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The Aterian of the Central Sahara

Topography and stratigraphy

The Aterian of the Central Sahara is best seen as the isolated massif of Adrar Bous the study of which was carried out in the first nine weeks of 1970 as a team project of the British Expedition to the Aïr Mountains under the leadership of Major (now Colonel) D.N. Hall. Two students – Andrew B. Smith and Allen G. Pastron – from the Department of Anthropology at the University of California, Berkeley, and the writer together with geological colleague, Dr. M.A.J. Williams, then of Macquarie University, New South Wales, Australia, carried out a survey of the massif and the surrounding region. We are greatly endebted to a number of individuals and institutions for making this expedition possible, especially to the Government of Niger and to Major Hall for inviting us to undertake this study.

Adrar Bous is a dissected mass of Younger Granite at the northwest corner of the Ténéré Desert, some 75 km from the northeast tip of the Aïr (Greboun Mountain) which has been made famous by a previous expedition – Berliet-Ténéré-Tchad – and the cultural remains that they brought back (Hugot 1962). Our objectives were essentially survey and some trial excavation to establish a stratigraphic and cultural sequence for the region. In this we were successful and our results have been published in preliminary reports (Hall *et al.* 1971; Clark, Williams and Smith 1973) and in more specialized accounts of the Epi-Palaeolithic (Smith 1976; Cark 1976) and Neolithic (Smith 1974; 1980).

Adrar Bous is very rich in cultural remains dating from the later Acheulian up to the Neolithic and this paper reviews the evidence for Middle Palaeolithic/Aterian occupation there. The geology and sedimentary context of the assemblages were established by Dr. M.A.J. Williams and the sites were systematically collected and tested by excavations by Smith, Pastron, Williams and the writer. The analysis of the assemblages was carried out in the laboratory at Berkeley in 1976 by a group of students under the author's direction. The artifact illustrations are redrawn by Ms. Judith Ogden from the very fine line drawings of Madame Y. Bale of the Musée Royal de l'Afrique Centrale thanks to Dr. Francis

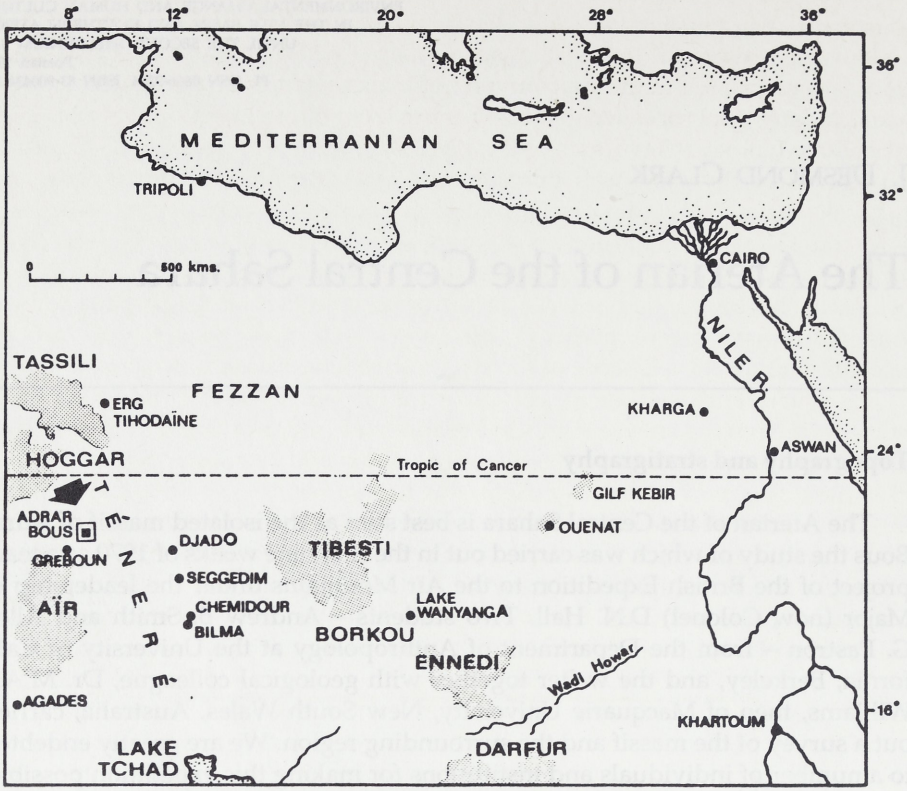


Fig. 1. Map of the Central Sahara to show the location of Adrar Bous and some other Aterian sites referred to in the text.

van Noten. In this paper, the stratigraphic position of the Middle Palaeolithic/Aterian is identified; the technological and typological nature of the assemblage is described and a general comparison made with that from other regions of the Sahara. A behavioral model for Middle Palaeolithic hunter/gatherer occupation of the Sahara is also presented.

As yet, the Middle Palaeolithic/Aterian occupation at Adrar Bous remains undated radiometrically but new significance comes from the age of ≥ 100,000 for this Techno-Complex in the Eastern Sahara (Wendorf *et al.* 1991) and the molecular biological evidence from DNA that indicates that the first Modern humans evolved in the African continent sometime between 290,000 and 140,000 years B.P. (Cann *et al.* 1987).

Fig. 1 shows the position of Adrar Bous, the Aïr, the Hoggar, Tassili, Tibesti and the Ténéré Desert as well as the Erg Tihodaine and the area of the Lake Tchad Basin in Borku south of the Tibesti where the Aterian has been studied respectively by the late Professor Arambourg and by Professor Balout (1955), by Dr. Thiery Tillet (1983) and earlier, in the region of Lake Wanyanga, by A.J. Arkell (1964). Today there is no water and there are no people living at Adrar

Bous but during much of the Later Pleistocene and Early Holocene, swamps and a lake were present on the south side of the massif. This massif is a dissected upland consisting of granite, metamorphosed rocks, veins of quartzite and dolerite dykes. Mostly local rocks were used by the makers of the Acheulian and Middle Palaeolithic tool kits. These rocks generally comprised metamorphosed sediments and volcanics – rhyolite, basalt, micro-granite, metamorphosed vitric tuff, hornfels and greywacke. With the Aterian, besides hornfels, a fine-grained, silicified vitric tuff (SVT or "greenstone") appears and increasing use is made of this through time. It resembles a green chert and is not local, indeed, outcrops of this rock occur 280 km to the northeast of Adrar Bous so that all that used at Adrar Bous had to have been brought in. This is evidence either for a highly mobile population or for the existence of some pattern of long-distance exchange.

