9.72	1.87	NS
	T	4	7.5	1.29	33	10.1	3.10	1.66	NS
On blades	L	13	45.1	13.37	75	43.0	10.35	0.64	NS
	W	13	22.4	6.44	75	18.4	4.66	2.68	S
	T	13	8.5	4.48	75	8.1	3.16	0.39	NS
IV Backed pieces									
On flakes		insufficient data for valid statistics							
On blades	L	-	-	-	12	64.8	11.80	-	-
	W	-	-	-	12	21.9	6.76	-	-
	T	-	-	-	12	7.7	2.46	-	-
V Composite Tools									
On flakes	L	3	43.3	0.58	7	33.1	6.67	-	-
	W	3	36.7	4.73	7	33.4	6.45	-	-
	T	3	15.7	2.08	7	10.3	3.45	-	-
On blades	L	2	36/22	-	8	50.1	4.64	-	-
	W	2	20/10	-	8	21.9	4.42	-	-
	T	2	9/2	-	8	10.1	4.09	-	-
VI Backed Bladelets									
Complete	L	15	26.8	10.05	57	27.9	8.39	0.43	NS
	W	15	8.9	3.74	57	7.1	3.17	1.88	NS
	T	15	2.7	1.28	57	3.3	1.65	1.31	NS
Distal fragments	L	86	20.4	6.26	150	19.9	6.42	0.58	NS
	W	86	6.7	2.70	150	6.4	2.46	0.84	NS
	T	86	2.4	0.91	150	2.8	0.94	3.27	S
Medial fragments	L	104	16.4	5.44	149	17.0	6.63	0.75	NS
	W	104	6.9	2.24	149	6.2	2.38	2.36	S
	T	104	2.4	1.21	149	2.9	1.18	3.28	S
Proximal fragments	L	28	20.0	7.03	63	20.1	6.35	0.09	NS
	W	28	7.6	2.06	63	7.7	3.29	0.14	NS
	T	28	2.4	1.00	63	3.1	0.89	3.33	S

All obverse backed	W	119	8.1	2.81	175	7.7	3.06	1.14	NS
	T	119	2.4	1.04	175	2.9	1.22	3.66	S
All sur enclume backed	W	91	5.5	1.57	222	5.7	1.93	0.88	NS
	T	91	2.4	1.01	222	3.0	1.06	4.61	S
VII Notches and denticulates									
On flakes	L	28	37.1	10.28	31	35.2	12.27	0.64	NS
	W	28	28.3	8.78	31	29.5	10.01	0.49	NS
	T	28	7.1	3.64	31	8.1	3.51	1.07	NS
On blades Complete	L	14	44.4	14.04	26	50.3	15.64	2.00	NS
	W	14	17.0	5.68	26	18.1	5.77	0.58	NS
	T	14	6.4	2.34	26	6.6	3.73	0.18	NS
Distal fragments	L	23	28.6	6.46	11	36.8	16.01	2.12	S
	W	23	14.2	4.70	11	18.1	5.77	2.10	S
	T	23	4.5	1.83	11	6.4	3.59	2.04	S
Medial fragments	L	105	21.7	7.34	34	24.7	9.89	1.89	NS
	W	105	12.5	3.38	34	14.1	4.14	2.26	S
	T	105	3.4	1.64	34	4.1	2.08	2.02	S
Proximal fragments	L	43	32.0	11.82	21	35.9	17.52	1.05	NS
	W	43	13.5	3.95	21	15.1	5.83	1.29	NS
	T	43	3.9	2.13	21	3.9	1.60	0.00	NS
VIII Truncations									
On flakes	L	3	29.7	15.14	7	23.3	6.34	-	-
	W	3	22.3	7.51	7	18.8	6.67	-	-
	T	3	7.0	3.46	7	4.1	3.48	-	-
On blades	L	7	28.8	9.26	16	33.2	16.79	0.65	NS
	W	7	11.3	3.04	16	15.1	4.62	1.99	NS
	T	7	2.8	1.07	16	5.4	2.34	2.81	S
IX Geometrics									
On flakes and blades	L	56	24.3	5.60	29	20.4	3.53	3.41	S
	W	56	8.2	6.07	29	6.7	2.34	1.28	NS
	T	56	2.4	0.80	29	2.8	0.90	2.09	S
XI Miscellaneous Type 105									
On flakes	L	35	29.9	8.57	42	31.0	10.58	0.49	NS
	W	35	24.2	7.20	42	25.3	8.64	0.60	NS
	T	35	6.5	3.48	42	6.8	3.23	0.39	NS
On blades	L	10	29.8	9.82	30	52.3	20.11	9.84	S
	W	10	13.2	3.55	30	18.5	7.59	4.88	S
	T	10	4.7	2.06	30	5.9	3.16	1.12	NS

Table 37. — Dimensions of retouched tools (unbroken only unless specified).

		Left	Right	Bilateral	None	Total N	Total %
Upper Level							
Flake		6	4	18	8	36	72.0
Blade		2	4	8	--	14	28.0
Total	N	8	8	26	8	50	
	%	16.0	16.0	52.0	16.0		
Lower Level							
Flake		6	12	22	11	51	57.3
Blade		8	2	18	10	38	42.7
Total	N	14	14	40	21	89	
	%	15.7	15.7	44.9	23.6		

Table 38. — Position of additional retouch on endscrapers (AM 1976).

