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THE EARLIEST OCCUPATION OF NORTH-AFRICA : THE MOROCCAN PERSPECTIVE

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Abstract : The long sequence at Casablanca covers the last 5.5 Ma. 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 of Acheulian assemblages is well documented following recent excavations in various sites around the well known locality of Sidi Abderrahmane (Bears Cave, Cap Chatelier, Unit L and Hominid Cave at Thomas Quarry 1, Rhino Cave at Oulad Hamida Quarry 1, Sidi Abderrahmane Extension and Sidi Al Khadir open-air sites). The Casablanca sequence 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.

It was a stroke of luck for archaeologists that Sultan Moulay Abdelaziz decided to build a modern harbour at Casablanca. Work began in 1907 and large quarries were immediatly dug. The ocean destroyed the work twice, but it was continued and considerably extended. In 1913, the French company, Schneider, was given the contract and in 1919, it was decided that rocks would be used to build the jetties instead of concrete, in part due to the "sexcellent quarry at Sidi Abderrahmane". Archaeological discoveries followed. Only a few cities in the world can claim such an amazing heritage hidden below their streets, a heritage difficult to preserve (Raynal et Geraads, 1993), and many researchers have contributed towards bringing it to light, through outstanding joint projects (including Neuville et Ruhlman, 1941 ; Lecointre, 1952 ; Gigout, 1956 ; Biberson, 1961a et a). We will give here only a brief overview of the diversity of these endeavors.

A joint Morocco-France research program, began in 1978 in Casablanca area, well known for its prehistoric heritage and its well-preserved Quaternary sequences (figure 1). This has allowed the stratigraphic reappraisal in particular of the classic sites, among which, the Thomas Quarry sites had earlier produced several hominid remains (Geraads, 1980, Geraads *et al.,* 1980 : Debénath *et al.,* 1982). In Thomas Quarry 1, archaeological elements dating to the Lower Acheulean have been discovered since 1986. Several excavations have also been carried out at different Middle Pleistocene sites : Rhino Cave at Oulad Hamida 1 Quarry, Bear Cave and Cap Chatelier at Sidi Abderrahmane, and the Sidi Abderrahmane Extension (Raynal *et al.,* 1995) Moreover, new and important palaeontological sites have been discovered in the older part of the sequence, dated between 2.4 and 5.5 Ma. They provide a considerable amount of new informations on biological environments for these key periods.

Between Wadi Mellah to the Northeast and Dar Bou Azza to the Southwest, the hinterland of Casablanca is characterised by a series of large barrier systems sub-parallel to the present-day Atlantic coast. Intertidal depositional units, dune formations characteristic of regressive sequences, alteration facies (karsts, palaeosols) and reworked deposits are associated with each of these morphological units. Stretching from 180 m a.s.l. down to the current sea leval, these terraces form the long «Quaternary sequence» of Casablanca (Biberson, 1961; Stearns, 1978). The long sequence of Casablanca is an exceptional record of global oceanic level variations relative to the fluctuations of the global glaciation in the high latitudes since the final Miocene. Age estimates for the different phases of this sequence have been established by various methods :

lithostratigraphy, biostratigraphy, absolute dating (OSL, ESR), palaeomagnetism and aminochronology (Texier *et al.,* 1985, 1987, 1994 ; Occhietti *et al.,* 1993 ; El Graoui, 1994 ; Lefèvre *et al.,* 1994). The biological and chronostratigraphical framework for prehistoric Meseta is now much more firmly established than it was just ten years ago (Raynal *et al.,* 1995) (tables 1 and 2). It can now be compared to the East African one. Still it needs refining and could indeed be improved, in particular for the Lower Pleistocene.

1 - Mio-Pliocene environments :

Mio-Pliocene environments are characterized at extremely rich palaeontological sites, for example Lissasfa and Ahl-Al-Oughlam. These have not yet yielded hominids remains or artefacts - only geofacts. This is the first point to be stressed: no ancient pebble-tool culture has yet been discovered in Morocco. None of the sites previously decribed by Biberson as illustrative of the different stages of pebble-culture can stand up to a detailed analysis.

The bottom of the sequence has been dated at the locality of Lissasfa, discovered in 1995 (Geraads, 1998 ; Raynal *et al.,* 1999). This is a fissure filling in an open quarry south of Casablanca and about 12 km from the present-day shoreline. It has yielded a few large Mammals (cf *Sivatherium* sp., Canid indet.) and an abundant collection of micro-mammals : Chiroptera, Insectivora and many Rodents, of which the following have the most biochronological meaning :

- the Murid *Paraethomys* looks different from all other previously described species of this genus, but reminds of those from Spanish sites close to the Mio-Pliocene boundary,
- the genus *Myocricetodon*, although very rare, points to a Miocene age, because it has almost never been found in the Pliocene,
- the Gerbillid *Protatera* has a very peculiar dental morphology, but looks slightly more derived than other Mio-Pliocene species,
- the Cricetid *Ruscinomys*, very rare in North-Africa, is very primitive by its large third molars.

With four new species, the Rodent fauna of Lissasfa is too original to be easily correlated with any previously established bio-chronological scale, such as that provided by Coiffait-Martin (1991). The site cannot be older than the late Miocene, because of the occurrence of *Mus* and *Paraethomys*, but is not more recent than the early Pliocene, because of the occurrence of *Myocricetodon*, a primitive *Ruscinomys*, and because of the absence of *Golunda*. Finally, this association suggests an age towards the Mio-Pliocene boundary, in the vicinity of 5.5 Ma. These animals also indicate a very open vegetation setting, analogous to the one recognised in the upper Pliocene at Ahl Al Oughlam and related to the global climatic crisis of 2.4 Ma. The palaeontological data from Lissasfa permits a bio-stratigraphic dating based of the long sequence of Casablanca that begins at the Mio-Pliocene boundary in a regional climate context tending towards aridity, synchronous of a generalised lowering of the marine level (Messinian crisis).

The top of the Mio-Pliocene part of the sequence is illustrated by the richest palaeontological site of the Casablanca area, and one of the richest in the whole Africa, Ahl al Oughlam near Tit Mellil, discovered in 1985 and regularly excavated since 1989 (Raynal *et al.,* 1990 ; Geraads *et al.,* 1998). It has yielded more than fifty species of Mammals, including for the first time in North-Africa, a direct association of rich micro- and Macro-fauna (Geraads, 1993a, 1995, 1996, 1997 ; Geraads et Amani, 1998 ; Alemseged et Geraads, 1998). This makes the locality of Ahl al Oughlam by far the best reference locality for the North-African Plio-Pleistocene. Although comparisons are difficult because all North-African sites of this period are much poorer, the fauna allows a rather precise chronological placement of these fissure fillings, posterior in age to the marine level where Biberson had found his so-called pebble-culture:

- numerous Equid remains all belong to the three-toed *Hipparion* and the absence of *Equus* is not in doubt. This latter genus was probably widespread in Europe and Africa by about 2.5 M. a., and an age of 2.2 Ma for Ahl al Oughlam is certainly a minimum estimate ;
- the Suid *Kolpochoerus* is specifically distinct from East-African forms but, assuming similar rate of dental evolution, Ahl al Oughlam compares favourably with Omo member D, at c.a. 2.4 Ma,
- the Carnivores are more diverse than in any other African locality, they remind of those of the Middle/Upper Pliocene East-African sites, small Hyaenas, Acinonyx, Panthera,
- Bovids are slightly more primitive than those of the Plio-Pleistocene boundary in East-Africa, but the Giraffid *Sivatherium* is more clearly of Pliocene affinities,

- Rodents as for example *Paraethomys* are slightly more primitive than those of Irhoud Ocre, a site probably dating from the latest Pliocene.