The Quaternary sediments comprise fanglomerates and fine gravel and coarse sand spreads and aeolian sand plains with seif and barchan dunes. Alluvium occurs in former stream courses, swamps and Holocene lake beds, the latter including two periods of diatomite formations. Fig. 2 shows the main localities where Middle Palaeolithic/Aterian assemblages were found: Hidden Valley, in the massif, Agorass Nessoui (Valley of the Lake), Lookout Hill, Yellowstone Hill and the Main Wadi.

Limited geological and archaeological excavations showed evidence for three cycles of erosion and deposition. There is no cultural material associated

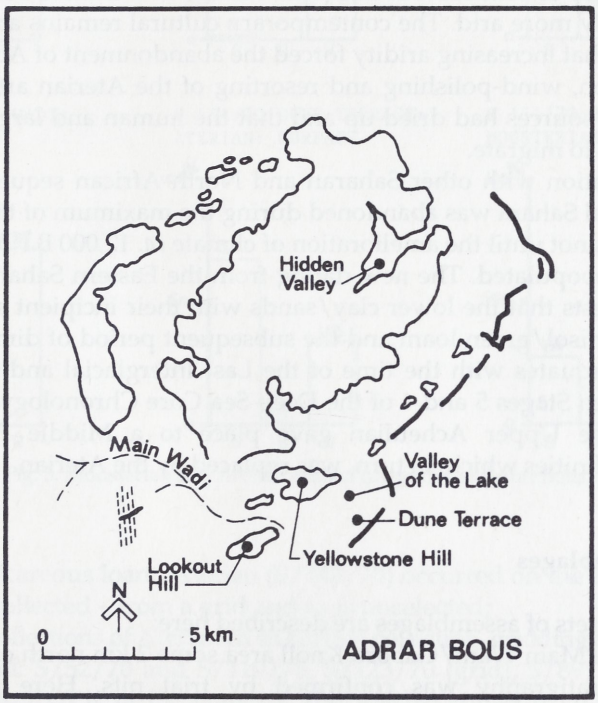


Fig. 2. Mousterian and Aterian localities at Adrar Bous.

with Cycles 1 and 2 but the Acheulian appears in a Lower Sandy Clay Loam in the depositional phase of Cycle 3; this underlies green lacustrine loams and black swamp clays (Lower Vertisol) immediately prior to the appearance of an Early Middle Palaeolithic. Over this is the Upper Sandy Clay Loam – the product of a drier, windy phase with aeolian sands and Aterian assemblages. Above again is the Upper Vertisol and the Early Holocene sequence. Details of the Early Middle Palaeolithic and Aterian will be found in Clark (Clark *et al.* 1973: 250 - 260) and Williams (1976).

This sedimentary sequence is interpreted by Williams as follows: a long period of aggradation of clay/sands ended in a period of pedogenesis during which an incipient soil formed suggesting a fluctuating water table; the Acheulian is contemporary with this phase. A long swampy phase followed when dark clays formed in local swamps (Lower Vertisol) and green clays and loams built up in the lake to the south of the massif up as far west as the Main Wadi. These occupied much of the basin of the "Valley of the Lake" which contained acid water. This main vertisol probably developed in seasonally flooded swamps around the edge of the early lake as in the Tchad Basin in the Sudan. It is to the end of this time that the early Middle Palaeolithic belongs. The drying up of the lake was accompanied by the deposition of carbonates from groundwater. On the lower slopes of the hills, local slopewash and clayey sands accumulated; this and windblown sands interfinger with colluvial sediments. Clearly, this was of reduced but adequate rainfall in a climate that was becoming increasingly more arid. The contemporary cultural remains are Aterian and it is apparent that increasing aridity forced the abandonment of Adrar Bous. The severe deflation, wind-polishing and resorting of the Aterian artifacts suggest that the water sources had dried up and that the human and large mammalian fauna had had to migrate.

The correlation with other Saharan and North African sequences suggests that the Central Sahara was abandoned during the maximum of the Last Glacial and that it was not until the amelioration of climate *ca.* 12,000 B.P. that the desert began to be repopulated. The new dating from the Eastern Sahara (Wendorf *et al.* 1991) suggests that the lower clay/sands with their incipient soil formation, the Lower Vertisol/green loam and the subsequent period of diminishing rainfall probably equates with the time of the Last Interglacial and the early Last Glacial, Oxygen Stages 5 and 4 of the Deep Sea Core Chronology. This was the time when the Upper Acheulian gave place to a Middle Palaeolithic of Mousterian affinities which, in turn, was replaced by the Aterian.

Artifact assemblages

Four main sets of assemblages are described here:

1. From the Main Wadi/Gabbro Knoll area some 2 km north of Lookout Hill where the stratigraphy was confirmed by trial pits. Here, early Middle Palaeolithic (Mousterian) (S/151/70) was found *in situ* in the top 5 cm of an

A D R A R B O U S

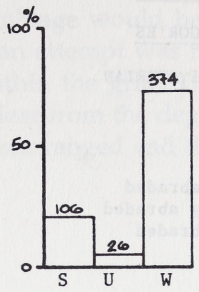
ARTEFACT CATEGORIES

MOUSTERIAN and ATERIAN

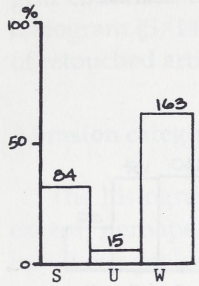
Artifact Classes:

S = Shaped Tools
U = Utilized/Modified Pieces
W = Waste

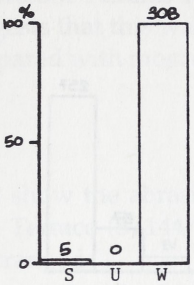
S 52/170 LOOKOUT HILL: ATERIAN SURFACE



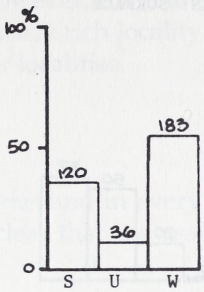
S 110/70 LOOKOUT HILL: ATERIAN: SURFACE



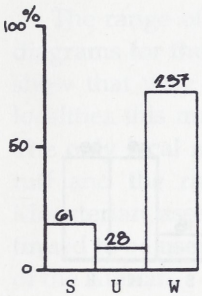
S 139/70 YELLOWSTONE HILL: ATERIAN: GRID



