The Lower Palaeolithic Sequence of Atlantic Morocco Revisited After Recent Excavations at Casablanca

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THE LOWER PALAEOLITHIC SEQUENCE OF ATLANTIC MOROCCO REVISITED AFTER RECENT EXCAVATIONS AT CASABLANCA

J.P. RAYNAL[1], F.Z. SBIHI ALAOUI[2], L. MAGOGA[3], A. MOHIB[4] , M. ZOUAK[5]

Résumé : Casablanca est mondialement connu pour son patrimoine préhistorique. Des sites majeurs y ont été découverts dès le début du siècle dernier et certains ont livré des vestiges d'hominidés ("Atlanthropes" de Sidi-Abderrahmane et des Carrières Thomas 1 et Oulad Hamida 1). Un programme de recherches y est conduit depuis 1978 et comporte, outre la révision des sites "classiques", de nouveaux travaux générés par l'urbanisation galopante et la nécessité d'exploiter et de sauvegarder au mieux ce patrimoine exceptionnel. Ces dix dernières années, plusieurs résultats ont confirmé l'intérêt de ce programme. La séquence de Casablanca est beaucoup plus longue qu'on ne le pensait il y a encore quelques années: elle a enregistré en détail l'évolution des milieux physiques et biologiques depuis près de 6 Ma et couvre donc - avec des gisements riches et bien datés - la totalité de la période qui a vu se dérouler l'évolution des Australopithèques et des premiers Hommes en Afrique orientale. Les sites paléontologiques de Lissasfa (environ 5,5 Ma), découvert en 1995, et d'Ahl Al Oughlam (anciennement carrière Déprez) (environ 2,5 Ma), découvert en 1985, ont livré des faune mio-pliocènes de macro et micro-vertebrés qui précisent la chronologie régionale et permettent de mieux comprendre l'évolution du milieu animal d'Afrique du Nord et ses liens avec les autres grandes régions africaines. En 1991, la mise au jour de la grotte des Rhinocéros (Carrière Oulad Hamida1) a révélé une occupation de l'Acheuléen (environ 0,6 Ma) et une faune de petits et grands mammifères considérée comme la plus riche en Afrique du Nord pour cette période du Pléistocène moyen. En 1993, l'extension du nettoyage de la carrière Thomas 1 a montré - sur plus de mille mètres carrés - la présence de vestiges de l'Acheuléen ancien (1,0 Ma environ) dans un paléo-marigot, associés à une faune dominée par l'Hippopotame. Les premiers restes humains de cette région sont tous datés de différents moments du Pléistocène moyen (entre 0.6 et 0,4 Ma) et ont été découverts, associés à des outillages acheuléens, dans des cavités occupées également par des carnivores (Grotte des Littorines, grottes des carrières Thomas 1 et Thomas 3). En 1994 et 1995, trois nouveaux restes humains dentaires du Pléistocène moyen ont été exhumés dans la Grotte à Hominidés de la carrière Thomas 1. La variabilité des outillages de la séquence acheuléenne et sa chronologie sont bien établis par les fouilles récentes de gisements variés, en grotte et en plein air, dans la zone de Sidi-Abderrahmane/Oulad Hamida (Grotte des Ours, Cap Chatelier, niveau L et Grotte de Thomas 1, Grotte des Rhinocéros, Sidi Abderrahmane Extension, Sidi Al Khadir). Le programme archéologique "Casablanca" offre donc, dans une zone de référence incontournable, des éléments de contribution à la résolution de questions fondamentales de la préhistoire africaine et des premiers peuplements européens.

Mots-clés : Maroc, Casablanca, géofacts, Acheuléen, quartzites, hominidés.

Abstract : The Mio-Plio-Pleistocene sequence at Casablanca covers the last six millions years. The age estimates for different phases of this sequence have been established by various methods: lithostratigraphy, biostratigraphy, absolute dating (OSL, ESR), palaeomagnetism and aminochronology. Mio-Pliocene environments are characterized at extremely rich palaeontological sites (Lissasfa, Ahl-Al-Oughlam) but these have not yet yielded hominids remains. The oldest lithic assemblages are found in Late Lower Pleistocene deposits, circa 1 Ma, in unit L of Thomas Quarry 1, and consist of Acheulian artefacts made from quartzite and flint. The first human remains discovered in this area were found in younger Middle Pleistocene deposits and cover an important period of human evolution between *Homo erectus* and modern *Homo*. They are associated with Acheulian artefacts and rich faunas in caves (Littorines Cave at Sidi Abderrahmane, caves at Thomas Quarries 1 and 3). The variability and the chronology of the Acheulian sequence is well documented following recent excavations in various sites around the well known locality of Sidi Abderrahmane (Ours Cave, Cap Chatelier, Unit L and Hominid Cave at Thomas Quarry 1, Rhinoceros Cave at Oulad Hamida Quarry 1, Sidi Abderrahmane Extension and Sidi Al Khadir open-air sites). The Casablanca sequence thus offers useful data for comparison with those from other African areas where hominids appeared and developed and should be considered in the debate on the earliest occupation of Europe.

Key-words : Morocco, Casablanca, geofacts, Acheulian, quartzites, hominids.

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The city of Casablanca (fig. 1) played an important role in african prehistory as soon as it began to grow and developp at the beginning of the 20th century. Numerous quarries where opened and several major archaeological finds occured until the sixties, including discovery of human remains (Lecointre, 1926; Neuville et Ruhlmann, 1941; Biberson, 1956, 1961; Ennouchi, 1969, 1972). This heritage is helas now quickly disappearing under the modern city and archaeologists have to race with builders to protect and excavate the sites (Raynal et Geraads, 1993; Raynal, 1998; Sbihi-Alaoui et Mohib, 1998). The joint french-moroccan program "Casablanca"[1] has been undertaken twenty-four years ago to excavate sites due to destruction, to revise the stratigraphical frame of this major zone of african prehistory with modern methods and to reconstruct palaeoenvironments of early hominids.

We have now clearly established that the long sequence of Casablanca covers the last six millions years and constitutes an exceptional record of sea level variations (Raynal *et al*, 1999). The age estimates for different phases of this sequence have been established by various methods: lithostratigraphy (Texier *et al*, 1994, 2002), biostratigraphy (Geraads, 2002), absolute dating (OSL, ESR) (Rhodes, 1990; Rhodes *et al*, 1994, 2002), palaeomagnetism and aminochronology (Occhietti *et al*, 1993, 1996, 2002). Detailed studies have precised the evolution of the palaeoenvironment (El Graoui, 1994; Lefèvre *et al*, 1985, 1994, 1996; Lefèvre 2000) . Recent archaeological studies and synthesis have contributed to establish the evolution of human activities in the area (Raynal *et al*, 1995, 2001a and b, 2002; Mohib, 2001). We will consider here only some of these aspects.

The biochronological framework of the Moroccan Quaternary is now much more firmly established than it still was ten years ago (Geraads, 2002). It can now be compared to the East African one, and some periods or aspects are even better sampled. It still needs refinements and could indeed be improved for some parts, especially the transition between Middle and Upper Pleistocene. We shall focus below on some of the key-sites, roughly in decreasing ages, and come back to the characteristics and evolution of lithic assemblages.