Thus, on the whole, the fauna indicates a very open vegetation setting, related to the global climatic crisis of 2.4 Ma. At this moment, Hominids are not present at Ahl Al Oughlam. Moreover, considering that no artefacts have been found in Upper Pliocene formations, but only geofacts, there is for now no clear evidence for hominids presence in this part of Maghreb. Unhappily, the Lower Pleistocene formations at Casablanca never yielded any archaeological layer but only a few mammals remains. The first clear evidence for human activity is found in Upper Lower Pleistocene, at Thomas - Oulad Hamida Quarries complex.

2 - The Lower-Middle Pleistocene transition

This period is best illustrated in Thomas Quarry 1 where the oldest lithic assemblages of the Casablanca sequence are found in Late Lower Pleistocene deposits, circa 1 Ma, in unit L, and consist of Acheulian artefacts made of quartzite and flint (Raynal et Texier, 1989). The assemblage contains flakes struck from discoidal cores and polyhedrons. Besides chopping-tools, polyhedrons and some cleavers, trihedrons and bifaces form the most characteristic element within the tools (figure 2). They are often partial only and usually display lateral or lateral-distal concavities, that make up the point of the bifaces (figure 3). A comparison of the probable use of the objects identified in our classification with experimental results leads to conclude that activities of stone working, hide slitting, heavy-duty butchery and bone breaking were performed in unit L1; dominative stone working and light-duty butchery characterize unit L5.

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. Hippo, zebra and gazelle 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. Micromammals, 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 M. a., in full accordance with typology and technology of the artefacts, and with the paleomagnetic data obtained by Sevket Sen.

3 - Middle Pleistocene and the Acheulian sequence

Middle Pleistocene levels are represented in the Oulad Hamida 1 Quarry, where the Rhino cave has yielded a rich collection of micro and macromammals that indicate a rather open and dry environment, associated with a rich acheulian assemblage and is now one of the best reference levels for this period in North-Africa (Raynal *et al.,* 1993 ; Geraads, 1993b ; Rhodes *et al.,* 1994). The abundant remains of white rhinoceros suggest specialized hunting by hominids, though scavenging cannot be discarded. Compared to the local early Acheulian, one can observe an increase of discoidal cores and of flake production ; cleavers are rare while bifacial pieces are larger, characterized by convex and/or concave edges that constitute a pointed extremity (figures 4, 5). 3485 artefacts have been removed from the bottom layer for a 70 m2 excavation. Tools on flakes represent only 3,5% of the assemblage and are dominated by notches and denticulates, the others being different types of scrapers and some multiple tools. Stone working was important in this site, along with hide slitting, light and heavy-duty butchery and bone breaking.

The assemblage recovered in a 65 m^2 excavation of the Hominid level at Thomas Quarry 1 is quite different from the series of the Rhino Cave bottom unit, as it is dominated by flaked pebbles, but comparable to the (too) small series from Rhino Cave top unit and series collected at the time of the discovery of the *Homo* jaw in 1969. Geological studies demonstrated that this assemblage was not in primary position but had been secondarily introduced in the cave, presumely removed from the entrance and transported by run off which mixed fauna remains and artefacts. But the macrofauna is similar to the one from Rhino Cave, but dominated here by carnivoras (bears, hyaenas and *Canis*) (Bernoussi, 1997). Three new teeth of *Homo* have been recently recovered in this level (Zouak, unpublished). This Thomas Quarry 1 Hominids Cave is vast and some parts of the stratigraphy are still under study (figure 6). Both preliminary dates, biostratigraphic and lithostratigraphic data point towards a greater antiquity than it was previously estimated, 0.4 Ma being a minimum.

The relatively great antiquity of these two faunal sets from these caves 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 (table 3). 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. Micro-mammals allow refinement of the biochronological succession within this faunal unit. The best collection is from the Rhino cave (OH1-GDR ; 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, agree to place these levels circa 0.6/0.7 Ma, and this is another new perspective.

The recent phases of the Acheulian sequence are well illustrated in the classic Sidi Abderrahmane localities. At Sidi-Abderrahmane-Extension, we observe an important use of block-fragments and frequent recycling of rolled artefacts mith 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 rares here as if they had become useless with the increase of new bifacial patterns. Stone working was important at this site, along with hide slitting, light-duty butchery and bone breaking.

The uppermost part of the Acheulean sequence is represented at the Cap Chatelier site, with an age in excess of 200 Kyr (optically stimulated luminescence dates by Rhodes 1990) : production of predetermined flakes and thin, small bifaces, a diverse set of tools on flakes and a very few cleavers. This Acheulian is the technical reservoir which evolves later to give, before the last interglacial, Mousterian facies associated with modern humans, as demonstrated at Djebel Ihroud.

4 - Variability among the Acheulian

The exploitation of the same raw materials throughout the Acheulean sequence at Casablanca allows a comparison of the technological characteristics of some representative series. They are presented here along the lines of the classification model developed on basis of a study of the assemblages from Unit L of the Thomas quarry, briefly explained below. 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 (specifie morphology, transformation by usage...). 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 strikîng platforms for one and the same working surface

Group 4: flaking using three to five non-cortical striking 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 flaked surfaces this group contains the majority of complex and/or typical objects. The most complete bifaces as well as the best exploited cores are within this group.

Group 5: flaking from non-cortical striking platforms belonging to various working surfaces.

Group 6: exploitation/shaping of flakes and fragments

Group 7: objects transformed by usage. With cores on flakes and fragments and tools on flakes testifies to the final stages of the knapping process. Items transformed by usage or re-utilization are at the origin of part of the observed assemblage variability.

The group-subdivisions thus repose upon technological and/or secondary morphological criteria (such as re-use of striking platforms, recurrence of flake removals, length of blanks (both arteficial and natural ones), surface size of flake removals and presence/absence of cortex). A comparison can be made with categories defined by J. and N. Chavaillon (1981) :

J.et 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 voire 5B, 7A
Bolas	7A

The raw material, abundantly available in all sizes, 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 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) Bears Cave (GDO), Cap Chatelier, Sidi Abderrahmane Extension (SAE) and Sidi Al Khadir open-air sites.

Sites Age est.	TH1/L1 >0.78 Ma		TH1/L5 <0.78 Ma		TH1/GH 0.4/0.6 Ma ?		GDR 0.4/0.6 Ma ?		GDO 0.4 Ma		SAE <0.4 Ma	
	n	%	n	%	n	%	n	%	n	%	n	%
Groupes												
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*

The series demonstrate an alternation between industries rich or not in bifacials but are all supposed to belong to the Acheulian technocomplex (figure 7). 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). 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.

Bifacials also Bears 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.

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 (excavated on a 1000 m^2 surface) where small flakes and bone fragments have been washed or concentrated and where fabrics 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 m^2).

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. Perhaps different camivoras have acted in these sites as providers and scavengers, thus different meat ressources where offered to hominids, and different tool kit was employed...

Finally, among the progressive transformations of assemblages, thresholds appear that could be linked with human evolutionary steps, reflect different biomechanical solutions or simply mark different capacities for predetermini,g flaking actions. An example would be the remarkably regular change over time of the angle formed by the directions of the two flake removals that initiates two sequences of flake removals on one (or two) working surfaces. But this is another story which is still to write.

In our opinion, the Casablanca sequence offers now useful data for comparison with other African areas where hominids appeared and developed, and should be considered in the debate on the earliest occupation of Europe. For instance, we might view in it technological and biological evidences for supporting a multiple "Out of Africa" hypothesis and reconsider the debate about crossing mediterranean straits.