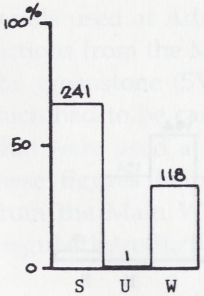
S 140/70 YELLOWSTONE HILL: ATERIAN: SURFACE



S 142/70 MAIN WADI: ATERIAN: GRID



S 144/70 DUNE TERRACE: ATERIAN: SURFACE



S 151/70 MAIN WADI: MOUSTERIAN: SURFACE

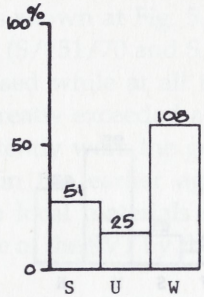


Fig. 3. Mousterian and Aterian artifact categories at Adrar Bous.

olive-green calcareous loam. Aterian (S/142/70) occurred on the eroded surface and was also collected – from a grid and so is unselected;

2. Several collections of Aterian from surface collecting, gridding and excavation at Lookout Hill: S/52/70 and S/110/70, S/123/70 (grid), S/89/70 (geological pit), S/112-116/70 (Pit 14 Excavation). The Aterian comes from yellow-brown sand with gravel lenses and overlying yellow-brown and grey sands;

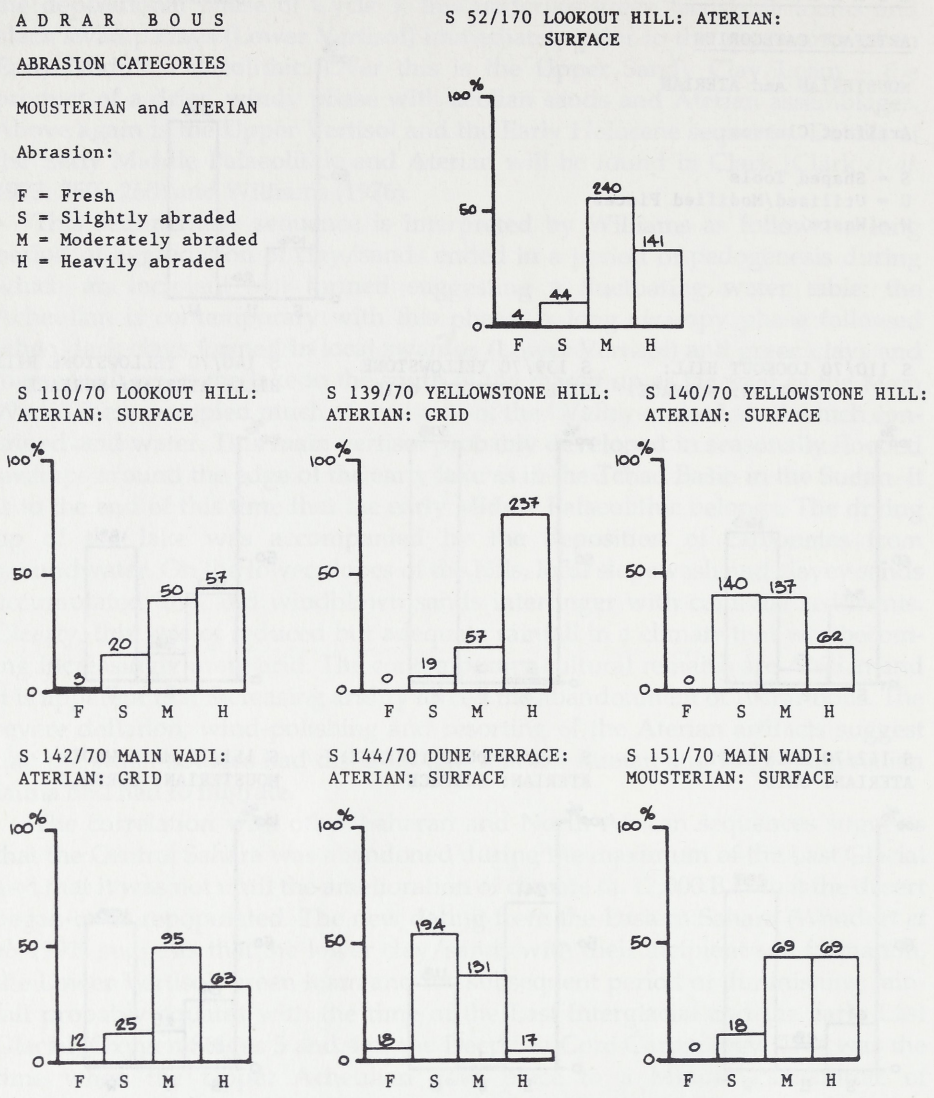


Fig. 4. Abrasion categories for Mousterian and Aterian assemblages from Adrar Bous.

3. A large but selected collection eroding from the foot slopes at the northwest end of the Yellowstone Hill (S/139/70, Grid, and S/140/70, surface);

4. Another large but selected collection from the Terrace at the foot of the High Dunes that line the eastern edge of the "Valley of the Lake" and where the stratigraphic position of the Aterian has been checked by trial pits (S/144/70) in a yellow-brown sand over olive-green loam.

Most of these collections are selected by reason of the logistics of transporting large collections in the desert. They are, however, believed to be representative of what an unselected Aterian assemblage would be except for the quantitative aggregate of debitage. However, an attempt was made to sample this by gridding and collecting everything within the grid. These are not, of course, primary context occurrences and it is clear from the degree of abrasion, mostly by wind, that these artifacts have been rearranged and there are, in fact, few contexts where they are in fresh condition.

Artifact categories

The effect of selective collecting can be seen in these histograms (Fig. 3) where the Shaped/Retouched Tool Category is over-represented, except in the grid collection from Yellowstone Hill (S/139/70). However, the Dune Terrace histogram (S/144/70) suggests that this was a particularly rich locality in terms of retouched artifacts, compared with most of the other localities.

Abrasion categories

The histograms (Fig. 4) show the abrasion categories and in every instance except, perhaps, the Dune Terrace (S/144/70), it is clear that the assemblages have been geologically rearranged.

Raw materials

The range of raw materials used at Adrar Bous is shown at Fig. 5. The bar diagrams for the two collections from the Main Wadi (S/151/70 and S/142/70) show that very little of the greenstone (SVT) was used while at all the other localities this material, which had to be carried in, greatly exceeded all others. The only local materials that were used at all consistently were the grey vitric tuff and the rhyolite. These figures help to explain the earlier age of the Mousterian assemblage from the Main Wadi where local materials still continued to be used prior to regular introduction and use of the SVT by the makers of the Aterian.