Mio-Pliocene environments are characterized at extremely rich palaeontological sites: Lissasfa around 5.5 Ma (Geraads, 1998; Raynal *et al*, 1999, Geraads, 2002), Ahl-Al-Oughlam around 2.5 Ma (Raynal *et al*, 1990, Geraads et al, 1998, Geraads, 2002) These have not yielded yet hominids remains nor artefacts, but only geofacts: up to now, there is no ancient pebble-culture in Morocco clearly documented and *in situ* within Plio-pleistocene sediments.

[1] Programme de coopération Casablanca de l'Institut National des Sciences de l'Archéologie et du Patrimoine du Royaume du Maroc, Convention franco-marocaine relative aux recherches archéologiques et anthropologiques du 19/01/71 révisée en décembre 1979.

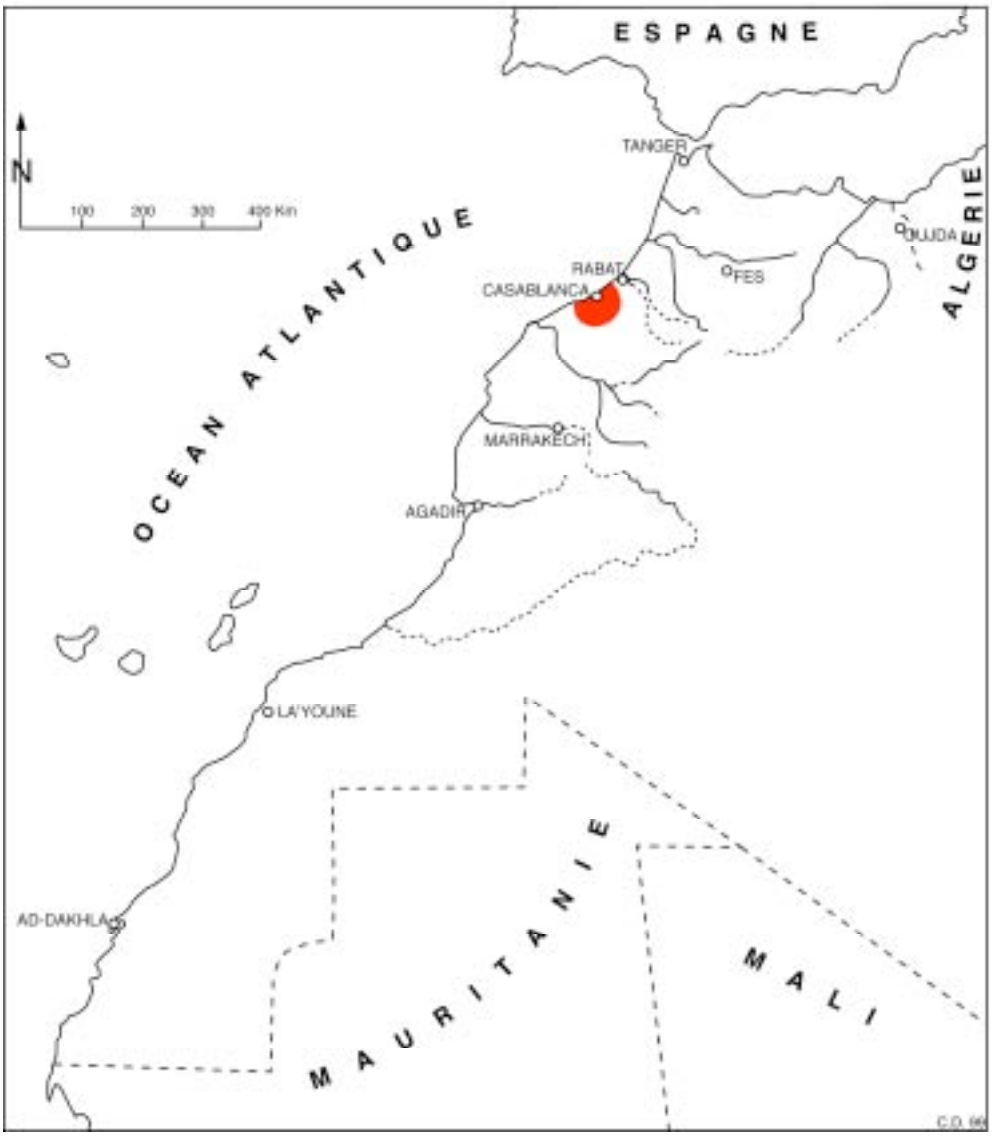

Fig. 1 – Location map

1 - THE PLEISTOCENE KEY-SITES

1.1 - Thomas Quarry Unit L

The oldest lithic assemblages were found in Late Lower Pleistocene deposits, circa 1 Ma, in unit L of Thomas Quarry 1, and consist of Acheulian artefacts made of quartzite and flint (Raynal et Texier, 1989). The assemblage described *infra* has been recovered in a 80 m^2 excavation but 1000 m^2 of layer L have been exposed and are now under excavation. The lithic series contains fiakes struck from discoidal cores and polyhedrons. Besides chopping-tools, polyhedrons, and some deavers, trihedrons and bifaces form the most characteristic elements among the tools (Fig. 2). They are often only partial and usually display lateral or lateral-distal concavities, which form the point of the bifaces (Fig. 3). A comparison of the probable use of

the objects identified in our classification with experimental results leads us to conclude that the activities of stone working, hide slitting, heavy-duty butchery, and bone breaking were probably performed in unit L1, while stone working and light-duty butchery characterize unit L5 (photo 1).

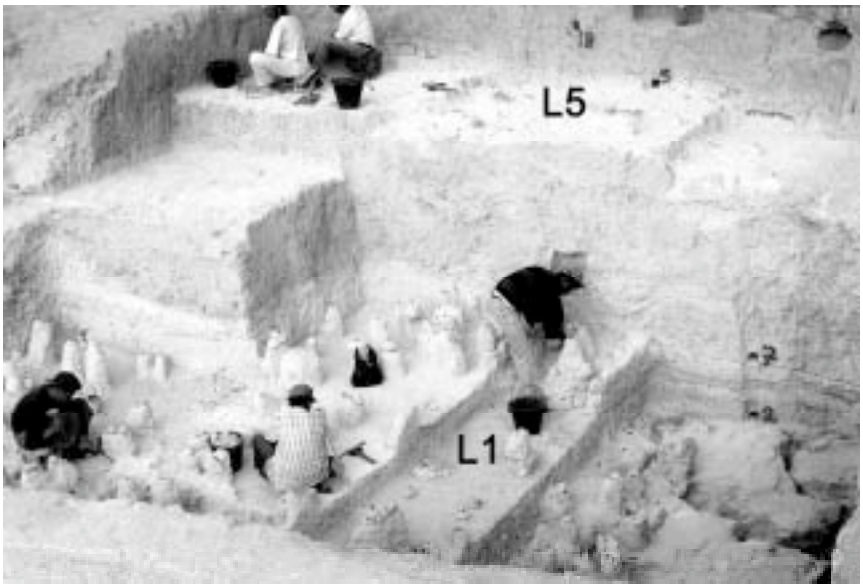

Photo 1. Casablanca, Thomas 1 Quarry, 1993 excavations in layers L1 and L5 (© J.P. Raynal)

The lowermost layers of Thomas 1 quarry have yielded but a few large Mammals, left over by *Homo erectus* as food refuse, and rather badly preserved. After Geraads (*in* Raynal *et al*, 2001), Hippo, Zebra and Gazella have little biochronological meaning, but the discovery in 1996 of a *Kolpochoerus* third molar suggests great antiquity. This Suid, widespread in Eastern and Southern Africa, was previously known in North Africa only in Plio-Pleistocene sites, the youngest of them being Aïn Hanech, a locality which is certainly of lower Pleistocene age, perhaps close to 1.2 Ma. Kolpochoerus is absent from all other level in Thomas/Oulad Hamida quarries, and from Tighenif, an Algerian locality which age is close to the Lower/Middle Pleistocene boundary (Geraads *et al*, 1986).