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	LITHOSTRATIGRAPHIE D'après travaux récents (1978-1996) (1) et inédits		Altitude > mer	CHRONOLOGIE Ages (3,4,5,6,7)	Aminozones Maroc (2)	Stades isotopiques	SERIE CLASSIQUE DE CASABLANCA (BIBERSON, 1961)		OUTILLAGES LITHIQUES Technologie et classification d'après les travaux récents (1978-99) (8)	SITES MAJEURS Fouilles récentes (9)	FOSSILES HUMAINS	FAUNES MAMMALIENNES Principaux taxons (14)
HOLOCENE	FORMATION DE REDDAD BEN ALI		0-2 m	1 à 3 ka OSL (3) 3,7 à 3,5 ka BP	H	1	MELLAHIEN	Néolithique	Néolithique moyen à final	El Kiffen	Nécropole : Protomediterranéens (10) hétérogènes	
								Ibéromaurusien	Ibéromaurusien	Grotte Velozzo		Carrière Oulad Hamida 2, Grotte des Félins, sommet : *Panthera, Hyaena, Canis, Vulpes Dicerorhinus hemitoechus Sus scrofa, Phacochoerus Equus, Gazella, Connochaetes...* grotte des Félins, base : *Panthera, Felis, Canis, Vulpes Crocuta, Equus, Camelus, Phacochoerus...*
PLEISTOCENE SUPERIEUR	FORMATION DE DAR BOU AZZA	Membre de Lahlalfa			S	4 à 2	SOLTANIEN	Atérien	Atérien	Oulad Hamida 2 : grotte des félins; ? Limons rouges de Sidi Abderrahmane ?		
		Membre de l'Aïn Roummana	0-6 m		O	5	OULJIEN					
PLEISTOCENE MOYEN	GROUPE DE KEF EL HAROUN	Formation de Bir Feghloul	7-8 m	164 ka OSL (3)	BF	6 7						
		Formation d'Oulad Aj Jmel	9-11 m	320 ka OSL (3) 350 ka OSL (3)	OAJ	9	HAROUNIEN		Acheuléen supérieur			
	GROUPE D'ANFA	Complexe continental de Sidi Abderrahmane		390 ka OSL (3)		11	PRESOLTANIEN (D2); TENSIFTIEN (D0, D1)	Acheuléen évolué Stade VIII; Ach. évolué Stade VII; Ach. moyen Stade VI		Cap Chatelier sommet; Grotte des Littorines; ? Sidi Abderrahmane Extension	Sidi Abderrahmane (11)	
		Formation 3	20-23 m		Pré-OAJ		ANFATIEN (G)	Ach. moyen Stade V; Ach. moyen Stade IV	Acheuléen	Cap Chatelier base Grotte des Ours; ?		Sidi Abderrahmane Cunette, Grotte des Ours : *Ursus, Gazella, Redunca*
		Formation 2	18-20 m							?		
		Formation1	17-20 m	>0,4 Ma U/Th (4)	Pré-OAJ	≥11	AMIRIEN (H) MAARIFIEN (J) et complexe K-L-M-N-O	Ach. ancien I, II, III Pebble-C. Stade IV	? Acheuléen ancien	Sidi Abderrahmane Grande Exploitation site B		
	GROUPE D'OULAD HAMIDA	Formation 3	29-32 m	0,6/1,0 Ma OSL (3)			Depôts des carrières Thomas precédemment rapportés à l'AMIRIEN et l'ANFATIEN			carrière Thomas I Grotte à Hominidés et Oulad Hamida 1 Grotte des Rhinocéros	Thomas I et Thomas III (12,13)	Oulad Hamida 1, grotte des Rhinocéros *Lycaon, Ursus, Crocuta, Canis Ceratotherium simum, Equus Parmularius, Phacochoerus Theropithecus...*
		Formation 2	32-35 m									
?		Formation 1	28-35 m	0,8/1,4 Ma OSL (3) polarité inverse (5)	Pré-OAJ	>21			Acheuléen ancien	Carrière Thomas1, Unité L		Carrière Thomas I, Unité L : *Hippopotamus, Equus Gazella, Loxodonta...*
PLEISTOCENE INFERIEUR		Carrière Ghandour Ben Habib	45 m		Pré-OAJ		MESSAOUDIEN, SALETIEN et MAARIFIEN des anciennes carrières du Maarif et de l'aéroport d'Anfa	Pebble-Culture Stade III	Pas d'artefact *in situ*			
		Carrière Dar Bouchaïb O. Caïla	<67 m									
		Carrière Tal'at Al Ghorbal	80-85 m		Pré-OAJ							
?		Sidi Messaoud unité 2	90-97 m	≤1,8 Ma (6) Mineralogie	Pré-OAJ		MESSAOUDIEN des anciennes carrières Haj Salah Ben Tahar Gaudin I et II Bona Déprez et Bouchaïb Bel Kamel					Ahl-Al-Oughlam, unité 2 : *Macaca, Theropithecus, Ursus Panthera, Pliocrocuta, Acinonyx Anancus, Ceratotherium Hipparion, Sivatherium, Kobus Kolpochoerus phacochoeroides,* Alcelaphini...
PLIOCENE		Ahl-Al-Oughlam unité 2	108 m	Biochronologie ± 2,5 Ma (7)					Géofacts	Ahl-Al-Oughlam		
		Ahl-Al- Oughlam unité 1	≥103 m					Pebble-Culture Stade II		Ancienne Carrière Déprez		
		Bir As Smar	115 m							Bir-As-Smar		
		Formation de Mediouna	170 m	Biochronologie ± 5,50 Ma (7)			PLIOCENE					Lissasfa : microfaune *Paraethomys, Mus, Myocricetodon Ruscinomys, Protatera, Lophiomys Irhoudia, Atlantoxerus*

Outillages lithiques : BG NO L T S H B ODE Q RS

BG : débitage de blocs et galets
NO : Nucléus organisés
L : Débitage Levallois
S : Sphéroïdes
T : Trièdres
B : Bifaces
H : Hachereaux
ODE : Outils diversifiés sur éclats
Q : Quartzite local seulement
RS : Recherche de silex

Faciès : I : Intertidal
S : Supratidal
C : Continental

(1) TEXIER, LEFEVRE, RAYNAL (1994, 1996) ; LEFEVRE et al (1994, 1996)

(2) OCCHIETTI et al (1993)
(3) RHODES (inédit)
(4) SCHWARCZ (in litteris)
(5) SEN (in litteris)
(6) EL GRAOUI (1994)
(7) GERAADS (1993, 1995, 1998)

(8) DEBENATH et al (1982), RAYNAL et TEXIER (1989), RAYNAL et al (1993) et données DEBENATH, MAGOGA, RAYNAL, SBIHI-ALAOUI, TEXIER, inédites

(9) Fouilles par DEBENATH, GERAADS, RAYNAL, SBIHI-ALAOUI, TEXIER

(9) LACOMBE, inédit
(10) BIBERSON (1956)
(12) ENNOUCHI (1969, 1972)
(13) RAYNAL et al, inédit

(14) GERAADS (1993, 1997, 1998) GERAADS in RAYNAL et al (1990, 1993), BERNOUSSI (1997)

Table 1 : The Casablanca sequence: a synthesis after recent excavations and field surveys compared to previous hypothesis.

Table 2 : The Casablanca faunal sets in a revised biostratigraphy of North-African faunas by Geraads