	Left \ Right		None	Retouch Obv.	Retouch Inv.	Backing Obv.	Backing Inv.	Backing Encl.	Total N	Total %
Upper Level	None		-	1	-	2	-	-	3	18.8
	Obv. ret.		1	2	1	-	-	-	4	25.0
	Inv. ret.		-	-	-	-	-	1	1	6.2
	Obv. back.		-	-	-	1	-	-	1	6.2
	Inv. back.		-	-	-	1	-	-	1	6.2
	Encl. back.		1	-	3	1	1	-	6	37.6
	Total	N	2	3	4	5	1	1	16	
		%	12.5	18.8	25.0	31.3	6.2	6.2		
Lower Level	None		2	1	-	1	-	-	4	16.0
	Obv. ret.		2	3	-	2	-	2	9	36.0
	Inv. ret.		-	-	-	-	-	-	-	-
	Obv. back.		-	-	-	4	-	1	5	20.0
	Inv. back		-	1	-	-	-	-	1	4.0
	Encl. back.		-	3	-	1	-	2	6	24.0
	Total	N	4	8	-	8	-	5	25	
		%	16.0	32.0	-	32.0	-	20.0		

(a) On this and all subsequent similar tables : Obv. = ventral to dorsal retouch or backing ; Inv. = dorsal to ventral retouch or backing ; Encl. = sur enclume backing ; Alt. = alterning backing or retouch.

Table 39. — Position and attributes of retouch on perforators (AM 1976) (a).

		Left edge	Right edge	Bilateral	Dihedral	Total N	Total %
Upper Level (a)							
Distal		15	11	4	3	33	76.7
Proximal		3	3	-	1	7	16.3
Both		1	1	1	-	3	7.0
Total	N	19	15	5	4	43	
	%	44.2	34.9	11.6	9.3		
Lower Level (a)							
Distal		50	36	21	9	116	73.4
Proximal		11	10	6	1	28	17.7
Both		2	2	10	-	14	8.9
Total	N	63	48	37	10	158	
	%	39.9	30.4	23.4	6.3		

Table 40. — Orientation of burins (AM 1976).

(a) One burin in the UL and seventeen in the LL were too fragmentary to permit determination of orientation.

	Left \ Right		None	Retouch			Backing				Total	
				Obv.	Inv.	Alt.	Obv.	Inv.	Encl.	Obv.+Encl.	N	%
Upper Level (a)	None		-	-	-	-	3	-	-	-	3	16.6
	Obv. ret.		-	-	-	-	1	-	-	-	1	5.6
	Inv. ret.		-	-	-	-	1	-	1	-	2	11.1
	Alt. ret.		-	-	-	-	-	-	1	-	1	5.6
	Obv. back.		3	4	2	1	1	-	-	-	11	61.1
	Inv. back.		-	-	-	-	-	-	-	-	-	-
	Encl. back		-	-	-	-	-	-	-	-	-	-
	Obv.+Encl. back.		-	-	-	-	-	-	-	-	-	-
	Total	N	3	4	2	1	6	-	2	-	18	
		%	16.6	22.2	11.1	5.6	33.3	-	11.1			
Lower Level (a)	None		-	-	-	-	5	-	2	1	8	11.1
	Obv. ret.		1	-	-	-	12	-	-	1	14	19.4
	Inv. ret.		-	-	-	-	4	-	-	-	4	5.6
	Alt. ret.		-	1	-	-	1	-	1	1	4	5.6
	Obv. back.		18	12	1	1	-	-	-		32	44.4
	Inv. back.		2	-	-	-	-	-	-	-	2	2.8
	Encl. back.		6	1	-	1	-	-	-	-	8	11.1
	Obv.+Encl. back.		-	-	-	-	-	-	-	-	-	-
	Total	N	27	14	1	2	22	-	3	3	72	
		%	37.5	19.4	1.4	2.8	30.5	-	4.2	4.2		

(a) Two pieces in the UL and three in the LL are too fragmentary to determine the orientation.

Table 41. — Position and attributes of retouch on backed flakes and blades (AM 1976).

	Right Left		None	Retouch Obv.	 Inv.	Backing Obv.	 Inv.	 Encl.	Other	Total N	 %
Upper Level (a)	None		-	1	-	38	2	25	2	68	37.4
	Obv. ret.		1	2	-	12	-	9	1	25	13.7
	Inv. ret.		1	1	-	4	-	1	-	7	3.8
	Obv. back.		31	4	13	-	-	-	-	48	26.4
	Inv. back.		2	-	-	-	-	-	-	2	1.1
	Encl. back.		14	6	7	-	-	-	1	28	15.4
	Other		1	-	-	2	-	1	-	4	2.2
	Total	N	50	14	20	56	2	36	4	182	
		%	27.5	7.7	11.0	30.7	1.1	19.8	2.2		
Lower Level (a)	None		-	1	-	38	1	54	2	96	27.4
	Obv. ret.		1	2	-	13	-	24	1	41	11.7
	Inv. ret.		1	3	-	2	-	13	-	19	5.4
	Obv. back.		76	10	3	4	-	-	1	94	26.9
	Inv. back.		3	1	-	-	-	-	-	4	1.1
	Encl. back.		53	19	12	1	-	-	1	86	24.6
	Other		4	2	-	3	-	-	1	10	2.9
	Total	N	138	38	15	61	1	91	6	350	
		%	39.4	10.9	4.3	17.4	0.3	26.0	1.7		

Table 42. — Retouch and backing on backed bladelets (AM 1976).