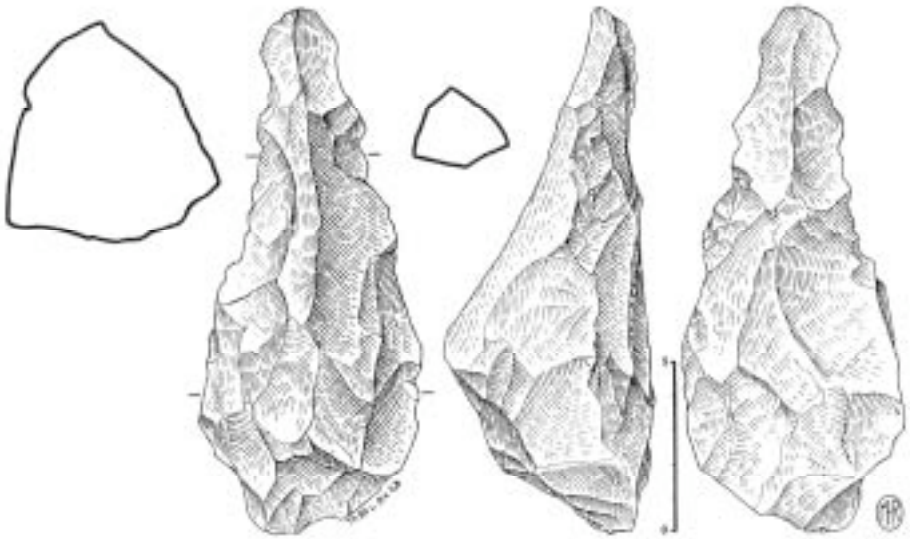

Fig. 2. Casablanca, Thomas 1 Quarry, Unit L1, classical trihedron, quartzite.

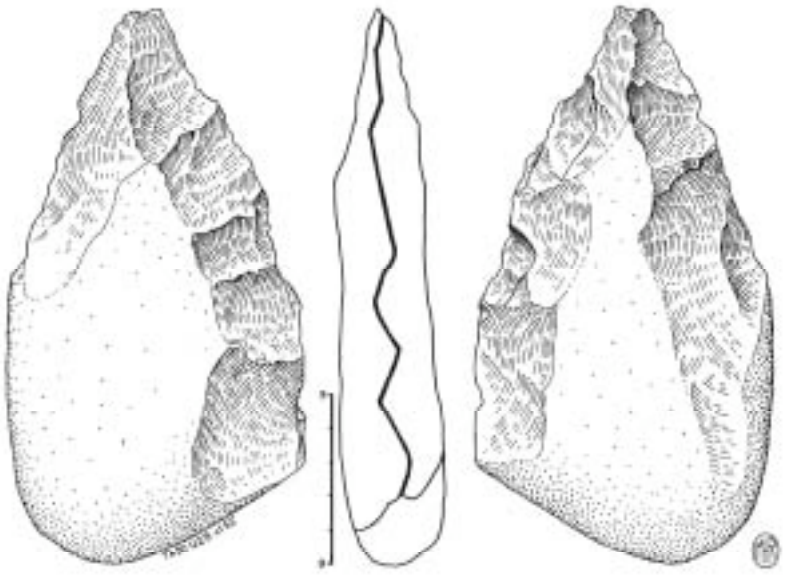

Fig. 3. Casablanca, Thomas 1 Quarry, Unit L1, partial biface on quartzite flat pebble

Micromammals (Geraads *in* Raynal *et al*, 2001), although also rare, tend to confirm the great age of level L. There are two species of *Gerbillus*; the larger one is of the size of *G. grandi* known in other levels of the Thomas 1 quarry but with a very broad M/1, and it is certainly specically distinct; the smaller species is also distinct from the similar-sized *G. minutus*, *G jebileti* or *G. campestris*. a lower M/1 of *Paraethomys* has the anterior lobe quite transversal instead of V-shaped as in all other Middle Pleistocene species, and it looks more like *P. mellahe* AMEUR, from Oued Mellah, a locality older than Tighenif. The absence of Ellobius, an Arvicolid present at Tighenif also supports an age greater than that of this locality.

On the whole, the fauna from level L demonstrates its lower Pleistocene age, suggesting an age of perhaps 1 Ma or more, in full accordance with typology and technology of the artefacts, with the paleomagnetic data obtained by Sevket Sen (*in* Raynal *et al*, 1996), and with the OSL dates for unit L5 (Rhodes et al, 2002): 989 ± 208 ka, 1683 ± 473 ka, 1037 ± 1204 ka, even if they have very large uncertainties... The presence of regular polyhedrons (spheroids) as well as irregular ones, both similar to those described in the algerian locality at Aïn Hanech (Sahnouni et Hadjouis, 1987) supports this opinion: in this site, the absence of bifacials could only be a matter of variability related to the surface excavated and has to be confirmed by larger excavations. On the whole, the lithic assemblage from Thomas 1 quarry unit L is contemporaneous and similar to those of Lower Acheulian from East Africa and Middle East.

1.2 - Oulad Hamida 1 Rhinoceros Cave and Thomas Quarry Hominid Cave

Middle Pleistocene levels are represented in the Oulad Hamida 1 quarry, where the Rhino cave (photo 2) has yielded in the lower part of the filling a very rich collection of micro and macromammals that indicate a rather open and dry environment, associated with a rich acheulian assemblage (Raynal *et al*, 1993; Geraads, 1993, 1994, 2002; Bernoussi, 1994, 1997). This occupation has been dated by ESR (Rhodes *et al*, 1993) and new calculations provide older dates: 435 ± 85 ka by early uptake and 737 ± 129 ka by linear uptake (Rhodes *et al*, 2002). They are in better agreement with biostratigraphic data (Geraads, 2002) and with unpublished lithostratigraphic observations which point towards a 0.6 Ma minimum age. This site is now one of the best reference levels for this period of Middle Acheulian in North-Africa. The abundant remains of white rhinoceros suggest specialized hunting by hominids. Compared to the local early Acheulean one can observe an increase of discoidal cores and of flake production; cleavers are rare while bifacial pieces are larger – even if one can observe a large

variability in sizes - and characterized by convex and/or concave edges that constitute a pointed extremity (Figs. 4 and 5). In total, 3485 artefacts were removed from the bottom layer of a 70m^2 excavation (photo 3).

Photo 2. Casablanca, Oulad Hamida 1 Quarry, Rhinoceros cave, front view of the quarry wall in 1991 (© J.P. Raynal).

Photo 3. Casablanca, Oulad Hamida 1 Quarry, Rhinoceros cave, view of the 1991 excavation from above (© J.P. Raynal).