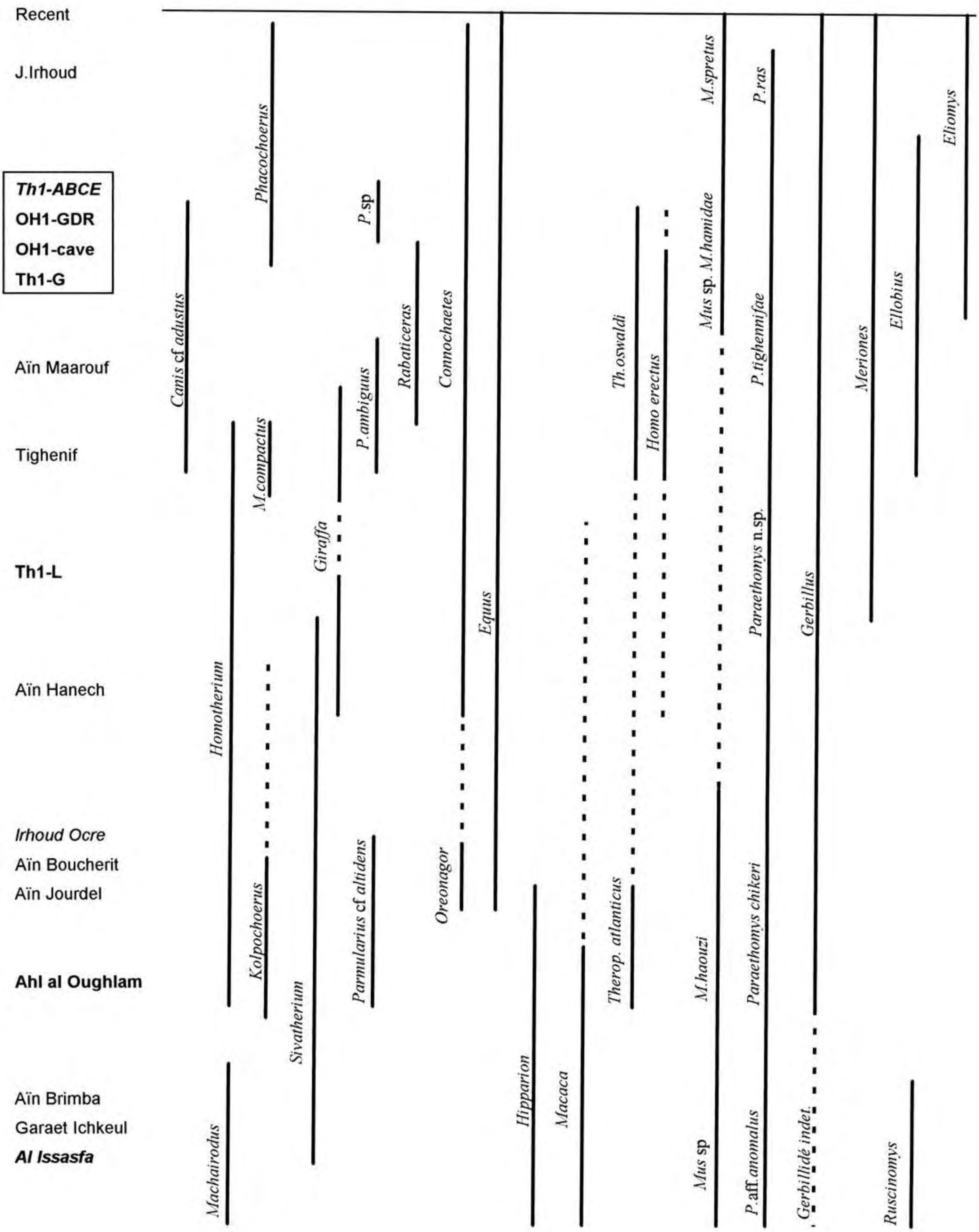

Table 3 : Detailed faunal lists of the different Thomas Quarries sites by Geraads

OH1-GDR *= Th III-fiss seulement	Th III-grotte à H.erectus	Th I-ABCEF	Th I-grotte à H.erectus	TERNIFINE
Canis cf *adustus*	*Canis* cf *adustus*		*Canis* cf *adustus*	*Canis adustus*
Lycaon sp			*Lycaon* sp	
Ursus bibersoni	*Ursus bibersoni*		*Ursus bibersoni*	
Crocuta crocuta			*Crocuta crocuta*	*Crocuta crocuta*
Hyaena cf *hyaena*			*Hyaena* cf *hyaena*	
Panthera cf *leo*				
Felis cf *silvestris*				
Lynx thomasi *				
Phacoch. cf *africanus*	*P.* cf *africanus*		*P.* cf *africanus*	*Metridiochoerus compactus*
Camelus sp				*C.thomasi*
Bovini indet.			Bovini indet.	*Bos* cf *bubaloides*
			Oryx sp	*Oryx* cf *gazella*
Parm. cf angusticornis			*Alcelaphini indet*	*P.ambiguus*
Parmularius sp ?	*Rabaticeras arambourgi*			
	Connochaetes taurinus prognu		*Connochaetes taurinus prognu*	*Connochaetes taurinus prognu*
Gazella cf *atlantica*	*Gazella cf atlantica*		*Gazella cf atlantica*	*Gazella* cf *atlantica*
Equus cf *mauritanicus*	*E.* cf *mauritanicus*		*E.* cf *mauritanicus*	*Equus mauritanicus*
Ceratotherium simum	*C. simum*		*C. simum*	*C.simum*
Eléphantidé indét. *			Eléphantidé indet.	*Loxodonta atlantica*
Therop. cf *oswaldi*	*Th.* cf *oswaldi*		*Th.* cf *oswaldi*	*Therop.oswaldi*
Mus hamidae		*Mus hamidae*	*Mus* sp.	
Praomys darelbeidae		*P.pomeli*	*Praomys* sp	*P.eghrisae*
Paraethomys tighennifae		*P. tighennifae*	*P.tighennifae*	*P.tighennifae*
Gerbillus grandis minor		*Gerbillus grandis*	*G.grandis*	*G.cingulatus*
*G.*cf *campestris*		*G.*cf *campestris*		*G.major*
Meriones maximus		*Meriones maximus*		*Meriones maximus*
M. maghreb. hamidae		*M. maghrebianus*	*M. maghrebianus*	*M.maghrebianus*
E.atlanticus		*E.atlanticus*	*Ellobius* sp	*E.africanus*
Eliomys darelbeidae		*Eliomys* sp	*Eliomys* sp.	
Hystrix cf *cristata*	*Hystrix* cf *cristata*	*Hystrix* cf *cristata*	*Hystrix* cf *cristata*	*Hystrix* cf *cristata*
Serengetilagus raynali				
Lepus cf *capensis*				*Lepus* cf *capensis*
Crocidura darelbeidae		*Crocidura* sp	*Crocidura* sp	
*C.*cf *tarfayaensis*				
Erinacéidé indet.				Erinacéidé indet.
Chiroptère indet				

Sont de plus présents à Ternifine, mais non dans les carrières Thomas-Oulad Hamida:

Giraffa cf *pomeli*, *Tragelaphus algericus*, *Hippotragus* cf *gigas*, *Kobus* sp, *Gazella dracula*, *Gazella* sp.