(a) Orientation could not be determined for 40 pieces in the UL and 66 pieces in the LL.

	Left \ Right		None	Obverse	Inverse	Other	Total N	Total %
Upper Level (a)	None		7	20	4	2	33	36.7
	Obverse		27	21	1	-	49	54.4
	Inverse		3	2	-	-	5	5.6
	Other		2	1	-	-	3	3.3
	Total	N	39	44	5	2	90	
		%	43.3	48.9	5.6	2.2		
Lower Level (a)	None		10	20	2	-	32	43.8
	Obverse		14	15	1	-	30	41.1
	Inverse		6	3	-	-	9	12.3
	Other		-	1	1	-	2	2.7
	Total	N	30	39	4	-	73	
		%	41.1	53.4	5.5	-		

(a) Orientation could not be determined for 20 pieces in the UL and 6 in the LL.

Table 43. — Position and kind of retouch on notched and denticulated flakes (AM 1976).

	Left \ Right		None	Obverse	Inverse	Other	Total N	Total %
Upper Level (a)	None		2	22	2	1	27	15.0
	Obverse		30	107	3	2	142	78.9
	Inverse		1	7	1	-	9	5.0
	Other		-	-	1	1	2	1.1
	Total	N	33	136	7	4	180	
		%	18.3	75.6	3.9	2.2		
Lower Level (a)	None		2	14	8	-	24	21.8
	Obverse		24	33	4	3	64	58.2
	Inverse		3	5	-	-	8	7.3
	Other		4	6	1	3	14	12.7
	Total	N	33	58	13	6	110	
		%	30.0	52.7	11.8	5.5		

(a) Orientation could not be determined for 7 pieces in the UL and in the LL.

Table 44. — Position and kind of retouch on notched and denticulated blades (AM 1976).

	Upper N	Upper %	Lower N	Lower %
Bilateral notches	23	18.4	5	9.3
Bilateral denticulation	47	37.6	16	29.6
Notch + denticulation	14	11.2	5	9.3
Retouch + notch	25	20.0	13	24.1
Retouch + denticulation	16	12.8	15	27.8
Total	125		54	

Table 45. — Summary of attributes for notched and denticulated blades (AM 1976).

		Distal	Basal	Lateral	Total N	Total %
Upper Level						
straight		4	1	-	5	13.2
straight/concave		2	1	-	3	7.9
straight/convex		-	-	-	-	-
oblique/straight		16	1	-	17	44.7
oblique/concave		6	4	-	10	26.3
oblique/convex		-	3	-	3	7.9
Total	N	28	10	-	38	
	%	73.7	26.3	-		
Lower Level (a)						
straight		9	2	1	12	19.7
straight/concave		4	2	-	6	9.8
straight/convex		1	-	-	1	1.6
oblique/straight		18	6	-	24	39.3
oblique/concave		8	4	1	13	21.3
oblique/convex		2	3	-	5	8.2
Total	N	42	17	2	61	
	%	68.8	27.9	3.3		

(a) The total here is 61 rather than 56 because 4 specimens are double truncations.

Table 46. — Position and form of truncations (AM 1976).

	Upper N	Upper %	Lower N	Lower %	Total
Crescents	12	15.4	21	56.8	33
Trapezes	34	43.6	7	18.9	41
Triangles	18	23.1	3	8.1	21
Scalene	14	17.9	6	16.2	20
Total	78		37		115

Table 47. — Geometrics – major groups (AM 1976).

	Type 102 N	Type 102 %	Type 103 N	Type 103 %	Total
UL	110	89.4	13	10.6	123
LL	183	81.3	42	18.7	225
Total	293		55		348

Table 48. — Microburins (AM 1976).

	Left \ Right		None	Obverse	Inverse	Other	Total N	Total %
Upper Level (a)	None		6	15	3	1	25	39.7
	Obverse		15	14	-	1	30	47.6
	Inverse		-	4	-	-	4	6.3
	Other		-	3	-	-	4	6.3
	Total	N	21	36	3	3	63	
		%	33.3	57.1	4.8	4.8		
Lower Level (a)	None		11	10	4	2	27	45.0
	Obverse		19	7	2	-	28	46.7
	Inverse		2	2	-	-	4	6.7
	Other		1	-	-	-	1	1.7
	Total	N	33	19	6	2	60	
		%	55.0	31.7	10.0	3.3		

(a) Orientation could not be determined for 3 pieces in the UL and 4 in the LL.

Table 49. — Position and kind of retouch on continuously retouched flakes — type 105 (AM 1976).

	Left \ Right		None	Obverse	Inverse	Other	Total N	Total %
Upper Level (a)	None		1	12	4	2	19	22.6
	Obverse		16	28	7	4	55	65.5
	Inverse		4	4	2	-	10	11.9
	Other		-	-	-	-	-	-
	Total	N	21	44	13	6	84	
		%	25.0	52.4	15.5	7.1		
Lower Level (a)	None		1	32	8	4	45	39.5
	Obverse		22	19	4	2	47	41.2
	Inverse		5	7	1	3	16	14.0
	Other		2	2	-	2	6	5.3
	Total	N	30	60	13	11	114	
		%	26.3	52.6	11.4	9.6		

(a) Orientation could not be determined for 23 pieces in the UL and 7 in the LL.

Table 50. — Position and kind of retouch on continuously retouched blades — type 105 (AM 1976).