Tools on flakes represent only 3.5% of the assemblage and notches and denticulates predominate, the others being different types of scrapers and some multiple tools. Stone

working was obviously important in this site, as probably were hide cutting, light- and heavy-duty butchery, and bone breaking.

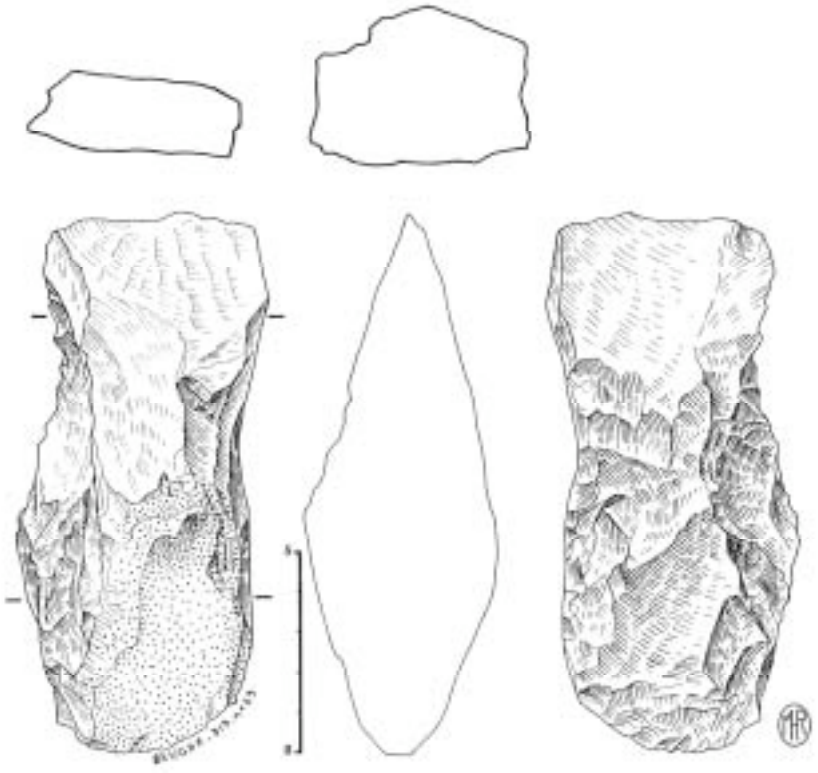

Fig. 4. Casablanca, Oulad Hamida 1 Quarry, Rhinoceros cave, cleaver, quartzite.

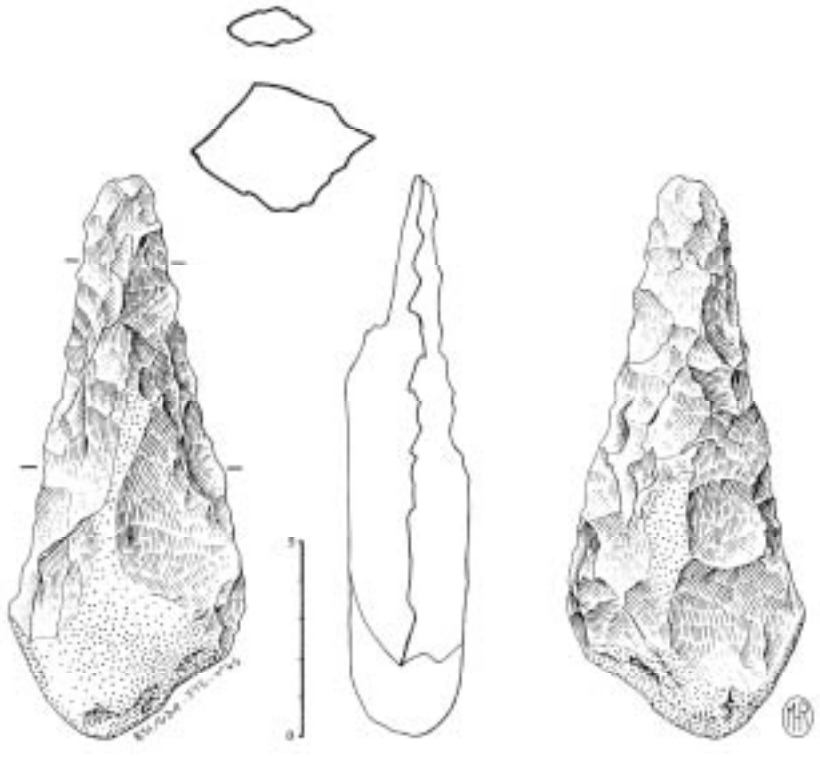

Fig. 5 Casablanca, Oulad Hamida 1 Quarry, Rhinoceros cave, small lanceolate bifacial, quartzite.

The assemblage recovered in a 65 m^2 excavation of the Hominid level at Thomas Quarry I is quite different from the series of the Rhino Cave bottom unit, as it is dominated by flaked pebbles. It is, however, comparable to the (too) small series from the Rhino Cave top unit and series collected at the time of the discovery of the *Homo* jaw in 1969. Geological studies by Texier demonstrate that this assemblage was not in primary position but has been secondarily introduced into the cave, presumably removed from the entrance and transported by run-off, which mixed fauna remains and artefacts. The macro-fauna is similar in composition to that of Rhino Cave, although domi-nated here by carnivores (bears, hyenas and *Canis)* (Bernoussi, 1997) but it is associated with a similar macrofauna than in GDR (Geraads, 1980; Geraads *et al*, 1980; Bernoussi, 1997). Three large sized and robust teeth of *Homo* have recently been recovered in this cave, only a few meters distant from the place where the mandible was discovered in 1969. They are very similar to other specimen of *Homo erectus* from North Africa (Zouak, unpublished). This Thomas Quarry 1 Hominid Cave is vast, and some parts of the stratigraphy are still under study (Fig. 6). The preliminary dates, as well as biostratigraphy, and lithostratigraphic data point towards a greater antiquity than was previously estimated, with 0.6 Ma as a minimum age.

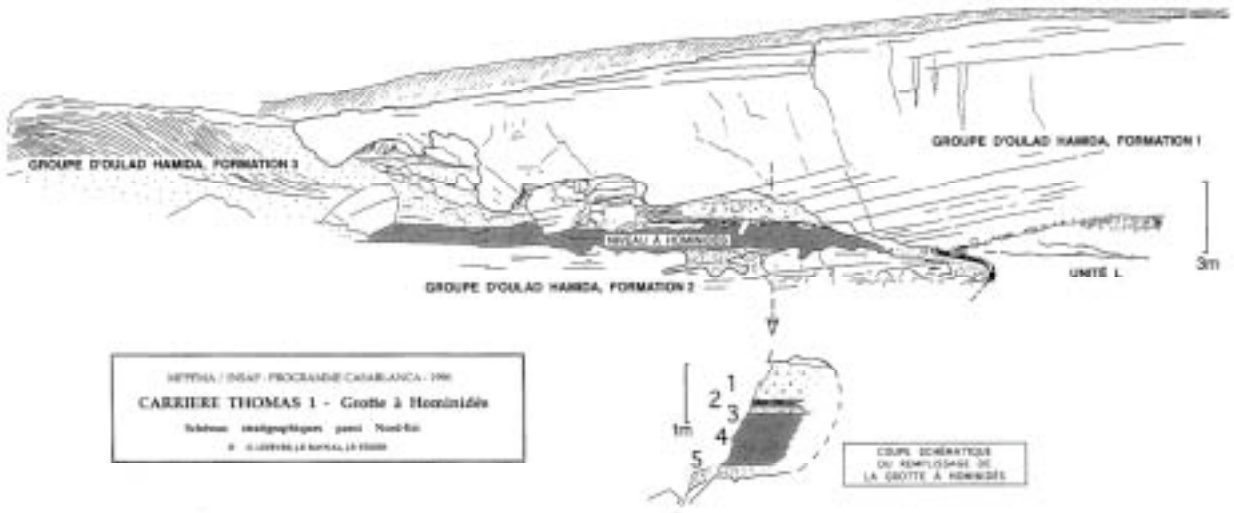

fig 6. Thomas Quarry 1, Hominid Cave stratigraphy.