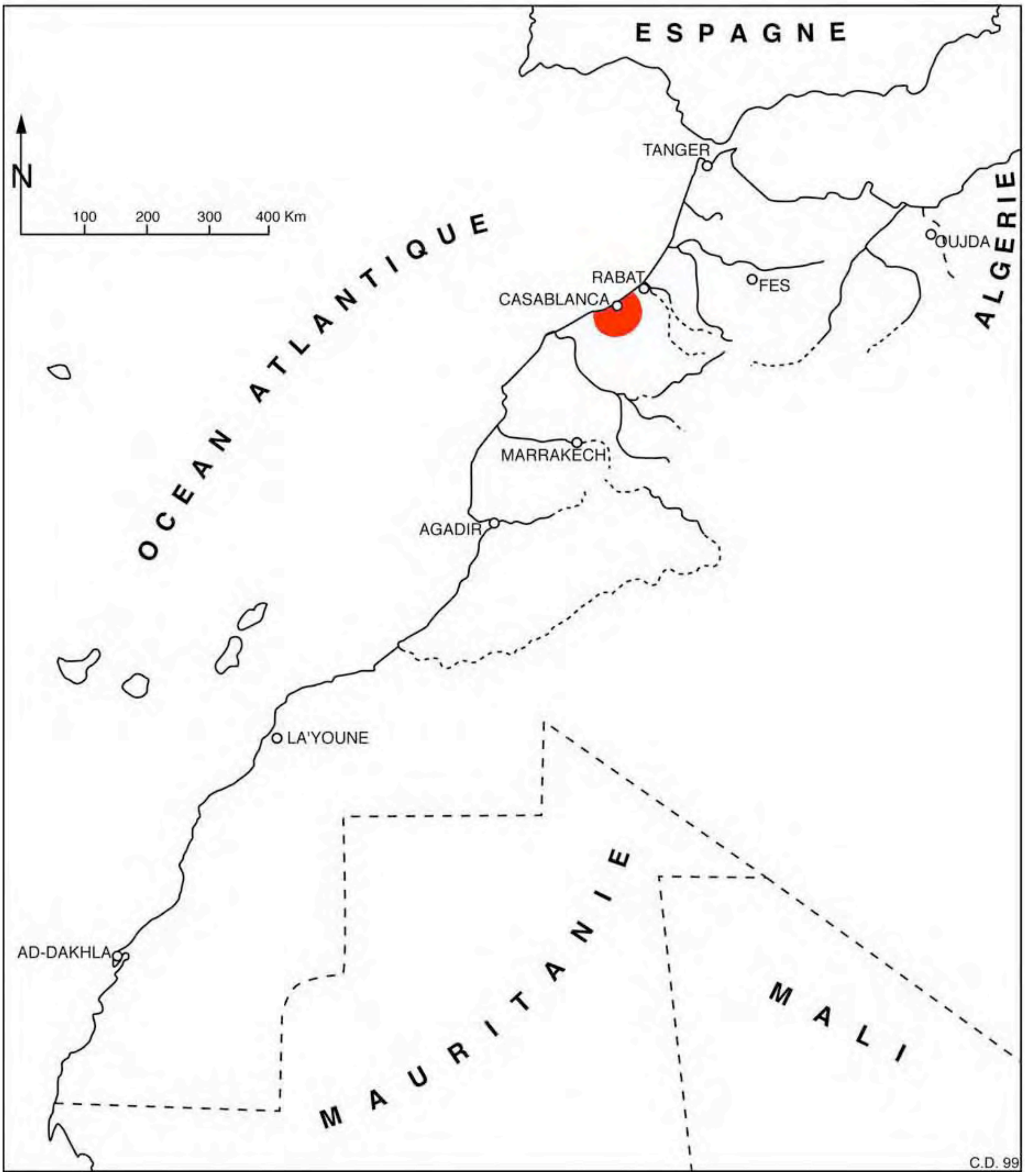

Fig. 1 – Location map *Carte de localisation*

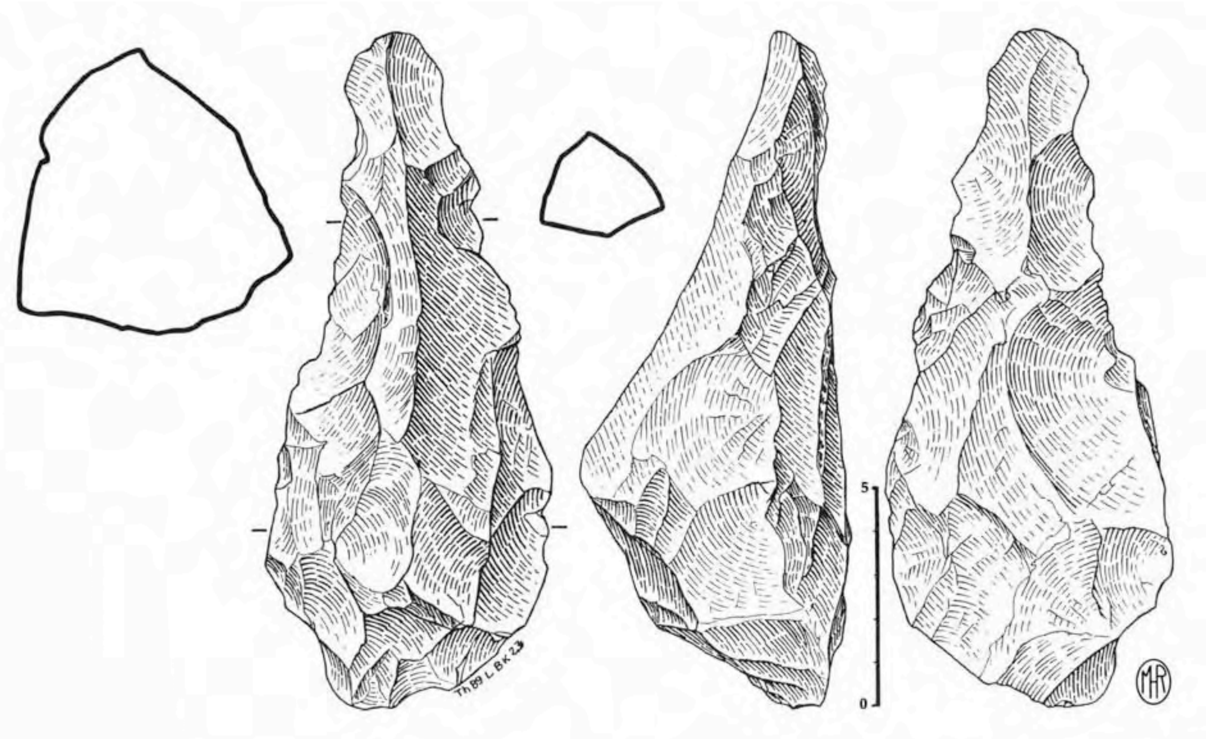

Fig. 2 - Casablanca, Thomas 1 Quarry, Unit L1, classical trihedron, quartzite.

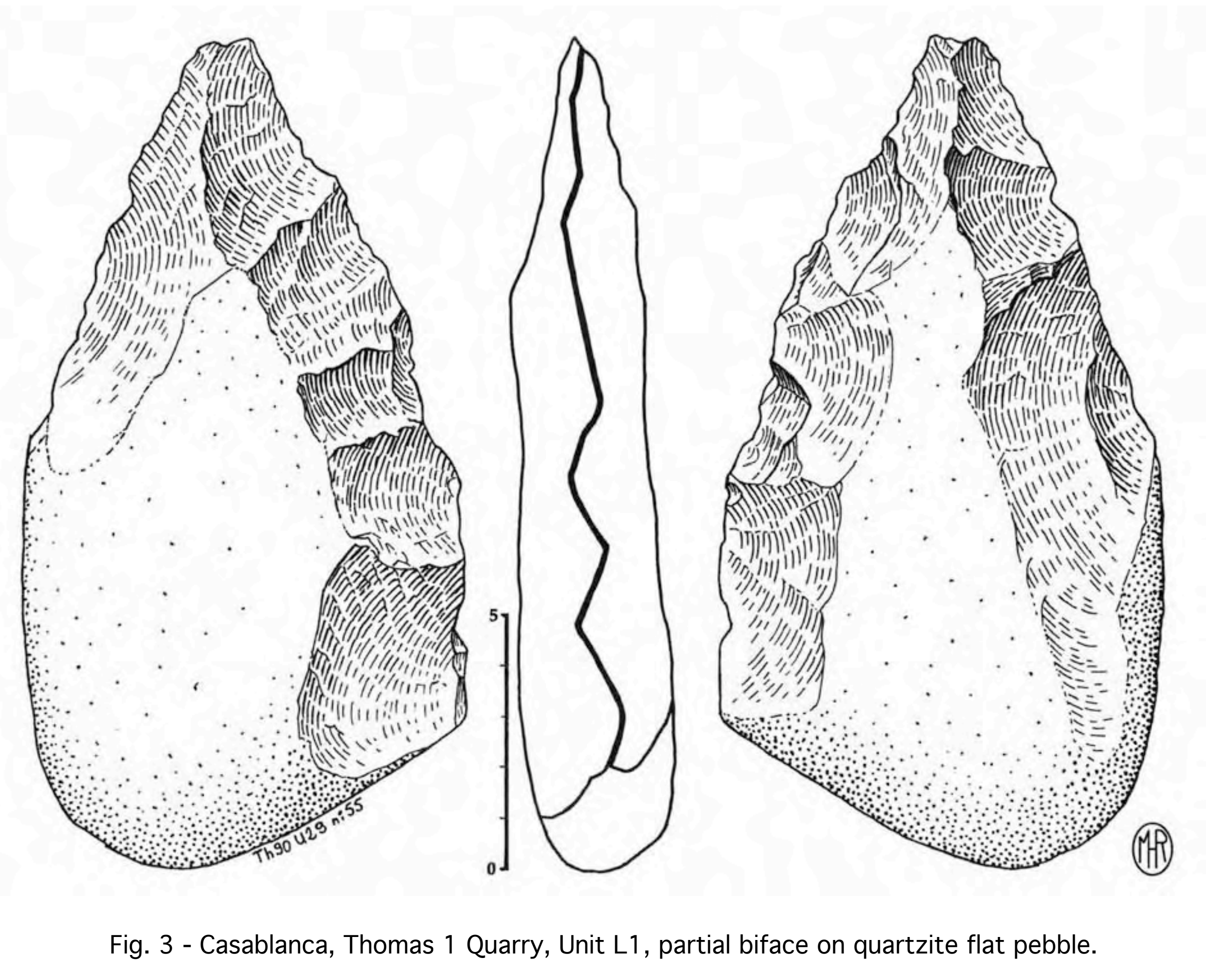

Fig. 3 - Casablanca, Thomas 1 Quarry, Unit L1, partial biface on quartzite flat pebble.