	Upper N	Upper %	Lower N	Lower %	Total N
Flakes					
right edge	19	30.2	16	26.7	35
left edge	15	23.8	22	36.7	37
bilateral	23	36.5	11	18.3	34
distal or proximal	6	9.5	11	18.3	17
Total	63		60		123
Blades					
right edge	18	21.4	44	38.6	62
left edge	20	23.8	29	25.4	49
bilateral	45	53.6	40	35.1	85
distal or proximal	1	1.2	1	0.9	2
Total	84		114		198

Table 51. — Position of retouch on continuously retouched flakes and blades — type 105 (AM 1976).

	Obverse	Inverse	Other
Flakes			
UL	19	5	-
LL	20	2	2
Blades			
UL	4	-	-
LL	9	1	-

Table 52. — Occurrence and type of distal end retouch on type 105 (AM 1976).

AM/025 -- RT. Clavicle (Acromial End Damaged)

AM/026 -- Right Ribs (12? Represented) (See AM/049)

AM/027 -- LT. Dec. $\underline{I}^{1}$

AM/028 -- RT. Dec. $\underline{I}^{1}$ (Retained by Examiner for Thin Sectioning)

AM/029 -- RT. Dec. $\underline{I}^{1}$

AM/030 -- LT. Dec. $\underline{D}$

AM/031 -- LT. Dec. P^{3} (= m^{1})

AM/032 -- RT. Dec. P^{3} (= m^{1})

AM/033 -- LT. Dec. P^{4} (= m^{2})

AM/034 -- RT. Dec. P^{4} (= m^{2})

AM/035 -- LT. Dec. $\underline{I}_{1}$

AM/036 -- RT. Dec. $\underline{I}_{1}$

AM/037 -- LT. Dec. $\underline{I}_{2}$

AM/038 -- LT. Dec. P_{3}

AM/039 -- RT. Dec. P_{3}

AM/040 -- LT. Dec. P_{4} (2 portions, main plus entoconid)

AM/041 -- RT. Humerus (Proximal Half)

AM/042 -- Cervical Neural Arches (12 sides present) (see AM/050)

AM/043 -- Thoracic Neural Arches (20 of 24 sides present)

AM/044 -- Lumbar Neural Arches (7 of 10 sides present)

AM/045 -- Vertebral Centra (22)

AM/046 -- Metacarpals (3) (see AM/053)

AM/047 -- Phalanges (8)

AM/048 -- Non-human (rodent?) Innominate

AM/001 -- RT. Parietal (fragment includes sagittal & medial lambdoid sutures)

AM/002 -- LT? Parietal (2 fragments)

AM/003 -- LT. Frontal (lateral fragment)

AM/004 -- LT. Alisphenoid

AM/005 -- Occipital Tabular Portion (Interparietal)

AM/006 -- LT. Exocipital

AM/007 -- RT. Exocipital

AM/008 -- Unidentified Cranial Vault Fragments (13)

AM/009 -- LT. Petrous of Temporal

AM/010 -- RT. Petrous of Temporal

AM/011 -- Basisphenoid (very fragmentary)

AM/012 -- RT. Orbitosphenoid

AM/013 -- LT. Maxilla (fragment) (See AM/052)

AM/014 -- RT. Malar (=ZYGoma) (Complete)

AM/015 -- LT. Mandible (Complete but damaged)

AM/016 -- RT. Mandible (2 fragments, DPT-DP$\overline{4}$ Crypts, and Ascending Ramus)

AM/017 -- RT.? Tympanic Ring (See AM/010)

AM/018 -- LT. Orbitosphenoid (See AM/012)

AM/019 -- LT. Incus

AM/020 -- RT. Incus

AM/021 -- RT. Malleus

AM/022 -- Unidentified Fragments (ca. 29)

AM/023 -- RT. Scapula (Acromion & Medial Border Damaged)

AM/024 -- LT. Clavicle (Acromial End Damaged)

AM/049 -- LT. Ribs (9 represented Including First)

AM/050 -- First Cervical Neural Arch (LT. and RT.)

AM/051 -- Deciduous Molar Cusp NOT FROM THIS INDIVIDUAL

AM/052 -- Alveolar Fragments (Mostly Maxillary) (7)

AM/053 -- First Metacarpal

Table 53. — Neonate skeleton - catalogue of remains (AM 1976) (a).

(a) Identifications by Dr. Mark Skinner, Department of Archaeology, Simon Fraser University, Burnaby, B.C. Canada.

Tool group	AM upper (73 + 76) N	%	R'Fana inférieur N	%	Medjez II phase II N	%	Ain Cherita N	%
I	106	6.8	6	5.9	115	4.9	61	3.9
II	43	2.8	1	1.0	35	1.5	11	0.7
III	93	6.0	9	8.8	290	12.4	90	5.7
IV	29	1.9	4	3.9	61	2.6	27	1.7
VI	504	32.4	36	35.3	803	34.4	554	35.3
VII	564	36.4	42	41.2	954	40.8	623	39.7
VIII	96	6.2	2	2.0	58	2.5	71	4.5
IX	117	7.5	2	2.0	21	0.9	134	8.5
	1554	100.0	102	100.1	2337	100.0	1571	100.0
Date in ^{14}C yrs BP	7280±115 7725±120		7450±300		7280±140 7780±140			