After Geraads (*in* Raynal *et al*, 2001), the relatively great antiquity of these two faunal sets is shown by their similarities with Tighenif, and by the occurence of several extinct species. Among the taxa shared with the Algerian site are probably the zebra *Equus mauritanicus*, the giant baboon *Theropithecus oswaldi* and several species of lesser biochronological significance. The OH1-Th1 faunal unit no longer has some lower Pleistocene survivors still present at Tighenif, such as the Suid *Metridiochoerus*, the antelope *Hippotragus gigas*, or the sabre-tooth cat *Homotherium*, but Canis, the ratel *Mellivora*, the lynx, the antelope *Parmularius* and the hare *Serengetilagus* are all of extinct (mostly new) species. Micromammals allow refinement of the biochronological succession within this faunal unit. The best collection is from the Rhinoceros Cave (Geraads, 1994) and samples have also been collected in several levels or spots of the Thomas 1 quarry. the Rodent fauna of this cave system, which is rather sharply dictinct from that of level L, is dominated by the Gerbillids, of which there are at least 4 species, confirming the aridity suggested by the abundance of Alcelaphines, and gazelles among bovids. Murids *(Paraethomys, Praomys and Mus)*, Arvicolids *(Ellobius)* and Glirids *(Eliomys)* are less common. The earliest level is the pink breccia at the base of the Thomas 1 cave, from where most probably comes the *Homo erectus* mandible. It has en Eliomys smaller than at OH1-GDR, and also a small, perhaps new, species of the Gerbillid genus Meriones.

Stratigraphic elements and absolute datings thus agree to place these levels circa 0.6/0.7 Ma. This gives a new palaeoanthropological perspective for the human remains of evolved *Homo erectus* or archaïc *Homo sapiens* (Hublin, 1991) which were recovered in Thomas 1 quarry cave and in Thomas III quarry cave, unhappily distroyed yet, since they are the oldest discovered in Casablanca: they cannot be linked with more recent fossils like those from Sidi Abderrahmane Littorines Cave, potentially contemporaneous of the end of isotopic stage 11 at most, and moreover with the Salé skull, which was not discovered during excavations and which stratigraphic position has never been clearly established.

1.3 - Other sites

At Sidi Al Khadir-Hélaoui Quarry, an open air site has been excavated. Flake production was the main activity on this site, may be in relationship with light-duty butchery. This assemblage represents a facies of Middle Acheulian without bifacials, with an isotopic stage 16 minimum age (Lefèvre, 2000).

In the Bear's Cave at Sidi Abderrhamane, a recent stage of the Middle Acheulian is illustrated, dating of the boundary of isotopic stages 12 and 11. A 64 m2 recent excavation in the cave deposits has given a large series of stone objects (2976) and a limited series of faunal remains (91), mainly *Ursus* bones fragments. Despite the high degree of marine reworking, the lithic assemblage in secondary position still reveals every step of the operative chains, from the raw material (quartzite pebbles and blocks form 97% of the lithic ressources) to the ultimate retouched tools (Mohib, 2001). Flaking, retouch and reduction processes are illustrated by different types of flakes, fragments and various cores: besides polyedric ones, we have identifed clactonian chopper-cores, cores on flakes and very large discoïd cores. Bifaces are often made on flakes and show an asymetric profile.

The upper part of the acheulian sequence is well illustrated at Cap Chatelier (Sidi-Abderrahmane Cunette) and at Sidi-Abderrahmane-Extension, and possibly for its basal part at Sidi Abderrahmane Littorines Cave, although it's assemblage has not been re-examined yet and it's exact stratigraphic position remains unclear, despite Biberson's explanations (Biberson, 1956).

The assemblage of Cap Chatelier demonstrates production of predetermined flakes and thin small bifaces, a diverse set of tools on flakes and a very few cleavers. It is older than isotopic stage 9 after new OSL dates obtained at top of Cap Chatelier section in "small dune" of Biberson (1961): 376 ± 34 ka and 317 ± 64 ka (Rhodes et al, 2002).

At Sidi-Abderrahmane Extension we observe an important use of block-fragments and frequent recycling of rolled artefacts with multiple scars. Flakes are mainly produced from discoidal cores and polyhedric forms are quite rare. So are predetermined flakes, but these coexist with a diverse toolkit on flakes. Bifacial pieces are generally made on flakes and mostly display convex sides and tend towards ovate forms, even to discoidal ones. Cleavers are rare hereperhaps as if they had become useless along with the increase of new bifacial patterns. Stone working was important at this site, along with hide cutting, lighy-duty butchery and bone breaking. This assemblage is neatly younger than isotopic stage 9 and can be situated either in isotopic stage 8 or 7, more likely 7 and then contemporaneous of the Bir Feghloul member of the Kef El Haroun Formation if we follow the stratigraphic relationships proposed by Lefevre (2000).

This Upper Acheulian, is the technical reservoir which, far before the Last Interglacial, developed into pre-Mousterian and Mousterian facies associated with modern humans, as demonstrated at Djebel Irhoud for example, where fauna collected by Ennouchi has recently

been revised (Amani, 1991; Amani et Geraads, 1993; Geraads et Amani, 1998b) and points towards an age close to the Middle / Upper Pleistocene boundary (Geraads, 2002).

2 - THE LITHIC PERSPECTIVE IN THE ACHEULEAN SEQUENCE OF CASABLANCA

The raw material was abundantly available in all sizes in the area and allowed a production of large flakes or voluminous fragments of pebbles and blocks. The only constraint consisted in the transport of heavy objects, making voluminous flaked items rare in the excavated sites. The various types of blanks introduced to the sites are very well recognizable in the bifaces of the various series.