Tool classes

The bar diagram (Fig. 6) that probably best represents an unselected Aterian assemblage is that from the grid at the Main Wadi locality (S/142/70). This assemblage contains points (tanged, bifacial and parti-bifacial, leaf-shaped and unifacially retouched); side-scrapers, end-scrapers, notched and denticulated pieces, burins and miscellaneous artifacts. The other unselected sample shown (S/139/70 from Yellowstone Hill) emphasizes tanged points, side-scrapers and notched pieces.

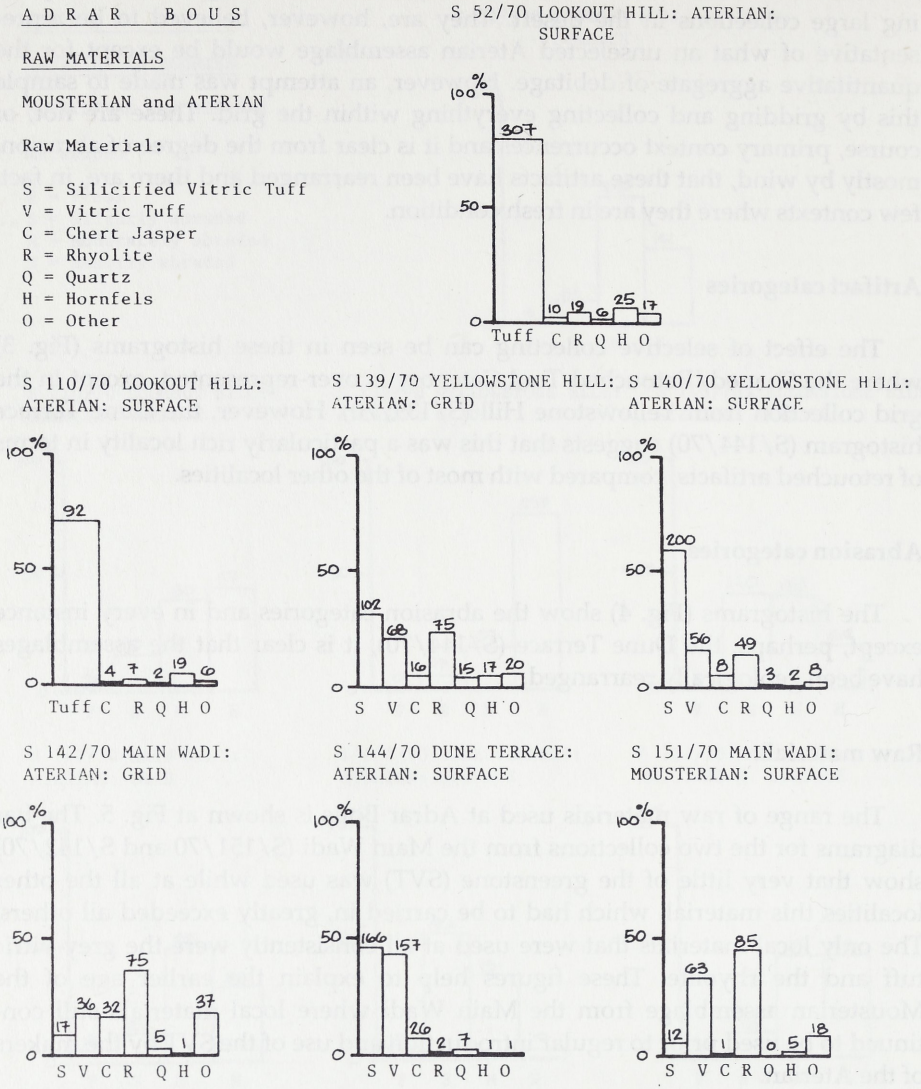


Fig. 5. Raw materials used at Mousterian and Aterian localities at Adrar Bous.

Although the other histograms for Aterian assemblages show the bias of selective collecting, there are no significant differences other than the addition of small numbers of borers. In contrast to the Aterian, the early Middle Palaeolithic (Mousterian) sample (S/151/70) from the Main Wadi has no tanged or bifacial points; the scraper forms are only lightly retouched and the main component consists of unretouched flakes and blades produced by the Levallois method.

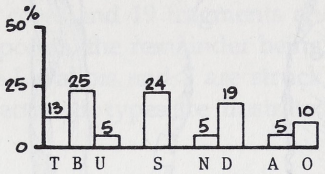
A D R A R B O U S

SHAPED TOOL CLASSES

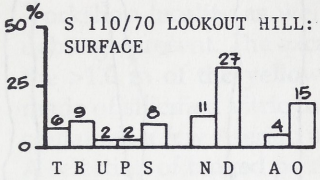
MOUSTERIAN and ATERIAN

T = Tanged Pieces
B = Bifacial Points
U = Unifacial Points
P = Parti-bifacial Points
S = Side Scrapers
E = End Scrapers
N = Notched Pieces
D = Denticulates
X = Burins
A = Awls O = Other

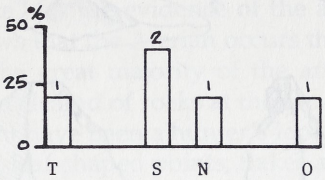
S 52/70 LOOKOUT HILL: ATERIAN: SURFACE



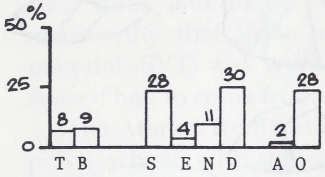
S 110/70 LOOKOUT HILL: ATERIAN: SURFACE



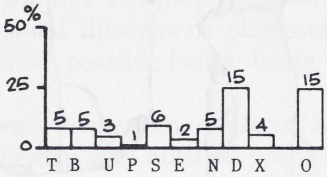
S 139/70 YELLOWSTONE HILL: ATERIAN: GRID



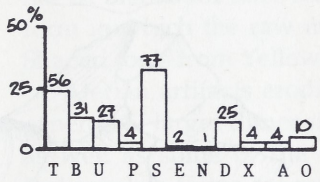
S 140/70 YELLOWSTONE HILL: ATERIAN: SURFACE



S 142/ 70 MAIN WADI: ATERIAN: GRID



S 144/70 DUNE TERRACE: ATERIAN SURFACE



S 151/70 MAIN WADI: MOUSTERIAN: SURFACE

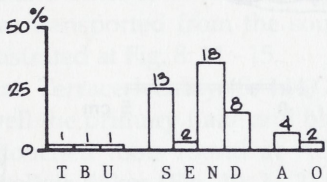


Fig. 6. Shaped tool classes: Mousterian and Aterian assemblages from Adrar Bous.