	AM lower (73 + 76) N	%	El Mekta N	%	Dakhlat es-Saâdane inf. N	%	Cubitus inférieur N	%	Columnata sous abri N	%	Dra-Mta-El-Ma-El-Abiod N	%
I	94	7.7	112	4.2	58	12.5	17	9.8	54	8.3	603	13.6
II	36	2.9	8	0.3	-	-	1	0.6	4	0.6	276	6.2
III	202	16.6	285	10.6	62	13.4	25	14.4	120	18.4	432	9.8
IV	78	6.4	143	5.3	14	3.0	-	-	8	1.2	95	2.1
VI	488	40.0	945	35.3	177	38.1	65	37.4	226	34.6	1359	30.7
VII	209	17.1	757	28.2	104	22.4	47	27.0	142	21.7	1024	23.1
VIII	63	5.2	74	2.8	11	2.4	5	2.9	10	1.5	117	2.6
IX	49	4.0	355	13.3	38	8.2	14	8.0	89	13.6	519	11.7
	1219	99.9	2679	100.0	464	100.0	174	100.1	653	99.9	4425	99.8
Date in ^{14}C yrs BP	ca. 7800 9805±160		8400±400						8140±150		ca. 7100	

Table 54. — Comparison of AM Upper and AM Lower with other Capsian assemblages.

cm	^{14}C yrs	m^3	$\bar{X}$ no. of bone fragments (a)	$\bar{X}$ no. of whole shells (a)	BDI (b)	SDI (c)	SDI/BDI
30-65	445	4.5	576	73,200	0.29	36.55	126.0
65-95	265	2.4	939	54,400	1.48	85.53	57.8
95-125	1290	2.4	1712	32,500	0.55	10.50	19.1
125-155	525	2.4	1200	19,700	0.95	15.63	16.4

Table 55. — Comparison of bone density and shell density indices (AM 1976).

(a) These are estimates for each time unit calculated by multiplying the quantities for each 5 cm level plotted in figure 10, by 40 for levels above 50 cm (4 quadrants X 10 squares) and by 32 for levels below 50 cm (4 quadrants X 8 squares).

(b) Bone density index (BDI) = $\frac{\text{number of bone fragments} \div m^3}{\text{years}}$

(c) Shell density index (SDI) = $\frac{\text{number of shells} \div m^3}{\text{years}}$

cm	$\bar{X}$ no. of whole shell N/0.0125m^3	$\bar{X}$ percent *Helix* %/0.0125m^3	$\bar{X}$ weight whole shell gr/0.0125m^3	$\bar{X}$ weight crushed shell gr/0.0125m^3	$\bar{X}$ weight total shell gr/0.0125m^3	$\bar{X}$ weight bone frgs. gr/0.0125m^3	Specific ratio (a)
30-65	286	28.3	534	121	655	23	28.5:1
65-95	243	24.5	441	116	557	34	16.4:1
95-125	145	36.8	287	127	414	64	6.5:1
125-155	88	65.0	207	82	289	59	4.9:1

cm	*Helix* meat (b) gr/0.0125m^3	*Helicella* and *Leucochroa* meat (c) gr/0.0125m^3	Total snail meat gr/0.0125m^3	Total mammal meat (d) gr/0.0125m^3	Dietary ratio (e)
30-65	172	313	485	115	4.2:1
65-95	127	280	407	170	2.4:1
95-125	141	174	315	320	1.0:1
125-155	174	67	241	295	0.8:1

Table 56. — Specific ratios (top) compared to dietary ratios (bottom) for AM 1976.

(a) Specific ratio = $\frac{\bar{X} \text{ weight total shell}/0.0125\ m^3}{\bar{X} \text{ weight bone fragments}/0.0125\ m^3}$

(b) *Helix meat* = ($\bar{X}$ weight total shell/0.0125 m^3) x (% *Helix*/0.0125 m^3) $\div$ (2.8) x 2.6) where 2.8 is the average weight (gr) of one *H. melanostoma* shell, and 2.6 is the average edible meat weight (gr) of one *H. Melanostoma.*

(c) ***Helicella*** + *Leucochroa* meat = ($\bar{X}$ weight total shell/0.0125 m^3) x (100-% *Helix*/0.0125 m^3) — (1.5) x (1.0) where 1,5 is the average weight (gr) of *Helicella* and *Leucochroa* shells and 1.0 is the average edible meat weight (gr) for these species.

(d) Total mammal meat = ($\bar{X}$ weight bone fragments/0.0125 m^3) — 0.10 x 0.50 where 0.10 is the assumed preservation rate fort bone 0,50 is the estimated percentage of edible meat per carcass.

(e) Dietary ratio = $\frac{\text{Total snail meat}/0.0125\ m^3}{\text{Total mammal meat}/0.0125\ m^3}$