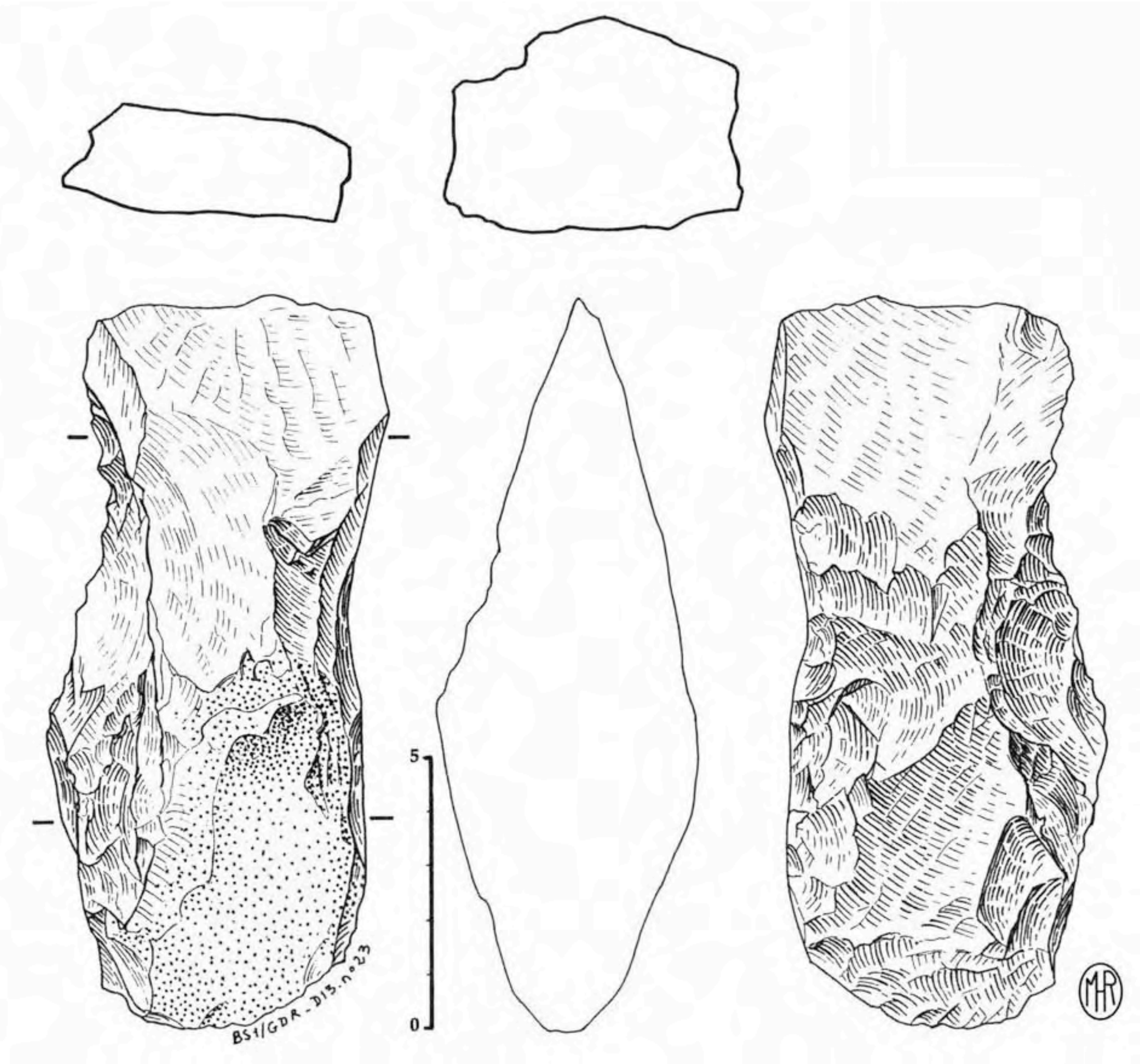

Fig. 4 - Casablanca, Oulad Hamida 1 Quarry, Rhinoceros cave, cleaver, quartzite.