The earlier Middle Palaeolithic, Mousterian (S/151/70)

This assemblage consists of a total of 184 artifacts of which 27.7% are shaped tools, 13.6% are modified and 58.7% are unmodified waste. The retouch/modification is mostly denticulate. This assemblage is characterized by the Levallois, discoid and single-platform, direct percussion method. The cores comprise

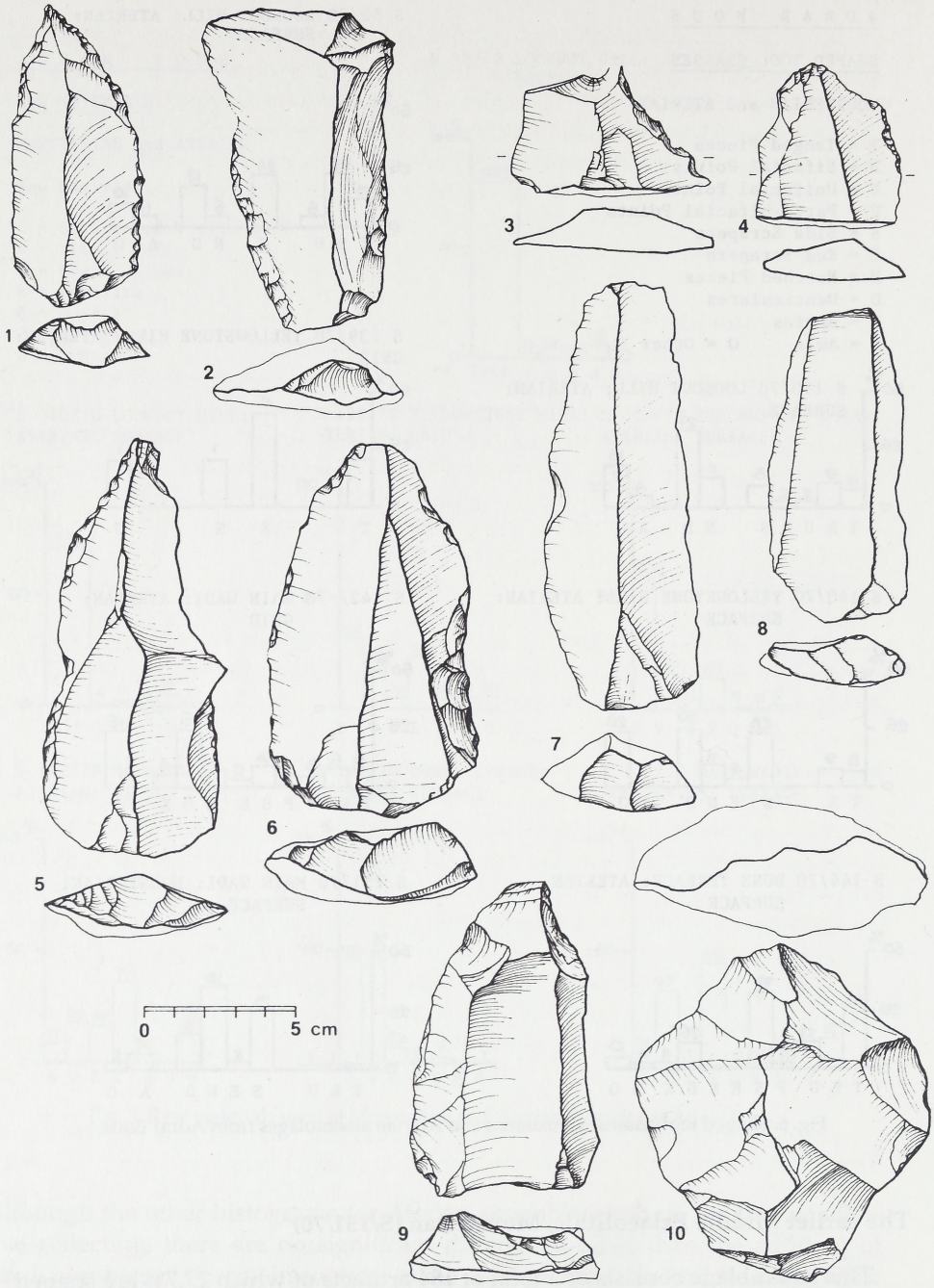


Fig. 7. Earlier Middle Palaeolithic (Mousterian) artifacts from the Main Wadi (Gabbro Knoll), S/151/70;

1: convergent scraper; 2: side scraper; 3: bec; 4: end-scraper; 5 - 6: Levallois flakes: 7 - 8 : Levallois blades; 9: Levallois blade core; 10: discoid core.

2 struck and 4 unstruck Levallois examples, 8 discoid and one single-platform core. The unmodified waste shows the techniques of production for flakes and blades. There are 60 flakes, 14 blades, 15 cores and 19 fragments and chunks. Of the flakes, 35 are Levallois flakes and points, the remainder being from unspecialized cores. Seven of the blades are Levallois and 7 are struck by direct percussion from "unprepared" cores. Characteristic types are illustrated at Fig. 7.

Aterian

Aterian artifact classes are illustrated at Fig. 8 - 11. At Lookout Hill, selected surface collections, a grid, pits and excavation show this to have been a workshop locality as well as a "living site" on the evidence of the amount of debitage present. The excavation also shows that the Aterian occurs throughout the >1.0 m of the yellow-brown sand. The great majority of the artifacts are made of silicified vitric tuff. A circular area cleared of rocks at the top of the hill contained a few Aterian artifacts and might have been a hunter's lookout point. A selection of tanged points and a scraper, leaf-shaped points, flakes and blades from Lookout Hill are shown at Fig. 8: 1 - 10.

Cores from Lookout Hill (Fig. 9) show well the range of techniques used at Adrar Bous namely, radially prepared Levallois cores, Levallois point cores, discoid cores and blade cores with and without Levallois preparation. It is noteworthy that these are all of fairly small dimensions showing that the material (SVT) was worked down as much as possible before being discarded since it had to come from a distance.

The Aterian from Yellowstone Hill repeats the pattern of bifacial and tanged points which, with side-scrapers and denticulate and notched pieces, comprise the majority of shaped tools. However, there are also present several small bifaces of a form that is not common but is not unusual in the Adrar Bous as well as other Aterian assemblages. One might speculate as to whether these may not be blanks for later reduction to points and other tools and so represent the form in which the raw material (SVT) was transported from the source areas. Shaped tools from Yellowstone Hill are illustrated at Fig. 8: 11 - 15.