The exploitation of the same raw materials throughout the Acheulean sequence at Casablanca allows a comparison of the technological characteristics of some representative series, presented here along the unes of the classification model developed on the basis of a study of the assemblages from Unit L of the Thomas quarry, briefly explained below (Raynal *et al*, 2001b). This model is based on the character of the working surfaces, their disposition and exploitation. It integrates dynamic aspects (sequences of production of flakes and of shaping, reduction of objects, re-use, etc.) and functional ones (specific morphology, transformation by usage, etc.). Seven main groups are discerned:

Group 1: flaking carried out by using cortical striking platforms;
Group 2: flaking from one non-cortical striking platform, possibly re-adjusted;
Group 3: flaking using two non-cortical striking platforms for one and the same working surface;
Group 4: flaking using three to five non-cortical strikmg platforms for one and the same working surface. It contains most objects with multiple flake removals. Starting with flaking from cortical striking platforms and followed by an increase of fiaked surfaces, this group contains the majority of complex and/or typical objects. The most complete bifaces as well as the best-exploited cores occur within this group;
Group 5: flaking from non-cortical striking platforms belonging to vanous working surfaces;
Group 6: exploitation/shaping of flakes and fragments; With cores on flakes and fragments and tools on flakes, this testifies to the final stages of the knapping process.
Group 7: objects transformed by utilization. Items transformed by usage or re-utilization are at the origin of part of the observed assemblage variability.

Pebbles and flakes are subdivided in the followings :
- M0: intact pebble.
- M1: naturally broken pebble, splitted pebble, pebble with a single flake removal, pebble with several non-adjacent flake removals.
- M2: block or blocks parts.
- M3:flaking accidents: pebbles broken during flaking or use, splitted sub-spheroids, broken hammer-stones.
- M4: flakes(6), chunks, pebble fragments,core fragments.

Among flakes, different technical categories are identified, corresponding to operative chains for bifacial production, discoïd core reduction, polyhedric flaking etc.

The group subdivisions thus rest on technological and/or secondary morphological criteria (such as reuse of striking platforms, recurrence of flake removals, length of blanks both artificial and natural surface size of flake removals, and presence/absence of cortex). A comparison can be made with categories defined by Chavaillon and Chavaillon (1981) and demonstrates the technological variability among them (Table 4).

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(6) Les abréviations suivantes seront utilisées dans le texte. TC : talon cortical ; TNC : talon non cortical (lisse, dièdre) ; SC : surface dorsale corticale ; SPC : surface dorsale partiellement corticale ; SNC : surface dorsale sans cortex.

J.and N. Chavaillon (1981) :	Classification in use
Pebble tools	1A, 2A, 2B1, 3, 4C, M1, M3
Cores	1A1, 2B1, 3, 4B, 4C, 5A, 6A, M4
Choppers	1A, 2A, 2B1, 3, 4C, M1
Hammerstones	7B, 7C, 7D
Broken pebbles	M1, M3, 7C
Polyhedrons	5A even 5B, 7A
Bolas	7A

Table 4

The variability of lithic assemblages is well documented, following recent excavations in Thomas Quarry 1 units L1 and L5 (Th1/L1, TH1/L5), Thomas Quarry 1 Hominid Cave (TH1/GH), Rhino Cave bottom unit (GDR), Bear Cave (GDO), Cap Chatelier, Sidi Abderrahman Extension (SAE), and Sidi Al Khadir open-air sites (Table 5, figure 7).

Sites	TH1/L1		TH1/L5		TH1/GH		GDR base		GDO		SAE	
Age	± 1.0 Ma		± 1.0 Ma		0.6/0.7 Ma ?		0.6/0.7 Ma ?		± 0.4 Ma		≥ 0.2 Ma	
OIS*	23 ?		23 ?		>15		> 15		11		≥7	
Groupes	n	%	n	%	n	%	n	%	n	%	n	%
1	18	6,0	18	4,8	40	54,8	66	11,3	104	51,2	31	5,4
2	56	18,8	79	21,2	17	23,3	82	14,0	15	7,4	62	10,7
3	38	12,8	11	2,9	9	12,3	46	7,8	9	4,4	96	16,6
4	124	41,6	61	16,4	7	9,6	22	3,8	23	11,3	199	34,5
5	18	6,0	66	17,7	0	0,0	59	10,1	27	13,3	5	0,9
6	36	12,1	97	26,0	0	0,0	156	26,6	25	12,3	181	31,4
7	8	2,7	41	11,0	0	0,0	155	26,5	0	0,0	3	0,5
total	298	100,0	373	100,0	73	100,0	586	100,0	203	100,0	577	100,0
* oxygen isotopic stage												

Table 5: Technical composition of the major sites of the acheulian Casablanca sequence after recent excavations, following the classification of Raynal, Magoga et Sbihi-Alaoui (in Bulletin d'Archéologie Marocaine, t. 19). Th1 L: Thomas 1 unit L; Th1 GH: Thomas 1 Homidid Cave; GDR: Rhinos Cave Oulad Hamida 1 Quarry; GDO: Bears's Cave at Sidi Abderrahmane; SAE: Sidi Abderrahmane Extension.

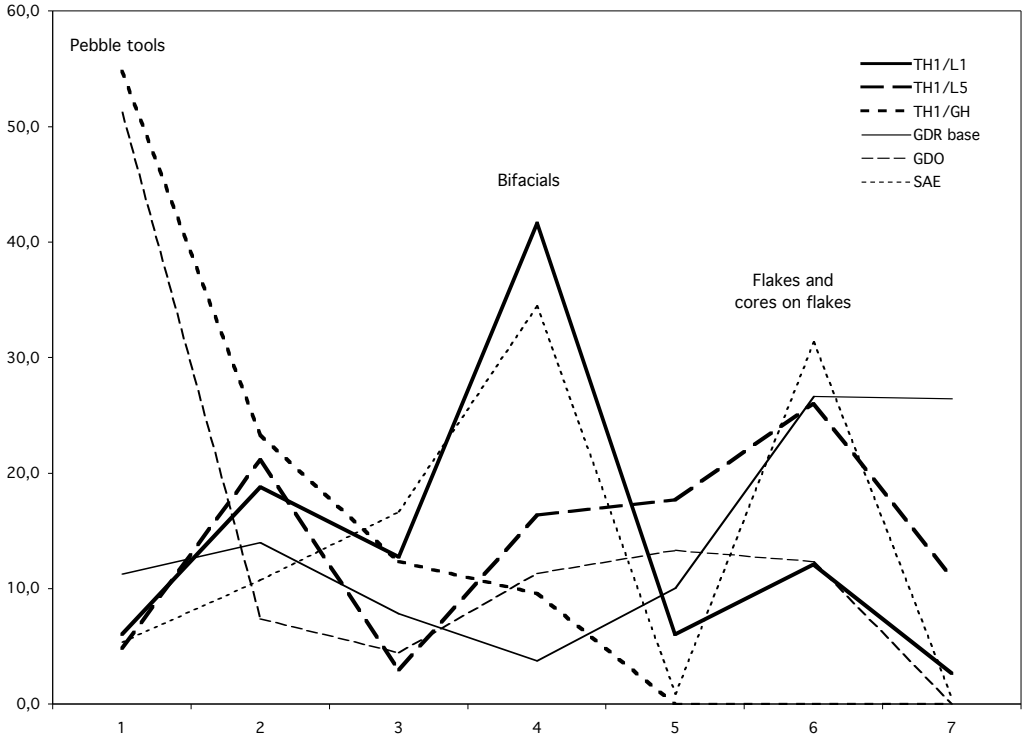


Figure 7

The series demonstrate an alternation between industries rich or not in bifacials but are all supposed to belong to the Acheulian technocomplex. This situation is like the one observed everywhere in Africa and in Europe . This variability occurs sometimes during a short duration of sedimentary events, i.e. Unit L at Thomas Quarry 1 (figure 8).