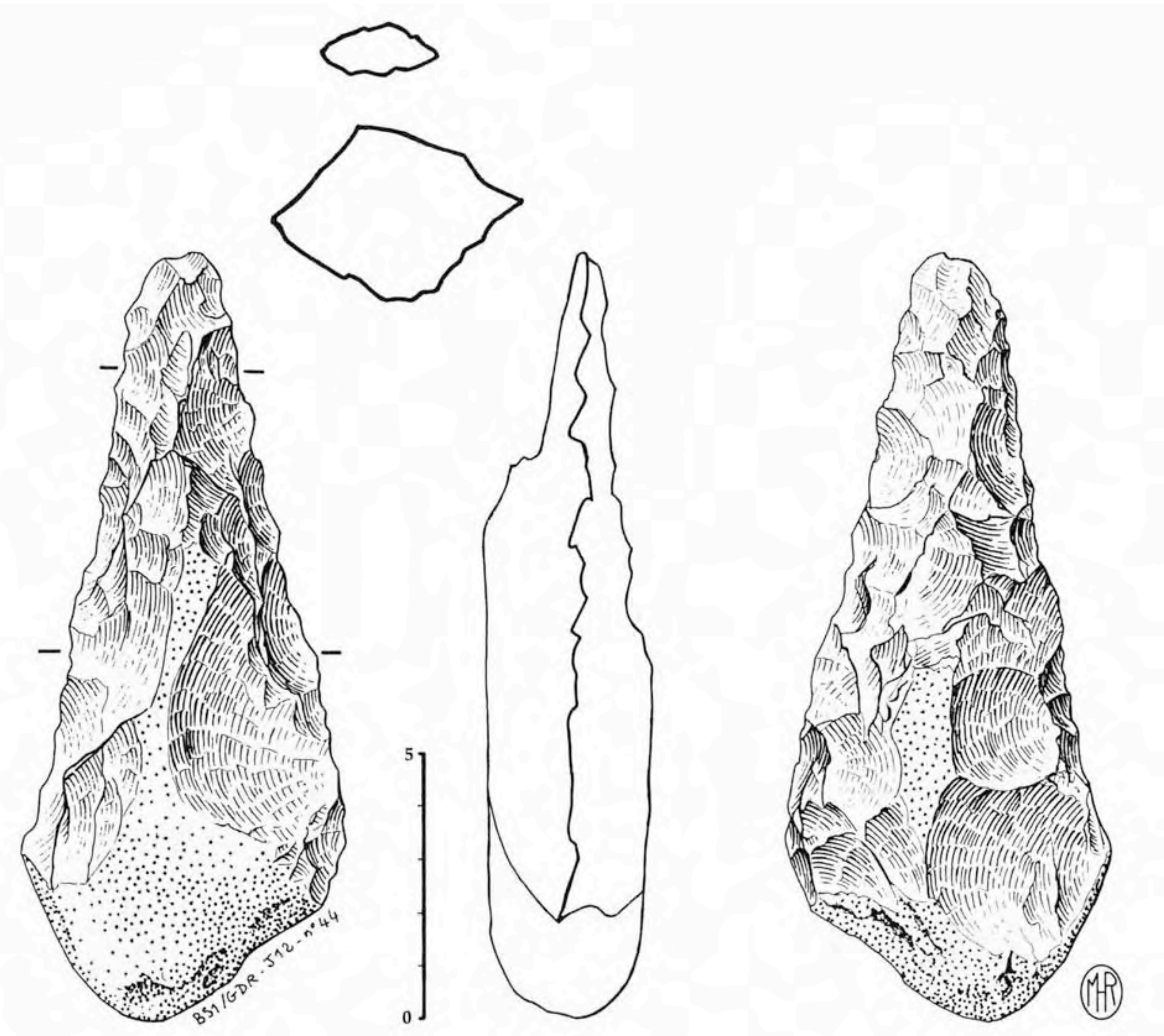

Fig. 5 - Casablanca, Oulad Hamida 1 Quarry, Rhinoceros cave, small lanceolate bifacial, quartzite.

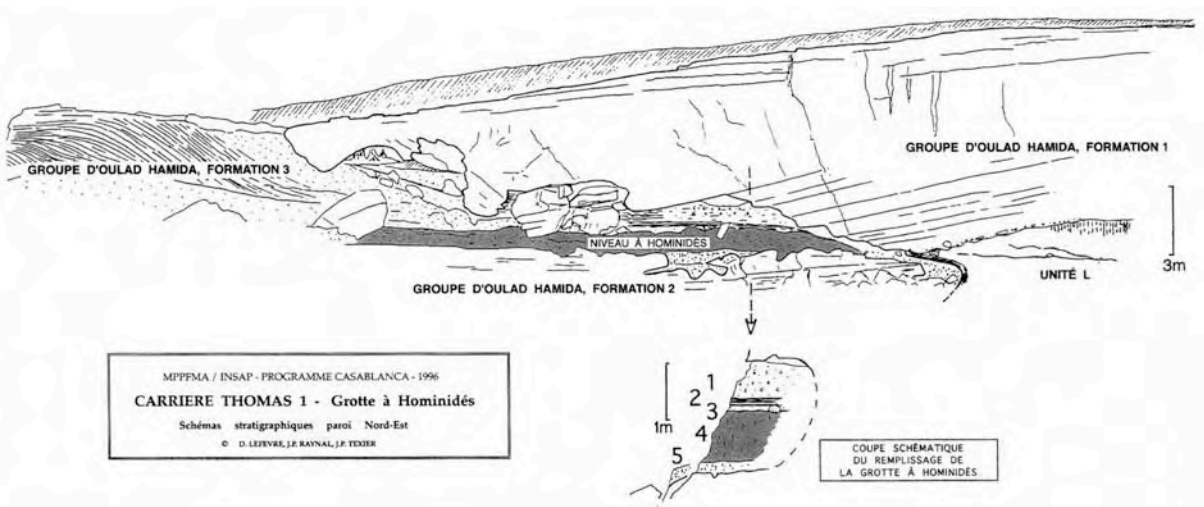

Fig. 6 - Thomas Quarry 1, Hominid Cave stratigraphy.

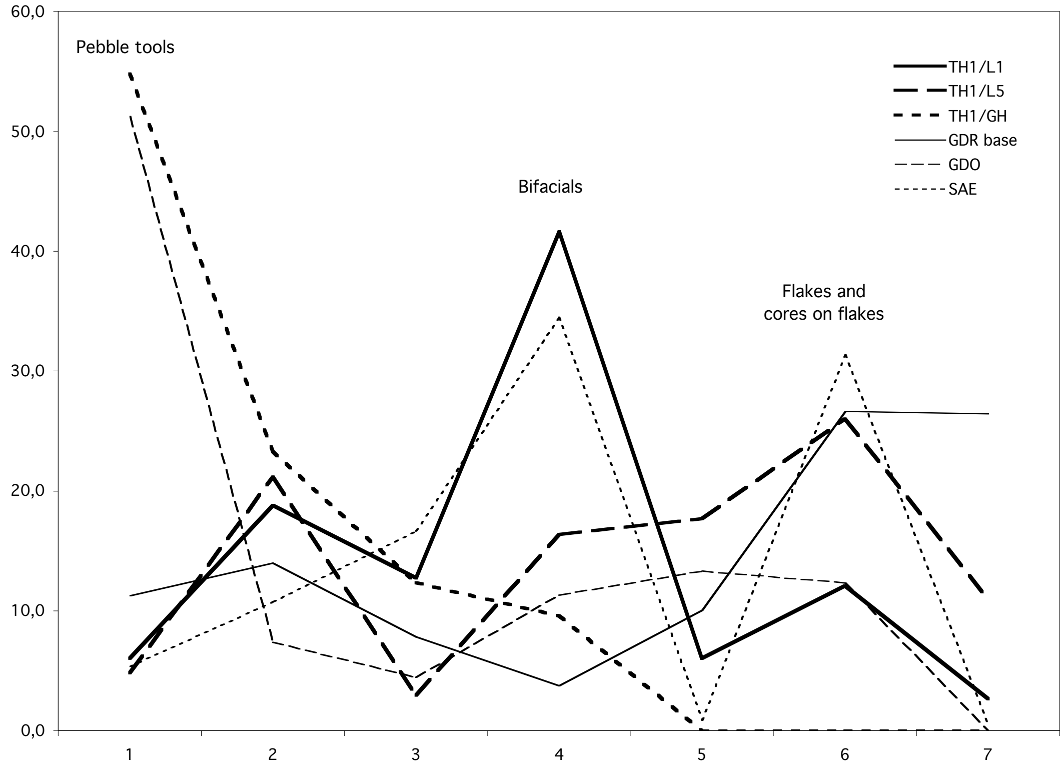

Fig. - 7 : Distribution of technical groups in key-sites of the Casablanca acheulian sequence.

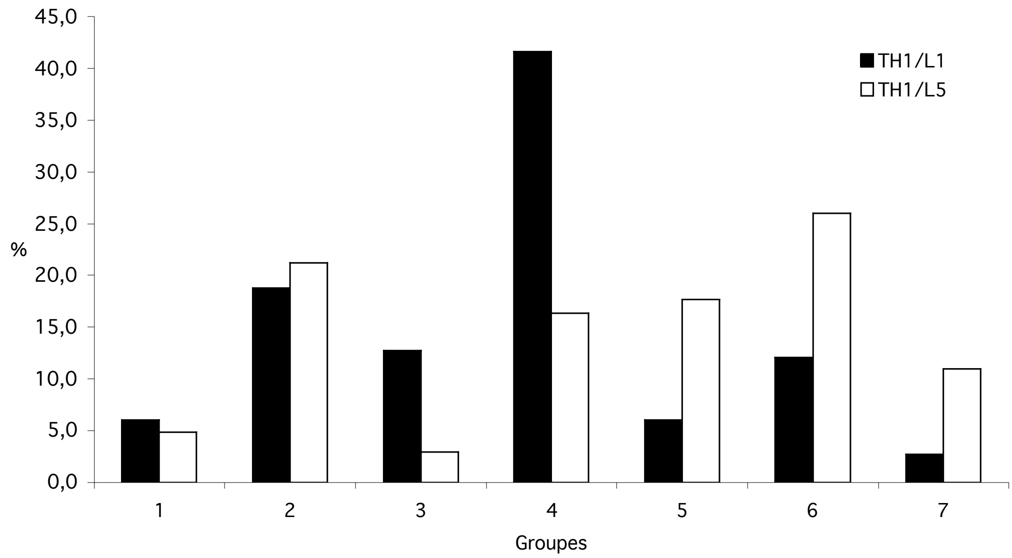

Fig. 8 - Distribution of technical groups in archaeological units L1 and L5 at Thomas Quarry 1.