Aterian artifacts eroding from the Dune Terrace locality (S/144/70) are, in general, of larger dimensions and show well the primary flake and blade forms as well as some of the more refined retouched tools found at Adrar Bous. Pedunculate forms range from tanged Levallois flakes (Fig. 10: 1 - 2) to partibifacial point forms (Fig. 10: 3) and tanged blades (Fig. 10: 4 - 5); these often show scraper-type retouch. Characteristic for Adrar Bous are the large, bifacially flaked and tanged points (Fig. 10: 6 - 7) and another characteristic, though rare, form is the lanceolate, bifacial point that recalls the Lupemban "lanceheads" from Equatoria (Fig. 10: 8 - 9). As at other Adrar Bous localities, however, the commonest bifacial point forms are the leaf-shaped points, either broad or narrow and usually of small dimensions. Fig. 11 illustrates some of the scraper, flake and blade forms. The great majority of these are of silicified vitric tuff. Unifacial, Mousterian-type points (Fig. 11: 1 - 2) are not common. Side-scrapers,

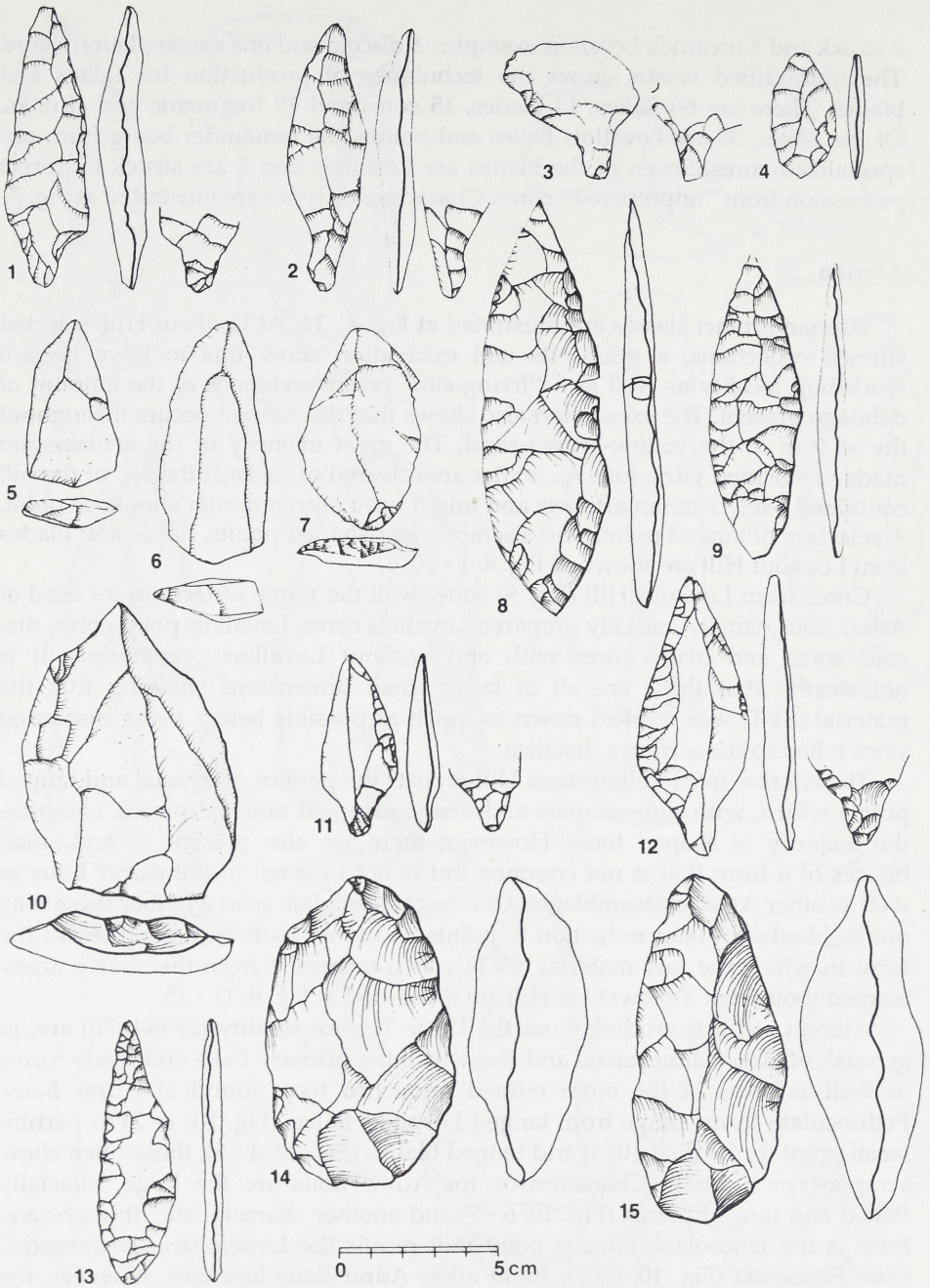


Fig. 8. Aterian artifacts from Lookout Hill (1 - 10), S/52/70: S/110/70, and Yellowstone Hill (11 - 15), S/140/70;

1 - 2: Aterian tanged points (unifacial); 3: tanged flake; 4: diminutive bifacial point; 5 - 6: Levallois points; 7, 10: Levallois flakes; 8 - 9: bifacial leaf-shaped points; 11 - 12: Aterian points (unifacial); 13: bifacial leaf-shaped point; 14 - 15: small bifaces.