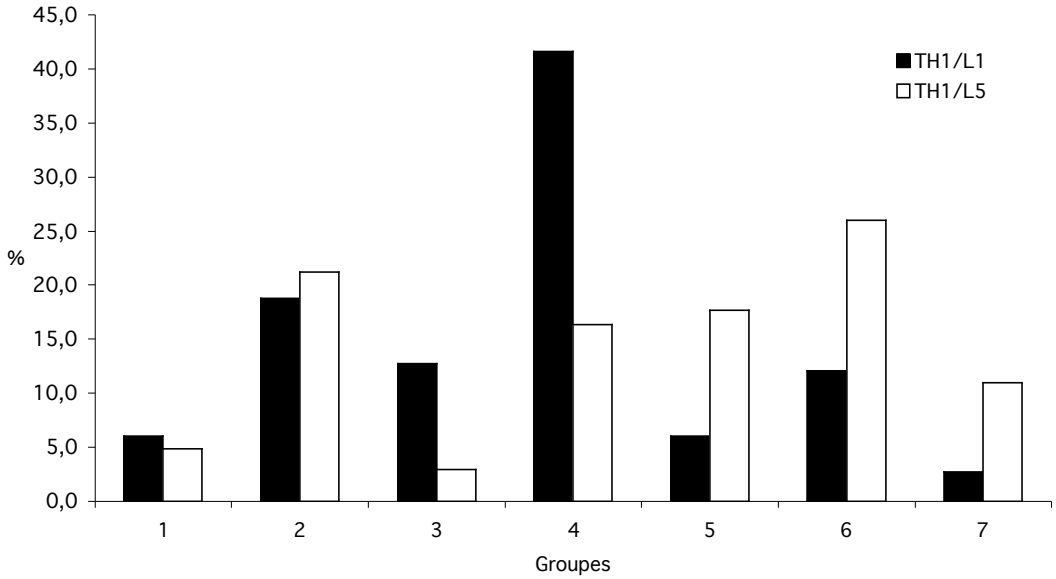


Figure 8 - Distribution of technical groups in archaeological units L1 and L5 at Thomas Quarry 1

But on another hand, similarities and differences in the structure of the various assemblages may actually derive from other factors. Among these, one can nevertheless discard the access to raw materials; sources are the same along the sequence and the composition of assemblages is remarquably stable from this point of view: El Hank quartzites are dominant, available in pebbles or chunks, and flint, only available in small pebbles, is much less flaked. Thus, the stability of technological solutions observed along the sequence derives evidently from raw materials quality and the variability derives from other factors. The neat correlation between the number of flake removals and the number of strikings platforms is a technological constant (a succession of x flakes originating from one platform), verified in experiments and determined by the mechanical characteristics of the raw material (figure 9).

Bifacials also bear witness of an increasing complexity of elementary modes of reduction and of a continuous technological enrichment in which earlier acquirements resurge (the polyhedric proximal part for example). The changes within the bifaces reflect in our view a morpho-functional evolution, relayed in time by more systematic production of flakes, including predetermined ones. There is a global trend towards biconvex symetric shapes which clearly reflects a functional specialization.

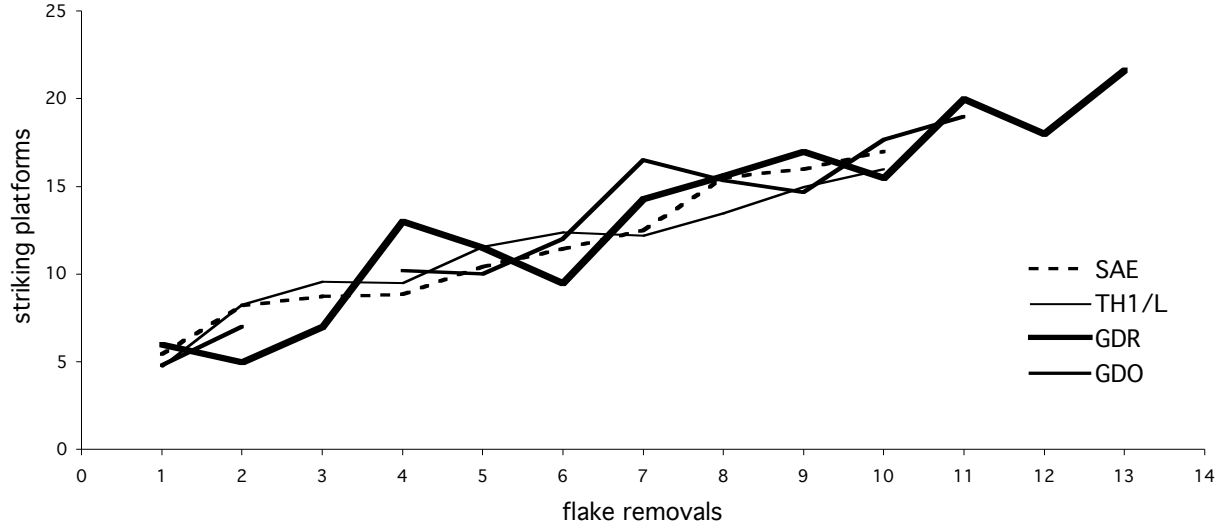
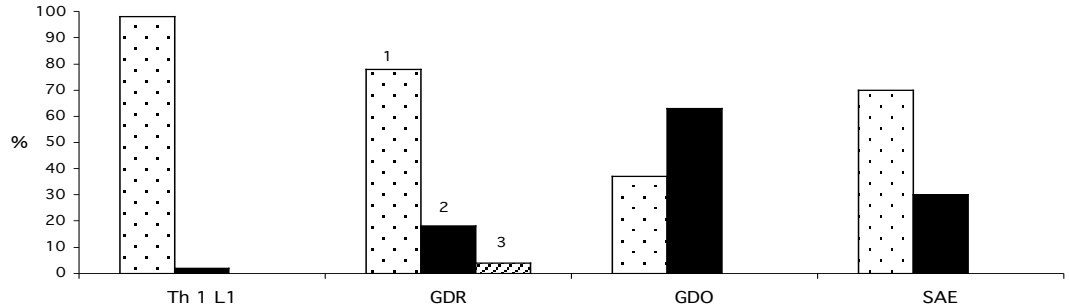


Figure 9 - Correlation between the number of flake removals and the number of strikings platforms on quartzite artefacts from key-sites of the Casablanca acheulian sequence.



Figur

e 10 – Morphology of proximal parts of bifacials.
1: natural or unretouched. 2: cutting. 3: polyedric.