Type			Upper Level N	%	Cum. %	Lower Level N	%	Cum. %
I Endscrapers			50	5.19		89	6.77	
Illus:	(2)	1	13	1.35	1.35	15	1.14	1.14
	(2)	2	8	0.83	2.18	21	1.60	2.74
		3	2	0.21	2.39	2	0.15	2.89
		4	1	0.10	2.49	1	0.07	2.96
	(1)	5	7	0.73	3.22	9	0.68	3.64
	(1)	6	3	0.31	3.53	8	0.61	4.25
	(1)	7	4	0.41	3.94	8	0.61	4.86
	(1)	8	4	0.41	4.35	8	0.61	5.47
	(1)	9	4	0.41	4.76	7	0.53	6.00
	(1)	10	3	0.31	5.07	6	0.46	6.46
		11	1	0.10	5.17	4	0.30	6.76
II Perforators			18	1.87		32	2.43	
	(2)	12	6	0.62	5.79	12	0.91	7.67
	(2)	13	9	0.93	6.72	9	0.68	8.35
		14	-	-	-	-	-	-
		15	-	-	-	-	-	-
	(1)	16	3	0.31	7.03	11	0.84	9.19
III Burins			44	4.56		176	13.38	
		17	-	-	-	5	0.38	9.57
	(1)	18	1	0.10	7.13	6	0.46	10.03
	(3)	19	9	0.93	8.06	33	2.51	12.54
	(1)	20	2	0.21	8.27	11	0.84	13.38
	(2)	21	4	0.41	8.68	13	0.99	14.37
	(2)	22	6	0.62	9.30	12	0.91	15.28
	(3)	23	7	0.73	10.03	31	2.36	17.64
	(1)	24	-	-	-	12	0.91	18.55
		25	-	-	-	-	-	-
	(3)	26	3	0.31	10.34	20	1.52	20.07
	(1)	27	2	0.21	10.55	13	0.99	21.06
		28	-	-	-	3	0.23	21.29
	(1)	29	3	0.31	10.86	2	0.15	21.44
		30	1	0.10	10.96	3	0.23	21.67
	(2)	31	6	0.62	11.58	7	0.53	22.20
		32	-	-	-	4	0.30	22.50
		33	-	-	-	1	0.07	22.57
IV Backed Flakes and Blades			20	2.07		75	5.70	
	(1)	34	1	0.10	11.68	3	0.23	22.80
	(2)	35	2	0.21	11.89	7	0.53	23.33
		36	1	0.10	11.99	3	0.23	23.56
	(1)	37	4	0.41	12.40	17	1.29	24.85
		38	-	-	-	-	-	-
		39	-	-	-	1	0.07	24.92
		40	-	-	-	4	0.30	25.22
	(1)	41	1	0.10	12.50	15	1.14	26.36
		42	11	1.14	13.64	25	1.90	28.26

V Composite Tools	*11*	*0.53*		*24*	*1.63*	
43	-	-	-	9	0.61	28.50
44	11	0.53	13.55	15	1.02	29.52
VI Backed Bladelets	*498*	*23.98*		*483*	*32.83*	
45	64	3.08	16.63	96	6.53	36.05
46	8	0.38	17.01	20	1.36	37.41
47	4	0.19	17.20	17	1.16	38.57
48	-	-	-	1	0.07	38.64
49	2	0.10	17.30	4	0.27	38.91
50	3	0.14	17.44	3	0.20	39.11
51	3	0.14	17.58	10	0.68	39.79
52	3	0.14	17.72	5	0.34	40.13
53	1	0.05	17.77	6	0.41	40.54
54	8	0.38	18.15	17	1.16	41.70
55	14	0.67	18.82	24	1.63	43.33
56	56	2.70	21.52	52	3.53	46.86
57	4	0.19	21.71	8	0.54	47.40
58	-	-	-	2	0.14	47.54
59	-	-	-	3	0.20	47.74
60	-	-	-	2	0.14	47.88
61	3	0.14	21.85	1	0.07	47.95
62	5	0.24	22.09	9	0.61	48.56
63	39	1.88	23.97	54	3.67	52.23
64	24	1.15	25.12	8	0.54	52.77
65	4	0.19	25.31	1	0.07	52.84
66	208	10.01	35.32	120	8.16	61.00
67	8	0.38	35.70	12	0.82	61.82
68	37	1.78	37.48	8	0.54	62.36
Ouchtata	*6*	*0.29*		*5*	*0.34*	
69	-	-	-	-	-	-
70	1	0.05	37.53	1	0.07	62.43
71	-	-	-	1	0.07	62.50
72	5	0.24	37.77	3	0.20	62.70
VII Notches and Denticulates	*566*	*27.25*		*209*	*14.21*	
73	-	-	-	1	0.07	62.77
74	142	6.84	44.61	50	3.40	66.17
75	44	2.12	46.73	39	2.65	68.82
76	201	9.68	56.41	44	2.99	71.81
77	135	6.50	62.91	53	3.60	75.41
78	5	0.24	63.15	2	0.14	75.55
79	39	1.88	65.03	20	1.36	76.91
VIII Truncations	*96*	*4.62*		*63*	*4.28*	
80	92	4.43	69.46	63	4.28	81.19
81	4	0.19	69.65	-	-	-

IX Geometrics		*78*	*8.09*		*37*	*2.81*	
(4)	82	12	1.24	74.28	21	1.60	83.58
(1)	83	6	0.62	74.90	1	0.07	83.65
	84	3	0.31	75.21	1	0.07	83.72
(1)	85	3	0.31	75.52	2	0.15	83.87
	86	1	0.10	75.62	–	–	–
(1)	87	7	0.73	76.35	1	0.07	83.94
(3)	88	14	1.45	77.80	2	0.15	84.09
(2)	89	4	0.41	78.21	1	0.07	84.16
(1)	90	1	0.10	78.31	2	0.15	84.31
(1)	91	8	0.83	79.14	–	–	–
(1)	92	2	0.21	79.35	–	–	–
	93	3	0.31	79.66	–	–	–
	94	1	0.10	79.76	–	–	–
(1)	95	4	0.41	80.17	2	0.15	84.46
	96	–	–	–	–	–	–
	97	4	0.41	80.58	2	0.15	84.61
(1)	98	3	0.31	80.89	–	–	–
	99	2	0.21	81.10	2	0.15	84.76
	100	–	–	–	–	–	–
X Microburins		*(123)*	–	–	*(225)*	–	–
	101	–	–	–	–	–	–
	102	110	–	–	183	–	–
	103	13	–	–	42	–	–
XI Miscellaneous		*181*	*18.78*		*199*	*15.13*	
	104	–	–	–	–	–	–
(14)	105	174	18.05	99.15	186	14.14	98.90
	106	2	0.21	99.36	3	0.23	99.13
	107	–	–	–	–	–	–
	108	–	–	–	–	–	–
	109	–	–	–	1	0.07	99.20
	110	–	–	–	–	–	–
	111	–	–	–	–	–	–
(1)	112	5	0.52	99.88	9	0.68	99.88
Restricted Total		964			1315		

Table 57. — Type list (AM 1976).