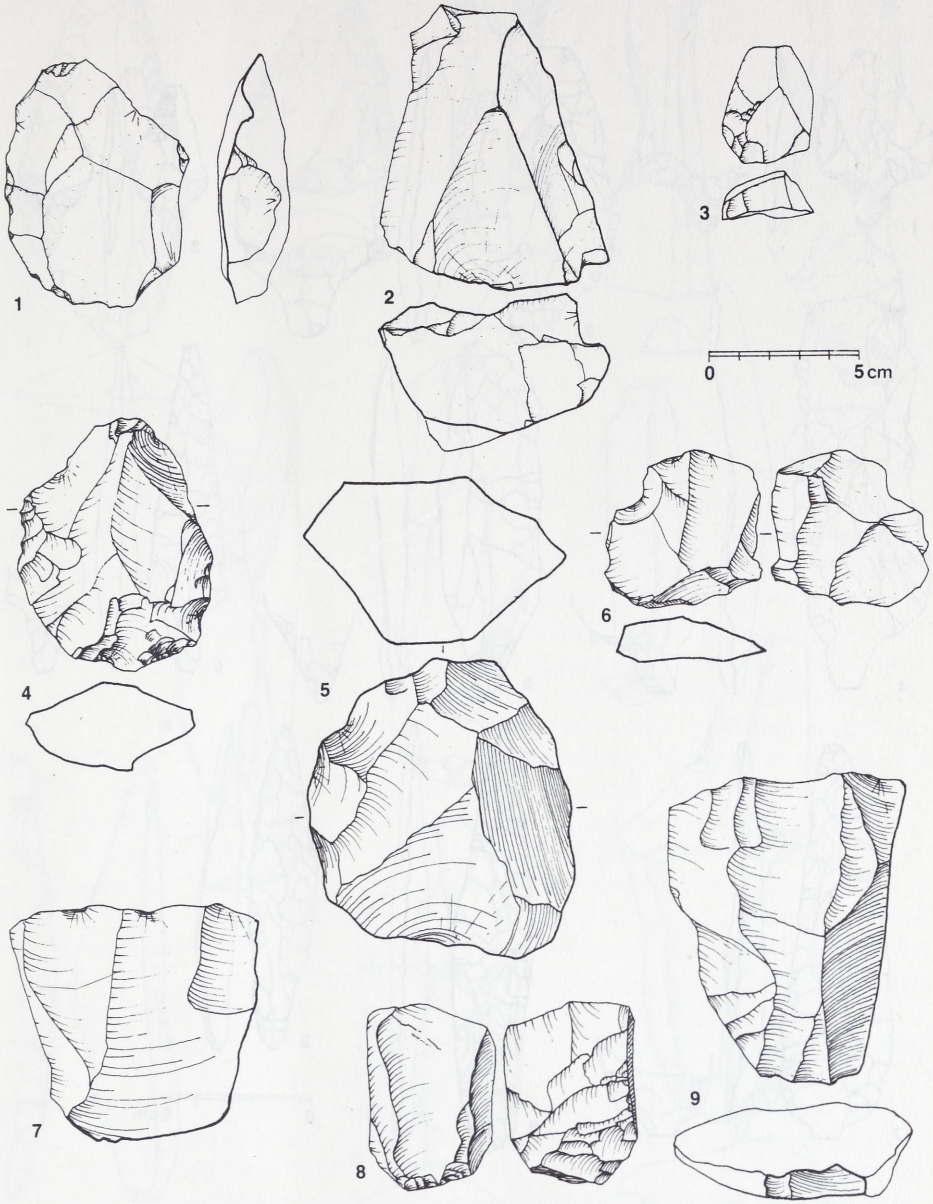


Fig. 9. Aterian cores from Lookout Hill, S/52/70: S/110/70;
1: radially prepared Levallois core; 2 - 3: Levallois point cores; 4 - 6: radially prepared discoid cores; 7 - 9: Levallois blade cores.

Fig. 10. Aterian artifacts from the Dune Terrace site, S/144/70;

1: unifacial tanged flake; 2: unifacial tanged flake with side-scraper retouch; 3: unifacial tanged point; 4: tanged blade with double side-scraper retouch; 5: shanked or tanged blade with side-scraper retouch; 6 - 7: tanged bifacial points; 8 - 9: bifacial lanceolate points.

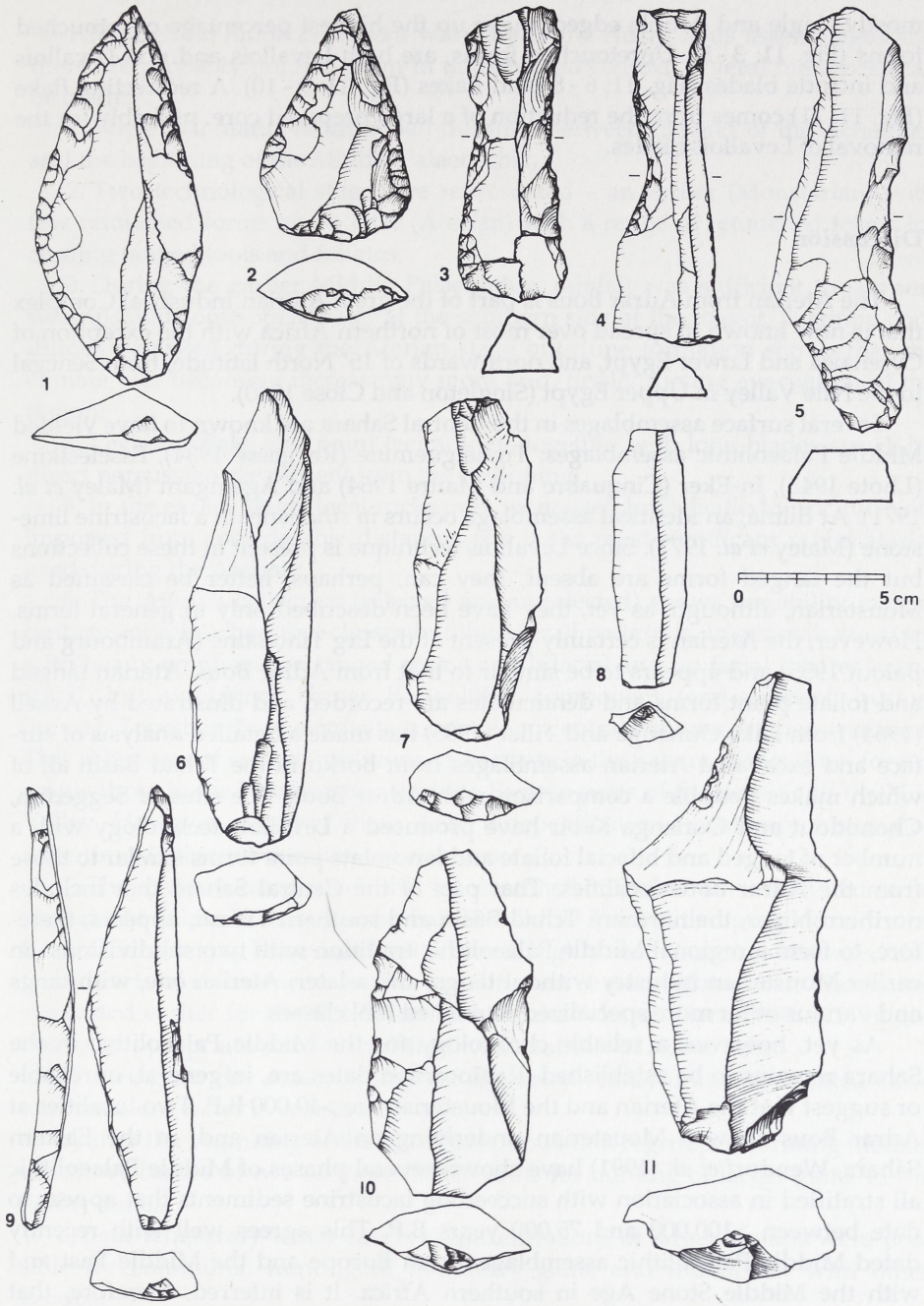


Fig. 11. Aterian artifacts from the Dune Terrace site, S/144/70;