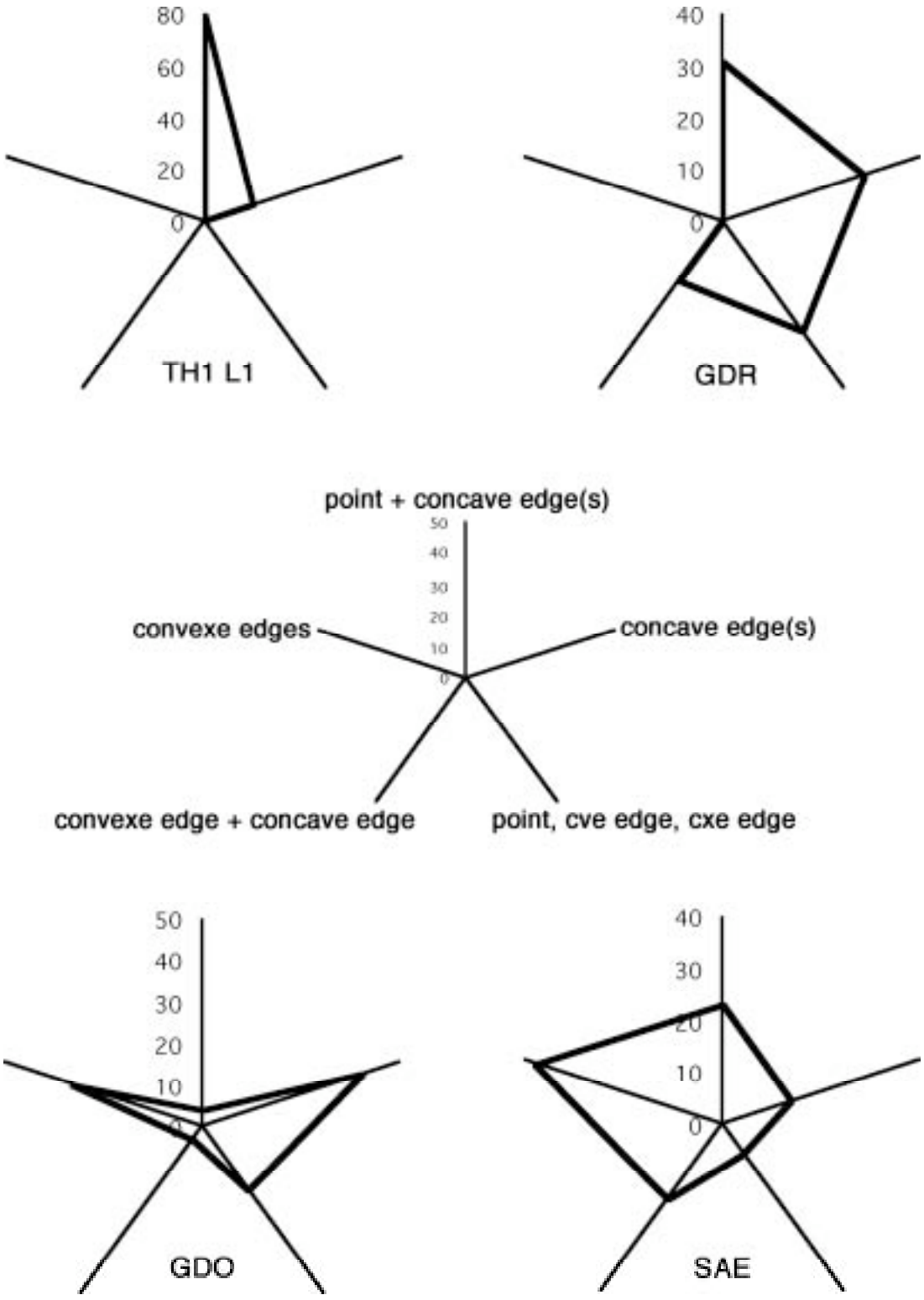


Figure 11 – Compared morphology of bifacials in key-sites of the Casablanca acheulian sequence. TH1 L1: Thomas Quarry 1 unit L1. GDR: Rhinoceros Cave Oulad Hamida 1 Quarry. GDO: Bears Cave at Sidi Abderrahmane. SAE: Sidi Abderrahmane Extension.

Some factors of variability might have had a natural origin such as for instance, the selection of materials by redepositional actions which has taken place in some layers: for example, Layer L1 at Thomas Quarry where small flakes and bone fragments have been washed or concentrated and where the fabric of bigger artefacts clearly indicate a water-flow action. On the other hand, the smallest flakes are preserved in eolian sands of Layer L5.

Another factor is the limited area of some excavations: for instance the area excavated in Layer L5 at Thomas Quarry 1 does not exceed 25 square metres....

Finally, possible cultural reasons for the various inter-relationships between the industries must of course be considered. Whenever the use of raw materials is not in question, there may be a certain variability connected with peculiar functional situations, such as adaptive reactions to environmental and/or to microenvironmental changes resulting from coincidence with limited or more global climatic changes. Evidence for such variability in assemblages according to climatic fluctuations within a short time span is illustrated by Layers L5 and L1 of Unit L at Thomas Quarry 1.

Variability in assemblages from sub-contemporaneous cave deposits at Thomas Quarry 1 and Oulad Hamida Quarry 1, may be considered from another point of view: different carnivoras have acted in these sites as providers and scavengers, different meat ressources where offered, different tool kits were employed...

At the end, among the progressive transformations of assemblages, some thresholds appear, which could be linked with human evolutionary steps or reflect different biomechanical solutions. They support the subdivisions of local Acheulian in several main stages, which is nevertheless subject to reexamination with further informations.

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There is still a lot to investigate: Lower Pleistocene sites beyond 1.0 Ma are still unknown in Morocco and the detailed chronological frame needs more refinments. Nevertheless, the Casablanca acheulian sequence is now better documented with mains subdivisions founded on recent excavations and clearly contemporaneous of those known from East Africa. The main differences with Biberson's proposals (1963) are :

- Stades I and IV of moroccan "Pebble-culture" have been respectively defined at Casablanca on the basis of geofacts and of reworked recent assemblages rich in pebble tools (Raynal et Texier, 1989). Up to now, there is no Oldowayan site identified in stratigraphic position below the Acheulian sequence,
- "Lower Acheulian" assemblages are now considered as Middle Acheulian,
- "Upper Acheulian" is much older at Cap Chatelier than supposed before and on the contrary, much more recent at Sidi Abderrahmane Extension.

The succession of archaeological layers, from the oldest to the youngest, appears today as following :

Lower Acheulian, isotopic stage 23 (?):
Thomas Quarry 1 L1, Oulad Hamida 1 unit L, Thomas Quarry 1 L5,

Middle Acheulian, isotopic stage 16 as a minimum age: Thomas Quarry 1 Hominid Cave, Oulad Hamida 1 Rhinos Cave, Sidi Abderahmane unit M, STIC Quarry, Sidi Abderrahmane Bears Cave at isotopic stages 12 to 11 transition,

Upper Acheulian, from isotopic stage 11 to isotopic stage 8 or 7 at least: Sidi Abderrahmane Littorines Cave (?), Sidi Abderrahmane Cap Chatelier, Sidi Abderrahmane Extension.

Nevertheless, this acheulian sequence offers useful data for detailed comparisons with other African areas where hominids appeared and developed, for example the Oldoway succession from Bed III to Ndutu Beds (Leakey, 1951, 1971; Leakey and Roe, 1994), in which we see the same variability between Acheulian and Developped Oldowayan facies, according to site function and abundance/scarcity of artefacts, or even the Melka Kunture series (Chavaillon et al, 1978).

North Africa Acheulian should now be reconsidered in the debate about the first occupation of Europe and especially the question of multiple "Out of Africa" hypothesis through mediterranean straits ans isthms. One million years ago, Homo supposed erectus – but we really don't know yet – who manufactured Lower Acheulian lithic assemblages, was facing Southern Europe and nobody can firmly exclude its possible desire and habiliity for crossing the waters of narrow straits…

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