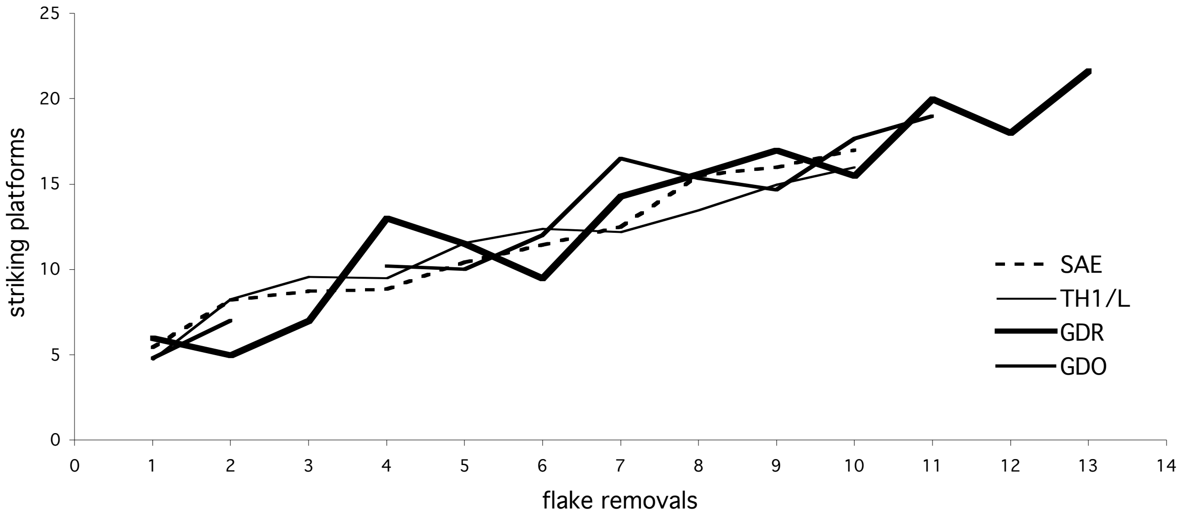

Fig. 9 - Correlation between the number of flake removals and the number of strikings platforms on quartzite artefacts from key-sites of the Casablanca acheulian sequence.

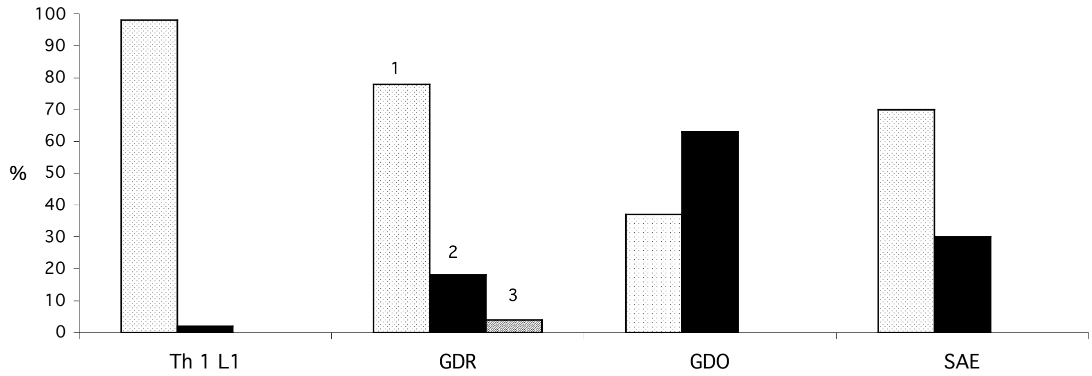

Fig. 10 – Morphology of proximal parts of bifacials. 1: natural or unretouched. 2: cutting. 3: polyedric.

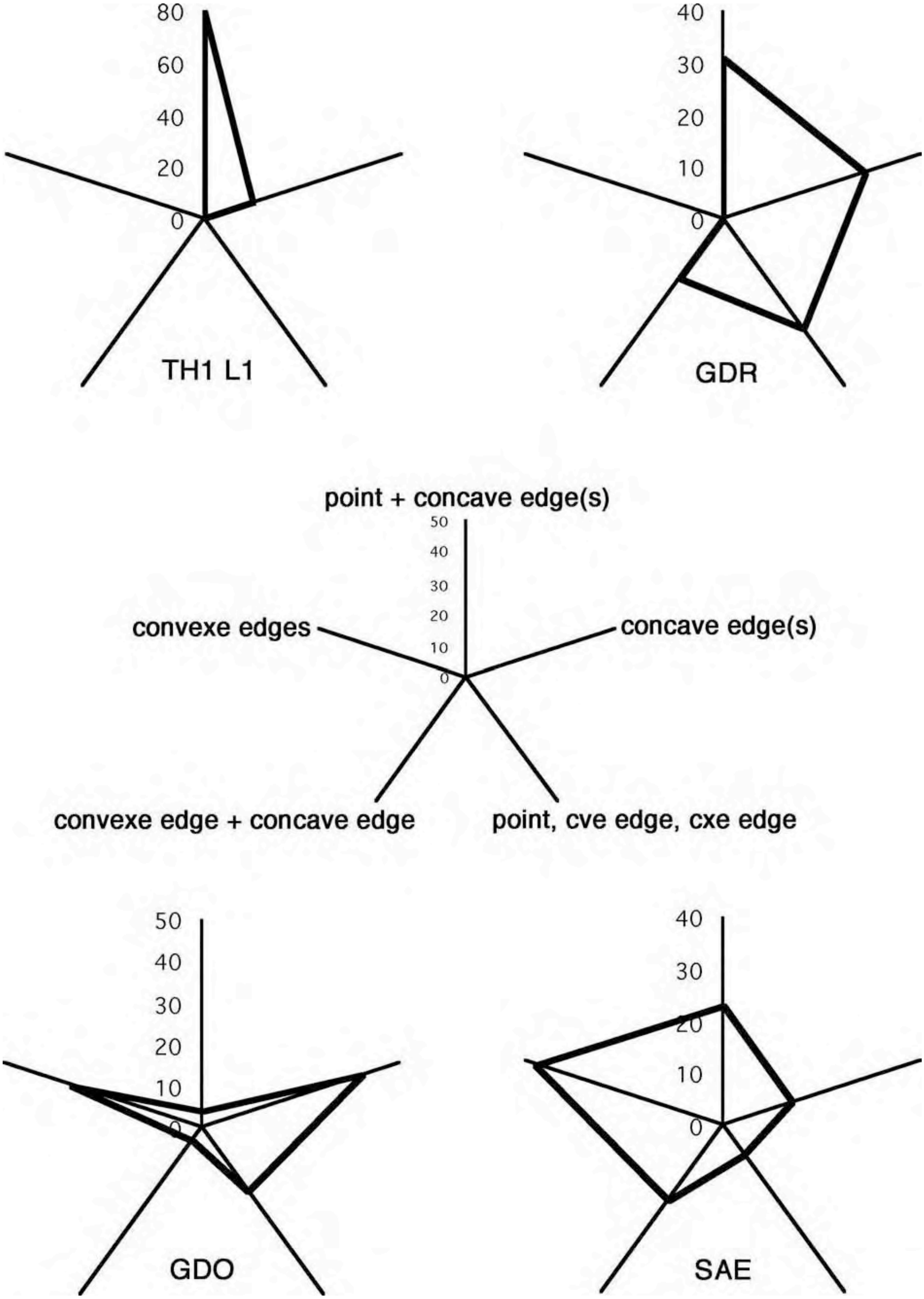

Fig. 11 – Compared morphology of bifacials in key-sites of the Casablanca acheulian sequence. TH1 L1: Thomas Quarry 1 unit L1. GDR: Rhinoceros Cave Oulad Hamida 1 Quarry. GDO: Bears Cave at Sidi Abderrahmane. SAE: Sidi Abderrahmane Extension.