Type	Upper Level N	Upper Level %	Upper Level Cum.%	Lower Level N	Lower Level %	Lower Level Cum.%
I Endscrapers	*106*	*5.10*		*94*	*6.39*	
1	30	1.44	1.44	19	1.29	1.29
2	14	0.67	2.11	21	1.43	2.72
3	2	0.10	2.21	2	0.14	2.86
4	2	0.10	2.31	1	0.07	2.93
5	12	0.58	2.89	9	0.61	3.54
6	9	0.43	3.32	8	0.54	4.08
7	13	0.63	3.95	8	0.54	4.62
8	13	0.63	4.58	9	0.61	5.23
9	7	0.34	4.92	7	0.48	5.71
10	3	0.14	5.06	6	0.41	6.12
11	1	0.05	5.11	4	0.27	6.39
II Perforators	*43*	*2.07*		*36*	*2.45*	
12	14	0.67	5.78	13	0.88	7.27
13	19	0.91	6.69	10	0.68	7.95
14	-	-	-	-	-	-
15	-	-	-	-	-	-
16	10	0.48	7.17	13	0.88	8.83
III Burins	*93*	*4.48*		*202*	*13.73*	
17	2	0.10	7.27	6	0.41	9.24
18	4	0.19	7.46	6	0.41	9.65
19	30	1.44	8.90	46	3.13	12.78
20	8	0.38	9.28	12	0.82	13.60
21	10	0.48	9.76	16	1.09	14.69
22	8	0.38	10.14	13	0.88	15.57
23	10	0.48	10.62	34	2.31	17.88
24	-	-	-	12	0.82	18.70
25	-	-	-	-	-	-
26	7	0.34	10.96	20	1.36	20.06
27	4	0.19	11.15	15	1.02	21.08
28	-	-	-	4	0.27	21.35
29	3	0.14	11.29	2	0.14	21.49
30	1	0.05	11.34	3	0.20	21.69
31	6	0.29	11.63	8	0.54	22.23
32	-	-	-	4	0.27	22.50
33	-	-	-	1	0.07	22.57
IV Backed Flakes and Blades	*29*	*1.40*		*78*	*5.30*	
34	3	0.14	11.77	4	0.27	22.84
35	2	0.10	11.87	7	0.48	23.32
36	3	0.14	12.01	4	0.27	23.59
37	4	0.19	12.20	17	1.16	24.75
38	-	-	-	-	-	-
39	-	-	-	1	0.07	24.82
40	-	-	-	4	0.27	25.09
41	1	0.05	12.25	15	1.02	26.11
42	16	0.77	13.02	26	1.78	27.89

V Composite Tools			6	0.62		24	1.82	
	(1)	43	-	-	-	9	0.68	28.94
	(2)	44	6	0.62	14.26	15	1.14	30.08
VI Backed Bladelets			227	23.55		428	32.55	
	(5)	45	36	3.73	17.99	77	5.86	35.94
	(1)	46	3	0.31	18.30	18	1.37	37.31
	(2)	47	3	0.31	18.61	17	1.29	38.60
		48	-	-	-	1	0.07	38.67
		49	2	0.21	18.82	4	0.30	38.97
	(1)	50	3	0.31	19.13	3	0.23	39.20
		51	1	0.10	19.23	9	0.68	39.88
	(2)	52	3	0.31	19.54	5	0.38	40.26
		53	-	-	-	6	0.46	40.72
	(1)	54	5	0.52	20.06	17	1.29	42.01
	(3)	55	11	1.14	21.20	23	1.75	43.76
	(4)	56	26	2.70	23.90	47	3.57	47.33
	(1)	57	1	0.10	24.00	5	0.38	47.71
		58	-	-	-	2	0.15	47.86
		59	-	-	-	3	0.23	48.09
		60	-	-	-	1	0.07	48.16
		61	-	-	-	1	0.07	48.23
	(1)	62	4	0.41	24.41	8	0.61	48.84
	(3)	63	26	2.70	27.11	53	4.03	52.87
	(1)	64	10	1.04	28.15	7	0.53	53.40
		65	2	0.21	28.36	1	0.07	53.47
		66	76	7.88	36.24	102	7.76	61.23
	(1)	67	3	0.31	36.55	10	0.76	61.99
		68	12	1.24	37.79	8	0.61	62.60
Ouchtata			5	0.52		5	0.38	
		69	-	-	-	-	-	-
	(1)	70	-	-	-	1	0.07	62.67
		71	1	0.10	37.89	1	0.07	62.74
		72	4	0.41	38.30	3	0.23	62.97
VII Notches and Denticulates			297	30.81		194	14.75	
	(1)	73	-	-	-	1	0.07	63.04
	(5)	74	57	5.91	44.21	41	3.12	66.16
	(4)	75	31	3.22	47.43	39	2.97	69.13
	(5)	76	73	7.57	55.00	40	3.04	72.17
	(7)	77	110	11.41	66.41	51	3.88	76.05
	(1)	78	4	0.41	66.82	2	0.15	76.20
	(3)	79	22	2.28	69.10	20	1.52	77.72
VIII Truncations			38	3.94		56	4.26	
	(4)	80	35	3.63	72.73	56	4.26	81.98
		81	3	0.31	73.04	-	-	-