1 - 2: unifacial (Mousterian-type) points; 3 - 5: concave and denticulate scrapers on blades; 6 - 7: Levallois blades, 8: blade from an unprepared core; 9: redirecting flake from a large Levallois blade core; 10 - 11: Levallois flakes.

mostly single and double edged, make up the highest percentage of retouched forms (Fig. 11: 3 - 5). Unretouched forms, are both Levallois and non-Levallois and include blades (Fig. 11: 6 - 8) and flakes (Fig. 11: 9 - 10). A redirecting flake (Fig. 11: 11) comes from the reduction of a large prepared core, probably for the removal of Levallois blades.

Discussion

The Aterian from Adrar Bous is part of the great Aterian Industrial Complex that is now known to spread over most of northern Africa with the exception of Cyrenaica and Lower Egypt, and northwards of 15° North latitude, from Senegal to the Nile Valley in Upper Egypt (Singleton and Close 1980).

Several surface assemblages in the Central Sahara are known to have yielded Middle Palaeolithic assemblages: Tiguelguemine (Reygasse 1934), Esselesikine (Lhote 1943), In-Eker (Cinquabre and Maitre 1964) and Agamgam (Maley *et al.* 1971). At Bilma, an identical assemblage occurs *in situ* beneath a lacustrine limestone (Maley *et al.* 1971). Since Levallois technique is present in these collections but the tanged forms are absent, they can, perhaps, better be classified as Mousterian, although, as yet, they have been described only in general terms. However, the Aterian is certainly present at the Erg Tihodaine (Arambourg and Balout 1955) and appears to be similar to that from Adrar Bous. Aterian tanged and foliate point forms and denticulates are recorded and illustrated by Arkell (1964) from Lake Ounanga and Tillet (1983) has made a detailed analysis of surface and excavated Aterian assemblages from Borku in the Tchad Basin all of which makes possible a comparison with Adrar Bous. The sites of Seggedim, Chemidout and Ounanga Kebir have produced a Levallois technology with a number of tanged and bifacial foliate and lanceolate point forms similar to those from the Adrar Bous localities. That part of the Central Sahara that includes northern Niger, the northern Tchad Basin and southern Tibesti, appears, therefore, to form a regional Middle Palaeolithic tradition with two subdivisions: an earlier Mousterian industry without tangs, and a later, Aterian one, with tangs and various other more specialized retouched tool classes.

As yet, however, a reliable chronology for the Middle Palaeolithic in the Sahara remains to be established. Radiocarbon dates are, in general, unreliable or suggest that the Aterian and the Mousterian are >40,000 B.P. Two localities at Adrar Bous show a Mousterian underlying an Aterian and, in the Eastern Sahara, Wendorf *et al.* (1991) have shown several phases of Middle Palaeolithic all stratified in association with succeeding lacustrine sediments that appear to date between >100,000 and 75,000 years B.P. This agrees well with recently dated Middle Palaeolithic assemblages from Europe and the Middle East and with the Middle Stone Age in southern Africa. It is inferred, therefore, that the Middle Palaeolithic at Adrar Bous covers an equally long period of time during the Last Interglacial and early Last Glacial, in the earlier part of the Later Pleistocene.

Although no fauna is present with any of the Adrar Bous assemblages and there are probably none of them in undisturbed context, several inferences can be made:

1. There is a hiatus of unknown duration between the end of the Acheulian and the beginning of the Middle Palaeolithic;

2. Two technological stages are represented – an earlier (Mousterian) with few retouched forms and a later (Aterian) with a range of retouched forms including tanged tools and foliates;

3. During the earlier Middle Palaeolithic, rainfall was sufficient to support swamps and some open water at the southern side of the massif. Swampy conditions persisted during the Aterian stage but dune formation shows that the climate was becoming increasingly more arid, finally forcing evacuation of the region;

4. Levallois flake and point technology, together with long blades struck by direct percussion are present from the beginning;

5. In the earlier stage, local rocks only were used but silicified vitric tuff was imported from considerable distances and is the most significant raw material used during the Aterian;

6. The Aterian collection (selected and unselected) shows variability in percentages of retouched tool classes but the overall pattern is, in general, the same with heavy emphasis on tanged forms and bifacial and unifacial foliates and a small, but significant Upper Palaeolithic component (end-scrapers, burins, borers). Together these elements constitute a Central Saharan Aterian tradition. This is but one of several traditions or variants in the Sahara at this time, for example those in the Northeastern and the Eastern parts of the desert and the Nile Valley. However, whether these were independent and contemporaneous or were time distinctive remains to be shown;

7. The distance from which the "greenstone" (silicified vitric tuff) had to be brought to Adrar Bous suggests that the Middle Palaeolithic population in the Central Sahara may have consisted of small, highly mobile groups that used different parts of an extensive territory at different seasons of the year. The model suggested earlier for the Epi-Palaeolithic in the Sahara (Clark 1980: 572) might not be inappropriate also for the Middle Palaeolithic of Adrar Bous:

a) during the dry season, camps of dispersed family units are situated close to permanent water in core areas;

b) after the beginning of the rains, the population regrouped forming mobile, transitory camps of two or more family units for hunting of larger game in the desert dunes;

c) near temporary water sources, concentrations of larger groups were possible for communal hunting of migratory game and interaction with other groups;

d) regrouping took place in the early part of the dry season into temporary camps situated by permanent springs and seeps for the hunting of gazelle and Barbary Sheep;

e) during this time, visits to sources of raw materials for stone working, pigment, *etc.*, and further interaction with other groups were possible;

f) as the dry season advanced, the population would again fall back on the permanent water of the core area. Adrar Bous could have been such a core area to which such a model could apply.

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