IX Geometrics	*117*	*5.63*		*49*	*3.33*	
82	13	0.63	70.28	27	1.83	83.02
83	17	0.82	71.10	3	0.20	83.22
84	6	0.29	71.39	1	0.07	83.29
85	3	0.14	71.53	3	0.20	83.49
86	4	0.19	71.72	-	-	-
87	11	0.53	72.25	1	0.07	83.56
88	18	0.87	73.12	2	0.14	83.70
89	5	0.24	73.36	2	0.14	83.84
90	3	0.14	73.50	3	0.20	84.04
91	8	0.38	73.88	-	-	-
92	4	0.19	74.07	-	-	-
93	3	0.14	74.21	1	0.07	84.11
94	1	0.05	74.26	-	-	-
95	6	0.29	74.55	2	0.14	84.25
96	1	0.05	74.60	-	-	-
97	5	0.24	74.84	2	0.14	84.39
98	3	0.14	74.98	-	-	-
99	3	0.14	75.12	2	0.14	84.53
100	3	0.14	75.26	-	-	-
X Microburins	*(291)*	-	-	*(253)*	-	-
101	4	-	-	-	-	-
102	258	-	-	204	-	-
103	29	-	-	49	-	-
XI Miscellaneous	*512*	*24.65*		*228*	*15.50*	
104	-	-	-	-	-	-
105	482	23.21	98.47	203	13.80	98.22
106	10	0.48	98.95	5	0.34	98.67
107	-	-	-	-	-	-
108	1	0.05	99.00	-	-	-
109	-	-	-	1	0.07	98.74
110	-	-	-	-	-	-
111	-	-	-	-	-	-
112	19	0.91	99.91	19	1.29	100.03
Restricted total	2077			1471		

Table 58. — Type list (AM 1973 + 1976).

ملخص

عين مستحية ، الواقعة جنوب شريا ولاية تبسة ، رمادية يؤرخ لها من 9800
الى 7300 ق / ج تنقسم الى مرحلتين .

الأولى : تتمثل في ادوات كالمكاشط والمحكات ، وحيوانات مثل الحلزونيات
والثيران البدائية والخيلة ، اما الثانية فادواتها صغيرة من مسننات وهندسيات
تفقد هنا الكاشط وتظهر الغزلان والقواضم ، وهذه التغيرات دليل على وجود
جفاف حل بالمنطقة بعد 8000 ق/ج ، نفس النتيجة وجدت بكيف زورة دال .

RESUME

Aïn Misteheyia est une petite escargotière du Sud de Cheria (W. de Tébessa) dont l'épaisseur atteint 1,50 m et s'étend d'env. 9800 à 7300 B.P. L'industrie, Capsien supérieur, se divise en deux niveaux. Le plus ancien se caractérise par des pièces larges, des burins et grattoirs abondants. Il contient de nombreux *Helix melanostoma,* restes osseux provenant d'espèces telles *Bos primigenius, Equus mauritanicus.* Le plus récent renferme de petites pièces, de nombreux denticulés, des géométriques plus fréquents, pas de burins. Il y a peu d'*H. melanostoma* mais un grand nombre de petits mammifères tels gazelles et Lagomorphes. Ces changements sont interprétés comme marque d'une crise d'aridité (ou réduction des pâturages) dans la région peu après 8000 BP, et trouve confirmation dans les analyses sédimentologiques. Des résultats semblables ont été retrouvés à Kef Zoura dont le niveau ancien est Capsien typique et le récent Capsien supérieur ne remontant pas au-delà de 6000 BP. Les conclusions générales montrent une forte adaptabilité de l'économie capsienne.

ABSTRACT

Aïn Misteheyia is a small escargotière located on the south of Cheria. It has a maximum depth of deposit of about 1.5 m and spans from ca. 9800 to ca. 7300 BP. The artifact industry is Upper Capsian, but can be divided into two components an earlier assemblage which lasted until about 8000 BP, is characterized by larger tools, more abundant burins and a great frequency of endscrapers. A later assemblage has significantly smaller tools, no burins, abundant denticulates, frequent geometrics. The earlier levels contain high frequencies of *Helix melanostoma* and greater numbers of bone fragments such as *Bos primigenius* and *Equus mauritanicus.* The later levels contain very few *H. melanostoma* and greater numbers than before of smaller mammals. These data are interpreted as an indication of increased aridity (or at least reduced grazing potencial) in the region at or shortly after 8000 BP. This is substantiated by sedimentological analyses. Similar patterns have been found at the nearby site of Kef Zoura D which will be published separately. There, however, the earlier assemblage is indisin faunal assemblages are even more pronounced at Kef Zoura D, where the putably Typical Capsian while the later one is Upper Capsian. The differences upper deposits date to as late as 6000 B.P. Dur overall conclusion, is that the Capsian economy represented a highly flexible adaptive pattern which did not change markedly in response to changes in the environment.